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# HARDINESS AND GROWTH OF WOODY ORNAMENTAL PLANTS

## REPLOQ RESULTS AND RECOMMENDATIONS

## VOLUME V

**Claude Richer**
**Jacques-André Rioux**

Canada

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# HARDINESS AND GROWTH OF WOODY ORNAMENTAL PLANTS VOLUME V

## REPLOQ Results and Recommendations

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# FOREWORD

This fifth volume has been produced by REPLOQ (Réseau d'essais des plantes ligneuses ornementales du Québec, or Quebec woody ornamental plant trial network) under the auspices of the ornamental horticulture committee of the Centre de référence en agriculture et agroalimentaire du Québec [CRAAQ, the Quebec agricultural and agri-food reference centre].

This volume contains the results and recommendations for the woody ornamental species evaluated by REPLOQ from 1993 to 1999.

The scientific names of species and cultivars used here are from the *Index of Ornamental Woody Plants of Quebec* published by the CPVQ, or plant production council of Quebec.

## ACKNOWLEDGMENTS

We are particularly grateful to the director of the Horticultural Research and Development Centre, Dr. Denis Demars, for supporting this research project for over 10 years. Once the research itself had been completed, he encouraged us to complete the writing and publication of the series, and provided the resources needed to do so.

The REPLOQ trials were made possible by financial assistance from **Agriculture and Agri-Food Canada** and the **Quebec Department of Agriculture, Fisheries and Food.**

The joint publication of this volume with Canadian Government Publishing has allowed us to produce a professional reference work in two languages, containing a wealth of information for nursery operators and horticulturists. The English translation, by **Agriculture and Agri-Food Canada,** will make the information more widely available.

Our special thanks go to Isabelle Lizée, a secretary at **Agriculture and Agri-Food Canada,** who worked with Claude Richer, patiently going over all the articles a number of times and pulling out all the stops to produce the final version of each one. I would like to thanks Caroline Lafond for researching and obtaining the pictures.

Our thanks to one and all.

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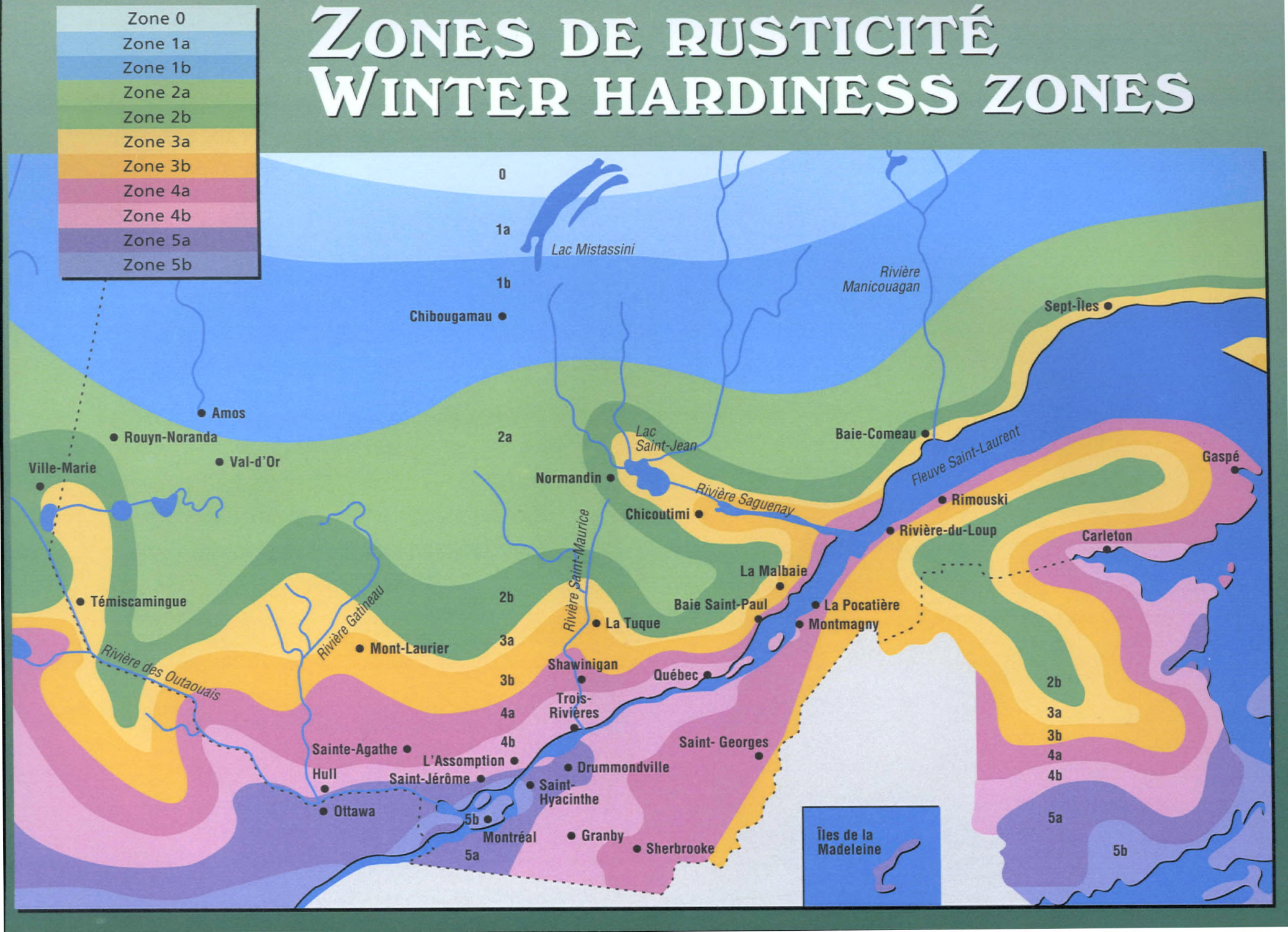


# HARDINESS OF WOODY ORNAMENTAL PLANTS

The climate conditions affecting the winter survival of plants vary from region to region. Latitude, longitude and altitude are some of the criteria used by researchers to define hardiness zones.

Over the years, a number of different systems for defining hardiness zones have been proposed. There is constant debate over the notion of hardiness, however, due to new findings on plant behaviour. The REPLOQ trials have allowed additional progress to be made in this area.

In the United States, hardiness zones for trees and shrubs are based solely on mean monthly minimum temperatures. The United States Department of Agriculture (USDA) has developed a system of plant hardiness zones that covers all of North America, based on records of minimum temperatures at 450 stations from 1898 to 1938. The area ranging from central Canada—including southern Quebec—to the southern U.S. was divided into 10 zones based on a 5.5°C difference in mean minimum temperatures. Each zone was further subdivided into two subzones representing 2.8°C intervals. The map was updated in 1992, based on information compiled from close to 14,000 weather stations over 10 years.

In Canada, a number of researchers have attempted to define hardiness zones. Ouellet and Sherk (1967) proposed hardiness zones based mainly on mean monthly minimum temperatures, but also on the length of the frost-free period, depth of snow cover and wind speed. Zones were based on the probability of adaptation of 174 species and cultivars of woody plants at 108 stations, 15 of them in Quebec. Their system divided Canada into 9 zones and 9 subzones: zone 1a (coldest) to 9b (warmest). Quebec consists of 5 zones, from 1a to 5b. Two hardiness zone maps are shown on the next two pages. Other researchers have made modifications to this work, incorporating the concepts of thermal capacity based on the number of degree-days above the 5.5°C threshold during the frost-free period in the years 1931–60, as well as data from scientific studies for the period 1965–76. The table on page vii shows the correspondence between the 10 U.S. zones and the 9 Canadian zones for comparison purposes.

Landry et al. have identified eight adaptation zones for woody ornamental plants in Quebec, based on a synthesis of bioclimatic data interrelated to better express the difference or sameness of natural regions in Quebec.

Since Ouellet and Sherk dealt with only 174 species and cultivars, the data have been extrapolated to assign hardiness ratings to species and cultivars from other regions, with the help of observers in different countries. Some authors of horticultural books for the general public use hardiness very narrowly to mean a plant's ability to survive under difficult conditions, which is a highly subjective definition. Some even use the terms hardy and non-hardy in an absolute sense. The concept of plant hardiness, however, is a complex and very relative one, depending as it does on not just the genetic capital of the plant but environmental conditions, particularly climate. REPLOQ was established to concretely assess the behaviour and hardiness of woody ornamentals.

REPLOQ's work has led to the development of a NEW way of defining plant hardiness, based on three considerations:

- A rating for SURVIVAL, corresponding to the coldest Canadian hardiness zone where the plant is able to survive, although it suffers winter damage that prevents it from expressing its ornamental characters
- A rating for USE, corresponding to the coldest Canadian hardiness zone where all or at least some of the plant's ornamental potential is achieved, despite the fact that it suffers winter damage
- A rating for achievement of FULL ORNAMENTAL POTENTIAL, corresponding to the coldest Canadian hardiness zone where the plant is generally not affected by the climatic conditions and where it achieves its full ornamental potential

## COMPARISON OF U.S. AND CANADIAN HARDINESS ZONE MAPS OF STUDY AREA

The Canadian hardiness zone map is based on seven climatic parameters (mean minimum and maximum temperatures in the coldest months, precipitation, snow cover, wind speed), while the only criterion used in establishing the U.S. map (updated and published by the USDA in 1990) was mean annual minimum temperature.

Examining the zone maps for the study area (Quebec and northeastern Ontario), the following observations and overall comparisons can be made (see table below):

- U.S. zone 2 includes all of Canadian zone 1 and part of Canadian zones 0 and 2.
- U.S. zone 3 includes large parts of Canadian zones 2 and 3 and part of zone 4.
- U.S. zone 4 covers Canadian zone 5 and a large part of zone 4, which takes in the Eastern Townships, Beauce, lower Laurentians and much of the land along the St. Lawrence estuary.

| **U.S. zones** (USDA, 1990) | **Mean annual minimum temperature** | **Canadian zones** (Ouellet & Sherk, 1967) | **Corresponding regions** |
|---|---|---|---|
| 1a–1b | below -50 °F<br>below -46°C | 0a–0b | Northern Quebec (including part of Lake Mistassini) and northern Ontario; Saskatchewan: La Ronge; Alberta: Fort McMurray |
| 2a–2b | -50 to -35°F<br>-46 to -37°C | 1a–1b | Manitoba: Flin Flon; Saskatchewan: Prince Albert; Alberta: Banff; British Columbia: Kleena Kleene |
| 3a–3b | -35 to -20°F<br>-37 to -29°C | 2a–2b | Quebec: Noranda; Ontario: Red Lake; Saskatchewan: Saskatoon, Regina; Alberta: Grande Prairie; British Columbia: Babine Lake |
| | | 3a–3b | Quebec: Témiscamingue, Mont Joli; Ontario: Thunder Bay; Saskatchewan: Swift Current; Alberta: Calgary, Edmonton |
| 4a–4b | -20 to -10 °F<br>-29 to -23 °C | 4a–4b | Newfoundland: Gander; New Brunswick: Grand Falls; Quebec: Gaspé, Quebec City, Lower St. Lawrence; Ontario: Sudbury |
| | | 5a–5b | Newfoundland: St. John's; Nova Scotia: Sydney; New Brunswick: Fredericton; Ontario: Ottawa; Quebec: Montreal |

The REPLOQ trial sites can be classified as follows under the two systems:

| **Site** | **U.S. system** | **Canadian system** | **Site** | **U.S. system** | **Canadian system** |
|---|---|---|---|---|---|
| St. Anne de Bellevue | 4b | 5b | Deschambault | 4a | 4b |
| St. Clotilde | 4b | 5b | St. Foy | 4b | 4b |
| St. Hyacinthe | 4b | 5a | La Pocatière | 4b | 4a |
| L'Assomption | 4a | 5a | Normandin | 3a | 2b |
| | | | Kapuskasing | 2b | 2a |

# REPLOQ TRIALS

REPLOQ is a co-operative research project, the aim of which is to obtain information on the behaviour of species and cultivars of woody plants, both native and exotic, that have ornamental potential under normal Quebec growing conditions (soil and climate).

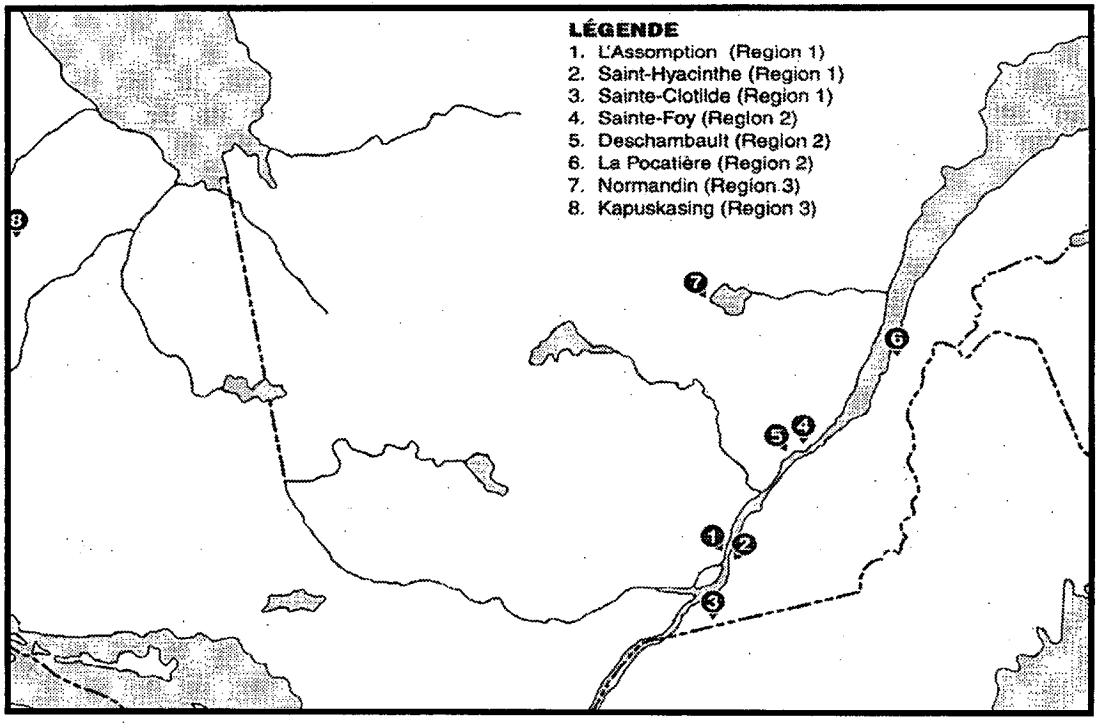
The results and recommendations presented here are intended to provide more detailed information about the behaviour and hardiness of various woody plants evaluated over a five-year period.

For these trials, Quebec was divided into three regions in order to identify the biophysical characteristics and climate conditions that might influence the growth of woody ornamentals. REPLOQ has eight or nine trial sites, depending on the year, located in the three adapation regions (see map below).

For each species or cultivar, we provide a botanical description and set out the plant's climate and soil requirements. We also include findings on winter damage and growth during the trials. Based on these results, we formulate recommendations for growing and using the plants.

In this volume, the hardiness of the woody plants is defined using REPLOQ's new criteria: ratings for survival, for use and for full ornamental potential, as described on page vi.

**Region 1:** **The Montreal and Outaouais areas**
**Region 2:** **The Mauricie, Quebec City, Beauce, Eastern Townships and Charlevoix areas**
**Region 3:** **The Saguenay–Lac St. Jean, Lower St. Lawrence, Abitibi–Témiscamingue and Gaspé areas**



## REPLOQ TRIALS (cont'd)

These recommendations were verified for plants obtained from specific clones, with respect to seedlings and cuttings. The authors are aware that different clones or breeding lines might have produced different results. It must be borne in mind that a plant has a unique genetic potential and that exceptions are always possible, especially when dealing with plants grown from seed.

Each plant falls into one of two categories, deciduous or evergreen, and one of four further subdivisions. Particular species or cultivars were selected as control plants for each subdivision. The controls were introduced in every planting year in order to compare their behaviour over time, thus making it possible to identify the years when the winters were particularly harsh. A control must be as well-adapted as possible to the trial regions.

The controls were as follows:

1. Large trees (more than 5 m tall)
   Control: *Acer saccharinum* or
   *Larix laricina*
2. Medium-sized trees (3–5 m tall)
   Control: *Malus baccata* or
   *Thuja occidentalis*
3. Shrub (less than 3 m tall)
   Control: *Cornus alba* 'Elegantissima' or
   *Juniperus sabina* or
   *Juniperus sabina* 'Blue Danube'
4. Climbing and creeping plants
   Control: *Clematis virginiana*

For the control plants, a descriptive report was completed the first year each plant was introduced, and thereafter only the trial results have been provided.

Individual descriptive reports, illustrated with colour plates, have been published on the species and cultivars introduced in 1984 and evaluated until 1989 (to order, see the form at the back of the book). Individual descriptive reports on the species and cultivars introduced in 1985 and 1986 and evaluated until 1990 and 1991 have been published as a book titled *Hardiness and Growth of Woody Ornamental Plants in Quebec,* publication no. VR 220. Individual descriptive reports on the species and cultivars introduced in 1987 and 1988 and evaluated until 1992 and 1993 have been published as a book titled *Rusticité et croissance de plantes ligneuses ornementales au Québec,* Vol. II, publication no. VR 221. Individual descriptive reports on the species and cultivars introduced in 1989 and 1990 and evaluated until 1994 and 1995 have been published as a book titled *Rusticité et croissance de plantes ligneuses ornementales au Québec,* Vol. III, publication no. VT 008. Individual descriptive reports on the species and cultivars introduced in 1991 and 1992 and evaluated until 1996 and 1997 have been published as a book titled *Hardiness and Growth of Woody Ornamental Plants in Quebec,* Vol. IV, publication no. WW 001. Individual descriptive reports on the species and cultivars introduced in 1993 and 1994 and evaluated until 1998 and 1999 are published here. The trials took place on experimental plots without winter protection. Plants in private use, in a more protected environment, might behave differently.

REPLOQ is a research project with other evaluation components, which are explained in *Plantes ligneuses ornementales: Méthode d'évaluation* (AGDEX 270/30, publication no. 95-0065).

All this work was obviously the result of close collaboration among many people. We would like to thank the heads of each trial site and their teams.

The following people were involved in the 1993 and 1994 plantings:

| | |
|---|---|
| **St. Clotilde** | *Michel Fortin and Alain Lévesque* |
| **L'Assomption** | *Jacques Côté and Raymond Pellerin* |
| **St. Hyacinthe** | *Gaétan Pion* |
| **St. Foy** | *Jacques-André Rioux, Éric Dugal and Marie-Pierre Lamy* |
| **Deschambault** | *Sylvie Atkins* |
| **La Pocatière** | *Michel Auger* |
| **Normandin** | *Raynald Drapeau* |
| **Kapuskasing** | *Laurier Guillemette* |

Claude Richer
REPLOQ Co-ordinator

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1984 — Evaluated until 1989

The descriptive reports for the 1984 planting have been published individually, illustrated with colour plates. They are available in two series (in French only). See the form at the back of the book for ordering information.

| Scientific name | French common name | English common name |
|---|---|---|
| *Acer platanoides*[1] | Érable de Norvège, faux sycomore | Norway Maple |
| *Acer saccharinum*[1] (C) | Érable argenté, plaine blanche | Silver Maple, River Maple |
| *Cornus alba* 'Argenteo-marginata'[2] (C) | Cornouiller blanc | Silver-Leaf Dogwood |
| *Cornus alba* 'Sibirica'[2] | Cornouiller de Sibérie | Siberian Dogwood |
| *Cotoneaster dammeri* 'Coral Beauty'[2] | Cotonéastre 'Coral Beauty' | Coral Beauty Bearberry Cotoneaster |
| *Euonymus alata*[1] | Fusain ailé, euonymus | Winged Spindle Tree, Burningbush |
| *Hydrangea paniculata* 'Grandiflora'[1] | Hydrangée paniculé | Peegee Hydrangea |
| *Kerria japonica*[1] | Kerria, corète du Japon | Japanese Rose |
| *Lonicera korolkowii* var. *zabelli*[2] | Chèvrefeuille de Zabel | Blue-Leaf Honeysuckle |
| *Lonicera morrowii*[2] | Chèvrefeuille de Morrow | Morrow Honeysuckle |
| *Lonicera* x *xylosteoides* 'Clavey's Dwarf'[2] | Chèvrefeuille nain 'Clavey's Dwarf' | Clavey's Dwarf Honeysuckle |
| *Malus baccata*[2] (C) | Pommetier de Sibérie, Pommetier décoratif | Siberian Crabapple |
| *Parthenocissus quinquefolia*[2] (C) | Vigne vierge | Virginia Creeper |
| *Paxistima canbyi*[1] | Paxistima, pachistima de Canby | Paxistima |
| *Physocarpus opulifolius*[2] | Physocarpe à feuilles d'obier, Bois à sept écorces | Common Ninebark |
| *Physocarpus opulifolius* 'Aureus'[2] | Physocarpe doré à feuilles d'obier | Golden Common Ninebark |
| *Physocarpus opulifolius* 'Nanus'[2] | Physocarpe nain à feuilles d'obier | Dwarf Common Ninebark |
| *Potentilla fruticosa* 'Goldfinger'[1] | Potentille frutescente 'Goldfinger' | Shrubby Cinquefoil |
| *Prunus* x *cistena*[1] | Prunier pourpre des sables | Purple-Leaf Sand Cherry |
| *Prunus tomentosa*[1] | Cerisier tomenteux | Manchu or Nanking Cherry |
| *Quercus macrocarpa*[1] | Chêne à gros fruits | Bur Oak, Mossy-Cup Oak |
| *Salix elaeagnos*[2] | Saule Chalef | Eleagnus Willow, Rosemary Willow |
| *Salix purpurea* 'Nana'[2] | Saule arctique, saule pourpre nain | Dwarf Arctic Willow, Purple Willow |
| *Viburnum opulus* 'Compactum'[1] | Obier nain | Dwarf or European Cranberry Bush |
| *Weigela hybrida* 'Bristol Ruby'[1] | Weigela 'Bristol Ruby' | Bristol Ruby Weigela |

1. First series (02-9227).
2. Second series (02-9309).

(C): Control

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1985 — Evaluated until 1990

The descriptive reports for the 1985 planting have been published as *Hardiness and Growth of Woody Ornamental Plants in Quebec* (VR 220).

| Scientific name | French common name | English common name |
|---|---|---|
| *Acer ginnala* | Érable de l'Amur, érable de l'Amour | Amur Maple, Siberian Maple |
| *Acer negundo* | Érable à Giguère | Box-Elder, Ashleaf Maple |
| *Acer saccharinum* (C) | Érable argenté, plaine blanche | Silver Maple |
| *Acer tataricum* | Érable de Tartarie | Tatarian Maple |
| *Actinidia kolomikta* | Actinidia | Actinidia |
| *Alnus crispa* | Aulne crispé | American Green Alder, Mountain Alder |
| *Alnus glutinosa* | Aulne, verne | European Alder, Common Alder |
| *Betula nigra* | Bouleau noir, bouleau des rivières | River Birch |
| *Betula pendula* | Bouleau européen, bouleau blanc | European White Birch |
| *Calluna vulgaris* 'Alportii' | Bruyère, callune | Scotch Heather |
| *Caragana arborescens* | Caragana de Sibérie | Siberian Pea Tree |
| *Caragana spinosa* | Caraganier | Peashrub |
| *Celtis occidentalis* | Micocoulier occidental | Common Hackberry |
| *Clematis virginiana* | Clématite de Virginie, herbe à gueux | Virgin's-Bower |
| *Cornus alba* 'Argenteo-marginata' (C) | Cornouiller blanc | Silver-Leaf Dogwood |
| *Corylus avellana* x *cornuta* | Noisetier hybride | Hybrid Hazelnut |
| *Cotoneaster dammeri* 'Skogholm' | Cotonéastre 'Skogholmen' | Skogholmen Bearberry Cotoneaster |
| *Elaeagnus angustifolia* | Olivier de Bohème | Russian Olive |
| *Elaeagnus commutata* | Chalef argenté | Silverberry, Wolf Willow |
| *Erica carnea* 'Praecox' | Bruyère alpine | Spring Heather |
| *Hippophae rhamnoides* | Argousier faux-nerprun | Sallow-Thorn, Sea-Buckthorn |
| *Juniperus conferta* | Genévrier du littoral | Shore Juniper |
| *Juniperus sabina* (C) | Sabinier, genévrier sabine | Savin Juniper |
| *Juniperus virginiana* | Genévrier de Virginie, Cèdre rouge de l'est | Eastern Red Cedar, Red Cedar |
| *Lonicera involucrata* | Chèvrefeuille involucré | Bracted Honeysuckle, Twinberry |
| *Malus baccata* (C) | Pommetier de Sibérie | Siberian Crabapple |
| *Myrica gale* | Myrique baumier | Sweet Gale |
| *Parthenocissus quinquefolia* (C) | Vigne vierge | Virginia Creeper |
| *Pinus nigra* 'Austriaca' | Pin noir d'Autriche | Austrian Pine |
| *Prunus padus* | Cerisier à grappes | European Bird Cherry |
| *Quercus palustris* | Chêne des marais | Pin Oak, Swamp Oak |
| *Quercus rubra* | Chêne rouge | Red Oak |
| *Rhododendron carolinianum* var. *album* | Rhododendron blanc | White Rhododendron |
| *Rhododendron carolinianum* var. *roseum* | Rhododendron rose | Rose Rhododendron |
| *Rhododendron mucronulatum* | Rhododendron de Corée | Korean Rhododendron |
| *Shepherdia argentea* | Shépherdie argentée | Buffaloberry |
| *Thuja occidentalis* L. (C) | Thuya occidental, thuya du Canada | American Arborvitae, White Cedar |
| *Thuja occidentalis* 'Fastigiata' | Thuya occidental fastigié | Columnar American Arborvitae, Pyramidal Arborvitae |
| *Thuja occidentalis* 'Lutea' | Thuya occidental doré | George Peabody Arborvitae |
| *Thuja occidentalis* 'Reidii' | Thuya occidental 'Reidii' | Reid American Arborvitae |
| *Thuja occidentalis* 'Wareana' | Thuya de Sibérie | Siberian Arborvitae, Siberian Cedar |
| *Thuja occidentalis* 'Woodwardii' | Thuya occidental 'Woodwardii' | Woodward American Arborvitae |
| *Ulmus pumila* | Orme de Sibérie | Siberian Elm, Manchurian Elm |
| *Viburnum lantana* | Viorne commune, viorne cotonneuse | Wayfaringtree Viburnum |
| *Viburnum lentago* | Alisier, bourdaine | Nannyberry, Sheepberry |
| *Viburnum opulus* 'Nanum' | Viorne obier naine | Dwarf European Cranberrybush |
| *Viburnum trilobum* | Viorne trilobée | American Cranberrybush |

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1986 — Evaluated until 1991

The descriptive reports for the 1986 planting have been published as *Hardiness and Growth of Woody Ornamental Plants in Quebec* (VR 220).

| Scientific name | French common name | English common name |
|---|---|---|
| *Acer rubrum* | Érable rouge, plaine rouge | Red Maple, Swamp Maple |
| *Acer saccharinum* (C) | Érable argenté, plaine blanche | Silver Maple |
| *Aesculus hippocastanum* | Marronnier d'Inde | Buckeye, Common Horsechestnut |
| *Betula alleghaniensis* | Bouleau jaune, merisier | Yellow Birch |
| *Betula pendula* (origin: Russia) | Bouleau blanc | European Birch |
| *Carpinus caroliniana* var. *virginiana* | Charme d'Amérique | American Hornbeam, Blue Beech |
| *Cornus alba* 'Argenteo-marginata' (C) | Cornouiller blanc | Silver-Leaf Dogwood |
| *Cornus alba* 'Spaethii' | Cornouiller de Spaeth | Golden Dogwood |
| *Cornus alternifolia* | Cornouiller à feuilles alternes | Pagoda, Alternated-Leaved Dogwood |
| *Cornus sanguinea* | Cornouiller sanguin | Bloodtwig Dogwood |
| *Cornus sericea* 'Flaviramea' | Cornouiller à tiges jaunes | Yellowtwig Dogwood |
| *Cotoneaster apiculatus* | Cotonéastre | Cranberry Cotoneaster |
| *Cotoneaster horizontalis* var. *perpusillus* | Cotonéastre horizontal | Cotoneaster |
| *Euonymus alatus* 'Compactus' | Fusain compact | Dwarf Winged Spindle, Burningbush |
| *Euonymus europaeus* | Fusain d'Europe | European Spindletree |
| *Forsythia ovata* 'Northern Gold' | Forsythie 'Northern Gold' | Northern Gold Forsythia |
| *Hydrangea arborescens* 'Annabelle' | Hydrangée 'Annabelle' | Smooth Hydrangea |
| *Juniperus chinensis* 'Hetzii' | Genévrier de Chine | Hetzii Juniper |
| *Larix decidua* | Mélèze d'Europe | European Larch, Common Larch |
| *Larix laricina* (C) | Mélèze laricin, tamarac | Eastern Larch, Tamarack |
| *Magnolia kobus* | Magnolier | Northern Japanese Magnolia |
| *Malus baccata* (C) | Pommetier de Sibérie | Siberian Crabapple |
| *Philadelphus* x *virginalis* 'Minnesota Snowflake' | Séringat 'Minnesota Snowflake' | Minnesota Snowflake Mock Snow |
| *Philadelphus* x *virginalis* 'Virginal' | Séringat Virginal | Virginal Mock Orange |
| *Picea pungens* | Épinette du Colorado | Colorado Spruce |
| *Picea pungens* 'Glauca' | Épinette bleue du Colorado | Colorado Blue Spruce |
| *Pinus sylvestris* | Pin sylvestre | Scotch Pine, Scots Pine |
| *Potentilla fruticosa* 'Abbotswood' | Potentille frutescente 'Abbotswood' | Abbotswood Cinquefoil |
| *Potentilla fruticosa* 'Daydawn' | Potentille frutescente 'Daydawn' | Daydawn Cinquefoil |
| *Potentilla fruticosa* 'Snowflake' | Potentille frutescente 'Snowflake' | Snowflake Cinquefoil |
| *Prunus tomentosa* (origin: Morden) | Cerisier tomenteux | Manchu Cherry, Nanking Cherry |
| *Quercus robur* 'Fastigiata' | Chêne pédonculé, chêne anglais | Fastigiate English Oak |
| *Ribes aureum* | Gadelier doré | Golden Currant |
| *Ribes sanguineum* | Groseillier sanguin, groseillier à fleurs | Winter Currant, Flowering Currant |
| *Rosa* 'Martin Frobisher' | Rosier 'Martin Frobisher' | Martin Frobisher Rose |
| *Rosa* x *Metis* | Rosier 'Metis' | Metis Rose |
| *Rosa multiflora* | Rosier multiflore | Japanese Rose |
| *Rosa rugosa* var. *typica* | Rosier du Japon, rosier rugueux | Rugosa Rose, Saltspray Rough Rose |
| *Spiraea japonica* 'Goldmound' | Spirée 'Goldmound' | Goldmound Japanese Spirea |
| *Spiraea nipponica* 'Snowmound' | Spirée 'Snowmound' | Snowmound Japanese Spirea |
| *Syringa reticulata* | Lilas japonais | Japanese Lilac |
| *Tamarix ramosissima* | Tamarix | Five-Stamen Tamarix, Amur Tamarix |
| *Thuja occidentalis* L. (C) | Thuya occidental | American Arborvitae, White Cedar |
| *Thuja occidentalis* 'Little Champion' | Thuya occidental 'Little Champion' | Little Champion American Arborvitae |
| *Thuja occidentalis* 'Pulcherrima' | Thuya occidental doré | Golden American Arborvitae |
| *Thuja occidentalis* 'Smaragd' | Thuya émeraude | Smaragd American Arborvitae |
| *Viburnum carlesii* | Viorne de Carles | Koreanspice Viburnum |
| *Viburnum opulus* 'Roseum' | Boule de neige, obier stérile | European Snowball |
| *Weigela florida* 'Variegata' | Diervillé panaché | Variegata Old Fashioned Weigela |
| *Weigela hybrida* 'Bristol Ruby' | Weigela 'Bristol Ruby' | Bristol Ruby Weigela |

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1987 — Evaluated until 1992

The descriptive reports for the 1987 planting have been published as
*Rusticité et croissance de plantes ligneuses ornementales au Québec*, Vol. II (VR 221).

| Scientific name | French common name | English common name |
|---|---|---|
| *Acer saccharinum* (C) | Érable argenté, plaine blanche | Silver Maple |
| *Acer tataricum* | Érable de Tartarie | Tatarian Maple |
| *Amelanchier alnifolia* | Amélanchier à feuilles d'aulne | Saskatoon Serviceberry |
| *Aronia melanocarpa* | Aronia noir, gueules noires | Black Chokeberry |
| *Buxus microphylla* var. *insularis* | Buis coréen Korean Boxwood | |
| *Caragana arborescens* | Caragana de Sibérie | Siberian Pea Tree |
| *Cornus alba* 'Elegantissima' (C) | Cornouiller blanc | Silver-Leaf Dogwood |
| *Corylus colurna* | Noisetier de Byzance | Turkish Filbert, Turkish Hazelnut |
| *Hypericum frondosum* | Millepertuis doré | Golden St. Johnswort |
| *Juniperus horizontalis* 'Douglasii' | Genévrier horizontal 'Douglasii' | Waukegan Juniper |
| *Juniperus* x *media* 'Pfitzeriana' | Genévrier de Chine | Pfitzer Juniper |
| *Juniperus sabina* (C) | Sabinier, genévrier sabine | Savin Juniper |
| *Juniperus sabina* 'Blue Danube' (C) | Sabinier 'Blue Danube' | Blue Danube Savin Juniper |
| *Larix laricina* (C) | Mélèze laricin, tamarac | Eastern Larch, Tamarack |
| *Malus baccata* (C) | Pommetier de Sibérie | Siberian Crabapple |
| *Malus sargentii* | Pommetier de Sargent | Sargent Crabapple |
| *Phellodendron amurense* | Phellodendron de Chine | Amur Cork Tree |
| *Picea omorika* | Épinette de Serbie | Serbian Spruce |
| *Pinus cembra* | Pin cembro, arolle | Arolla Pine, Stone Pine, Swiss Stone Pine |
| *Pinus mugo* | Pin des montagnes | Dwarf Mountain Pine |
| *Pinus mugo* var. *pumilio* | Pin mugo var. pumilio | Mountain Pine |
| *Pinus nigra* | Pin noir d'Autriche | Austrian Pine |
| *Pinus peuce* | Pin de Macédoine | Balkan Pine, Macedonian Pine |
| *Pinus resinosa* | Pin résineux, pin rouge | Red Pine, Norway Pine |
| *Pinus strobus* | Pin blanc | Eastern White Pine |
| *Populus alba* 'Nivea' | Peuplier argenté | Silver Poplar |
| *Populus alba* 'Pyramidalis' | Peuplier blanc pyramidal | White Poplar |
| *Populus laurifolia* | Peuplier à feuilles de laurier | Laurel Poplar |
| *Pseudotsuga menziessi* ssp. *glauca* | Sapin bleu de Douglas | Blue Douglas Fir |
| *Rhododendron canadense* 'Albiflorum' | Rhododendron du Canada à fleurs blanches | Rhodora |
| *Rhododendron fastigiatum* | Rhododendron à feuilles pourpres | Autum Purple Rhododendron |
| *Rhododendron* 'Ramapo' | Rhododendron 'Ramapo' | Rhododendron |
| *Ribes alpinum* 'Schmidt' | Gadelier alpin 'Schmidt' | Schmidt Alpine Currant |
| *Syringa vulgaris* | Lilas des jardins | Common Lilac |
| *Thuja occidentalis* L. (C) | Thuya occidental, thuya du Canada | American Arborvitae, White Cedar |
| *Thuja standishii* | Thuya du Japon | Japanese Arborvitae |
| *Viburnum* x *rhytidophylloides* 'Alleghany' | Viorne Alleghany | Alleghany Lantanaphyllum Viburnum |

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1988 — Evaluated until 1993

The descriptive reports for the 1988 planting have been published as *Rusticité et croissance de plantes ligneuses ornementales au Québec*, Vol. II (VR 221).

| Scientific name | French common name | English common name |
|---|---|---|
| *Acer platanoides* 'Summershade' | Érable de Norvège | Summershade Norway Maple |
| *Acer saccharinum* (C) | Érable argenté, plaine blanche | Silver Maple |
| *Acer saccharinum* 'Pyramidale' | Érable argenté pyramidal, plaine blanche pyramidale | Pyramidale Silver Maple |
| *Clematis macropetala* 'Rosy O'Grady' | Clématite des alpes 'Rosy O'Grady' | Rosy O'Grady Virgin's-Bower |
| *Clematis tibetana* ssp. *tangutina* | Clématite | Golden Clematis |
| *Clematis virginiana* (C) | Clématite de Virginie | Virgin's-Bower |
| *Cornus alba* 'Gouchaultii' | Cornouiller de Gouchault | Mottled Tartarian Dogwood |
| *Cytisus decumbens* | Cytise prostrée | Prostrate Broom |
| *Fraxinus pennsylvanica* | Frêne de Pennsylvanie, frêne rouge | Red Ash, Green Ash |
| *Fraxinus pennsylvanica* 'Marshall Seedless' | Frêne rouge 'Marshall Seedless' | Marshall Seedless Red Ash |
| *Fraxinus pennsylvanica* 'Summit' | Frêne vert 'Summit' | Summit Green Ash |
| *Genista tinctoria* | Genêt des teinturiers | Dyer's Greenweed, Woadwaxen |
| *Genista tinctoria* var. *alpestris* | Genêt des teinturiers | Dyer's Greenweed |
| *Larix laricina* (C) | Mélèze laricin, tamarac | Eastern Larch, Common Larch |
| *Lonicera* x *brownii* 'Dropmore Scarlet' | Chèvrefeuille grimpant | Dropmore Scarlet Honeysuckle |
| *Mahonia aquifolium* 'Atropurpurea' | Mahonie à feuilles de houx | Oregon Holly Grape |
| *Malus baccata* (C) | Pommetier de Sibérie | Siberian Crabapple |
| *Malus baccata* 'Columnaris' | Pommetier de Sibérie colonnaire | Columnar Siberian Crabapple |
| *Malus* 'Royalty' | Pommetier 'Royalty' | Royalty Crabapple |
| *Picea abies* | Épinette de Norvège | Norway Spruce, Common Spruce |
| *Picea glauca* | Épinette blanche | White Spruce |
| *Potentilla fruticosa* 'Coronation Triumph' | Potentille 'Coronation Triumph' | Bush Cinquefoil |
| *Potentilla fruticosa* 'Maanelys' | Potentille frutescente Maanelys | Maanelys Shrubby Cinquefoil |
| *Quercus alba* | Chêne blanc | White Oak |
| *Rosa corymbifera* | Rosier | Rose |
| *Rosa corymbifera* 'Laxa' | Rosier du Turkestan | Rose |
| *Rosa glauca* | Rosier à feuilles pourpres | Purple Leaf Rose |
| *Rosa maximowicziana* | Rosier Maximowicziana | Rose |
| *Rosa pimpinellifolia* 'Grandiflora' | Rosier d'Altaï, rosier d'Écosse | Altai Scotch Rose |
| *Rosa pimpinellifolia* 'Maigold' | Rosier épineux 'Maigold' | Maigold Scotch Rose, Burnet Rose |
| *Rosa* 'Alexander Mackenzie' | Rosier 'Alexander Mackenzie' | Alexander Mackenzie Rose |
| *Rosa* 'Hansa' | Rosier 'Hansa' | Hansa Rose |
| *Rosa* 'F.J. Grootendorst' | Rosier à fleurs d'œillet | Nelkenrose Rose, F.J. Grootendorst Rough Rose |
| *Rosa* 'Prairie Youth' | Rosier 'Prairie Youth' | Prairie Youth Rose |
| *Rosa* 'William Baffin' | Rosier 'William Baffin' | William Baffin Rose |
| *Thuja occidentalis* L. (C) | Thuya occidental | American Arborvitae, White Cedar |

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1989 — Evaluated until 1994

The descriptive reports for the 1989 planting have been published as *Rusticité et croissance de plantes ligneuses ornementales au Québec*, Vol. III (VT 008).

| Scientific name | French common name | English common name |
|---|---|---|
| *Acer ginnala* (dark pink) | Érable de l'Amour | Amur Maple |
| *Acer platanoides* 'Emerald Queen' | Érable de Norvège 'Emerald Queen' | Emerald Queen Maple |
| *Acer saccharum* (Morden) | Érable à sucre | Sugar Maple |
| *Acer saccharinum* (C) | Érable argenté | Silver Maple |
| *Acer saccharinum* 'Wieri' | Érable argenté 'Wieri' | Wieri Silver Maple |
| *Amelanchier bartromiana* | Amélanchier | Shadbush |
| *Amelanchier stolonifera* | Amélanchier | Running Serviceberry |
| *Chamaecyparis pisifera* | Faux-cyprès de Sawara, Chamaecyparis à pois | Japanese False Cypress, Sawara Chamaecyparis |
| *Chamaecyparis pisifera* 'Filifera' | Faux-cyprès de Sawara | Thread-Leaf False Cypress |
| *Chamaecyparis pisifera* 'Filifera Nana' | Faux-cyprès de Sawara nain | Dwarf-Leaf False Cypress |
| *Chamaecyparis pisifera* 'Gold Spangle' | Faux-cyprès de Sawara 'Gold Spangle' | Thread-Leaf False Cypress |
| *Cotoneaster hupehensis* | Cotonéastre de Hupeh | Hupeh Cotoneaster |
| *Forsythia mandshurica* | Forsythia de Mandchourie | Manchurian Forsythia, Vermont Sun |
| *Juniperus* x *media* 'Mint Julep' | Genévrier de Chine 'Mint Julep' | Mint Julep Juniper, Sea Green Juniper |
| *Larix laricina* (C) | Mélèze laricin, tamarac | Eastern Larch, Tamarack |
| *Lonicera* x *xylosteoides* 'Mini-globe' | Chèvrefeuille 'Miniglobe' | Miniglobe Honeysuckle |
| *Maackia amurensis* | Maackie de l'Amur | Amur Maackia |
| *Malus baccata* (C) | Pommetier de Sibérie | Siberian Crabapple |
| *Physocarpus opulifolius* 'Dart's Gold' | Physocarpe 'Dart's Gold' | Dart's Gold Ninebark |
| *Prunus nipponica* var. *kurilensis* | Cerisier kurile | Kurile Cherry |
| *Prunus spinosa* 'Purpurea' | Prunier à feuillage pourpre | Blackthorn |
| *Quercus alba* | Chêne blanc | White Oak |
| *Rosa beggeriana* | Rosier | Rose |
| *Rosa* 'David Thompson' | Rosier 'David Thompson' | David Thompson Rose |
| *Rosa* 'John Cabot' | Rosier 'John Cabot' | John Cabot Rose |
| *Rosa* 'William Baffin' | Rosier 'William Baffin' | William Baffin Rose |
| *Salix* x 'Prairie Cascade' | Saule pleureur 'Prairie Cascade' | Weeping White Willow, Prairie Cascade |
| *Sorbaria sorbifolia* | Sorbaria à feuilles de sorbier, fausse spirée | Ural False Spirea |
| *Spiraea* x *billardii* | Spirée | Billard Spirea |
| *Spiraea japonica* 'Little Princess' | Spirée 'Little Princess' | Little Princess Spirea |
| *Taxus* x *media* | If | Anglo-Japanese Yew |
| *Thuja occidentalis* L. (C) | Thuya occidental, thuya du Canada | American Arborvitae, White Cedar |
| *Weigela* 'Styriaca' | Weigela 'Styriaca' | Styriaca Weigela |
| *Weigela* x 'Rosabella' | Weigela 'Rosabella' | Rosabella Weigela |

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1990 — Evaluated until 1995

The descriptive reports for the 1990 planting have been published as *Rusticité et croissance de plantes ligneuses ornementales au Québec*, Vol. III (VT 008).

| Scientific name | French common name | English common name |
|---|---|---|
| *Acer pseudoplatanus* 'Atropurpureum' | Érable sycomore à feuilles pourpres | Spaethii Sycamore Maple |
| *Acer saccharinum* (C) | Érable argenté | Silver Maple |
| *Acer saccharinum* (La Pocatière) | Érable argenté | Silver Maple |
| *Aesculus glabra* | Marronnier de l'Ohio | Ohio Buckeye |
| *Betula nana* | Bouleau nain | Dwarf Birch |
| *Betula platyphylla* var. *japonica* | Bouleau blanc du Japon | Japanese White Birch |
| *Callicarpa dichotoma* | Callicarpa | Beauty Berry |
| *Calluna vulgaris* 'Martha Herman' | Calluna 'Martha Herman' | Martha Herman Scotch Heather |
| *Calluna vulgaris* 'Peter Sparkes' | Calluna 'Peter Sparkes' | Peter Sparkes Scotch Heather |
| *Cornus alba* 'Argenteo-marginata' (C) | Cornouiller blanc | Tatarian Dogwood |
| *Cornus racemosa* | Cornouiller à grappes | Panicled Dogwood |
| *Cotoneaster melanocarpus* | Cotonéastre à fruits noirs | Blackberry Cotoneaster |
| *Erica darleyensis* 'Pirbright' | Bruyère 'Pirbright' | Pirbright Spring Heather |
| *Erica darleyensis* 'Silberschmelze' | Bruyère 'Silberschmelze' | Silberschmelze Spring Heather |
| *Gymnocladus dioica* | Chicot du Canada, arbre à café | Kentucky Coffeetree |
| *Kolkwitzia amabilis* | Kolkwitzia | Beauty Bush |
| *Lonicera caerulea* var. *dependens* | Chèvrefeuille | Bearberry Honeysuckle |
| *Lonicera xylosteum* | Chèvrefeuille d'Europe | European Fly Honeysuckle |
| *Neillia ueckii* | Neillie | Neillia |
| *Malus baccata* (C) | Pommetier de Sibérie | Siberian Crabapple |
| *Malus hupehensis* | Pommetier de Hupeh | Tea Crabapple |
| *Malus* 'Radiant' | Pommetier 'Radiant' | Radiant Crabapple |
| *Populus alba* 'Raket' | Peuplier | Bolleana Poplar |
| *Rhododendron viscosum* | Rhododendron des marais | Swamp Azalea |
| *Rosa* 'Champlain' | Rosier 'Champlain' | Champlain Rose |
| *Rosa* 'Henry Kelsey' | Rosier 'Henry Kelsey' | Henry Kelsey Rose |
| *Rosa rugosa* 'Blanc Double de Coubert' | Rosier rugueux 'Blanc Double de Coubert' | Blanc Double de Coubert Rough Rose |
| *Rhus aromatica* | Sumac aromatique | Fragrant Sumac |
| *Staphylea bumalda* | Staphyllier | Bladder Nut |
| *Stephanandra incisa* | Stéphanandra | Cut Leaf Stephanandra |
| *Stephanandra incisa* 'Crispa Nana' | Stéphanandra nain | Dwarf Cut Leaf Stephanandra |
| *Thuja occidentalis* L. (C) | Thuya occidental, thuya du Canada | American Arborvitae, White Cedar |
| *Thuja occidentalis* 'Boisbriand' | Thuya occidental 'Boisbriand' | Boisbriand American Arborvitae |
| *Thuja occidentalis* 'Ellwangeriana Aurea' | Thuya occidental 'Ellwangeriana Aurea' | Ellwangeriana Aurea American Arborvitae |
| *Thuja occidentalis* 'Ellwangeriana' | Thuya occidental 'Ellwangeriana' | Ellwangeriana American Arborvitae |
| *Tsuga canadensis* | Pruche de l'est, tsuga du Canada | Eastern Hemlock, Canadian Hemlock |
| *Viburnum dentatum* | Viorne dentée | Arrow Wood Viburnum |
| *Viburnum trilobum* 'Nanum' | Viorne trilobée naine | Dwarf Wood Viburnum |
| *Weigela* 'Candida' | Weigela 'Candida' | Candida Weigela |
| *Weigela* 'Rumba' | Weigela 'Rumba' | Rumba Weigela |

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1991 — Evaluated until 1996

The descriptive reports for the 1991 planting have been published as *Hardiness and Growth of Woody Ornamental Plants in Quebec*, Vol. IV (WW 001).

| Scientific name | French common name | English common name |
|---|---|---|
| *Acer saccharinum* L. (C) | Érable argenté | Silver Maple |
| *Acer spicatum* Lam. | Érable à épis, plaine bâtarde | Mountain Maple |
| *Aesculus hippocastanum* L. | Marronnier d'Inde, châtaignier des chevaux, bois de Spa | Buckeye, Common Horsechestnut |
| *Buxus microphylla* 'Green Gem' | Buis à petites feuilles 'Green Gem' | Green Gem Little Leaf Boxwood |
| *Buxus microphylla* 'Green Mound' | Buis à petites feuilles 'Green Mound' | Green Mound Little Leaf Boxwood |
| *Buxus microphylla* 'Green Mountain' | Buis à petites feuilles 'Green Mountain' | Green Mountain Little Leaf Boxwood |
| *Cornus alba* 'Argenteo-marginata' (C) | Cornouiller blanc | Tatarian Dogwood |
| *Cotoneaster acutifolius* Turcz. | Cotonéastre de Pékin | Peking Cotoneaster |
| *Cotoneaster horizontalis* Decne. | Cotonéastre des rochers | Rock Cotoneaster |
| *Crataegus crus-galli* L. | Aubépine ergot-de-coq | Cockspur Hawthorn |
| *Daphne cneorum* Pall. | Daphné odorant | Garland Flower Daphne |
| *Gleditsia triacanthos inermis* (L.) Zabel. | Févier inerme d'Amérique | Thornless Honeylocust |
| *Hydrangea quercifolia* Bartr. | Hydrangée à feuilles de chêne | Oakleaf Hydrangea |
| *Juniperus sabina* 'Blue Danube' (C) | Sabinier 'Blue Danube' | Blue Danube Savin Juniper |
| *Juniperus sabina* 'Broadmoor' | Sabinier 'Broadmoor', | Broadmoor Juniper, Broadmoor Savin Juniper |
| *Malus baccata* (L.) Borkh. (C) | Pommetier de Sibérie | Siberian Crabapple |
| *Philadelphus coronarius* 'Aureus' | Séringat doré | Golden Mock Orange |
| *Potentilla fruticosa* 'Goldstar' | Potentille frutescente 'Gold Star' | Gold Star Cinquefoil |
| *Potentilla fruticosa* 'McKay's White' | Potentille frutescente 'McKay's White' | McKay's White Cinquefoil |
| *Prunus besseyi* L.H. Bailey | Cerisier des sables | Sand Cherry |
| *Rosa* 'J.P. Connell' | Rosier 'J.P. Connell' | J.P. Connell Rose |
| *Rosa* 'John Davis' | Rosier 'John Davis' | John Davis Rose |
| *Rosa pimpinellifolia* var. *Frühlingsduft* | Rosier 'Frühlingsduft' | Scotch Rose |
| *Rosa rugosa* 'L'Assomption' | Rosier rugeux 'L'Assomption' | L'Assomption Rough Rose |
| *Spiraea japonica* 'Flaming Mound' | Spirée japonaise 'Flaming Mound' | Flaming Mound Japanese Spirea |
| *Spiraea trichocarpa* 'Snow White' | Spirée 'Snow White' | Snow White Spirea |
| *Syringa meyeri* 'Palibin' | Lilas de Mandchourie, lilas coréen | Palibin Lilac, Dwarf Korean Lilac |
| *Taxus cuspidata* Siebold & Zucc. | If du Japon | Japanese Yew |
| *Thuja occidentalis* L. (C) | Thuya occidental, thuya du Canada | American Arborvitae, White Cedar |
| *Thuja occidentalis* 'Cloth of Gold' | Thuya occidental 'Cloth of Gold' | Cloth of Gold American Arborvitae |
| *Thuja occidentalis* 'Globosa Aurea' | Thuya occidental 'Globosa Aurea' | Globosa Aurea American Arborvitae |
| *Thuja occidentalis* 'Holmstrump' | Thuya occidental 'Holmstrump' | Holmstrump American Arborvitae |
| *Thuja occidentalis* 'Lutescens' | Thuya occidental 'Lutescens' | Lutescens American Arborvitae |
| *Thuja occidentalis* 'Mastersii' | Thuya occidental 'Mastersii' | Mastersii American Arborvitae |
| *Tilia cordata* Mill. | Tilleul à petites feuilles<br>Tilleul des bois | Small-Leaved European Linden |
| *Tilia japonica* (Miq.) Simonkai | Tilleul japonais | Japanese Linden |
| *Ulmus rubra* Muhlenb. | Orme rouge | Slippery Elm, Red Elm |
| *Weigela* 'Minuet' | Weigela 'Minuet' | Minuet Weigela |

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1992 — Evaluated until 1997

The descriptive reports for the 1992 planting have been published as *Hardiness and Growth of Woody Ornamental Plants in Quebec*, Vol. IV (WW 001).

| Scientific name | French common name | English common name |
|---|---|---|
| *Abies concolor* (Gord.) Lindl. ex Hildebr. | Sapin du Colorado | White Fir |
| *Acer saccharinum* L. (C) | Érable argenté | Silver Maple |
| *Amorpha fruticosa* L. | Amorpha, faux indigo | Indigobush Amorpha, False Indigo |
| *Amorpha fruticosa* var. *tenessensis* (Shuttlew.) | Amorpha | Bastard Indigo |
| *Aronia arbutifolia* (L.) Pers. | Aronia | Red Chokeberry |
| *Betula tianschanica* Rupr. | Bouleau des Monts Tien'Chan | Tien'Chan Mountain Birch |
| *Calluna vulgaris* 'Golden Carpet' | Bruyère 'Golden Carpet' | Golden Carpet Heather |
| *Cercidiphyllum japonicum* Siebold & Zucc. ex J. Hoffm. & H. Schult. | Arbre de Katsura | Katsura Tree |
| *Chamaecyparis lawsoniana* (A. Murr.) Parl. | Cyprès | Lawson False Cypress |
| *Cornus alba* 'Argenteo-marginata' (C) | Cornouiller blanc | Tatarian Dogwood |
| *Crataegus basilica* | Aubépine magnifique | Magnificient Thorn |
| *Crataegus coccinea* L. | Aubépine écarlate | Scarlet Thorn |
| *Crataegus submollis* Sarg. | Aubépine duveteuse ou Aubépine du Québec | Downy Hawthorn, Quebec Hawthorn |
| *Forsythia* x *ovata* 'Happy Centennial' | Forsythie 'Happy Centennial' | Happy Centennial Forsythia |
| *Ilex* x *meserveae* 'Blue Prince' | Houx hybride 'Blue Prince' | Blue Prince Holly |
| *Ilex* x *meserveae* 'Blue Princess' | Houx hybride 'Blue Princess' | Blue Princess Holly |
| *Juniperus communis* 'Rependa' | Genévrier commun rampant | Rependa Juniper |
| *Juniperus sabina* 'Blue Danube' (C) | Sabinier 'Blue Danube' | Blue Danube Savin Juniper |
| *Juniperus scopulorum* 'Blue Haven' | Genévrier des Rocheuses 'Blue Haven' | Blue Haven Juniper |
| *Larix kaempferi* (Lamb.) Carr. | Mélèze du Japon | Japanese Larch |
| *Larix laricina* (Du Roi) K. Koch. (C) | Mélèze laricin, tamarac | American Larch, Tamarack |
| *Ligustrum* x *vicaryi* Rehd. | Troène doré | Golden Vicary Privet |
| *Lonicera webbiana* Wall. | Chèvrefeuille d'Asie | Honeysuckle |
| *Malus baccata* (L.) Borkh. (C) | Pommetier de Sibérie | Siberian Crabapple |
| *Picea abies* 'Nidiformis' | Épinette de Norvège 'Nidiformis' | Nidiformis Norway Spruce, Bird's Nest Spruce |
| *Pinus aristata* Engelm. | Pin à cônes épineux | Bristle Cone Pine |
| *Populus* x *canescens* 'Tower' | Peuplier 'Tower' | Tower Poplar |
| *Rhododendron canadense* (L.) Torr. | Rhododendron du Canada | Rhodora |
| *Rhododendron molle* (Blume.) G. Don. | Rhododendron molle | Rhododendron, Azalea Molle, Chinese Azalea |
| *Rhododendron* 'Ramapo' | Rhododendron 'Ramapo' | Ramapo Rhododendron |
| *Rhododendron vaseyi* A. Gray. | Rhododendron vaseyi | Pink Shell Azalea |
| *Rosa* 'Louis Jolliet' | Rosier 'Louis Jolliet' | Louis Jolliet Rose |
| *Spiraea japonica* 'Shirobana' | Spirée 'Shirobana' | Shirobana Spirea |
| *Thuja occidentalis* L. (C) | Thuya occidental, thuya du Canada | American Arborvitae, White Cedar |
| *Tilia cordata* 'Greenspire' | Tilleul 'Greenspire' | Greenspire Linden |
| *Tilia* x 'Flavescens Glenleven' | Tilleul 'Flavescens Glenleven' | Flavescens Glenleven Linden |
| *Weigela florida* 'Nana Purpurea' | Weigela 'Nana Purpurea' | Nana Purpurea Weigela |
| *Weigela* 'Java Red' | Weigela 'Java Red' | Java Red Weigela |
| *Weigela* 'Red Prince' | Weigela 'Red Prince' | Red Prince Weigela |
| *Weigela* 'Samba' | Weigela 'Samba' | Samba Weigela |

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1993 — Evaluated until 1998

| Scientific name | French common name | English common name |
|---|---|---|
| *Acer platanoides* 'Crimson King' | Érable de Norvège 'Crimson King', | Crimson King Norway Maple |
| *Acer saccharinum* L. (C 1993) | Érable argenté | Silver Maple |
| *Aesculus parviflora* Walter. | Marronnier à petites fleurs, Pavier blanc | Bottlebrush Buckeye |
| *Buxus microphylla* 'Green Velvet' | Buis 'Green Velvet', Buis à petites feuilles | Green Velvet Boxwood, Little Leaf Boxwood |
| *Buxus microphylla* 'Pincushion' | Buis à petites feuilles 'Pincushion' | Little Leaf Pincushion Boxwood |
| *Buxus microphylla* 'Winter Beauty' | Buis à petites feuilles 'Winter Beauty' | Winter Beauty Little Leaf Boxwood |
| *Cornus alba* 'Argenteo-marginata' (C) | Cornouiller blanc | Tatarian Dogwood |
| *Cotinus coggygria* 'Notcutt's Variety' | Arbre à perruque 'Notcutt', Arbre à perruque rouge | Notcutt's Variety Smoketree, Purple Smoketree |
| *Cotoneaster dammeri* 'Royal Carpet' | Cotonéastre 'Royal Carpet' | Royal Carpet Bearberry Cotoneaster |
| *Crataegus coccinioides* Ashe. | Aubépine, Cenellier, Senellier | Hawthorn |
| *Euonymus hamiltonianus* 'Maackii' | Fusain | Spindle Tree |
| *Hydrangea paniculata* 'Unique' | Hydrangée paniculé 'Unique' | Unique Peegee Hydrangea |
| *Hydrangea serrata* (Thunb.) Mak. | Hydrangée du Japon, Hortensia commun | Japanese Hydrangea, Tea-of-Heaven Hortensia |
| *Hypericum kalmianum* L. | Millepertuis de Kalm | Kalm's St-John's Wort |
| *Juniperus communis* 'Depressa Aurea' | Genévrier doré du Canada | Common Juniper, Golden Prostrated Juniper |
| *Juniperus sabina* 'Blue Danube' (C 1993) | Sabinier 'Blue Danube' | Blue Danube Savin Juniper |
| *Juniperus sabina* 'Wapiti' | Sabinier 'Wapiti' | Wapiti Juniper |
| *Juniperus squamata* 'Blue Carpet' | Genévrier écailleux 'Blue Carpet' | Singleseed Juniper |
| *Malus baccata* (double-flowered) | Pommetier de Sibérie à fleurs doubles | Siberian Crabapple |
| *Malus baccata* (L.) Borkh. (C 1993) | Pommetier de Sibérie | Siberian Crabapple |
| *Picea abies* 'Argenteospica' | Épinette de Norvège dorée | Golden Norway Spruce |
| *Picea pungens* 'Aurea' | Épinette du Colorado dorée, Épicea du Colorado dorée | Golden Colorado Spruce |
| *Potentilla fruticosa* 'Hachmann's Giant' | Potentille 'Hachmann's Giant' | Hachmann's Giant Shrubby Cinquefoil |
| *Prunus virginiana* L. | Cerisier de Virginie, Cerisier à grappes, Cerisier sauvage | Common Chokecherry |
| *Rosa* 'Captain Samuel Holland' | Rosier 'Captain Samuel Holland' | Captain Samuel Holland Rose |
| *Rosa* 'Henry Hudson' | Rosier 'Henry Hudson' | Henry Hudson Rose |
| *Rosa* 'Jens Munk' | Rosier 'Jens Munk' | Jens Munk Rose |
| *Rosa* 'Marie-Victorin' | Rosier 'Marie-Victorin' | Marie-Victorin Rose |
| *Rosa* 'Morden Centennial' | Rosier 'Morden Centennial' | Morden Centennial Rose |
| *Symphoricarpos albus* (L.) S. F. Blake | Symphorine blanche | Common Snowberry, Waxberry |
| *Symphoricarpos orbiculatus* Moench. | Symphorine à feuilles rondes, Symphorine rouge | Indian Currant, Coralberry |
| *Thuja occidentalis* L. (C 1993) | Thuya occidental, thuya du Canada | American Arborvitae, White Cedar |
| *Thuja occidentalis* 'Buchanani' | Thuya occidental 'Buchanani' | Buchanani Arborvitae |
| *Thuja occidentalis* 'Spiralis' | Thuya occidental 'Spiralis' | Spiralis Eastern Arborvitae |
| *Thuja occidentalis* 'Umbraculifera' | Thuya occidental 'Umbraculifera' | Eastern Arborvitae, Arborvitae, Cedar |
| *Tilia* x 'Flavescens Sheridan Hybrids' | Tilleul à petites feuilles 'Sheridan Hybrids' | Sheridan Hybrids Linden |
| *Ulmus americana* L. | Orme d'Amérique, Orme blanc | White Elm, American Elm |
| *Weigela florida* 'Foliis Purpureus' | Weigela au feuillage pourpre | Old Fashioned Weigela, Purple-Leaf Weigela |

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN CHRONOLOGICAL ORDER BY YEAR OF PLANTING

Introduced in 1994 — Evaluated until 1999

| Scientific name | French common name | English common name |
|---|---|---|
| *Acer platanoides* 'Deborah' | Érable de Norvège 'Deborah' | Deborah Norway Maple |
| *Acer saccharinum* L. (C 1994) | Érable argenté | Silver Maple |
| *Betula papyrifera* var. *kenaica* (W.H. Evans) | Bouleau à papier de l'Alaska | Alaskan Paper Birch A. Henry |
| *Castanea* x 'Douglas Hybrids' | Châtaignier 'Douglas hybrids' | Chestnut |
| *Chamaecyparis obtusa* 'Nana' | Faux-cyprès du Japon, Faux-cyprès de Hinoki | Hinoki False Cypress, Dwarf Hinoki Cypress |
| *Chamaecyparis pisifera* 'Boulevard' | Faux-Cyprès 'Boulevard', Faux-Cyprès de Sawara | Boulevard Japanese False Cypress, Sawara False Cypress |
| *Clethra alnifolia* L. | Cléthra à feuilles d'aulne | Summer Sweet Clethra, Sweet Pepper Bush |
| *Cornus alba* 'Argenteo-marginata' (C) | Cornouiller blanc | Tatarian Dogwood |
| *Cornus alba* 'Kesselringii' | Cornouiller blanc 'Kesselringii' | Red-Bark Dogwood |
| *Cornus hemsleyii* 'Nana' | Cornouiller nain | Dwarf Dogwood |
| *Euonymus fortunei* 'Canadale Gold' | Fusain 'Canadale Gold' | Canadale Gold Euonymus |
| *Euonymus fortunei* 'E.T.' | Fusain 'E.T.' | E.T. Gold Euonymus |
| *Euonymus nanus* var. *turkestanicus* Dieck. | Fusain nain, Fusain nain du Turkestan | Dwarf Euonymus, Turkestan Euonymus |
| *Hydrangea paniculata* 'Kyushu' | Hydrangée paniculé, Hydrangée 'Kyushu, | Peegee Hydrangea, Kyushu Hortensia |
| *Juniperus sabina* 'Blue Danube' (C) | Sabinier 'Blue Danube' | Blue Danube Savin Juniper |
| *Juniperus squamata* 'Blue Star' | Genévrier écailleux 'Blue Star', Genévrier du Népal 'Blue Star' | Singleseed Juniper |
| *Juniperus squamata* 'Meyeri' | Genévrier écailleux 'Meyeri', Genévrier du Népal 'Meyeri' | Singleseed Juniper, Fishtail Juniper |
| *Liriodendron tulipifera* L. | Tulipier de Virginie | Tulip Tree, Yellow Poplar |
| *Lonicera gynochlamydea* Hemsl. | Chèvrefeuille | Honeysuckle |
| *Lonicera maximowicziana* var. *sachalinensis* Fr. Schmidt. | Chèvrefeuille de Sakhalin | Sakhalin Honeysuckle |
| *Lonicera orientalis* Lam. | Chèvrefeuille oriental | Honeysuckle |
| *Lonicera tatarinovii* Maxim. | Chèvrefeuille | Honeysuckle |
| *Lonicera xylosteum* 'Compacta' | Chèvrefeuille d'Europe, Chèvrefeuille nain | European Fly Honeysuckle |
| *Microbiota decussata* Komar. | Microbiota, Cyprès de Russie, Cyprès de Sibérie | Russian Arborvitae, Siberian Cypress |
| *Potentilla fruticosa* 'Red Ace' | Potentille 'Red Ace' | Red Ace Shrubby Cinquefoil |
| *Rhododendron calendulaceum* (Michx.) Torr. | Rhododendron | Flame Azalea |
| *Rhododendron mucronulatum* 'Roseum' | Rhododendron de Corée | Korean Rhododendron |
| *Rhododendron* 'Ramapo' (C 1994) | Rhododendron 'Ramapo' | Ramapo Rhododendron |
| *Rhododendron roseum* (Loisel.) Rehd. | Rhododendron | Roseshell Azalea, Early Azalea |
| *Rhododendron vaseyi* A. Gray. | Rhododendron vaseyi | Pink Shell Azalea |
| *Rosa canina* L. | Rosier | Dog Rose |
| *Salix fragilis* 'Bullata' | Saule fragile 'Bullata' | Bullata Crack Willow |
| *Spiraea hypericifolia* 'Obovata' | Spirée à feuilles de Millepertuis | Spirea |
| *Spiraea japonica* 'Crispa' | Spirée crispée du Japon | Bumalda Spirea, Twist Spirea |
| *Spiraea nipponica* var. *tosaensis* (Yatabe) Mak. | Spirée du Japon | Nippon Spirea, Japanese Spirea |
| *Syringa Komarowii* Schneid. | Lilas de Chine | Chinese Lilac |
| *Thuja occidentalis* L. (C 1994) | Thuya occidental, thuya du Canada | American Arborvitae, White Cedar |
| *Thuja occidentalis* 'Sherwood Frost' | Thuya occidental 'Sherwood Frost' | Sherwood Frost American Arborvitae |
| *Thuja occidentalis* 'Sherwood Moss' | Thuya occidental 'Sherwood Moss' | Sherwood Moss Americain Arborvitae |
| *Tilia platyphyllos* Scop. | Tilleul à grandes feuilles, Tilleul de Hollande | Bigleaf Linden |

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN 1993 AND 1994 IN ALPHABETICAL ORDER

A
*Acer platanoides* 'Crimson King'
*Acer platanoides* 'Deborah'
*Acer saccharinum* L. (C 1993)
*Acer saccharinum* L. (C 1994)
*Aesculus parviflora* Walter.

B
*Betula papyrifera* var. *kenaica* (W.H. Evans) A. Henry
*Buxus microphylla* 'Green Velvet'
*Buxus microphylla* 'Pincushion'
*Buxus microphylla* 'Winter Beauty'

C
*Castanea* x 'Douglas Hybrids'
*Chamaecyparis obtusa* 'Nana'
*Chamaecyparis pisifera* 'Boulevard'
*Clethra alnifolia* L.
*Cornus alba* 'Argenteo-marginata' (C 1993)
*Cornus alba* 'Argenteo-marginata' (C 1994)
*Cornus alba* 'Kesselringii'
*Cornus hemsleyii* 'Nana'
*Cotinus coggygria* 'Notcutt's Variety'
*Cotoneaster dammeri* 'Royal Carpet'
*Crataegus coccinioides* Ashe.

E
*Euonymus fortunei* 'Canadale Gold'
*Euonymus fortunei* 'E.T.'
*Euonymus hamiltonianus* 'Maackii'
*Euonymus nanus* var. *turkestanicus* Dieck.

H
*Hydrangea paniculata* 'Kyushu'
*Hydrangea paniculata* 'Unique'
*Hydrangea serrata* (Thunb.) Mak.
*Hypericum kalmianum* L.

J
*Juniperus communis* 'Depressa Aurea'
*Juniperus sabina* 'Blue Danube' (C 1993)
*Juniperus sabina* 'Blue Danube' (C 1994)
*Juniperus sabina* 'Wapiti'
*Juniperus squamata* 'Blue Carpet'
*Juniperus squamata* 'Blue Star'
*Juniperus squamata* 'Meyeri'

L
*Liriodendron tulipifera* L.
*Lonicera gynochlamydea* Hemsl.
*Lonicera maximowicziana* var. *sachalinensis* Fr. Schmidt.
*Lonicera orientalis* Lam.
*Lonicera tatarinovii* Maxim.
*Lonicera xylosteum* 'Compacta'

M
*Malus baccata* (L.) Borkh. (C 1993)
*Malus baccata* (double-flowered)
*Microbiota decussata* Komar.

P
*Picea abies* 'Argenteospica'
*Picea pungens* 'Aurea'
*Potentilla fruticosa* 'Hachmann's Giant'
*Potentilla fruticosa* 'Red Ace'
*Prunus virginiana* L.

R
*Rhododendron calendulaceum* (Michx.) Torr.
*Rhododendron mucronulatum* 'Roseum'
*Rhododendron* 'Ramapo' (C 1994)
*Rhododendron roseum* (Loisel.) Rehd.
*Rhododendron vaseyi* A. Gray.
*Rosa* 'Captain Samuel Holland'
*Rosa* 'Henry Hudson'
*Rosa* 'Jens Munk'
*Rosa* 'Marie-Victorin'
*Rosa* 'Morden Centennial'
*Rosa canina* L.

S
*Salix fragilis* 'Bullata'
*Spiraea hypericifolia* 'Obovata'
*Spiraea japonica* 'Crispa'
*Spiraea nipponica* var. *tosaensis* (Yatabe) Mak.
*Symphoricarpos albus* (L.) S. F. Blake
*Symphoricarpos orbiculatus* Moench.
*Syringa Komarowii* Schneid.

T
*Thuja occidentalis* 'Buchanani'
*Thuja occidentalis* L. (C 1993)
*Thuja occidentalis* L. (C 1994)
*Thuja occidentalis* 'Sherwood Frost'
*Thuja occidentalis* 'Sherwood Moss'
*Thuja occidentalis* 'Spiralis'
*Thuja occidentalis* 'Umbraculifera'
*Tilia platyphyllos* Scop.
*Tilia* x 'Flavescens Sheridan Hybrids'

U
*Ulmus americana* L.

W
*Weigela florida* 'Foliis Purpureus'

# LIST OF WOODY ORNAMENTAL PLANTS TESTED BY REPLOQ IN 1993 AND 1994 BY WOODY PLANT CATEGORY

## LARGE TREES

*Acer platanoides* 'Crimson King'
*Acer platanoides* 'Deborah'
*Acer saccharinum* L. (C 1993)
*Acer saccharinum* L. (C 1994)
*Betula papyrifera* var. *kenaica* (W.H. Evans) A. Henry
*Castanea* x 'Douglas Hybrids'
*Liriodendron tulipifera* L.
*Prunus virginiana* L.
*Tilia platyphyllos* Scop.
*Tilia* x 'Flavescens Sheridan Hybrids'
*Ulmus americana* L.

## MEDIUM-SIZED TREES

*Crataegus coccinioides* Ashe.
*Malus baccata* (L.) Borkh. (C 1993)
*Malus baccata* (double flowered)
*Salix fragilis* 'Bullata'
*Syringa Komarowii* Schneid.

## SHRUBS

*Aesculus parviflora* Walter.
*Buxus microphylla* 'Green Velvet'
*Buxus microphylla* 'Pincushion'
*Buxus microphylla* 'Winter Beauty'
*Clethra alnifolia* L.
*Cornus alba* 'Argenteo-marginata' (C 1993)
*Cornus alba* 'Argenteo-marginata' (C 1994)
*Cornus alba* 'Kesselringii'
*Cornus hemsleyii* 'Nana'
*Cotinus coggygria* 'Notcutt's Variety'
*Cotoneaster dammeri* 'Royal Carpet'
*Euonymus fortunei* 'Canadale Gold'
*Euonymus fortunei* 'E.T.'
*Euonymus hamiltonianus* 'Maackii'
*Euonymus nanus* var. *turkestanicus* Dieck.
*Hydrangea paniculata* 'Kyushu'
*Hydrangea paniculata* 'Unique'
*Hydrangea serrata* (Thunb.) Mak.
*Hypericum kalmianum* L.
*Lonicera gynochlamydea* Hemsl.
*Lonicera maximowicziana* var. *sachalinensis* Fr. Schmidt.
*Lonicera orientalis* Lam.
*Lonicera tatarinovii* Maxim.
*Lonicera xylosteum* 'Compacta'
*Potentilla fruticosa* 'Hachmann's Giant'
*Potentilla fruticosa* 'Red Ace'
*Rosa* 'Captain Samuel Holland'
*Rosa* 'Henry Hudson'
*Rosa* 'Jens Munk'
*Rosa* 'Marie-Victorin'
*Rosa* 'Morden Centennial'
*Rosa canina* L.
*Spiraea hypericifolia* 'Obovata'
*Spiraea japonica* 'Crispa'
*Spiraea nipponica* var. *tosaensis* (Yatabe) Mak.
*Symphoricarpos albus* (L.) S. F. Blake
*Symphoricarpos orbiculatus* Moench.
*Weigela florida* 'Foliis Purpureus'

## EVERGREENS

*Chamaecyparis obtusa* 'Nana'
*Chamaecyparis pisifera* 'Boulevard'
*Juniperus communis* 'Depressa Aurea'
*Juniperus sabina* 'Blue Danube' (C 1993)
*Juniperus sabina* 'Blue Danube' (C 1994)
*Juniperus sabina* 'Wapiti'
*Juniperus squamata* 'Blue Carpet'
*Juniperus squamata* 'Blue Star'
*Juniperus squamata* 'Meyeri'
*Microbiota decussata* Komar.
*Picea abies* 'Argenteospica'
*Picea pungens* 'Aurea'
*Thuja occidentalis* 'Buchanani'
*Thuja occidentalis* L. (C 1993)
*Thuja occidentalis* L. (C 1994)
*Thuja occidentalis* 'Sherwood Frost'
*Thuja occidentalis* 'Sherwood Moss'
*Thuja occidentalis* 'Spiralis'
*Thuja occidentalis* 'Umbraculifera'

## ERICACEAE

*Rhododendron calendulaceum* (Michx.) Torr.
*Rhododendron mucronulatum* 'Roseum'
*Rhododendron* 'Ramapo' (C 1994)
*Rhododendron roseum* (Loisel.) Rehd.
*Rhododendron vaseyi* A. Gray.

# *ACER PLATANOIDES* 'CRIMSON KING'

| | |
|---|---|
| **Family:** | Aceraceae |
| **English common name:** | Crimson King Norway Maple |
| **French common name:** | Érable de Norvège 'Crimson King' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Medium-sized tree |

## BOTANICAL DESCRIPTION

This cultivar, smaller than the species, has a globular to ovoid form with a regular crown. Its slow growth amounts to some 30 cm in five years, to reach 12 m height and 8 m in diameter.

The straight trunk is covered with very decorative grey bark that remains smooth a long time before splitting into low vertical ridges. The branches are ascending. Twigs are fairly stout, smooth, hairless and the same colour as the buds.

Buds are purplish green or reddish purple, ovoid and smooth. The terminal bud, plump and blunt, is formed of three or four pairs of scales, while the lateral buds have only one or two pairs.

This cultivar is distinguished by its dense foliage, a brilliant wine red in spring turning maroon in summer. Wrinkly young leaves later become smooth. The simple opposite five-lobed leaves have palmate veining. They appear early in spring, but drop early in autumn. The milky sap that exudes from cut leafstalks, bud scales and young twigs is characteristic of the species.

The flowering of the Norway maple is probably the most remarkable of all the maple species, because of the size of the flowers. It occurs in late April or early May before or with the leaves. The five-petalled hermaphroditic greenish-yellow flowers, 5–10 mm in diameter, are clustered in corymbs at the ends of branches.

In late spring, the flowers are succeeded by a proliferation of reddish brown keys with widely spread wings measuring 3–5 cm. They mature in autumn and fall at the same time as the leaves.

The shallow, spreading root system of the rootstock forms three or four taproots.

## ORIGIN AND DISTRIBUTION

The Norway maple originates in Western Europe, where it grows naturally in mountain forests. Its range is from Norway to the Caucasus and south. It is naturalized in many places where its has escaped from cultivation, especially in the United States.

The cultivar *Acer platanoides* 'Crimson King' was grown from seeds sown by Tips in Belgium, then sold commercially by Barbier at Orléans, France, in 1946.

## USE

This little tree is greatly valued as an ornamental and is best used alone, although it may also be suitable for groupings of trees in parks and large spaces, or for lining side streets. It makes a good street tree, because it is resistant to urban conditions, including salt put down in winter.

## REQUIREMENTS

This cultivar must be planted in full sun. A rich, loose, loamy soil and moderate moisture are favourable. The tree tolerates an alkaline to neutral pH.

Water sprouts that appear on the rootstock must be removed, because they provide strong competition to the graft.

The shallow root system of this cultivar is less invasive than that of the species.

## DISEASES AND INSECTS

Anthracnose (*Gloeosporium* sp.), eutypella canker (*Eutypella parasitica*) and septoria spot (*Septoria* sp.) are fungal diseases that may strike maples in favourable conditions or when the tree has suffered a break or mechanical injury. *Acer platanoides* cultivars are among the maples most vulnerable to eutypella canker.

Maples in general are susceptible to scale insects, including the oystershell scale (*Lepidosaphes ulmi*), cottony maple scale and lecanium scale.

Leafhoppers may also damage the foliage. Japanese beetles (*Popillia japonica*) attack the aerial portion of the plant. At present, this insect occurs only in southwestern Quebec and the Richelieu Valley.

## PROPAGATION

**Grafting:** Norway Maple cultivars can be T-budded in the field or cleft grafted in the greenhouse.

T-budding may be done early in the season, as scions are taken from branches that are not growing. The rootstock must have scarcely started to lignify (use the wood of the year). The wrapping should be removed 8 to 10 days after grafting. A good union has generally been formed after three weeks. Later, the rootstock is cut back to the snag and the scion is tied.

Cleft grafting is done in August on a rootstock of the species, well rooted in pots or in the field. The scions are taken from lignified branches and the grafts are waxed.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant: Scion:** City of L'Assomption, Quebec

**Rootstock:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** Rootstocks were three-year-old seedlings with trunks the diameter of a pencil. The scions were taken on August 12, 1991, from an 18-year-old parent plant 6 m tall and 210 mm in diameter on a private lot in L'Assomption. T-budding was done on August 12 on 333 specimens; the bark was difficult to remove. The rootstocks were cut back in May 1992 to 1 cm above the union. The survival rate as of June 14 was 30%. The scions were staked and tied for the growing season. On October 29, the seedlings were dug up and heeled in. In mid-April 1993, they were wrapped and stored in a cellar until being shipped in May.

**Inclusion in testing network:** Seedlings 95 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Several trees died when planted: close to 10% at the St. Hyacinthe, St. Foy and Deschambault sites and about 25% at L'Assomption.

### Winter damage

#### *Region 1*

At L'Assomption, one seedling died the second winter (13%). A further 71, 71 and 14% of the seedlings had frost damage to the branch tips the last three winters; the second and fifth winters, 14, 12 and 14% of seedlings suffered frost damage to the shoots of the previous year.

At St. Clotilde, all the seedlings suffered winter damage the first winter: 31% were killed down to the snow cover, while 31% had frost damage to the previous year's shoots and 38% had frost damage to the branch tips. Also, 31% of seedlings had damaged branch tips the second winter.

At St. Hyacinthe, two seedlings died the first winter (18%), 18% of seedlings suffered frost damage to the branch tips and 64% to the entire length of the branches above the snow cover. The second winter, 33% of seedlings had frost damage to the shoots of the previous year. The damage caused the seedlings to look stunted in the first three years of the trial.

*Region 2*

At St. Foy, all the seedlings suffered frost damage to the previous year's shoots the first winter. The second and third winters, 73 and 45% of seedlings suffered frost damage to the branch tips. Furthermore, 73% of seedlings had mechanical breakage the fourth winter.

At Deschambault, one seedling died the first winter (9%). The first two winters, 36 and 10% of seedlings had frost damage to the previous year's shoots. The first and last three winters, frost damage to the branch tips occurred on 27, 30, 20 and 10% of the trees.

At La Pocatière, 25, 25 and 8% of trees had frost damage to the branch tips the first, second and fourth winters. Furthermore, 17 and 8% of seedlings suffered frost damage to the previous year's shoots and to old wood the first winter.

*Region 3*

At Normandin, the damage got worse from the second to the fourth winters, as initially undamaged seedlings suffered frost damage to the previous year's shoots. Furthermore, 42% of trees had frost damage to the branch tips the first winter. The last winter, 58% of seedlings sustained frost damage to the previous year's shoots and 25% of seedlings were damaged by rodents.

At Kapuskasing, 8, 9 and 20% of trees died in the course of the first three winters. Furthermore, frost damage to the previous year's shoots occurred each winter on 75, 9, 10, 50 and 13% of seedlings. Frost damage was observed on the branch tips of 56, 40 and 87% of seedlings the second, third and fifth winters, while 17% of them died down to the ground the first winter.

**Height and trunk diameter growth**

Figures 1 and 2 show the mean height and trunk diameter of the seedlings after five years at each site in the three regions.

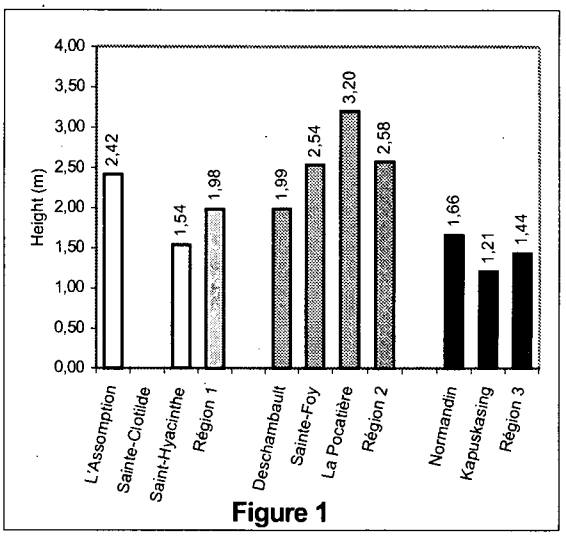



**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

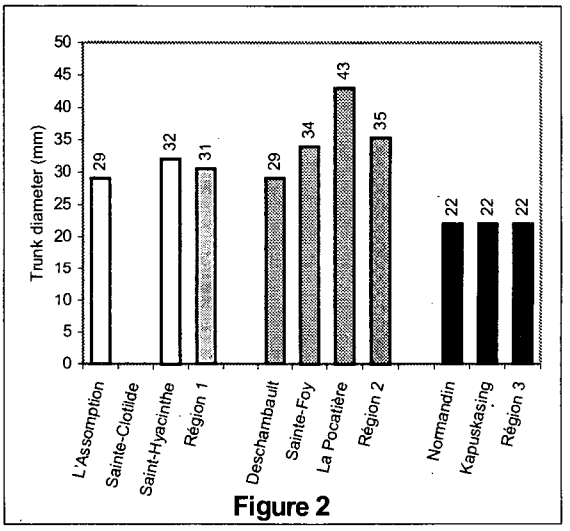



**Figure 2.** Mean trunk diameter of trees at trial's end for each of the sites and three regions

Height growth increased regularly at the La Pocatière, St. Hyacinthe and L'Assomption sites. The annual height increase was greater in the fourth season at the St. Foy,

St. Clotilde, Deschambault and Normandin sites, although it was very small the fifth season. At Kapuskasing, seedling height did not increase in the first four seasons.

### Effect of pruning

Very severe pruning was done at the two sites in zone 2.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and trunk diameter categories (heights and diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

Although all seedlings were more than 2.0 m tall in the fourth season at St. Foy and La Pocatière, production of this cultivar is risky, as seedlings may suffer damage to the branch tips and the previous year's growth at sites in regions 1 and 2.

Conditions conducive to growth in the latter half of the summer seemed to have a great influence on the seedlings' cold tolerance in the fall.

## HARDINESS EVALUATION

According to the literature, this cultivar is hardy to zone 4, yet slight and severe damage was common at the region 3 sites (zones 2a and 2b) and frequent at the sites in regions 1 and 2 (zones 4 and 5). The cultivar can survive in zone 2b, but may become shrubby if frost damage to branch tips is too severe.

It may be used to zone 4, in the knowledge that serious damage may occur with harsher fall or winter conditions, as the young seedlings are more fragile.

The tree's full ornamental potential was not achieved during the trial, but the parent plant in L'Assomption has shown no evidence of winter damage in the past 10 years.

**WRITTEN BY**

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Christine Galipeau, Biologist

Table 1: **Frequency of winter damage observed in *Acer platanoides* 'Crimson King,' 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 61 | 31 | | 6 | | | | 2 | | | | 39 |
| St. Clotilde | 57 | 23 | | 10 | | 10 | | | | | | 43 |
| St. Hyacinthe | 73 | 4 | | 6 | | 13 | | 4 | | | | 27 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 71 | 18 | | 9 | | | | 2 | | | | 29 |
| St. Foy | 42 | 23 | | 20 | | | | | | 15 | | 58 |
| **REGION 3** | | | | | | | | | | | | |
| La Pocatière | 83 | 12 | | 3 | 2 | | | | | | | 17 |
| Normandin | 35 | 28 | | 32 | | | | | | | 5 | 65 |
| Kapuskasing | 22 | 36 | | 32 | | | 3 | 7 | | | | 78 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3 or 9 occurred in the plants tested.

Table 2: **Breakdown of specimens of *Acer platanoides* 'Crimson King' by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 13 | 0 | 0 | 0 | 0 | 15 | 8 | 0 | 0 | - | 0 | 22 | 0 | 0 | 0 |
| 051-100 | 12 | 38 | 0 | 0 | 0 | 16 | 62 | 25 | 0 | - | 55 | 67 | 22 | 0 | 11 |
| 101-150 | 75 | 50 | 17 | 0 | 15 | 69 | 23 | 25 | 17 | - | 45 | 11 | 56 | 56 | 33 |
| 151-200 | 0 | 12 | 67 | 29 | 14 | 0 | 7 | 17 | 17 | - | 0 | 0 | 22 | 44 | 44 |
| 201-250 | 0 | 0 | 16 | 28 | 29 | 0 | 0 | 33 | 17 | - | 0 | 0 | 0 | 0 | 11 |
| 251-300 | 0 | 0 | 0 | 43 | 28 | 0 | 0 | 0 | 41 | - | - | - | - | - | - |
| 301-350 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 8 | - | - | - | - | - | - |
| 351-400 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 0 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 051-100 | 36 | 60 | 20 | 10 | 20 | 55 | 9 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 |
| 101-150 | 64 | 30 | 40 | 40 | 0 | 36 | 73 | 0 | 0 | 0 | 83 | 25 | 0 | 0 | 0 |
| 151-200 | 0 | 0 | 40 | 30 | 30 | 9 | 18 | 82 | 0 | 9 | 0 | 58 | 25 | 0 | 0 |
| 201-250 | 0 | 0 | 0 | 20 | 30 | 0 | 0 | 18 | 27 | 27 | 0 | 17 | 25 | 8 | 8 |
| 251-300 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 55 | 55 | 0 | 0 | 50 | 34 | 0 |
| 301-350 | - | - | - | - | - | 0 | 0 | 0 | 18 | 9 | 0 | 0 | 0 | 50 | 67 |
| 351-400 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 8 | 25 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 0 | 25 | 0 | 0 | 0 | 8 | 55 | 70 | 0 | 0 |
| 051-100 | 34 | 50 | 0 | 0 | 8 | 75 | 45 | 30 | 75 | 25 |
| 101-150 | 58 | 17 | 8 | 0 | 17 | 17 | 0 | 0 | 25 | 75 |
| 151-200 | 8 | 8 | 50 | 25 | 58 | - | - | - | - | - |
| 201-250 | 0 | 0 | 42 | 33 | 17 | - | - | - | - | - |
| 251-300 | 0 | 0 | 0 | 42 | 0 | - | - | - | - | - |
| 301-350 | - | - | - | - | - | - | - | - | - | - |
| 351-400 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: Breakdown of specimens of *Acer platanoides* 'Crimson King' by saleable trunk diameter category, 1993-97

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 |
| 11-20 | 88 | 50 | 0 | 14 | 14 | 62 | 23 | 0 | 0 | - | 100 | 78 | 22 | 11 | 11 |
| 21-30 | 12 | 50 | 83 | 14 | 43 | 38 | 77 | 33 | 0 | - | 0 | 22 | 67 | 56 | 11 |
| 31-40 | 0 | 0 | 17 | 58 | 43 | 0 | 0 | 50 | 50 | - | 0 | 0 | 11 | 33 | 78 |
| 41-50 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 17 | 42 | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | 0 | 0 | 0 | 8 | - | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 0 | 10 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |
| 11-20 | 100 | 80 | 40 | 20 | 10 | 100 | 64 | 9 | 0 | 0 | 92 | 25 | 8 | 0 | 0 |
| 21-30 | 0 | 10 | 50 | 60 | 40 | 0 | 36 | 82 | 27 | 18 | 0 | 75 | 75 | 8 | 8 |
| 31-40 | 0 | 0 | 0 | 20 | 40 | 0 | 0 | 9 | 73 | 64 | 0 | 0 | 17 | 75 | 42 |
| 41-50 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 17 | 25 |
| 51-60 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 25 |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 0 | 0 | 0 | 0 | 8 | 8 | 18 | 10 | 0 | 0 |
| 11-20 | 75 | 83 | 42 | 0 | 25 | 92 | 64 | 50 | 38 | 38 |
| 21-30 | 25 | 17 | 58 | 100 | 59 | 0 | 18 | 40 | 50 | 62 |
| 31-40 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 12 | 0 |
| 41-50 | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

# *ACER PLATANOIDES* 'DEBORAH'

| | |
|---|---|
| **Family:** | Aceraceae |
| **English common name:** | Deborah Norway Maple |
| **French common name:** | Érable de Norvège 'Deborah' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Large tree |

## BOTANICAL DESCRIPTION

This slender, ovoid tree may grow up to 18 m tall and 10 m in diameter. The crown has erect, straight, vigorous branches that give the tree a stretched-out appearance. Tree growth is medium to rapid.

The grey-brown bark, which on older trees has vertical cracks, does not come off in sheets.

The smooth, ovoid, reddish buds consist of a larger terminal bud formed of three or four pairs of scales and lateral buds with only one or two pairs.

The simple five-lobed leaves, bright red and slightly edged with green during leafing out, turn a bronzy green during the growing season and then red again in fall. The leafstalk exudes a milky sap when cut.

The reddish, hermaphroditic flowers measure 8 mm in diameter. The size of the flowers and the corymb cluster at the ends of branches make the flowering of the species probably the most remarkable and spectacular of all the maples. It occurs in late April and continues into the first week of May before or with the leaves.

The fruits, keys with widely divergent wings, measure 3-5 cm in length.

This tree has many taproots and lateral roots are shallow.

## ORIGIN AND DISTRIBUTION

The Norway maple originates in Western Europe, where it is found from Norway south to the Caucasus growing naturally in mountain forests. This cultivar was developed in Oregon from an *A. p.* 'Schwedleri' seedling.

## USE

**Ornamental:** This slow-growing cultivar may be used alone or planted in a line. It adapts well to city conditions and requires no particular soil type. Its dense foliage makes it an excellent shade tree.

## REQUIREMENTS

This tree prefers a sunny exposure. It is not very demanding with regard to soil type, but prefers a cool, well-drained location out of prevailing winter winds. It withstands pruning well and tolerates the salt spread in winter and compacted soil.

## DISEASES AND INSECTS

Anthracnose (*Gloeosporium* sp.), eutypella canker (*Eutypella parasitica*) and septoria spot (*Septoria* sp.) are fungal diseases that may strike maples in favourable conditions or when the tree has suffered a break or mechanical injury. *Acer platanoides* cultivars are among the maples most vulnerable to eutypella canker.

Scale insects, especially the apple oystershell scale (*Lepidosaphes ulmi*), cottony maple scale and lecanium scale, like maples.

Leafhoppers may also damage the foliage. Japanese beetles (*Popillia japonica*) attack the aerial portion of the plant. At present, this insect occurs only in southwestern Quebec and the Richelieu Valley.

## PROPAGATION

**Grafting:** Norway Maple cultivars can be T-budded in the field or cleft grafted in the greenhouse.

T-budding may be done early in the season, as scions are taken from branches that are not growing. The rootstock must have scarcely started to lignify (use the wood of the year). The wrapping should be removed 8 to 10 days after grafting. A good union has generally been formed after three weeks. Later, the rootstock is cut back to the snag and the scion is tied.

Cleft grafting is done in August on rootstock of the species, well rooted in pots or in the field. The scions are taken from lignified branches and the grafts are waxed.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Scion: Seedlings purchased from Sheridan and established at Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** The rootstocks, two-year-old seedlings grown from seed from La Pocatière, had trunks the diameter of a pencil. The scions were taken on August 10, 1992, from an 11-year-old parent plant at L'Assomption, which measured 6.5 m tall with a trunk diameter of 120 mm. T-budding was done on 400 specimens, from which the bark was difficult to remove. The rootstocks were cut back on May 10, 1993, to 1.0 cm above the union. On June 22, the survival rate was 50%; 30% of the seedlings were broken by violent winds late in the season, despite having been staked and tied throughout the growing season. In October, they were dug up and heeled in. In mid-April 1994, they were wrapped and stored in a cellar until being shipped in May.

**Inclusion in testing network:** Seedlings 112 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

A few seedlings died at four of the eight sites during the trial.

*Region 1*

At L'Assomption, one seedling died the second winter. Frost damage was seen on the branch tips of 38, 100 and 14% of seedlings the first, third and fourth winters.

At St. Clotilde, 30% of seedlings had frost damage to the branch tips after the first winter.

At St. Hyacinthe, all winter damage occurred the first winter: 40% of seedlings suffered frost damage to the branch tips and one died.

*Region 2*

At Deschambault, one seedling died the fourth winter. Frost damage to the branch tips was seen every winter, on 9, 64, 9, 54 and 9% of seedlings. Frost damage to the previous year's shoots occurred on 9 and 18% of seedlings the first and third winters. Furthermore, the third and fourth winters, 45 and 9% of seedlings suffered mechanical injury.

At St. Foy, 67% of seedlings suffered frost damage to the branch tips the second winter and mechanical breakage was observed on 56% of seedlings after the third winter.

No damage occurred at La Pocatière during the trial.

*Region 3*

At Normandin, one seedling died the fourth winter. All the seedlings were killed to the ground the second winter and the previous year's shoots of all trees froze the third winter. The last winter, 18% of seedlings had frost damage to the branch tips.

At Kapuskasing, three seedlings died the first two winters. Furthermore, 40% of seedlings froze down to the ground the first winter. The previous year's shoots sustained frost damage every winter, on 10, 80, 88, 57 and 71% of seedlings. In addition, 20, 43 and 28% of seedlings had frost damage to the branch tips the first and last two winters.

### Height and trunk diameter growth

Figures 1 and 2 show the mean height and trunk diameter of the seedlings after five years at each site in the three regions.

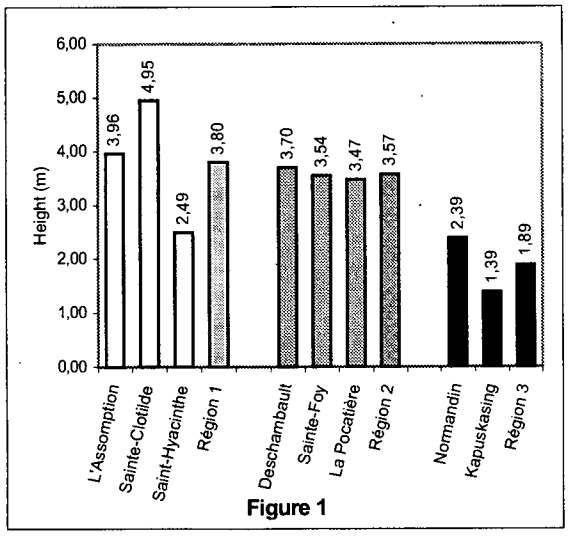


**Figure 1.** Mean height of trees at trial's end for each of the eight sites and three regions

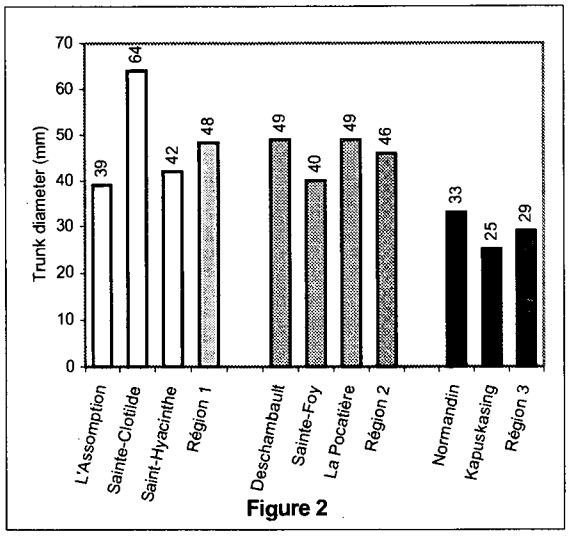


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the eight sites and three regions

### Effect of pruning

Severe pruning to 1 cm above the ground was done at Normandin the third spring and the trees were cut back to 50% of their height three times.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and trunk diameter categories (heights and diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

Growth of seedlings of this cultivar is strongly related to temperature, as the tallest seedlings were seen at the warmest site (St. Clotilde, zone 5b). At least 90% of trees at L'Assomption, St. Clotilde, St. Foy and La Pocatière reached a height of 2.0-3.0 m in the third growing season, while a fourth season was necessary at Deschambault and St. Hyacinthe. Trees at the zone 2 sites did not grow this tall.

## HARDINESS EVALUATION

According to the literature, this cultivar is hardy to zone 4b, yet slight and severe damage was common at zone 2 sites and frequent at the sites in zones 4 and 5. The cultivar can survive in zone 2, but severe damage weakens the trees and makes them shrubby.

Although some damage may occur occasionally with harsher autumn or winter conditions, the beauty of its foliage allows this cultivar to be used to zone 4.

The cultivar achieved its full ornamental potential in zone 4a during the trial. The more temperate conditions (less dramatic temperature variations) at this site meant that some trees were undamaged over five years.

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**Table 1:** **Frequency of winter damage to *Acer platanoides* 'Deborah,' 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 67 | 30 | | | | | | 3 | | | | 33 |
| St. Clotilde | 94 | 6 | | | | | | | | | | 6 |
| St. Hyacinthe | 90 | 8 | | | | | | 2 | | | | 10 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 50 | 31 | | 5 | | | | 2 | | 12 | | 50 |
| St. Foy | 69 | 17 | | | | | | | | 14 | | 31 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 55 | 3 | | 20 | | | 20 | 2 | | | | 45 |
| Kapuskasing | 6 | 9 | | 61 | | | 8 | 6 | | | | 94 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 5, 6, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of specimens of *Acer platanoides* 'Deborah' by saleable height category, 1994-98**

| | REGION 1 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 25 | 25 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 20 | 22 | 0 | 0 | 0 |
| 101-200 | 75 | 75 | 14 | 0 | 0 | 90 | 30 | 0 | 0 | 0 | 80 | 67 | 33 | 11 | 11 |
| 201-300 | 0 | 0 | 72 | 72 | 0 | 0 | 70 | 0 | 0 | 0 | 0 | 11 | 67 | 67 | 67 |
| 301-400 | 0 | 0 | 14 | 14 | 57 | 0 | 0 | 80 | 40 | 0 | 0 | 0 | 0 | 22 | 22 |
| 401-500 | 0 | 0 | 0 | 14 | 43 | 0 | 0 | 20 | 60 | 60 | - | - | - | - | - |
| 501-600 | - | - | - | - | - | 0 | 0 | 0 | 0 | 40 | - | - | - | - | - |
| | **REGION 2** | | | | | | | | | | | | | | |
| Height | Deschambault | | | | | St. Foy* | | | | | La Pocatière | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 27 | 9 | 0 | 0 | 0 | - | 22 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101-200 | 73 | 18 | 19 | 10 | 10 | - | 78 | 0 | 0 | 0 | 100 | 22 | 0 | 0 | 0 |
| 201-300 | 0 | 73 | 45 | 45 | 0 | - | 0 | 100 | 78 | 11 | 0 | 78 | 45 | 22 | 11 |
| 301-400 | 0 | 0 | 36 | 45 | 50 | - | 0 | 0 | 22 | 89 | 0 | 0 | 55 | 78 | 89 |
| 401-500 | 0 | 0 | 0 | 0 | 40 | - | - | - | - | - | - | - | - | - | - |
| 501-600 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| | **REGION 3** | | | | | | | | | | | | | | |
| Height | Normandin | | | | | Kapuskasing | | | | | | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | | | | | |
| 001-100 | 24 | 0 | 8 | 0 | 0 | 20 | 40 | 0 | 0 | 14 | | | | | |
| 101-200 | 76 | 42 | 50 | 25 | 18 | 80 | 60 | 88 | 43 | 86 | | | | | |
| 201-300 | 0 | 58 | 42 | 75 | 82 | 0 | 0 | 12 | 57 | 0 | | | | | |
| 301-400 | - | - | - | - | - | - | - | - | - | - | | | | | |
| 401-500 | - | - | - | - | - | - | - | - | - | - | | | | | |
| 501-600 | - | - | - | - | - | - | - | - | - | - | | | | | |

*St. Foy data were not collected in 1994.

Table 3: **Breakdown of specimens of *Acer platanoides* 'Deborah' seedlings by saleable trunk diameter category, 1994-98**

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 |
| 11-20 | 100 | 75 | 28 | 0 | 0 | 100 | 20 | 0 | 0 | 0 | 80 | 22 | 11 | 0 | 0 |
| 21-30 | 0 | 25 | 57 | 43 | 14 | 0 | 70 | 0 | 0 | 0 | 0 | 78 | 11 | 11 | 11 |
| 31-40 | 0 | 0 | 15 | 57 | 43 | 0 | 10 | 70 | 0 | 0 | 0 | 0 | 78 | 67 | 22 |
| 41-50 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 30 | 40 | 40 | 0 | 0 | 0 | 22 | 55 |
| 51-60 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 40 | 40 | 0 | 0 | 0 | 0 | 12 |
| 61-70 | - | - | - | - | - | 0 | 0 | 0 | 20 | 20 | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy* | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11-20 | 91 | 27 | 0 | 9 | 0 | - | 89 | 0 | 0 | 0 | 100 | 11 | 0 | 0 | 0 |
| 21-30 | 0 | 64 | 36 | 36 | 10 | - | 11 | 67 | 56 | 0 | 0 | 89 | 22 | 11 | 0 |
| 31-40 | 0 | 9 | 45 | 45 | 30 | - | 0 | 33 | 44 | 56 | 0 | 0 | 78 | 67 | 11 |
| 41-50 | 0 | 0 | 19 | 10 | 40 | - | 0 | 0 | 0 | 44 | 0 | 0 | 0 | 22 | 56 |
| 51-60 | 0 | 0 | 0 | 0 | 20 | - | - | - | - | - | 0 | 0 | 0 | 0 | 33 |
| 61-70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 0 | 0 | 0 | 8 | 0 | 0 | 30 | 0 | 0 | 0 |
| 11-20 | 100 | 25 | 100 | 0 | 0 | 100 | 40 | 50 | 29 | 14 |
| 21-30 | 0 | 75 | 0 | 92 | 36 | 0 | 30 | 50 | 71 | 71 |
| 31-40 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 0 | 15 |
| 41-50 | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - |
| 61-70 | - | - | - | - | - | - | - | - | - | - |

*St. Foy data were not collected in 1994.

# *ACER SACCHARINUM*

L. (CONTROL 1993)

The sections "Botanical Description," "Origin and Distribution," "Use," "Requirements" and "Propagation" can be found in the first series of fact sheets (02-9227), and "Diseases and Insects" in the *Hardiness and Growth of Woody Ornamental Plants in Quebec*, Volume III (VT 008).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Agriculture and Agri-Food Canada's Experimental Farm, La Pocatière, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** The seeds were harvested in early June 1992 from parent plants about 40 years old, 15 m tall, with a trunk 30 cm in diameter. The seeds were sown in a cold frame as soon as they were received. Emergence occurred over roughly 10 days. The seedlings were dug up in mid-October, puddled and heeled in for the winter. In early May 1993, they were wrapped in plastic bags and put in the cold store at 5°C to await shipping.

**Inclusion in testing network:** Seedlings 37 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

*Acer saccharinum* was less frost resistant in the first two years at all sites except St. Foy, Normandin and Kapuskasing.

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption and St. Clotilde, 67% of seedlings had frost damage to the branch tips the first winter. Also, 8% of the trees at L'Assomption suffered mechanical breakage the fourth winter.

At St. Hyacinthe, 14% of seedlings died the second winter. Frost damage to the branch tips was observed on 52% of seedlings the first winter.

*Region 2*

At St. Foy, 100, 86 and 50% of seedlings suffered frost damage to the branch tips the first three winters. In addition, 33% of seedlings suffered mechanical breakage the fourth winter.

At Deschambault, 48 and 5% of seedlings had frost damage to the branch tips the first two winters. In addition, 10% of seedlings suffered frost damage to the previous year's shoots the first winter.

At La Pocatière, 90 and 38% of seedlings had frost damage to the branch tips the first two winters. In addition, 5% of seedlings suffered frost damage to the previous year's shoots the first winter.

*Region 3*

At Normandin, 90 and 8% of seedlings had frost damage to the branch tips the first and third winters. In addition, 5% of seedlings suffered mechanical breakage the first winter.

At Kapuskasing, 30, 5, 50 and 8% of seedlings suffered frost damage to the branch tips the first four winters. In addition, 70 and 33% of seedlings suffered frost damage to the previous year's shoots the first and third winters.

### Height and trunk diameter growth

Figures 1 and 2 show the mean height and trunk diameter of the seedlings after five years at each site in the three regions.

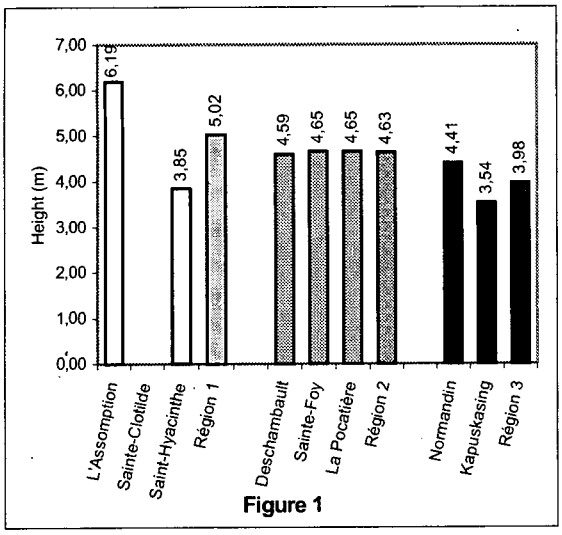


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

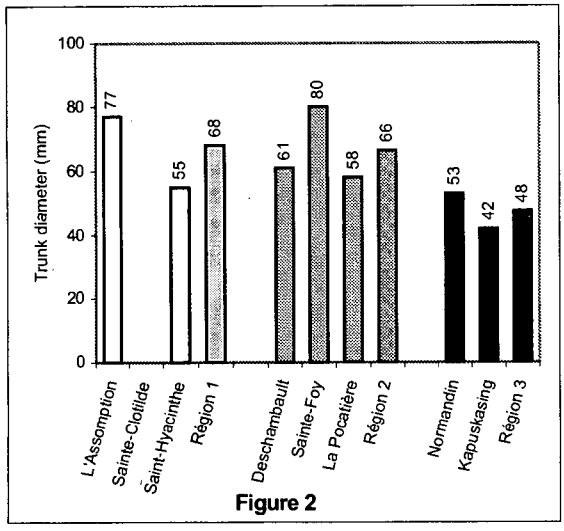


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the sites and three regions

Height growth gradually increased throughout the trial, with the strongest increases in the second, third and fourth years. Growth in trunk diameter was greatest in the last two years.

### Effect of pruning

No pruning, other than training and removal of damaged parts, was required.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and trunk diameter categories (heights and diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

All seedlings were taller than 3.0 m after three years of cultivation at L'Assomption, St. Foy and La Pocatière, four years at St. Clotilde and five years St. Hyacinthe and Deschambault.

The trunk diameter of all seedlings was greater than 40 mm after three years of cultivation at St. Foy, four years at L'Assomption and St. Clotilde and five years at St. Hyacinthe and La Pocatière.

This tree can be produced at all sites in regions 1 and 2.

## HARDINESS EVALUATION

The species can survive to zone 2a, as there was no mortality at the Kapuskasing site. The species can be used to zone 2b without severe damage; most damage occurred in the first two winters.

The tree did not achieve its full ornamental potential at the trial sites, although the parent plant in La Pocatière has suffered no winter damage. But, excluding the damage suffered the first winter, full expression of ornamental characters was observed in zone 5.


## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Acer saccharinum* L. (Control 1993), 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 85 | 13 | | | | | | | | 2 | | 15 |
| St. Clotilde | 78 | 22 | | | | | | | | | | 22 |
| St. Hyacinthe | 87 | 10 | | | | | | 3 | | | | 13 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 88 | 11 | | 1 | | | | | | | | 12 |
| St. Foy | 46 | 47 | | | | | | | | 7 | | 54 |
| La Pocatière | 73 | 26 | | 1 | | | | | | | | 27 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 79 | 20 | | | | | | | | 1 | | 21 |
| Kapuskasing | 61 | 19 | | 20 | | | | | | | | 39 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 5, 6, 7, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of specimens of *Acer saccharinum* L. (Control 1993) by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 19 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 95 | 9 | 0 | 0 | 0 |
| 101-200 | 81 | 43 | 0 | 0 | 0 | 48 | 5 | 0 | 0 | 0 | 5 | 86 | 8 | 0 | 0 |
| 201-350 | 0 | 52 | 0 | 0 | 0 | 52 | 23 | 33 | 0 | 0 | 0 | 5 | 84 | 17 | 0 |
| 301-400 | 0 | 0 | 75 | 8 | 0 | 0 | 67 | 58 | 33 | 0 | 0 | 0 | 8 | 83 | 50 |
| 401-500 | 0 | 0 | 25 | 25 | 8 | 0 | 5 | 9 | 33 | 0 | 0 | 0 | 0 | 0 | 50 |
| 501-600 | 0 | 0 | 0 | 67 | 17 | 0 | 0 | 0 | 34 | 0 | - | - | - | - | - |
| 601-700 | 0 | 0 | 0 | 0 | 67 | - | - | - | - | - | - | - | - | - | - |
| 701-800 | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 43 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 0 | 0 | 0 | 0 |
| 101-200 | 57 | 76 | 8 | 0 | 0 | 40 | 0 | 0 | 0 | 0 | 71 | 10 | 0 | 0 | 0 |
| 201-350 | 0 | 24 | 50 | 9 | 0 | 60 | 52 | 0 | 0 | 0 | 0 | 76 | 0 | 8 | 0 |
| 301-400 | 0 | 0 | 42 | 58 | 25 | 0 | 48 | 0 | 0 | 0 | 0 | 14 | 92 | 17 | 8 |
| 401-500 | 0 | 0 | 0 | 33 | 50 | 0 | 0 | 100 | 0 | 8 | 0 | 0 | 8 | 67 | 75 |
| 501-600 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 75 | 75 | 0 | 0 | 0 | 8 | 17 |
| 601-700 | - | - | - | - | - | 0 | 0 | 0 | 25 | 17 | - | - | - | - | - |
| 701-800 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 57 | 5 | 0 | 0 | 0 | 90 | 10 | 0 | 0 | 0 |
| 101-200 | 43 | 67 | 0 | 0 | 0 | 10 | 90 | 8 | 8 | 0 |
| 201-350 | 0 | 28 | 50 | 17 | 8 | 0 | 0 | 92 | 58 | 8 |
| 301-400 | 0 | 0 | 50 | 33 | 33 | 0 | 0 | 0 | 34 | 92 |
| 401-500 | 0 | 0 | 0 | 50 | 9 | - | - | - | - | - |
| 501-600 | 0 | 0 | 0 | 0 | 50 | - | - | - | - | - |
| 601-700 | - | - | - | - | - | - | - | - | - | - |
| 701-800 | - | - | - | - | - | - | - | - | - | - |

**Table 3:** **Breakdown of specimens of *Acer saccharinum* L. (Control 1993) by saleable trunk diameter category, 1993-97**

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 86 | 5 | 0 | 0 | 0 | 100 | 10 | 0 | 0 | 0 | 100 | 76 | 0 | 0 | 0 |
| 021-040 | 14 | 95 | 33 | 0 | 0 | 0 | 90 | 33 | 0 | 0 | 0 | 24 | 100 | 25 | 0 |
| 041-060 | 0 | 0 | 67 | 33 | 17 | 0 | 0 | 67 | 58 | 0 | 0 | 0 | 0 | 75 | 75 |
| 061-080 | 0 | 0 | 0 | 50 | 50 | 0 | 0 | 0 | 42 | 0 | 0 | 0 | 0 | 0 | 25 |
| 081-100 | 0 | 0 | 0 | 17 | 33 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 100 | 52 | 0 | 0 | 0 | 90 | 10 | 0 | 0 | 0 | 100 | 14 | 0 | 0 | 0 |
| 021-040 | 0 | 48 | 92 | 17 | 17 | 10 | 86 | 0 | 0 | 0 | 0 | 86 | 67 | 8 | 0 |
| 041-060 | 0 | 0 | 8 | 75 | 33 | 0 | 4 | 92 | 8 | 0 | 0 | 0 | 33 | 75 | 75 |
| 061-080 | 0 | 0 | 0 | 8 | 42 | 0 | 0 | 8 | 84 | 50 | 0 | 0 | 0 | 17 | 25 |
| 081-100 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 8 | 50 | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 100 | 67 | 25 | 0 | 0 | 100 | 100 | 8 | 0 | 0 |
| 021-040 | 0 | 33 | 75 | 58 | 33 | 0 | 0 | 92 | 100 | 33 |
| 041-060 | 0 | 0 | 0 | 42 | 25 | 0 | 0 | 0 | 0 | 67 |
| 061-080 | 0 | 0 | 0 | 0 | 42 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |

# *ACER SACCHARINUM*

L. (CONTROL 1994)

The sections "Botanical Description," "Origin and Distribution," "Use," "Requirements" and "Propagation" can be found in the first series of fact sheets (02-9227), and "Diseases and Insects" in the *Hardiness and Growth of Woody Ornamental Plants in Quebec*, Volume III (VT 008).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Agriculture and Agri-Food Canada's Experimental Farm, La Pocatière, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** Seeds were harvested on June 8, 1992, from a 71-year-old parent plant, 20 m tall, with a 75-cm-diameter trunk. They were sown in a cold frame three days later, at a depth of 10 mm, in a Promix®-sand mixture (1:2; v:v), covered with 2 cm of Sylvagrest® and shaded by a cloth (63%). Emergence occurred over roughly 10 days. Mean height growth during the first year was 15 cm. The seedlings were dug up in mid-October and heeled in. On May 19, 1993, they were transplanted to the nursery and fertilized in the spring with soluble fertilizer (10-52-10). They were dug up in October, puddled and heeled in for the winter. The winter survival rate was 100%. In mid-April 1994, the seedlings were wrapped and kept in the cold store at 4°C until they were shipped in May.

**Inclusion in testing network:** Seedlings 43 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

Only one seedling sustained mechanical breakage at L'Assomption the third winter.

No damage occurred at St. Clotilde and one seedling died the first winter at St. Hyacinthe.

*Region 2*

At Deschambault, 10 and 17% of seedlings had frost damage to the branch tips the first and third winters and mechanical breakage. In addition, 10% suffered frost damage to the previous year's shoots the first winter.

At St. Foy, 71, 61 and 8% of seedlings suffered frost damage to the shoots of the previous year the first three winters. In addition, the third winter, 17% of seedlings suffered mechanical injury.

At La Pocatière, 30% of seedlings had frost damage to the branch tips the second winter.

*Region 3*

At Normandin, 63% of seedlings suffered frost damage to the branch tips the second winter and 33% suffered frost damage to the previous year's shoots the following winter.

At Kapuskasing, 38, 52 and 17% of seedlings had frost damage to the branch tips the first three winters. Frost damage to the previous year's shoots occurred on 9% of the seedlings the second and third winters.

### Height and trunk diameter growth

Figures 1 and 2 show the mean height and trunk diameter of the seedlings after five years at each site in the three regions.

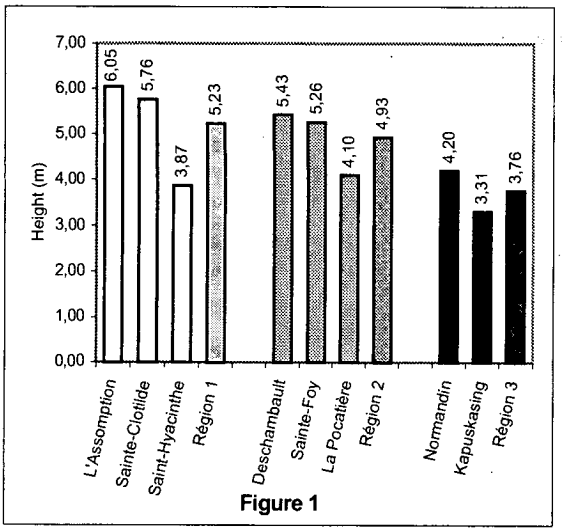


**Figure 1.** Mean height of trees at trial's end for each of the eight sites and three regions

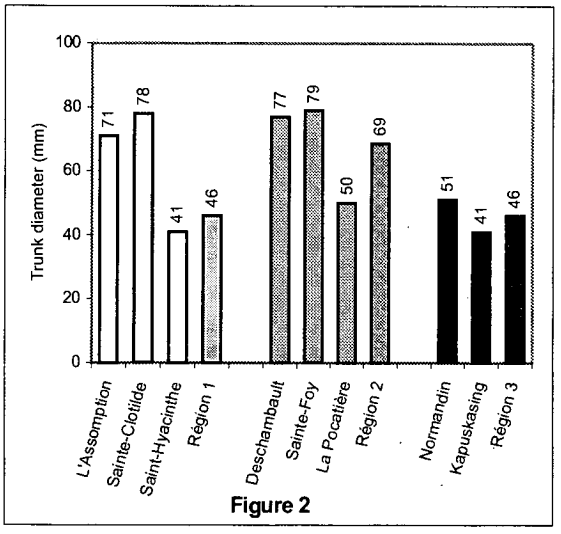


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the eight sites and three regions

### Effect of pruning

Light pruning was done several times, eliminating 20% of the height of the seedlings at St. Foy. More severe pruning, about 50%, was necessary at Normandin the third year.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and trunk diameter categories (heights and diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

Over 83% of seedlings were more than 3.0 m tall after three years of cultivation at L'Assomption, Deschambault and St. Foy. Another year was necessary at St. Hyacinthe, La Pocatière and Normandin to obtain trees of similar height.

Eighty percent of seedlings had a trunk diameter greater than 40 mm after three years of cultivation at St. Foy, four years at L'Assomption, St. Clotilde, St. Hyacinthe and Deschambault, and after a fifth year at La Pocatière and Normandin.

This tree can be produced at all sites in regions 1 and 2.

## HARDINESS EVALUATION

Comparison of the results of this trial with those of earlier trials confirms that plants of this provenance can survive beyond zone 2, that the potential for use corresponds to zone 2a, but that in this zone, growth will be slower and seedlings will tend to be more slender.

The tree achieved its full ornamental potential in zone 5.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

Table 1: Frequency of winter damage observed in *Acer saccharinum* L. (Control 1994), 1995-99

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 98 | | | | | | | | | 2 | | | 2 |
| St. Clotilde | 100 | | | | | | | | | | | | 0 |
| St. Hyacinthe | 99 | | | | | | | 1 | | | | | 1 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 88 | 5 | | 2 | | | | | | 5 | | | 12 |
| St. Foy | 68 | 29 | | | | | | | | 3 | | | 32 |
| La Pocatière | 94 | 6 | | | | | | | | | | | 6 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 81 | 13 | | 6 | | | | | | | | | 19 |
| Kapuskasing | 75 | 22 | | 3 | | | | | | | | | 25 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 5, 6, 7, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of specimens of *Acer saccharinum* L. (Control 1994) by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 76 | 0 | 0 | 0 | 0 | 52 | 0 | 0 | 0 | 0 | 60 | 10 | 0 | 0 | 0 |
| 101-200 | 24 | 52 | 8 | 8 | 0 | 48 | 21 | 13 | 0 | 0 | 40 | 40 | 0 | 0 | 0 |
| 201-300 | 0 | 48 | 0 | 0 | 0 | 0 | 58 | 0 | 8 | 0 | 0 | 50 | 64 | 18 | 0 |
| 301-400 | 0 | 0 | 75 | 8 | 8 | 0 | 21 | 50 | 17 | 8 | 0 | 0 | 36 | 82 | 82 |
| 401-500 | 0 | 0 | 17 | 42 | 0 | 0 | 0 | 25 | 25 | 8 | 0 | 0 | 0 | 0 | 9 |
| 501-600 | 0 | 0 | 0 | 42 | 34 | 0 | 0 | 12 | 42 | 34 | 0 | 0 | 0 | 0 | 9 |
| 601-700 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 8 | 42 | - | - | - | - | - |
| 701-800 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 43 | 10 | 0 | 0 | - | 33 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 0 |
| 101-200 | 57 | 33 | 17 | 0 | - | 67 | 14 | 0 | 0 | 0 | 65 | 30 | 0 | 0 | 0 |
| 201-300 | 0 | 57 | 0 | 17 | - | 0 | 76 | 8 | 8 | 0 | 0 | 70 | 34 | 8 | 0 |
| 301-400 | 0 | 0 | 83 | 0 | - | 0 | 10 | 50 | 25 | 17 | 0 | 0 | 58 | 67 | 50 |
| 401-500 | 0 | 0 | 0 | 50 | - | 0 | 0 | 42 | 58 | 8 | 0 | 0 | 8 | 25 | 50 |
| 501-600 | 0 | 0 | 0 | 33 | - | 0 | 0 | 0 | 9 | 58 | - | - | - | - | - |
| 601-700 | - | - | - | - | - | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - |
| 701-800 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 74 | 0 | 0 | 0 | 0 | 53 | 19 | 0 | 0 | 0 |
| 101-200 | 26 | 32 | 8 | 8 | 0 | 47 | 57 | 25 | 8 | 0 |
| 201-300 | 0 | 63 | 25 | 8 | 0 | 0 | 24 | 75 | 17 | 25 |
| 301-400 | 0 | 5 | 67 | 75 | 33 | 0 | 0 | 0 | 75 | 75 |
| 401-500 | 0 | 0 | 0 | 9 | 67 | - | - | - | - | - |
| 501-600 | - | - | - | - | - | - | - | - | - | - |
| 601-700 | - | - | - | - | - | - | - | - | - | - |
| 701-800 | - | - | - | - | - | - | - | - | - | - |

Table 3: **Breakdown of specimens of *Acer saccharinum* L. (Control 1994) by saleable trunk diameter category, 1994-98**

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 43 | 0 | 0 | 0 | 95 | 7 | 0 | 0 | 0 | 100 | 40 | 0 | 0 | 0 |
| 021-040 | 0 | 57 | 42 | 8 | 0 | 5 | 72 | 62 | 17 | 9 | 0 | 60 | 64 | 9 | 0 |
| 041-060 | 0 | 0 | 58 | 75 | 17 | 0 | 14 | 38 | 25 | 8 | 0 | 0 | 36 | 91 | 82 |
| 061-080 | 0 | 0 | 0 | 17 | 67 | 0 | 7 | 0 | 33 | 25 | 0 | 0 | 0 | 0 | 18 |
| 081-100 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 25 | 50 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 38 | 8 | 0 | 0 | 81 | 10 | 0 | 0 | 0 | 100 | 45 | 0 | 0 | 0 |
| 021-040 | 0 | 62 | 8 | 17 | 17 | 19 | 86 | 17 | 8 | 0 | 0 | 55 | 92 | 50 | 0 |
| 041-060 | 0 | 0 | 84 | 33 | 0 | 0 | 4 | 67 | 25 | 25 | 0 | 0 | 8 | 50 | 100 |
| 061-080 | 0 | 0 | 0 | 50 | 25 | 0 | 0 | 16 | 67 | 17 | - | - | - | - | - |
| 081-100 | 0 | 0 | 0 | 0 | 58 | 0 | 0 | 0 | 0 | 58 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 64 | 8 | 0 | 0 | 100 | 67 | 8 | 0 | 0 |
| 021-040 | 0 | 36 | 92 | 42 | 17 | 0 | 33 | 92 | 83 | 42 |
| 041-060 | 0 | 0 | 0 | 58 | 58 | 0 | 0 | 0 | 17 | 58 |
| 061-080 | 0 | 0 | 0 | 0 | 25 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

# *AESCULUS PARVIFLORA* WALTER.

| | |
|---|---|
| **Family:** | Hippocastanaceae |
| **English common name:** | Bottlebrush buckeye |
| **French common name:** | Marronnier à petites fleurs, Pavier blanc |
| **Synonym:** | *A. macrostachya* Michx., *Pavia macrostachya* (Michx.) Loisel |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This buckeye, a shrub forming a wide, spreading bush, produces suckers easily. It is wider than it is tall, and may grow to be 2.5–4.0 m tall and 3.0–5.0 m wide.

Its slender but sturdy ascending branches, with few twigs but prone to suckering, are brown with many light brown lenticels. The leaf scar encircles the bud, and the three to six vein scars form the outline of a human face.

The slightly overlapping buds are covered with four scales. The terminal bud is about 5 mm long. Lateral buds are very small, with slightly pubescent, glaucous brownish-grey scales.

The coarse-textured, dense foliage, which is light green turning yellow in fall, consists of palmately compound leaves of five to seven opposite leaflets about 11 cm long; they are almost sessile, oval, pointed, toothed and covered below with grey down.

The flowering of this shrub is very showy. It lasts two months in summer, from July through to the end of August. The small yellowish-white flowers have four petals, long, protuberant stamens and red anthers. They form terminal panicles 20 to 30 cm held above the foliage.

The smooth, capsular, dehiscent brown fruit (a nut), measuring 3 to 4 cm in length, is inedible and poisonous. It reaches maturity in September or October.

The roots are well ramified and deep.

The old wood grows slowly, but suckers grow at an impressive rate.

## ORIGIN AND DISTRIBUTION

The shrub's natural habitat is the U.S., from South Carolina to Alabama and Florida. It was introduced as an ornamental in 1785.

## USE

**Ornamental:** This graceful shrub is of interest for its foliage and late flowering. Easy to grow, it can tolerate some shade. It is a good shrub for small gardens. It can be used alone or in a mix.

## REQUIREMENTS

The bottlebrush buckeye tolerates sun well. It adapts to poor soil, but prefers acid, clayey, loamy, sandy or organic soil rich in humus. It must be planted in moist, well-drained soil, as it does not tolerate drought.

It is not very hardy and tends to freeze easily, yet if killed back by severe ground frost, it will send out suckers. For this reason, it should not be planted in too windy a location. It will not be harmed by cutting back.

## DISEASES AND INSECTS

Powdery mildew (*Uncinula* sp.) is a fungal disease of the leaves that occurs under certain conditions.

The foliage can be destroyed by spittlebugs and the Japanese beetle (*Popillia japonica*), which is found in southwestern Quebec and the Richelieu Valley.

## PROPAGATION

**Cutting:** Propagation is by root cuttings: a 5–7 cm section, covered with sand and stored in a cool place in December, will be ready for outdoor planting in spring.

Taking softwood cuttings from new suckers may also be a good propagation method. Cuttings, treated with a hormone solution of 10,000 ppm of IBA, are placed in a substrate of peat and perlite under mist.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** 353 fruits were gathered on September 14, 1989, sown directly in the bed without any specific treatment and covered with 10 cm of peat. Emergence was irregular (germination rate approximately 15%) and mean growth was 30 cm the first year. The seedlings remained in the bed until October 1991. They were dug up and placed in the cold store at a temperature of 2–5°C. On May 20, 1992, they were transplanted to a nursery and regularly fertilized through the growing season. On October 25, they were dug up, puddled and heeled in. The winter survival rate was 100%. In mid-April 1993, the seedlings were wrapped and placed in cold storage at 4°C until being shipped in May.

**Inclusion in testing network:** Seedlings 15 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

In L'Assomption, 40% and 10% of seedlings died the first two winters, while 20% of seedlings suffered frost damage to the branch tips the first winter and 20% were killed to the ground. All seedlings suffered damage to the branch tips the fourth winter. The last winter, 50% of seedlings suffered frost damage to the previous year's shoots.

In St. Clotilde, two seedlings died the first winter. A further 20% had damage to the branch tips the next winter.

All the seedlings at St. Hyacinthe died the first winter.

*Region 2*

In Deschambault, 25, 17 and 80% of seedlings died the first, third and fourth winters. In addition, the first winter, 50% of seedlings froze at the branch tips or down to ground level. The fourth and fifth winters, 20 and 100% of seedlings suffered damage to the branch tips.

In St. Foy, one seedling died in each of the first, fourth and fifth winters. One seedling died to the ground the second winter and another the third winter. The first and third winters, another 29 and 16% of seedlings suffered frost to the previous year's shoots. There was frost damage to old wood as well in 29% of seedlings the first winter, while 16% of seedlings suffered frost damage to the branch tips the third and fourth winters. The fourth winter, 33% of seedlings suffered mechanical breakage.

In La Pocatière, 10, 43 and 8% of seedlings died the first, third and fifth winters. The first, second and fourth winters, the branch tips of 10–28% of seedlings froze. Frost damage to the previous year's shoots occurred on 20–25% of seedlings the first, second and fourth winters. Frost killed 25, 50, 28 and 75% of seedlings to the ground the first three and the last winters. As well, the fourth winter, 25% of seedlings were frozen down to the snow cover.

*Region 3*

In Normandin, all the seedlings died by the end of the first three winters; 50% were eliminated the first year, 25% the second and 100% the third. All the surviving seedlings each year were severely damaged.

In Kapuskasing, 15, 67, 50 and 100% of seedlings died the first three and last winters. All the other seedlings were killed to the ground each winter.

### Height and trunk diameter growth

Figures 1 and 2 show the mean height and trunk diameter of the seedlings after five years at each site in the three regions.

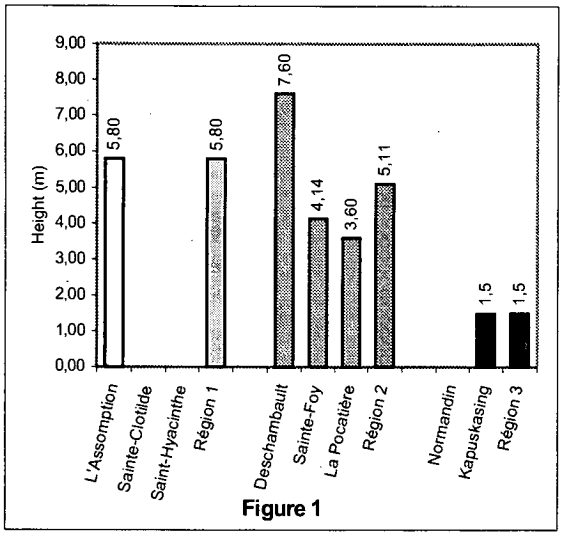


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

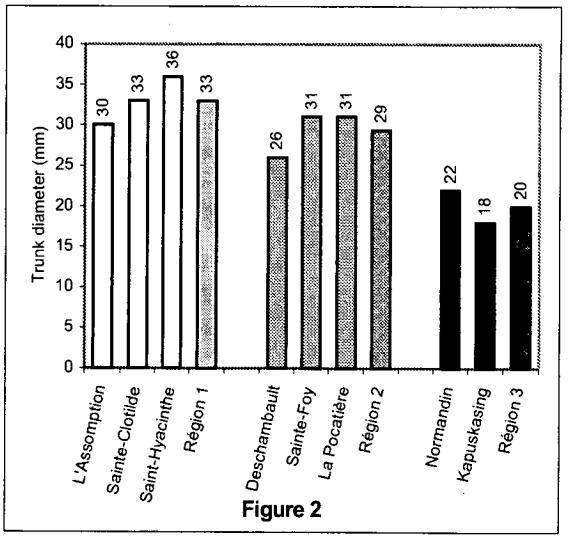


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the eight sites and three regions

### Effect of pruning

Severe pruning, eliminating 60–90% of the seedling biomass, after the intense frost down to the ground, delayed the upward growth of seedlings in Normandin, St. Foy, and especially La Pocatière and Kapuskasing.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and trunk diameter categories (heights and diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

Production of this species is recommended only in the warmest zones and with reservations; mortality is very high the first few winters. Natural selection takes place from the time of sowing and only the hardiest seedlings can survive the first few winters.

## HARDINESS EVALUATION

According to the literature, this species is hardy to zone 5. The trial results show that the species can survive at the

sites in zone 5 and zone 4, with adequate snow cover and after severe natural selection.

The species can be used to zone 5, as the shrubs develop slowly and are severely damaged whenever there is not enough snow cover.

The tree did not achieve its full ornamental potential at the trial sites.

**WRITTEN BY**

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**Table 1:** **Frequency of winter damage observed in *Aesculus parviflora* Walter., 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 47 | 24 | | 10 | | | 5 | 14 | | | | 53 |
| St. Clotilde | 84 | 6 | | | | | | 10 | | | | 16 |
| St. Hyacinthe | 0 | | | | | | | 100 | | | | 100 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 42 | 29 | | | | | 5 | 24 | | | | 58 |
| St. Foy | 55 | 6 | | 6 | 10 | | 7 | 10 | | 6 | | 45 |
| La Pocatière | 23 | 13 | | 12 | | 5 | 31 | 16 | | | | 77 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 25 | 15 | | | | | | 60 | | | | 75 |
| Kapuskasing | 13 | | | | | | 41 | 46 | | | | 87 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of specimens of *Aesculus parviflora* Walter. by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 20 | 0 | 0 | 0 | 0 | 86 | 20 | 20 | 0 | - | 78 | - | - | - | - |
| 021-040 | 80 | 100 | 100 | 0 | 50 | 14 | 40 | 40 | 100 | - | 22 | - | - | - | - |
| 041-060 | 0 | 0 | 0 | 50 | 0 | 0 | 40 | 40 | 0 | - | - | - | - | - | - |
| 061-080 | 0 | 0 | 0 | 50 | 0 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | 0 | 0 | 0 | 0 | 50 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 88 | 50 | 33 | 20 | 0 | 71 | 66 | 33 | 33 | 40 | 38 | 14 | 57 | 0 | 25 |
| 021-040 | 12 | 50 | 67 | 60 | 0 | 29 | 34 | 33 | 34 | 0 | 62 | 57 | 29 | 0 | 25 |
| 041-060 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 34 | 0 | 40 | 0 | 29 | 14 | 25 | 50 |
| 061-080 | 0 | 0 | 0 | 20 | 100 | 0 | 0 | 0 | 33 | 20 | 0 | 0 | 0 | 25 | 0 |
| 081-100 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 50 | 0 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 67 | 75 | 34 | - | - | 43 | 50 | 100 | 0 | 100 |
| 021-040 | 33 | 0 | 0 | - | - | 57 | 50 | 0 | 100 | 0 |
| 041-060 | 0 | 25 | 33 | - | - | - | - | - | - | - |
| 061-080 | 0 | 0 | 33 | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |

Table 3: **Breakdown of specimens of *Aesculus parviflora* Walter. by saleable trunk diameter category, 1993-97**

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-05 | 20 | 0 | 0 | 0 | 0 | 14 | 20 | 20 | 0 | - | 0 | - | - | - | - |
| 06-10 | 60 | 34 | 100 | 0 | 0 | 58 | 0 | 0 | 50 | - | 44 | - | - | - | - |
| 11-15 | 20 | 33 | 0 | 100 | 100 | 14 | 40 | 40 | 0 | - | 22 | - | - | - | - |
| 16-20 | 0 | 0 | 0 | 0 | 0 | 14 | 20 | 20 | 0 | - | 34 | - | - | - | - |
| 21-25 | 0 | 33 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - | - |
| 26-30 | - | - | - | - | - | 0 | 20 | 20 | 50 | - | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-05 | 100 | 67 | 67 | 20 | 0 | 57 | 50 | 67 | 50 | 20 | 50 | 14 | 28 | 0 | 25 |
| 06-10 | 0 | 33 | 33 | 80 | 0 | 43 | 0 | 33 | 17 | 60 | 50 | 86 | 43 | 0 | 50 |
| 11-15 | 0 | 0 | 0 | 0 | 100 | 0 | 50 | 0 | 33 | 0 | 0 | 0 | 29 | 75 | 0 |
| 16-20 | - | - | - | - | - | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 25 | 25 |
| 21-25 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 26-30 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-05 | 89 | 75 | 33 | - | - | 43 | 100 | 100 | 0 | 100 |
| 06-10 | 11 | 25 | 33 | - | - | 57 | 0 | 0 | 100 | 0 |
| 11-15 | 0 | 0 | 34 | - | - | - | - | - | - | - |
| 16-20 | - | - | - | - | - | - | - | - | - | - |
| 21-25 | - | - | - | - | - | - | - | - | - | - |
| 26-30 | - | - | - | - | - | - | - | - | - | - |

# *BETULA PAPYRIFERA* VAR. *KENAICA* (W.H. EVANS) A. HENRY

| | |
|---|---|
| **Family:** | Betulaceae |
| **English common name:** | Alaskan Paper Birch |
| **French common name:** | Bouleau à papier de l'Alaska |
| **Synonym:** | *B. kenaica* W.H. Evans |
| **Category:** | Deciduous plant |
| **Subdivision:** | Large tree |

## BOTANICAL DESCRIPTION

This birch's spreading habit distinguishes it from the species form. It can grow to 9 m tall and 13 m wide.

The thin, creamy white bark is marked with numerous lenticels and brown or orangey bands.

The young twigs and shoots are verrucose and pubescent, but become glabrous with age.

The oval leaves, with a rounded base and double serrate margins, are 5 cm long. They are borne on a yellow petiole and have five or six pairs of yellowish veins. The leaf blade, which is dark green on the upperside and yellowish green beneath, is paler than that of the species. The leaves turn bright yellow in fall.

The long pollen catkins are 10 cm long. The pistillate flowers are borne on stout, pendulous, conelike catkins, 4 cm long and 6-8 cm in diameter.

## ORIGIN AND DISTRIBUTION

This native tree originates from coastal Alaska.

## USE

**Ornamental:** This variety can be used alone or in mass plantings, as long as care is taken to ensure it has the space needed for lateral growth. It does well in urban settings.

## REQUIREMENTS

Paper birch prefers a sandy loam soil with an acid pH. It is shallow rooted and does not do well in compacted soil.

## DISEASES AND INSECTS

Anthracnose (*Gloeosporium* sp.) causes blight in the young leaves and twigs. Rust (*Melamspora* sp.) needs a principal host (larch) to begin its life cycle.

Paper birches are particularly susceptible to bronze birchborer (*Agrilus anxius*), birch skeletonizer (*Bucculatrix canadensisella*) and birch leafminer (*Fenusa pusilla*). Other potential insect pests include leafhoppers, the poplar and willow borer (*Cryptorhynchus lapathi*), gypsy moth (*Lymantria dispar* (L.)), birch shootworm, fall webworm (*Hyphantria cunea*) and Japanese beetle (*Popillia japonica*). The damage from these insects ranges from temporary to permanent (partial or complete mortality of the tree).

## PROPAGATION

No specific references to this variety were found in the literature, but birches are usually propagated by seed.

**Seeds:** The seeds mature when the seed catkins take on a yellowish colour, between August and November. Since the seeds do not all mature at the same time, harvesting is spread over a fairly long period. After harvest, the seeds should be stored in a thin layer in a well-aired place and stirred daily to ensure that they dry properly. Once dry, they should be kept in bags in a cool, well-aired place.

The seeds should be sown very early in spring (end of April) by broadcasting them over a well-loosened, damp (but not wet) soil. They should be very lightly buried. To prevent the seeds from blowing away, the ground should be covered with boughs and kept moist. Germination will begin in four to six weeks. When the seeds are germinating, watering should only be done if necessary.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** The seeds were harvested on July 24, 1991 from an outstanding 55-year-old specimen. They were kept in a dry environment at 4°C over the winter and, in May 1992, they were sown in a cold frame outdoors. Uniform germination began in early June. In July, 240 seedlings were transplanted into plug trays with a diameter of 2.5 cm. They were put in outdoor beds and remained there during the 1992 and 1993 growing seasons. The seedlings were given a weekly treatment of a soluble fertilizer (20-20-20, 400 ppm N). Winter protection consisted of an Astro-Foam® mulch and cold frame; the survival rate was 100%. The seedlings were wrapped and shipped in May 1994.

**Inclusion in testing network:** Seedlings 38 cm high were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the variety over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Winter damage was slight, but two seedlings died at Deschambault and another one at La Pocatière.

*Region 1*

At L'Assomption, mechanical breakage was observed in 8% of seedlings after the third winter.

No damage occurred at St. Clotilde or St. Hyacinthe during the trials.

*Region 2*

At Deschambault, 10% of seedlings suffered mechanical breakage the first winter and one seedling died in each of the third and fourth winters.

The first winter at St. Foy, 21% of seedlings suffered frost damage to the branch tips and 7% sustained rodent damage. The third winter, mechanical breakage was observed in one seedling.

At La Pocatière, one seedling had frost damage to the branch tips the first winter, while another died.

*Region 3*

At Normandin, mechanical breakage occurred in 33% of the seedlings the third winter.

At Kapuskasing, in the second winter, one plant suffered frost damage to the branch tips, while another had damage to the previous year's shoots and two others suffered mechanical breakage.

### Height and trunk diameter growth

Figures 1 and 2 show the mean height and trunk diameter of the seedlings after five years at each site in the three regions.

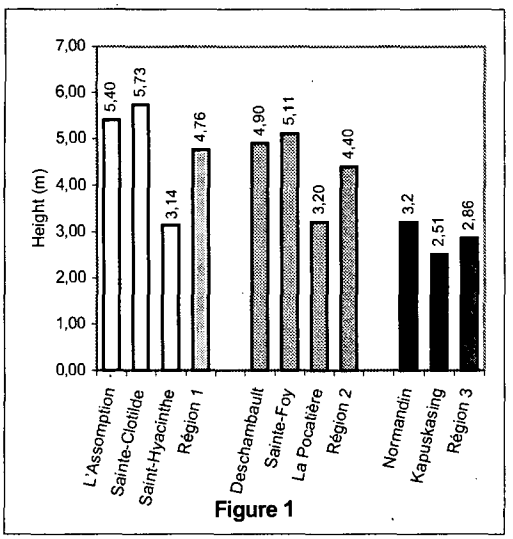


**Figure 1.** Mean height of trees at trial's end at each of the eight sites and three regions

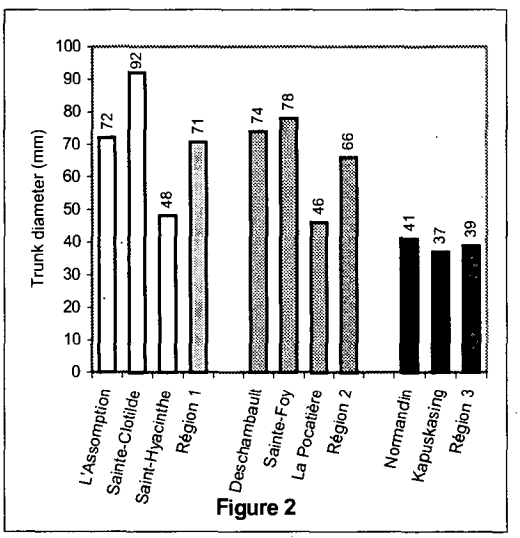


**Figure 2.** Mean trunk diameter of trees at trial's end at each of the eight sites and three regions

### Effect of pruning

Height growth was regular and continuous at all the sites. Slight pruning only was done at L'Assomption and St. Foy.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable seedlings obtained at each trial site after each year by height and trunk diameter categories (heights and diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

Growth was best at the site with the longest, warmest growing season (hardiness zone 5b).

After three growing seasons, over 90% of the seedlings had reached over 3 m tall at St. Clotilde, while four growing seasons were required to reach this height at L'Assomption, Deschambault and St. Foy and five seasons at St. Hyacinthe.

## HARDINESS EVALUATION

The variety can survive and be used as far as zone 2a since no seedlings died at Kapuskasing and winter damage was very slight at all sites.

The variety achieved its full ornamental potential at the three sites in hardiness zones 5a and 5b. Despite mechanical breakage and some mortality, this could also be extended to zones 2 and 4.

## WRITTEN BY

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**Table 1: Frequency of winter damage observed in *Betula papyrifera* var. *kenaica* (W.H. Evans) A. Henry, 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 98 | | | | | | | | | 2 | | 2 |
| St. Clotilde | 100 | | | | | | | | | | | 0 |
| St. Hyacinthe | 100 | | | | | | | | | | | 0 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 94 | | | | | | | 4 | | 2 | | 6 |
| St. Foy | 93 | 4 | | | | | | | | 2 | 1 | 7 |
| La Pocatière | 96 | 2 | | | | | | 2 | | | | 4 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 93 | | | | | | | | | 7 | | 7 |
| Kapuskasing | 96 | 1 | | 1 | | | | | | 2 | | 4 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 5, 6, 7, 9 or 14 occurred in the plants tested.

Table 2 : **Breakdown of specimens of *Betula papyrifera* var. *kenaica* (W.H. Evans) A. Henry by saleable height category, 1994-1998**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 100 | 8 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 85 | 8 | 0 | 0 | 0 |
| 101-200 | 0 | 50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 15 | 62 | 0 | 0 | 0 |
| 201-300 | 0 | 42 | 33 | 0 | 0 | 0 | 41 | 0 | 0 | 0 | 0 | 30 | 91 | 64 | 18 |
| 301-400 | 0 | 0 | 67 | 58 | 0 | 0 | 59 | 0 | 0 | 18 | 0 | 0 | 9 | 36 | 73 |
| 401-500 | 0 | 0 | 0 | 42 | 17 | 0 | 0 | 91 | 18 | 9 | 0 | 0 | 0 | 0 | 9 |
| 501-600 | 0 | 0 | 0 | 0 | 67 | 0 | 0 | 9 | 73 | 9 | - | - | - | - | - |
| 601-700 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 9 | 64 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 91 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 0 | 0 | 100 | 10 | 0 | 0 | 0 |
| 101-200 | 9 | 64 | 0 | 0 | 0 | 57 | 14 | 0 | 0 | 0 | 0 | 80 | 20 | 0 | 0 |
| 201-300 | 0 | 36 | 36 | 0 | 0 | 0 | 78 | 17 | 0 | 0 | 0 | 10 | 70 | 70 | 20 |
| 301-400 | 0 | 0 | 54 | 60 | 0 | 0 | 8 | 67 | 34 | 0 | 0 | 0 | 10 | 30 | 80 |
| 401-500 | 0 | 0 | 10 | 40 | 56 | 0 | 0 | 16 | 58 | 42 | - | - | - | - | - |
| 501-600 | 0 | 0 | 0 | 0 | 44 | 0 | 0 | 0 | 8 | 50 | - | - | - | - | - |
| 601-700 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 100 | 12 | 0 | 0 | 0 | 84 | 11 | 0 | 0 | 0 |
| 101-200 | 0 | 63 | 17 | 8 | 0 | 16 | 84 | 50 | 8 | 8 |
| 201-300 | 0 | 25 | 83 | 42 | 33 | 0 | 5 | 50 | 84 | 84 |
| 301-400 | 0 | 0 | 0 | 50 | 67 | 0 | 0 | 0 | 8 | 8 |
| 401-500 | - | - | - | - | - | - | - | - | - | - |
| 501-600 | - | - | - | - | - | - | - | - | - | - |
| 601-700 | - | - | - | - | - | - | - | - | - | - |

Table 3: **Breakdown of specimens of *Betula papyrifera* var. *kenaica* (W.H. Evans) A. Henry by saleable trunk diameter category, 1994-1998**

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 50 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 54 | 0 | 0 | 0 |
| 021-040 | 0 | 50 | 50 | 8 | 0 | 0 | 41 | 0 | 0 | 0 | 0 | 46 | 82 | 64 | 9 |
| 041-060 | 0 | 0 | 50 | 58 | 17 | 0 | 59 | 27 | 0 | 0 | 0 | 0 | 18 | 36 | 82 |
| 061-080 | 0 | 0 | 0 | 34 | 58 | 0 | 0 | 73 | 36 | 28 | 0 | 0 | 0 | 0 | 9 |
| 081-100 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 64 | 54 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - |
| 121-140 | - | - | - | - | - | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 27 | 0 | 0 | 0 | 100 | 7 | 0 | 0 | 0 | 100 | 100 | 10 | 0 | 0 |
| 021-040 | 0 | 73 | 54 | 0 | 0 | 0 | 93 | 17 | 0 | 0 | 0 | 0 | 90 | 70 | 20 |
| 041-060 | 0 | 0 | 46 | 60 | 0 | 0 | 0 | 83 | 58 | 0 | 0 | 0 | 0 | 30 | 80 |
| 061-080 | 0 | 0 | 0 | 40 | 78 | 0 | 0 | 0 | 42 | 75 | - | - | - | - | - |
| 081-100 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | 0 | 25 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 121-140 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 33 | 8 | 0 | 100 | 100 | 8 | 0 | 0 |
| 021-040 | 0 | 0 | 67 | 75 | 58 | 0 | 0 | 92 | 100 | 75 |
| 041-060 | 0 | 0 | 0 | 17 | 42 | 0 | 0 | 0 | 0 | 25 |
| 061-080 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |
| 121-140 | - | - | - | - | - | - | - | - | - | - |

# *Buxus microphylla* 'GREEN VELVET'

| | |
|---|---|
| **Family:** | Buxaceae |
| **English common name:** | Green Velvet Boxwood, Little Leaf Boxwood |
| **French common name:** | Buis 'Green Velvet', Buis à petites feuilles |
| **Synonym:** | *Buxus* 'Green Velvet' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This small globose shrub may grow to 0.6 m tall and 0.5 m wide. It is slow growing and has a spreading habit.

The slender, green, flat stems are grooved, giving them a quadrangular appearance. The glabrous shoots grow at a narrow angle to the main stem.

The solitary, sessile ovoid buds are small and covered with one or two pairs of scales.

The dense evergreen foliage consists of small opposite and entire leaves, which are rounded in shape and glabrous and waxy. They measure 1.8 cm long and 1.0 cm wide and are short petioled. Pale when they first emerge, the leaves turn dark green in summer and retain their colour year-round (unlike the species form, in which the leaves are a paler green and turn brownish yellow in winter). The tips of the leaves are sometimes yellow.

The apetalous unisexual flowers occur in small dense clusters in the leaf axils in early spring. Each cluster consists of a terminal pistillate flower, surrounded by several staminate flowers.

The fruits are small, three-horned, three-valved capsules containing two black, shiny seeds.

## ORIGIN AND DISTRIBUTION

There are over 70 species of box, mainly from Western Europe and the Mediterranean region, East Asia, India, tropical Africa, South Africa and Central America. *Buxus microphylla* is native to Japan and was introduced to the New World in 1860. The cultivar 'Green Velvet' is a hybrid cross between *B. m.* var. *koreana* and a *B. microphylla* var. *japonica* hybrid.

## USE

**Ornamental:** The cultivar can be used as a low hedge, and in mass plantings and rock gardens. It is well suited to baroque gardens, with their formal beds and précise geometric patterns. Winter protection against snow damage, drying winds and sunscald and a shady spot in summer are keys to successful growth.

## REQUIREMENTS

All *Buxus* require full sun to partial shade. The variety does well in a loamy, moist, neutral-pH soil.

This shrub is shallow rooted and easy to transplant. It is usually produced in containers or bare root.

## DISEASES AND INSECTS

There is no mention of any particular problems for the species or cultivar in the references consulted.

## PROPAGATION

**Cutting:** Cuttings taken in late fall and kept in the cold store, or taken in spring before the new leaves appear, will root well; this also reduces the growing time by six months. Cuttings taken in June or July will root before fall but must be protected over the winter.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Gift of Sheridan Nurseries, cultivated at Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** 400 cuttings (4-5 cm) were taken on July 16, 1991 from roughly 11-year-old parent plants measuring 40 cm tall and 30 cm wide. The cuttings were dipped for five seconds in a solution of IBA (5000 ppm) and ethanol (50%). They were planted in Todd® trays in a mixture of Promix®, Turface® and perlite (2:2:1; v:v:v) and placed under an automatic mist unit (operating for 4 seconds every 10 minutes). Heating cables were set at 25°C. The seedlings were treated with a fungicide solution of Benomyl® throughout the propagation period. The rooting rate was 88%. The cuttings were transplanted in the greenhouse in late December into a mixture of Promix®, sand and compost (2:2:1; v:v:v). A 10-52-10 soluble fertilizer was applied at the recommended rate and supplementary lighting was provided for 16 hours a day until spring. On May 20, 1992, the seedlings were moved to the nursery. On October 25, they were dug up, puddled and heeled in for the winter and protected with a winter mulch. The winter survival rate was 100%. In mid-April 1993, they were wrapped and stored in the cellar to await shipping in May.

**Inclusion in testing network:** Seedlings 10 cm high were planted at eight trial sites throughout Quebec and in north-eastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 10% of the seedlings died the second winter. Frost damage to the branch tips occurred during the first, fourth and fifth winters in 89%, 90% and 63% of plants respectively. Foliage browning occurred in all seedlings the second winter. The third winter, frost damage to the aerial portions above the snow cover was found in all plants.

At St. Clotilde, 18% of the seedlings died the first winter. Partial foliage browning occurred in all seedlings the second and third winters. Data on winter damage were not collected the last two winters.

At St. Hyacinthe, 31% and 9% of seedlings died the first two winters respectively. All plants suffered foliage browning the second winter and 50% were affected the following winter.

*Region 2*

At Deschambault, 67%, 81%, 100%, 83% and 100% of seedlings respectively had frost damage to the branch tips during the five winters of the trials. The first two winters, 33% and 14% of seedlings had damage to the previous year's shoots.

At St. Foy, 53%, 53%, 100%, 42% and 100% of seedlings respectively had frost damage to the branch tips during the five winters of the trials. Frost damage to the previous year's shoots occurred in 35% of seedlings the first winter.

At La Pocatière, one seedling died the second winter. The first and third winters, 68% and 40% of seedlings had frost damage to the aerial portion above the snow cover. The following winter, all the seedlings suffered mechanical breakage.

*Region 3*

At Normandin, foliage browning occurred in all seedlings the third winter and mechanical breakage was found in seedlings the fourth winter.

At Kapuskasing, one seedling died the second winter. The first three winters, the most common damage was frost damage to the branch tips; in addition, 16% and 8% of

seedlings had frost damage to the previous year's shoots during the first and third winters. No damage occurred the last two winters.

### Height and width growth

Figures 1 and 2 show the mean height and width of seedlings after five years of testing at each site in the three regions.

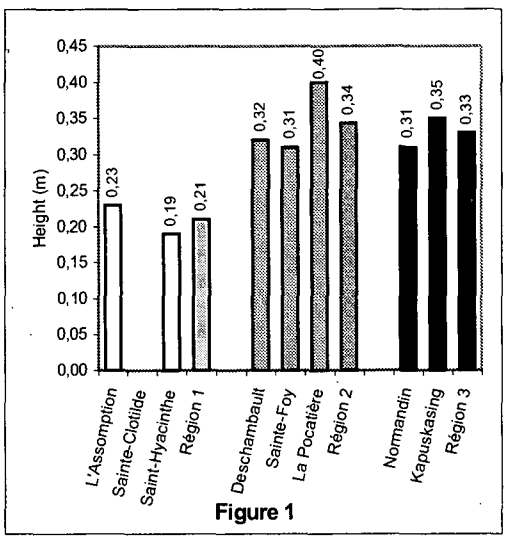


**Figure 1.** Mean height of shrubs at trial's end at each of the sites and three regions

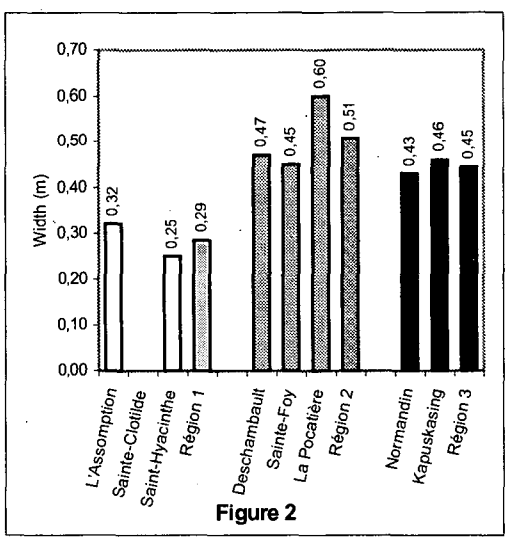


**Figure 2.** Mean width of shrubs at trial's end at each of the sites and three regions

### Effect of pruning

Pruning to eliminate 20% and 50% of the previous year's growth was carried out at Normandin, Kapuskasing, La Pocatière and Deschambault.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable seedlings obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

After three growing seasons, over 80% of the seedlings at the three region 1 sites and at La Pocatière and St. Foy were over 20 cm tall, while plants took four years to reach this size at Normandin and Deschambault. With the snow cover providing considerable protection, height increased gradually over the years in the coldest hardiness zones. At sites with less snow or an intermittent snow cover, height decreased with the intensity of winter damage and the subsequent amount of pruning required in spring.

Production is recommended at all sites tested given sufficient snow cover.

## HARDINESS EVALUATION

In the literature, the species is rated hardy to zone 5, while previous REPLOQ results show that it can survive in zone 4, with the limit being between zones 3 and 4. 'Green Velvet' is more winter hardy than the species form and the 'Pincushion' and 'Winter Beauty' cultivars, which were tested simultaneously under the same conditions. No mortality occurred at Kapuskasing, which means that the cultivar can survive as far as zone 2, with the snow cover protecting the plants adequately over the winter.

Almost no mortality occurred at St. Hyacinthe, signifying that this cultivar is better adapted to the clay soil found

there (which was not the case with the other two aforementioned cultivars).

The cultivar can be used as far as zone 2; foliage browning was observed only in zones 5 and 2a, but disappeared with the new spring leaves.

The cultivar did not achieve its full ornamental potential at the trial sites.

**WRITTEN BY**

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Christine Galipeau, Biologist

**Table 1: Frequency of winter damage observed in *Buxus microphylla* 'Green Velvet', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 7 | 50 | | 4 | | 20 | | 1 | | | | 18 | 93 |
| St. Clotilde | 0 | | | | | 7 | | | | | | 93 | 100 |
| St. Hyacinthe | 30 | | | | | | | 8 | | | | 62 | 70 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 1 | 86 | | 10 | | | | 3 | | | | | 99 |
| St. Foy | 17 | 69 | | 1 | | 7 | | | | 6 | | | 83 |
| La Pocatière | 56 | | | | | 33 | | 1 | | 10 | | | 44 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 47 | 44 | | 6 | | | | 1 | | | | 2 | 53 |
| Kapuskasing | 67 | | | | | | | | | 7 | | 26 | 33 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial browning of evergreen foliage

No damage of types 3, 5, 7, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of specimens of *Buxus microphylla* 'Green Velvet' by saleable height category, 1993-1997**

REGION 1

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 11 | 0 | 0 | 0 | 0 | 30 | 12 | 0 | 0 | - | 81 | 18 | 0 | 0 | 0 |
| 11-20 | 79 | 37 | 18 | 0 | 18 | 63 | 44 | 0 | 8 | - | 19 | 72 | 10 | 60 | 70 |
| 21-30 | 10 | 47 | 72 | 55 | 46 | 6 | 44 | 75 | 76 | - | 0 | 10 | 80 | 40 | 30 |
| 31-40 | 0 | 16 | 10 | 45 | 36 | 0 | 0 | 25 | 16 | - | 0 | 0 | 10 | 0 | 0 |
| 41-50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

REGION 2

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 76 | 24 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 21 | 0 | 0 | 0 | 0 |
| 11-20 | 24 | 76 | 66 | 0 | 0 | 83 | 35 | 0 | 0 | 0 | 74 | 48 | 9 | 0 | 0 |
| 21-30 | 0 | 0 | 34 | 100 | 90 | 17 | 65 | 75 | 8 | 42 | 5 | 47 | 36 | 10 | 0 |
| 31-40 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 25 | 84 | 58 | 0 | 5 | 55 | 70 | 70 |
| 41-50 | - | - | - | - | - | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 20 | 30 |

REGION 3

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 14 | 13 | 0 | 0 | 0 | 79 | 53 | 0 | 0 | 0 |
| 11-20 | 86 | 87 | 45 | 18 | 9 | 21 | 47 | 75 | 42 | 0 |
| 21-30 | 0 | 0 | 55 | 82 | 27 | 0 | 0 | 25 | 58 | 50 |
| 31-40 | 0 | 0 | 0 | 0 | 54 | 0 | 0 | 0 | 0 | 50 |
| 41-50 | 0 | 0 | 0 | 0 | 10 | - | - | - | - | - |

* Data were not collected for St. Clotilde in 1997.

Table 3: Breakdown of specimens of *Buxus microphylla* 'Green Velvet' by saleable width category, 1993-1997

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-20 | 100 | 90 | 55 | 9 | 0 | 100 | 89 | 38 | 8 | - | 100 | 100 | 70 | 70 | 20 |
| 21-40 | 0 | 10 | 45 | 82 | 82 | 0 | 11 | 62 | 92 | - | 0 | 0 | 30 | 30 | 80 |
| 41-60 | 0 | 0 | 0 | 9 | 18 | - | - | - | - | - | - | - | - | - | - |
| 61-80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-20 | 100 | 71 | 0 | 0 | 0 | 100 | 47 | 0 | 0 | 0 | 100 | 47 | 0 | 0 | 0 |
| 21-40 | 0 | 29 | 100 | 83 | 10 | 0 | 53 | 100 | 42 | 50 | 0 | 52 | 100 | 40 | 0 |
| 41-60 | 0 | 0 | 0 | 17 | 90 | 0 | 0 | 0 | 58 | 41 | 0 | 0 | 0 | 60 | 40 |
| 61-80 | - | - | - | - | - | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 60 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-20 | 100 | 80 | 9 | 18 | 0 | 94 | 84 | 0 | 0 | 0 |
| 21-40 | 0 | 20 | 91 | 82 | 27 | 6 | 16 | 100 | 91 | 17 |
| 41-60 | 0 | 0 | 0 | 0 | 73 | 0 | 0 | 0 | 9 | 83 |
| 61-80 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected for St. Clotilde in 1997.

# *Buxus microphylla* 'Pincushion'

| | |
|---|---|
| **Family:** | Buxaceae |
| **English common name:** | Little Leaf Pincushion Boxwood |
| **French common name:** | Buis à petites feuilles 'Pincushion' |
| **Synonym:** | *Buxus sinica* 'Cushion' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This small globose shrub may grow to 0.5 m tall and wide. It is slow growing.

The slender, green, flat stems are grooved, giving them a quadrangular appearance. The glabrous shoots grow at a narrow angle to the main stem.

The solitary, sessile ovoid buds are small and covered with one or two pairs of scales.

The dense evergreen foliage consists of small opposite and entire leaves, which are rounded in shape and glabrous and waxy. They measure 8-25 mm in width and are short petioled. They remain dark green year-round (unlike the species form, in which the leaves are a paler green and turn brownish yellow in winter).

The apetalous unisexual flowers occur in small dense clusters in the leaf axils in early spring. Each cluster consists of a terminal pistillate flower, surrounded by several staminate flowers.

The fruits are small, three-horned, three-valved capsules containing two black, shiny seeds.

## ORIGIN AND DISTRIBUTION

There are over 70 species of box, mainly from Western Europe and the Mediterranean region, East Asia, India, tropical Africa, South Africa and Central America. *Buxus microphylla* is native to Japan and was introduced to the New World in 1860. The cultivar 'Pincushion' is a form of *B. m.* var. *koreana*.

## USE

**Ornamental:** The cultivar can be used as a low hedge, and in mass plantings and rock gardens. It is well suited to baroque gardens, with their formal beds and precise geometric patterns. Winter protection against snow damage, drying winds and sunscald and a shady spot in summer are keys to successful growth.

## REQUIREMENTS

All *Buxus* require full sun to partial shade. The variety does well in a loamy, moist, neutral-pH soil.

This shrub is shallow rooted and easy to transplant. It is generally produced in containers or bare root.

## DISEASES AND INSECTS

There is no mention of any particular problems for the species or cultivar in the references consulted.

## PROPAGATION

**Cutting:** Cuttings taken in late fall and kept in the cold store, or taken in spring before the new leaves appear, will root well, reducing the growing time by six months. Cuttings taken in June or July will root before fall but must be protected during the winter.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Gift of Sheridan Nurseries and cultivated at Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** 400 cuttings (4-5 cm) were taken on July 16, 1991 from roughly 13-year old parent plants measuring 40 cm tall and 30 cm wide. The cuttings were dipped for five seconds in a solution of IBA (5000 ppm) and ethanol (50%). They were planted in Todd® trays in a mixture of Promix® and sand (1:2; v:v) and placed under an automatic mist unit (operating for 4 seconds every 10 minutes). Heating cables were set at 25°C. The cuttings were treated with a fungicide solution of Benomyl® throughout the propagation period. The rooting rate was 50%. A 10-52-10 soluble fertilizer was applied at the recommended rate and supplementary lighting was provided for 16 hours a day until spring. On May 20, 1992, 147 5-cm seedlings were moved to the nursery. On October 25, they were dug up, puddled and heeled in for the winter, protected with a winter mulch. The winter survival rate was 100%. In mid-April 1993, they were wrapped and stored in the cellar to await shipping in May.

**Inclusion in testing network:** Seedlings 7 cm high were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 100%, 20% and 100% of seedlings suffered frost damage to the branch tips the first, third and fourth winters. All seedlings had foliage browning the second winter, while no damage was observed the last winter.

At St. Clotilde, all seedlings suffered partial foliage browning the second and third winters. Data on winter survival were not collected the last two winters.

At St. Hyacinthe, all the seedlings died the first two winters, including 87% alone the first winter.

*Region 2*

At Deschambault, one seedling died the second winter. In addition, 83%, 50%, 60%, 100% and 100% of plants respectively had frost damage to the branch tips over the five years of the trials. Damage to the previous year's shoots occurred in 17% and 33% of seedlings the first two winters.

At St. Foy, 42% of seedlings died the first winter. In addition, 43%, 75%, 50%, 25% and 100% of seedlings respectively suffered frost damage to the branch tips over the five years of the trials.

At La Pocatière, no damage occurred the first two winters and the last winter. The third winter, 20% of seedlings suffered frost damage to the entire aerial portion above the snow cover. The fourth winter, 40% of seedlings suffered frost damage to the branch tips and 40% had mechanical breakage.

*Region 3*

At Normandin, one seedling died the second winter and foliage browning was found in all seedlings the last four winters.

At Kapuskasing, 90% of seedlings died the first winter. The surviving plants all had frost damage to the branch tips the second winter and to the previous year's shoots the third winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of seedlings after five years of testing at each site in the three regions.

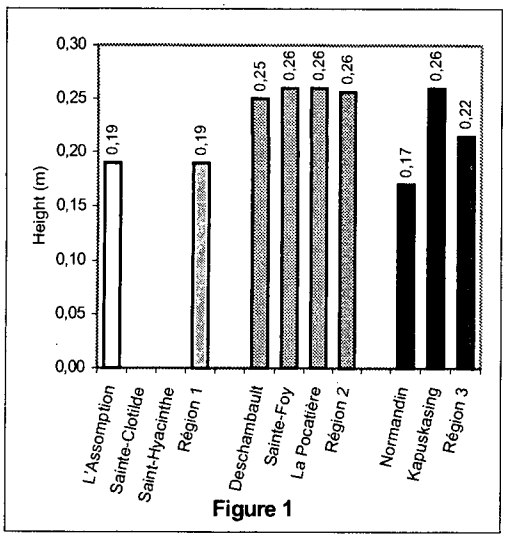


**Figure 1**. Mean height of shrubs at trial's end at each of the sites and three regions

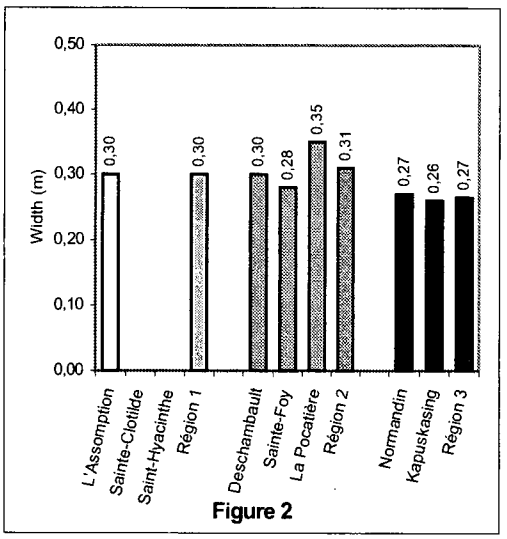


**Figure 2.** Mean width of shrubs at trial's end at each of the sites and three regions

### Effect of pruning

Pruning to eliminate 20-40% of the previous year's growth was carried out at Normandin, Kapuskasing, La Pocatière and Deschambault.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable seedlings obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

After three growing seasons, 50% of the seedlings at La Pocatière and St. Foy were over 30 cm tall, while plants took four years to reach this size at L'Assomption and five years at Kapuskasing. In the coldest areas, the snow cover provided protection for the plants that survived; however, at the limit of the cultivar's hardiness, the risks of losing plants are much greater. Therefore, it is recommended that the cultivar be produced in zones with abundant snow cover (region 2) and with light, rocky soil.

## HARDINESS EVALUATION

In the literature, the species is rated hardy to zone 5, while previous REPLOQ results show that it can survive as far as zone 4, with the actual limit being between zones 3 and 4. In Kapuskasing, the coldest site, 'Pincushion' behaved very similarly to the species form, with mortality the same as had been observed previously. At Normandin, mortality was low and the seedlings survived very well. The species can therefore survive as far as zone 2b, with the snow cover protecting the plants during winter. The high mortality observed at St. Hyacinthe is very surprising, the heavy soil probably accounting in large part for the poor results obtained.

The cultivar can be used as far as zone 2b, since foliage browning disappears with the new spring leaves. Growth is slower in the coldest areas, however.

The cultivar did not achieve its full ornamental potential at the trial sites.

## WRITTEN BY

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**Table 1:** **Frequency of winter damage observed in *Buxus microphylla* 'Pincushion', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 38 | 44 | | | | | | | | | | 18 | 62 |
| St. Clotilde | 0 | | | | | | | | | | | 100 | 100 |
| St. Hyacinthe | 0 | | | | | | | 94 | | | | 6 | 100 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 8 | 79 | | 5 | | | | 8 | | | | | 92 |
| St. Foy | 33 | 59 | | | | | | 8 | | | | | 67 |
| La Pocatière | 80 | 8 | | | | 4 | | | | 8 | | | 20 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 25 | | | | | | | 3 | | | | 72 | 75 |
| Kapuskasing | 40 | 30 | | 20 | | | | 10 | | | | | 60 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial browning of evergreen foliage

No damage of types 3, 5, 7, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of specimens of *Buxus microphylla* 'Pincushion' by saleable height category, 1993-1997**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 0 | 0 | 0 | 0 | 0 | 50 | - | - | 0 | - | 100 | 0 | - | - | - |
| 11-20 | 100 | 100 | 100 | 20 | 80 | 50 | - | - | 100 | - | 0 | 100 | - | - | - |
| 21-30 | 0 | 0 | 0 | 80 | 20 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 67 | 17 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 |
| 11-20 | 33 | 66 | 80 | 60 | 0 | 43 | 100 | 50 | 25 | 0 | 50 | 66 | 50 | 0 | 0 |
| 21-30 | 0 | 17 | 20 | 40 | 100 | 0 | 0 | 50 | 75 | 100 | 0 | 34 | 50 | 100 | 100 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 88 | 88 | 14 | 14 | 0 | 90 | 0 | 0 | 0 | 0 |
| 11-20 | 12 | 12 | 72 | 86 | 72 | 10 | 100 | 100 | 100 | 0 |
| 21-30 | 0 | 0 | 14 | 0 | 28 | 0 | 0 | 0 | 0 | 100 |

* Data were not collected at St. Clotilde in 1994, 1995 and 1997.

Table 3: **Breakdown of specimens of *Buxus microphylla* 'Pincushion' by saleable width category, 1993-1997**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 100 | 0 | 0 | 0 | 0 | 100 | - | - | 100 | - | 100 | 0 | - | - | - |
| 11-20 | 0 | 100 | 80 | 0 | 0 | - | - | - | - | - | 0 | 100 | - | - | - |
| 21-30 | 0 | 0 | 20 | 20 | 60 | - | - | - | - | - | - | - | - | - | - |
| 31-40 | 0 | 0 | 0 | 80 | 40 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 84 | 50 | 20 | 0 | 0 | 100 | 25 | 0 | 0 | 0 | 100 | 33 | 0 | 0 | 0 |
| 11-20 | 16 | 33 | 40 | 4 | 0 | 0 | 75 | 100 | 50 | 0 | 0 | 33 | 33 | 0 | 0 |
| 21-30 | 0 | 17 | 40 | 40 | 60 | 0 | 0 | 0 | 50 | 75 | 0 | 34 | 34 | 40 | 20 |
| 31-40 | 0 | 0 | 0 | 20 | 40 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 33 | 60 | 80 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 88 | 63 | 14 | 15 | 0 | 100 | 100 | 0 | 0 | 0 |
| 11-20 | 12 | 37 | 43 | 57 | 14 | 0 | 0 | 100 | 100 | 0 |
| 21-30 | 0 | 0 | 43 | 14 | 57 | 0 | 0 | 0 | 0 | 100 |
| 31-40 | 0 | 0 | 0 | 14 | 29 | - | - | - | - | - |

* Data were not collected at St. Clotilde in 1994, 1995 and 1997.

# *Buxus microphylla* 'WINTER BEAUTY'

| | |
|---|---|
| **Family:** | Buxaceae |
| **English common name:** | Winter Beauty Little Leaf Boxwood |
| **French common name:** | Buis à-petites feuilles 'Winter Beauty' |
| **Synonym:** | Buxus 'Winter Beauty' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This small shrub, which has a very regular conical shape naturally, can grow to 0.5 m tall and wide. It is slow growing.

The slender, green, flat stems are grooved, giving them a quadrangular appearance. The glabrous shoots grow at a narrow angle to the main stem.

The solitary, sessile ovoid buds are small and covered with one or two pairs of scales.

The dense evergreen foliage consists of small opposite and entire leaves, which are rounded in shape and glabrous and waxy. They measure 8-25 mm in width and are short petioled. The leaves remain dark green year-round (unlike the species form, in which the leaves are a paler green and turn brownish yellow in winter).

The apetalous unisexual flowers occur in small dense clusters in the leaf axils in early spring. Each cluster consists of a terminal pistillate flower, surrounded by several staminate flowers.

The fruits are small, three-horned, three-valved capsules containing two black, shiny seeds.

## ORIGIN AND DISTRIBUTION

There are over 70 species of box, mainly from Western Europe and the Mediterranean region, East Asia, India, tropical Africa, South Africa and Central America. *Buxus microphylla* is native to Japan and was introduced to the New World in 1860. The origin of this cultivar was not found in any of the references consulted.

## USE

**Ornamental:** The cultivar can be used as a low hedge, and in mass plantings and rock gardens. Winter protection against snow damage, drying winds and sunscald and a shady spot in summer are keys to successful growth.

## REQUIREMENTS

All Buxus require full sun to partial shade. The variety does well in a loamy, moist, neutral-pH soil.

This shrub is shallow rooted and easy to transplant. It is generally produced in containers or bare root.

## DISEASES AND INSECTS

There was no mention of any particular problems for the species or cultivar in the references consulted.

## PROPAGATION

**Cutting:** Cuttings taken in late fall and kept in the cold store, or taken in spring before the new leaves appear, will root well, reducing the growing time by six months. Cuttings taken in June or July will root before fall but must be protected during the winter.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Gift of Sheridan Nurseries, cultivated at Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** 400 cuttings (4-5 cm) were taken on July 22, 1991 from roughly 14-year old parent plants measuring 30 cm tall and wide. The cuttings were dipped for five seconds in a solution of IBA (5000 ppm) and ethanol (50%). They were planted in Todd® trays filled with a mixture of Promix® and sand (1:2; v:v) and placed under an automatic mist unit (operating for 4 seconds every 10 minutes). Heating cables were set at 25°C. The cuttings were treated with a fungicide solution of Benomyl® throughout the propagation period. The rooting rate was 70%. The cuttings were transplanted in the greenhouse in late December, and planted in Promix®, sand and compost (2:2:1; v:v:v). A 10-52-10 soluble fertilizer was applied at the recommended rate and supplementary lighting was provided for 16 hours a day until spring. On May 20, 1992, the seedlings were transplanted to the nursery. On October 25, they were dug up, puddled and heeled in for the winter, and protected with a winter mulch. The winter survival rate was 100%. In mid-April 1993, they were wrapped and stored in the cellar to await shipping in May.

**Inclusion in testing network:** Seedlings 3 cm high were planted at eight trial sites throughout Quebec and in north-eastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

The first winter, at L'Assomption, 29% of seedlings died and 57% of seedlings suffered frost damage to the branch tips. Foliage browning was found in all seedlings the second winter, while, the third winter, 20% suffered frost damage to the aerial portion above the snow cover. The last two winters, 80% and 20% of seedlings suffered frost damage to the previous year's shoots and 60% had frost damage to the old wood the last year.

At St. Clotilde, 72% and 100% of seedlings had partial foliage browning the second and third winters. The last two winters, data on survival were not collected.

At St. Hyacinthe, all the seedlings died the first winter.

*Region 2*

At Deschambault, 78%, 56%, 100%, 33% and 88% of plants had frost damage to the branch tips over the five years respectively. The rest of the plants had damage to the previous year's shoots.

At St. Foy, the first and third winters, 33% of seedlings had frost damage to the previous year's shoots; all the other seedlings had damage to the branch tips each winter.

At La Pocatière, 17% of seedlings died the third winter. No damage occurred the second and fifth winters. The first, third and fourth winters, 57%, 83% and 20% of seedlings suffered damage to the aerial portions above the snow cover. In addition, the fourth winter, 20% had frost damage to the branch tips and 20% had mechanical breakage.

*Region 3*

At Normandin, 20% and 25% of seedlings died the first and third winters. All plants had foliage browning the last four winters.

At Kapuskasing, 80% of seedlings died the first winter. Surviving plants had frost damage to the previous year's shoots the second and third winters and to the branch tips the last winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of shrubs after five years of testing at each site in the three regions.

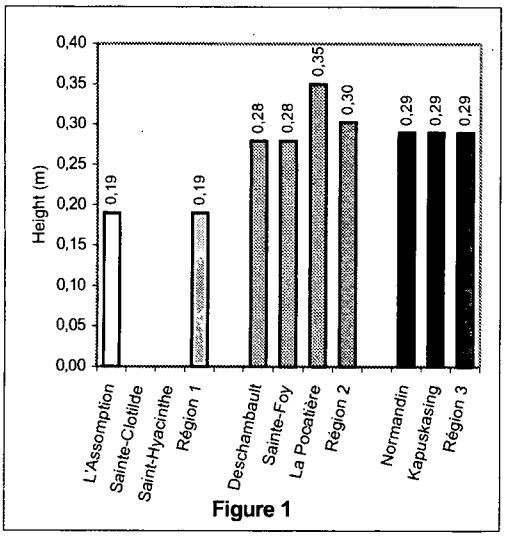


**Figure 1.** Mean height of shrubs at trial's end at each of the eight sites and three regions

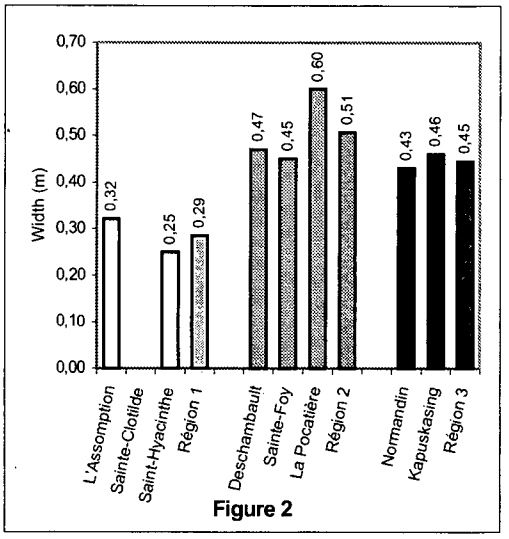


**Figure 2.** Mean width of shrubs at trial's end at each of the eight sites and three regions

### Effect of pruning

Pruning to eliminate 5-40% of the previous year's growth was done at all the sites except St. Clotilde.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable seedlings obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

After three growing seasons, 72% of the seedlings at La Pocatière and 100% of those at St. Foy were over 30 cm tall. The only other site where plants reached this size was Normandin, where 33% of shrubs were 30 cm tall by trial's end. The snow cover in the coldest region provided protection for those seedlings that survived; in the northernmost hardiness zone, however, the risks of loosing plants are much greater. Therefore, production is recommended in areas with abundant snow cover—i.e., in region 2 (zones 4a and 4b)—and light, rocky soils.

## HARDINESS EVALUATION

In the literature, the species is rated hardy to zone 5, while previous REPLOQ results show that it can survive in zone 4, with the limit being between zones 3 and 4.

'Winter Beauty' behaved very similarly to 'Pincushion' and the species form at all sites, contrasting with the performance of 'Green Velvet'. At Kapuskasing, the coldest site, mortality was very high, while at Normandin, mortality was low and the seedlings survived very well. The species can therefore survive as far as zone 2b, with the snow cover protecting the plants adequately in winter. The high mortality observed at St. Hyacinthe is very surprising; the heavy soil there probably accounted in large part for the poor results obtained.

The cultivar can be used as far as zone 2b; damage from foliage browning disappears with the new spring leaves. Growth is slower in the coldest areas, however.

The cultivar did not achieve its full ornamental potential at the trial sites.

## WRITTEN BY

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Christine Galipeau, Biologist

**Table 1: Frequency of winter damage observed in *Buxus microphylla* 'Winter Beauty', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 17 | 13 | | 18 | 13 | 13 | | 8 | | 4 | 4 | 10 | 83 |
| St. Clotilde | 43 | | | | | | | | | | | 57 | 57 |
| St. Hyacinthe | 0 | | | | | | | 100 | | | | | 100 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 0 | 71 | | 27 | | | | | | | | 2 | 100 |
| St. Foy | 0 | 87 | | 13 | | | | | | | | | 100 |
| La Pocatière | 56 | 5 | | | | 32 | | 3 | | 4 | | | 44 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 9 | | | | | | | 8 | | | | 83 | 91 |
| Kapuskasing | 0 | 44 | | 40 | | | | 16 | | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial browning of evergreen foliage

No type 3 or type 9 damage occurred in the plants tested.

Table 2: Breakdown of specimens of *Buxus microphylla* 'Winter Beauty' by saleable height category, 1993-1997

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 14 | 0 | 0 | 0 | 0 | 45 | 0 | 0 | 0 | - | 60 | - | - | - | - |
| 11-20 | 71 | 100 | 40 | 0 | 60 | 55 | 100 | 100 | 28 | - | 40 | - | - | - | - |
| 21-30 | 15 | 0 | 60 | 60 | 40 | 0 | 0 | 0 | 72 | - | - | - | - | - | - |
| 31-40 | 0 | 0 | 0 | 40 | | - | - | - | - | - | - | - | - | - | - |
| 41-45 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 43 | 14 | 0 | 0 | 0 |
| 11-20 | 89 | 34 | 11 | 11 | 11 | 100 | 67 | 0 | 0 | 0 | 57 | 14 | 0 | 0 | 0 |
| 21-30 | 0 | 66 | 78 | 67 | 55 | 0 | 33 | 0 | 0 | 0 | 0 | 58 | 28 | 20 | 0 |
| 31-40 | 0 | 0 | 11 | 22 | 34 | 0 | 0 | 100 | 100 | 100 | 0 | 14 | 43 | 80 | 100 |
| 41-45 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 29 | 0 | 0 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 80 | 50 | 0 | 0 | 0 | 60 | 0 | 100 | 0 | 0 |
| 11-20 | 20 | 50 | 50 | 100 | 0 | 40 | 100 | 0 | 100 | 0 |
| 21-30 | 0 | 0 | 50 | 0 | 67 | 0 | 0 | 0 | 0 | 100 |
| 31-40 | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - |
| 41-45 | - | - | - | - | - | - | - | - | - | - |

Table 3: Breakdown of specimens of *Buxus microphylla* 'Winter Beauty' by saleable width category, 1993-97

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 100 | 20 | 0 | 0 | 20 | 100 | 100 | 0 | 14 | - | 100 | - | - | - | - |
| 11-20 | 0 | 80 | 80 | 20 | 20 | 0 | 0 | 100 | 29 | - | - | - | - | - | - |
| 21-30 | 0 | 0 | 20 | 40 | 40 | 0 | 0 | 0 | 43 | - | - | - | - | - | - |
| 31-40 | 0 | 0 | 0 | 40 | 20 | 0 | 0 | 0 | 14 | - | - | - | - | - | - |
| 41-50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 78 | 33 | 22 | 11 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 14 | 0 | 0 | 0 |
| 11-20 | 22 | 67 | 55 | 11 | 22 | 0 | 100 | 67 | 0 | 33 | 0 | 57 | 14 | 0 | 0 |
| 21-30 | 0 | 0 | 23 | 67 | 0 | 0 | 0 | 33 | 100 | 0 | 0 | 29 | 14 | 0 | 0 |
| 31-40 | 0 | 0 | 0 | 11 | 78 | 0 | 0 | 0 | 0 | 67 | 0 | 0 | 72 | 0 | 0 |
| 41-50 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 80 | 0 |
| 51-60 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 20 | 100 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 100 | 50 | 0 | 0 | 0 | 100 | 100 | 100 | 0 | 0 |
| 11-20 | 0 | 50 | 25 | 0 | 0 | 0 | 0 | 0 | 100 | 0 |
| 21-30 | 0 | 0 | 75 | 67 | 0 | 0 | 0 | 0 | 0 | 100 |
| 31-40 | 0 | 0 | 0 | 33 | 67 | - | - | - | - | - |
| 41-50 | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - |

# *CASTANEA X* 'DOUGLAS HYBRIDS'

| | |
|---|---|
| **Family:** | Fagaceae |
| **English common name:** | Chestnut |
| **French common name:** | Châtaignier 'Douglas hybrids' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Large tree |

## BOTANICAL DESCRIPTION

This small tree, with a wide, erect habit, can grow to 15 m tall. It is a very fast grower.

The simple, alternate, serrate leaves have conspicuous pinnate secondary veins.

The unisexual inflorescences consist of male flowers borne on long, semi-erect axillary catkins and female flowers that usually occur at the base of the male flowers, in clusters of three within an involucre. Flowering occurs in June or July.

The fruits, edible achenes, occur in groups of 1–3 within a prickly, burr-shaped husk with 2–4 valves. They ripen in late September or early October.

## ORIGIN AND DISTRIBUTION

This hybrid is the product of a cross between *C. dentata* and *C. mollissima*. *C. dentata* comes from the eastern US and was introduced into cultivation in 1800; it is very susceptible to chestnut blight and is in danger of extinction in the United States, which is why new hybrids resistant to the disease have been developed. *C. mollissima*, which comes from North Korea and central China, was introduced in 1903. This fruit species, economically important in China, is resistant to chestnut blight.

The hybrid was selected for its habit, resistance to the blight and the quality of its nuts.

## USE

**Ornamental:** This variety can be used alone as a specimen tree or in a massed planting.

**Cooking:** The nuts are edible.

## REQUIREMENTS

Chestnuts are fairly easy to grow; they do well in moderately fertile soil as long as it is deep, well-drained and relatively lime free. They prefer full sun but will tolerate light shade.

## DISEASES AND INSECTS

To date, no specific problems have been reported in the Quebec Department of Agriculture, Fisheries and Food's crop protection warning network (Réseau d'avertissements phytosanitaires). However, a number of insects and diseases attack the cultivar in areas where it is grown in the United States.

## PROPAGATION

**Seeds:** Seeds should come from large fruits harvested from healthy trees. They are stratified in sand during the fall and must be protected from spring frosts. After germination, the seedlings are planted in beds and left to grow for two years. The first year, plants will measure 20-30 cm high. Beds should be covered in winter. The germination rate is 50-60% and seed viability is around six months.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Grimo Nut Nursery, Ontario

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** Nuts were ordered in the fall of 1992 by the Pépinière Lafeuillée in Joliette. On November 25, 200 nuts were transferred to L'Assomption and were stratified for five months at 5°C. On April 28, 1993, the

seeds were planted in the greenhouse in a peat-perlite mixture (1:1; v:v); 180 seeds germinated the following week. In early June, the seedlings were moved to the lath house and, on July 6, they were potted up and then treated weekly with a 20-20-20 liquid fertilizer at the recommended rate. The survival rate was 75%. They were over 30 cm tall at the end of the first growing season. They were overwintered outside under a thermal blanket. In May 1994, they were wrapped and put in the cold store to await shipping a few days later.

**Inclusion in testing network:** Young plants 27 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Winter damage was extensive in the hybrid and a number of plants died at each site.

*Region 1*

At L'Assomption, 22%, 14%, 14% and 25% of specimens died the first four winters. Over the same period, 67%, 43% and 25% of plants had frost damage to the branch tips. The second winter, one plant had damage to the old wood. The third winter, 40% had damage to the previous year's shoots and an equal proportion had rodent damage.

At St. Clotilde, 65% and 40% of plants died the first and fourth winters.

At St. Hyacinthe, 50% of plants died the first winter, 44% the following winter and the rest the third winter.

*Region 2*

At Deschambault, 25% and 11% of plants died the first two winters. Frost damage to the branch tips was observed every winter in 35–50% of plants. In addition, the first four winters, 8%, 11%, 50% and 37% had frost damage to the previous year's shoots and, the last three winters, around 12% had mechanical breakage.

At St. Foy, frost damage to the branch tips was observed the first four winters in 57%, 28%, 36% and 18% of specimens. The first three winters, 7%, 36% and 9% had frost damage to the previous year's shoots. One plant froze down to the ground level the first winter, another had damage to the old wood and a third had frost damage to the aerial portions above the snow cover the second winter. The third and fourth winters, 55% had mechanical breakage and 10% had rodent damage.

At La Pocatière, 17%, 6% and 9% of plants died the first two winters and last winter. Frost damage to the branch tips occurred all five winters (11%, 47%, 73%, 27% and 36%). The second winter, 13% froze down to the level of the snow cover and one specimen froze down to the ground level. The third winter, 18% had rodent damage. The fourth winter, 9% had frost damage to the previous year's shoots and 18% froze down to the ground level.

*Region 3*

At Normandin, 18%, 7%, 30% and 14% of specimens died the first three winters and last winter. Frost damage down to the ground level occurred in 93% the second winter. The third winter, 10% had frost damage to the previous year's shoots and 30% had mechanical breakage. The last winter, 14% had frost damage to the branch tips.

At Kapuskasing, 42%, 14% and 83% of specimens died the first three winters. Frost damage to the aerial portions above the ground level occurred all five winters (17%, 86%, 17%, 100% and 100%). The first winter, 33% had damage to the previous year's shoots and one specimen had frost damage to the branch tips.

### Height and trunk diameter growth

Figures 1 and 2 show the mean height and trunk diameter of specimens after five years of testing at the eight sites.

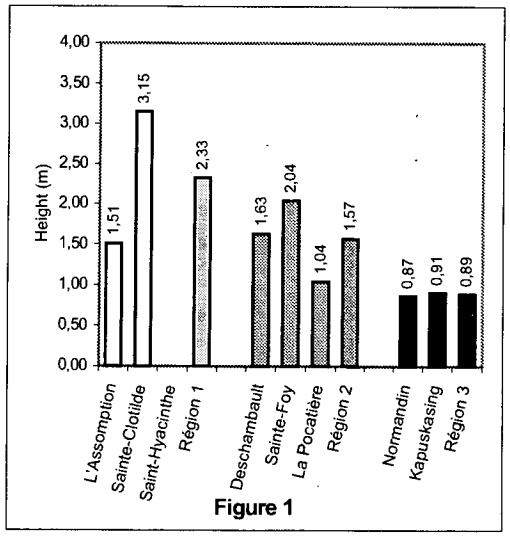


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

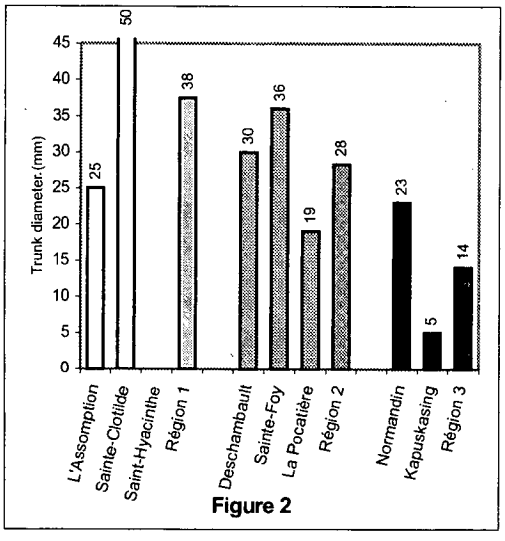


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the sites and three regions

### Effect of pruning

Extensive pruning to remove over 50% of the total height of specimens was done at L'Assomption, Deschambault and Normandin. At the zone 2 sites, plants had to be cut back to 1 cm from the ground once at Normandin and three times at Kapuskasing.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and trunk diameter categories (heights and trunk diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and diameter.

Growth was quite varied: surviving trees could be classified into two height classes at L'Assomption and St. Clotilde and into four or five classes at the other sites. This heterogeneity is due to genetic variability in plants produced from seeds.

Production of this hybrid from seeds can only be done at the zone 4 and 5 sites: losses of around 50% can be expected at Montreal region sites given the young plants' poor cold tolerance and the lack of snow cover during the coldest periods; at sites better protected by the snow, losses of 20-25% can be expected.

Given the scarcity of information on nut production in this hybrid under climatic conditions in hardiness zones 2 to 5, production is risky, since no fruits were obtained in the five years of the trials.

## HARDINESS EVALUATION

This hybrid is no hardier than its breeding lines; according to the literature, *C. dentata* is hardy to zone 5, and *C. mollissima*, to zone 6. The mortality that occurred in the young trees in zones 4 and 5 show that some seed-produced specimens of the hybrid can survive for five years, growing to above the level of the snow cover. A high level of natural selection occurred in the young plants and only the best adapted were able to survive.

The hybrid is intended to be used for nut production but was not tested long enough to verify this character.

The hybrid did not achieve its full ornamental potential in the tests.

**WRITTEN BY**

Claude Richer, Agr.

Jacques-André Rioux, Agr

Christine Galipeau, Biologist

**Table 1: Frequency of winter damage observed in *Castanea* x 'Douglas Hybrids', 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 28 | 27 | | 8 | 3 | | | 16 | | 10 | 8 | 72 |
| St. Clotilde | 79 | | | | | | | 21 | | | | 21 |
| St. Hyacinthe | 35 | | | | | | | 65 | | | | 65 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 17 | 47 | | 21 | | | | 5 | | 10 | | 83 |
| St. Foy | 45 | 28 | | 10 | 2 | 2 | 2 | | | 9 | 2 | 55 |
| La Pocatière | 42 | 39 | | 2 | | 2 | 4 | 8 | | | 3 | 58 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 57 | 3 | | 2 | | | 19 | 13 | | 6 | | 43 |
| Kapuskasing | 0 | 2 | | 6 | | | 64 | 28 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3 or 9 occurred in the plants tested.

Table 2. Breakdown of *Castanea* x 'Douglas Hybrids' specimens by saleable height category, 1994-98

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 71 | 0 | 50 | 0 | 80 | 0 | 0 | 0 | 0 | 88 | 89 | 100 | - | - |
| 051-100 | 0 | 29 | 60 | 0 | 67 | 20 | 40 | 0 | 0 | 0 | 12 | 11 | 0 | - | - |
| 101-150 | 0 | 0 | 20 | 25 | 0 | 0 | 60 | 67 | 67 | 0 | - | - | - | - | - |
| 151-200 | 0 | 0 | 20 | 25 | 0 | 0 | 0 | 33 | 33 | 33 | - | - | - | - | - |
| 201-250 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - |
| 251-300 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - |
| 301-350 | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - |
| 351-400 | - | - | - | - | - | 0 | 0 | 0 | 0 | 67 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 55 | 0 | 12 | 0 | 93 | 14 | 9 | 10 | 9 | 100 | 67 | 28 | 36 | 28 |
| 051-100 | 0 | 23 | 38 | 25 | 13 | 7 | 36 | 0 | 9 | 18 | 0 | 33 | 27 | 28 | 27 |
| 101-150 | 0 | 22 | 50 | 38 | 37 | 0 | 50 | 36 | 27 | 0 | 0 | 0 | 45 | 27 | 27 |
| 151-200 | 0 | 0 | 0 | 25 | 25 | 0 | 0 | 45 | 9 | 18 | 0 | 0 | 0 | 9 | 18 |
| 201-250 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 10 | 36 | 10 | - | - | - | - | - |
| 251-300 | 0 | 0 | 12 | 0 | 12 | 0 | 0 | 0 | 9 | 27 | - | - | - | - | - |
| 301-350 | - | - | - | - | - | 0 | 0 | 0 | 0 | 18 | - | - | - | - | - |
| 351-400 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 79 | 40 | 28 | 14 | 100 | 100 | 100 | 100 | 0 |
| 051-100 | 0 | 21 | 40 | 15 | 57 | 0 | 0 | 0 | 0 | 100 |
| 101-150 | 0 | 0 | 10 | 57 | 29 | - | - | - | - | - |
| 151-200 | 0 | 0 | 10 | 0 | 0 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |
| 251-300 | - | - | - | - | - | - | - | - | - | - |
| 301-350 | - | - | - | - | - | - | - | - | - | - |
| 351-400 | - | - | - | - | - | - | - | - | - | - |

Table 3. **Breakdown of *Castanea* x 'Douglas Hybrids' specimens by saleable trunk diameter category, 1994-98**

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 100 | 86 | 20 | 25 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | - | - |
| 11-20 | 0 | 14 | 60 | 50 | 33 | 0 | 60 | 33 | 0 | 0 | - | - | - | - | - |
| 21-30 | 0 | 0 | 20 | 25 | 34 | 0 | 0 | 34 | 100 | 0 | - | - | - | - | - |
| 31-40 | 0 | 0 | 0 | 0 | 33 | 0 | 20 | 33 | 0 | 33 | - | - | - | - | - |
| 41-50 | - | - | - | - | - | 0 | 20 | 0 | 0 | 0 | - | - | - | - | - |
| 51-60 | - | - | - | - | - | 0 | 0 | 0 | 0 | 67 | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 100 | 50 | 0 | 0 | 12 | 100 | 29 | 10 | 10 | 0 | 100 | 100 | 27 | 37 | 28 |
| 11-20 | 0 | 50 | 50 | 28 | 13 | 0 | 71 | 27 | 27 | 27 | 0 | 0 | 73 | 18 | 18 |
| 21-30 | 0 | 0 | 25 | 43 | 50 | 0 | 0 | 27 | 27 | 9 | 0 | 0 | 0 | 45 | 45 |
| 31-40 | 0 | 0 | 25 | 29 | 0 | 0 | 0 | 27 | 9 | 28 | 0 | 0 | 0 | 0 | 9 |
| 41-50 | 0 | 0 | 0 | 0 | 12 | 0 | 0 | 9 | 27 | 0 | - | - | - | - | - |
| 51-60 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 36 | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 100 | 100 | 70 | 29 | 0 | 100 | 100 | 100 | 100 | 100 |
| 11-20 | 0 | 0 | 30 | 71 | 14 | - | - | - | - | - |
| 21-30 | 0 | 0 | 0 | 0 | 86 | - | - | - | - | - |
| 31-40 | - | - | - | - | - | - | - | - | - | - |
| 41-50 | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - |

C

# *CHAMAECYPARIS OBTUSA* 'NANA'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Hinoki False Cypress, Dwarf Hinoki Cypress |
| **French common name:** | Faux-cyprès du Japon, Faux-cyprès de Hinoki |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

Though no more than 30 cm tall, this dwarf shrub grew to around 80 cm wide after roughly 30 years at the Roger Van den Hende Garden. Century-old specimens reach a maximum of 1.5 m in height but are wide, bushy and very lush.

The spreading branches are flat and horizontal and droop at the tips, with reddish or reddish- brown bark.

The twigs, covered with squamiform, obtuse leaves, are glossy dark green on top and have white marks underneath. The leaves occur in pairs; the lateral pairs are wider and pointed at the apex. The delicate foliage grows in graceful rosette-shaped sprays.

The solitary cones are brownish orange, globose and inconspicuous. They are covered with eight scales and contain 2–5 bulbous seeds.

## ORIGIN AND DISTRIBUTION

The species form *Chamaecyparis obtusa* comes from Japan and was introduced in 1861. No information was obtained on the origins of the cultivar.

## USE

**Ornamental:** This cultivar can be used as a specimen plant or in mass plantings in rock gardens and miniature gardens. It is prized for its bonsai-like shape and attractive foliage.

## REQUIREMENTS

This cultivar does not tolerate chalky soils or dry climates, and needs regular rain.

## DISEASES AND INSECTS

To date, no specific problems have been reported in the Quebec Department of Agriculture, Fisheries and Food's crop protection warning network (Réseau d'avertissements phytosanitaires).

## PROPAGATION

**Cutting:** Hardwood cuttings, taken in fall and treated with a 1000 ppm IBA/50% ethanol hormone solution, give good results. A sand-peat mixture is used as the rooting substrate.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** 484 cuttings (roughly 6 cm) were taken on June 30, 1992 from 30-year-old parent plants. The cuttings were dipped for five seconds in a 8000 ppm IBA/50% ethanol solution, rinsed under the tap and then immersed in a Benomyl-Captan® fungicide solution. They were planted in plug trays in a peat-perlite mixture (2:3; v:v) and placed under an automatic mist unit (Mist-A-Matic®). The rooting rate was 71% after over 120 days. Misting was discontinued in early October and the plants were treated twice, at a one-week interval, with a soluble fertilizer (20-20-20, 200 ppm N). In November, they were removed from the plug trays and placed in the cold store at -2°C in plastic bags perforated with a hatpin. In early May 1993, they were potted up in Fertil Pot® containers in

a peat-perlite mixture (3:2; v:v) and put in the tunnel greenhouse, where they were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until mid-October. In November, they were returned to the cold store. In May 1994, they were wrapped and kept in the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 11 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Foliage browning and mortality were observed at all sites. The mortality rate was greater at sites with a more severe winter: the harsher the climate in the hardiness zone, the greater the mortality rate.

*Region 1*

At L'Assomption, 10%, 8%, 7% and 33% of specimens died the first four winters; foliage browning occurred the last four winters in 25%, 79%, 67% and 25% of plants.

At St. Clotilde, 12% of plants died the first winter. During the first four winters, 82%, 27%, 40% and 40% had foliage browning.

At St. Hyacinthe, 12% of shrubs died the first winter. The first two winters, 5% and 100% had foliage browning.

*Region 2*

Every winter, 25–50% of the plants at Deschambault had foliage browning. The last four winters, 5%, 33%, 25% and 17% of plants died. The second winter, 5% had mechanical breakage.

At St. Foy, plants died every winter (5%, 16%, 17%, 40% and 67%), while foliage browning occurred in 35%, 10%, 83%, 60% and 33%. The first two winters, frost damage to the branch tips occurred in 15% and 47%.

At La Pocatière, during the first two winters and fourth winter, 25%, 7% and 38% of plants died. Frost damage to the branch tips was found in 7% and 25% the second and fourth winters. Damage to the previous year's shoots occurred in 36%, 37% and 12% the second, third and fourth winters. The first winter, the old wood was affected in 15% of plants.

*Region 3*

At Normandin, 24%, 31% and 62% of specimens died the first three winters. Foliage browning occurred in 4%, 12%, 33% and 100% of plants the first winter and last three winters.

At Kapuskasing, 47%, 50% and 40% of plants died the first three winters. The first two winters, 15% and 10% had frost damage to the branch tips and 32% and 40% had frost damage to the previous year's shoots. The next winter, 40% froze down to the ground level. The fourth winter, all the surviving plants died.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

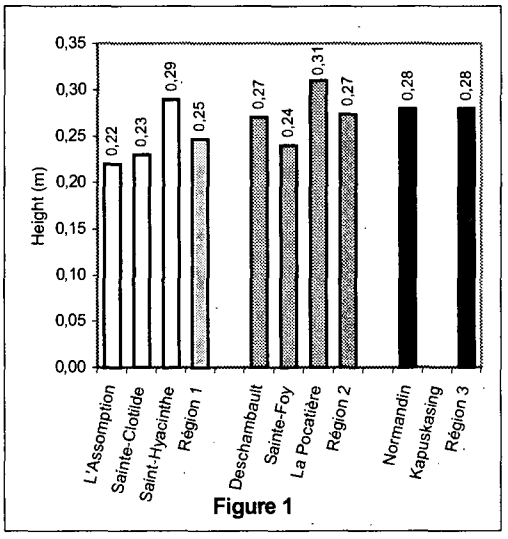


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

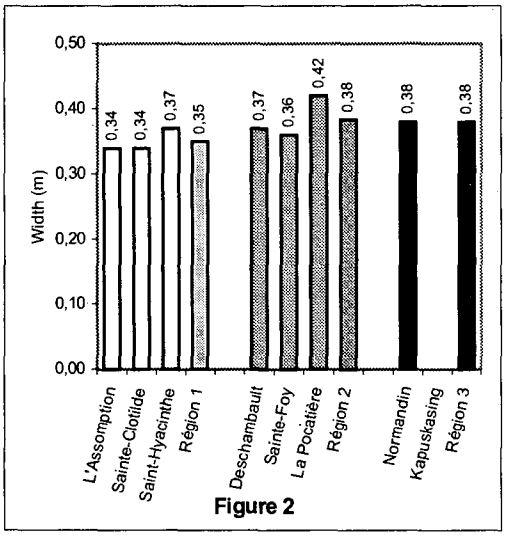


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

In this cultivar, the first growing season is often the one with the greatest height growth; width growth is greater than height growth.

### Effect of pruning

Light pruning was done at L'Assomption, St. Foy, Deschambault and Normandin.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

For this cultivar, the production recommendations are based mainly on plants' capacity to develop a good root system in order to survive Quebec winters, rather than on annual growth. Container production is one way of protecting plants during the first few winters.

## HARDINESS EVALUATION

According to the literature consulted, the species is hardy to zone 5; this was borne out in the trials, since mortality in zones 5a and 5b was observed only during the first winter. Even though the parent plant is in Quebec City (zone 4), mortality rates in this zone were very high. The results show that young plants are very frost prone during the first three or four growing seasons. Their root system is fragile and plants may be killed off over several winters. Once plants have become established, however, growth may be significant, even in zone 2.

If the parent plant is any indication, the cultivar can be used as far as zone 4; but this only applies to adult plants adapted to the environment and climate.

The cultivar did not achieve its full ornamental expression at the trial sites.

## WRITTEN BY

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Jacques-André Rioux, Agr

Christine Galipeau, Biologist

**Table 1: Frequency of winter damage observed in *Chamaecyparis obtusa* 'Nana', 1995-99**

| Tria site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 51 | | | | | | | 12 | | | | 37 | 49 |
| St. Clotilde | 60 | | | | | | | 2 | | | | 38 | 40 |
| St. Hyacinthe* | 66 | | | | | | | 8 | | | | 26 | 34 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 44 | | | | | | | 16 | | 1 | | 39 | 56 |
| St. Foy | 15 | 12 | | | | | | 29 | | | | 44 | 85 |
| La Pocatière | 47 | 6 | | 17 | 3 | | | 14 | | | | 13 | 53 |
| **REGION 3** | | | | | | | | | | | | | |
| Normalndin | 46 | | | | | | | 24 | | | | 30 | 54 |
| Kapuskasing | 6 | 7 | | 18 | | | 10 | 59 | | | | | 94 |

[a] Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of types 3, 6, 9 or 11 occurred in the plants tested.

* Data were not collected in 1997.

Table 2: **Breakdown of *Chamaecyparis obtusa* 'Nana' specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 10 | 6 | 0 | 9 | 0 | 6 | 0 | 0 | 10 | 0 | - | 0 | 0 | 0 | 0 |
| 11-20 | 70 | 56 | 55 | 46 | 37 | 88 | 13 | 10 | 70 | 50 | - | 54 | 50 | 25 | 9 |
| 21-30 | 20 | 34 | 45 | 45 | 63 | 6 | 87 | 90 | 20 | 50 | - | 38 | 33 | 42 | 63 |
| 31-40 | 0 | 4 | 0 | 0 | 0 | - | - | - | - | - | - | 8 | 17 | 33 | 18 |
| 41-50 | - | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 10 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 6 | 0 | 0 | 0 | 10 | 6 | 0 | 0 | 0 |
| 11-20 | 68 | 53 | 8 | 25 | 0 | 60 | 57 | 42 | 50 | 34 | 80 | 47 | 12 | 0 | 0 |
| 21-30 | 32 | 47 | 67 | 63 | 67 | 40 | 37 | 41 | 30 | 50 | 10 | 47 | 63 | 62 | 40 |
| 31-40 | 0 | 0 | 17 | 12 | 33 | 0 | 0 | 17 | 20 | 16 | 0 | 0 | 25 | 38 | 60 |
| 41-50 | 0 | 0 | 8 | 0 | 0 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 24 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11-20 | 71 | 82 | 87 | 67 | 66 | 47 | 50 | 40 | 66 | - |
| 21-30 | 5 | 6 | 0 | 0 | 0 | 47 | 50 | 60 | 34 | - |
| 31-40 | 0 | 6 | 13 | 33 | 0 | 6 | 0 | 0 | 0 | - |
| 41-50 | 0 | 0 | 0 | 0 | 34 | - | - | - | - | - |

* Data were not collected in 1994.

Table 3: **Breakdown of *Chamaecyparis obtusa* 'Nana' specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 30 | 0 | 0 | 0 | 0 | 94 | 26 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11-20 | 70 | 83 | 18 | 10 | 0 | 6 | 74 | 70 | 60 | 0 | - | 38 | 0 | 0 | 0 |
| 21-30 | 0 | 17 | 64 | 54 | 50 | 0 | 0 | 30 | 10 | 40 | - | 54 | 67 | 33 | 18 |
| 31-40 | 0 | 0 | 18 | 36 | 25 | 0 | 0 | 0 | 30 | 60 | - | 8 | 25 | 50 | 73 |
| 41-50 | 0 | 0 | 0 | 0 | 25 | - | - | - | - | - | - | 0 | 0 | 17 | 9 |
| 51-60 | - | - | - | - | - | - | - | - | - | - | - | 0 | 8 | 0 | 0 |
| 61-70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 5 | 10 | 8 | 0 | 0 | 10 | 6 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| 11-20 | 76 | 52 | 8 | 0 | 16 | 70 | 26 | 0 | 0 | 16 | 65 | 47 | 0 | 12 | 0 |
| 21-30 | 14 | 24 | 34 | 63 | 17 | 20 | 58 | 50 | 30 | 17 | 30 | 53 | 50 | 25 | 0 |
| 31-40 | 5 | 14 | 42 | 25 | 17 | 0 | 10 | 33 | 30 | 17 | 0 | 0 | 50 | 63 | 20 |
| 41-50 | 0 | 0 | 8 | 12 | 33 | 0 | 0 | 17 | 40 | 50 | 0 | 0 | 0 | 0 | 80 |
| 51-60 | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - | - | - | - | - | - |
| 61-70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 28 | 0 | 0 | 0 | 0 | 5 | 50 | 20 | 0 | - |
| 11-20 | 67 | 94 | 63 | 33 | 33 | 90 | 50 | 80 | 100 | - |
| 21-30 | 5 | 0 | 25 | 33 | 0 | 5 | 0 | 0 | 0 | - |
| 31-40 | 0 | 6 | 12 | 0 | 33 | - | - | - | - | - |
| 41-50 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - |
| 51-60 | 0 | 0 | 0 | 34 | 0 | - | - | - | - | - |
| 61-70 | 0 | 0 | 0 | 0 | 34 | - | - | - | - | - |

* Data were not collected in 1994.

# *CHAMAECYPARIS PISIFERA* 'BOULEVARD'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Boulevard Japanese Falsecypress, Sawara False Cypress |
| **French common name:** | Faux-Cyprès 'Boulevard', Faux-Cyprès de Sawara |
| **Synonym:** | *C. pisifera squarrosa cyano-viridis* Hort, *C. pisifera* 'Cyanoviridis' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub has a rounded crown and regular, pyramidal habit. It can grow to 2 m tall and 1 m wide.

The smooth, reddish-brown bark peels off in strips. The cultivar, which is very unlike the species form, has many branches densely covered with, and completely hidden by, the fine, feathery foliage.

The acicular leaves, pointed at the apex, are green above with a white line underneath. They are up to 1 cm long and decurved toward the branch. The foliage is silvery blue-green in summer but turns bluish grey in winter on the new shoots, giving it a frothy look.

The yellowish, globular cones are small and inconspicuous, bearing 10–12 scales, each containing one or two ovoid, bulbous seeds.

## ORIGIN AND DISTRIBUTION

The species, native to Japan, was introduced in North America by Robert Fortune in 1861. The cultivar 'Boulevard' comes from a mutation of *C. pisifera* 'Squarrosa' and was introduced in 1934 under the name *C. pisifera squarrosa* cyano-viridis Hort.

## USE

**Ornamental:** With its attractively coloured foliage, the cultivar is particularly well suited to containers, rock gardens and mass plantings or for use as a specimen plant.

## REQUIREMENTS

Sensitive to the wind and strong sun, the cultivar requires a certain degree of humidity year round. It prefers a rich, damp, well-drained soil. The foliage can be lightly pruned to remove dried-out portions.

## DISEASES AND INSECTS

No specific references to problems in this cultivar were found.

## PROPAGATION

**Cutting:** Hardwood cuttings taken in fall and treated with a 1000 ppm IBA/50% ethanol hormone solution give good results. A sand-peat mixture is recommended for the rooting substrate.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Purchased from Sheridan Nursery, Montreal, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** 530 cuttings (5–7 cm) were taken on October 28, 1992 from 35-cm-tall and wide parent plants. The cuttings were dipped for five seconds in a 4000 ppm IBA/50% ethanol solution, planted in Todd® cell trays in a Promix®-sand mixture (1:2; v:v) and placed under an automatic mist unit operating for 10 seconds every 32 minutes. The heating cables were set at 23°C. The rooting rate was 35% after a few weeks. In early April 1993, the seedlings were transplanted into 10-cm pots in a Promix®-Turface® mixture (1:2; v:v). They were moved to outdoor beds on May 26 and treated weekly with a soluble fertilizer

(20-20-20, 200 ppm N) until mid-August. They were overwintered in cold frames; the winter survival rate was 100%. In May 1994, they were wrapped and put in the cold store at 5°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 6 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Foliage browning occurred at all sites. In addition, three plants died at L'Assomption, two at St. Foy, six at Normandin and 19 at Kapuskasing.

*Region 1*

No damage occurred at L'Assomption the first and last winters, while 25% of specimens died the fourth winter. Foliage browning occurred the second, third and fourth winters in 7%, 92% and 75% of plants. The third winter, 8% had mechanical breakage.

At St. Clotilde, foliage browning occurred in all plants every winter, except the fourth winter when only 25% of plants were affected.

At St. Hyacinthe, all the shrubs had foliage browning the second winter. Data were not collected in 1997.

*Region 2*

At Deschambault, 38–100% of shrubs had foliage browning every winter.

At St. Foy, two specimens died the last two winters. The last four winters, 38%, 75%, 92% and 27% had foliage browning while, the first two winters, 100% and 20% had frost damage to the branch tips.

At La Pocatière, the second winter, 33% of specimens had frost damage to the branch tips and 5% had frost damage to the previous year's shoots. The last winter, 17% had foliage browning.

*Region 3*

At Normandin, 5%, 10% and 30% of specimens died the first three winters. The first winter and last three winters, 62%, 30%, 28% and 43% had foliage browning.

At Kapuskasing, mortality occurred each of the five winters (9%, 15%, 37%, 10% and 78% of shrubs). In addition, 40–80% had frost damage to the branch tips the first three winters and 15–30% had frost damage to the previous year's shoots the first, third and fourth winters. The last two winters, 60% and 22% had foliage browning.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

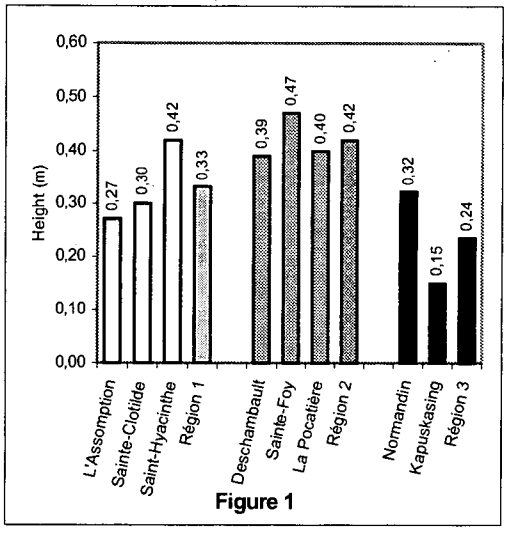


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

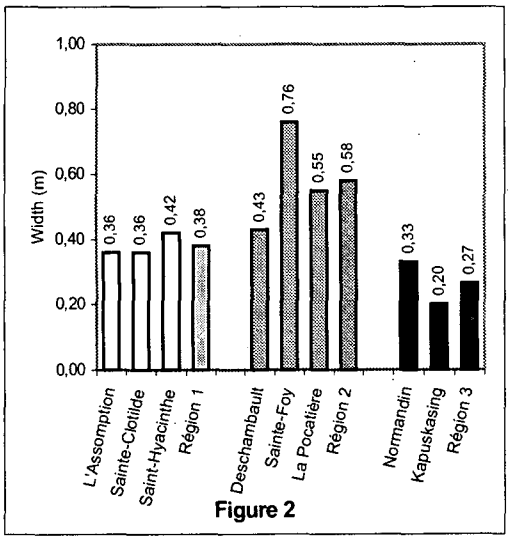


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

**Effect of pruning**

Light pruning was done at L'Assomption, St. Foy, Deschambault and Normandin.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Growth was very uniform at the region 1 and 2 sites. After three growing seasons, all plants at St. Foy, 83% at St. Hyacinthe and 75% at La Pocatière were over 21 cm tall. An additional year was required at Deschambault to obtain shrubs of comparable height, and a full five years were needed at L'Assomption and Normandin.

The production of this cultivar is not recommended in zone 2a, since mortality was too high. Production is much quicker at the warmest sites (zone 5b, South Shore) and sites where the snow accumulation minimizes winter damage.

## HARDINESS EVALUATION

In the literature, the species form is considered hardy to zone 4b or 5; there is no specific information on the cultivar. The significant mortality that occurred at the zone 2 sites indicates that the cultivar can only survive as far as zone 4. However, at St. Foy (zone 4b) and L'Assomption (5a), mortality was high during the last winters of the trials, indicating a gradual weakening of the plants or occasional very harsh winters. Therefore, this rating is given with the proviso that growing conditions must be favourable, plants must be hardened off properly and that an adequate winter snow cover must be present to provide protection in winter.

The cultivar can be used as far as zone 2b in the case of well-established specimens that have survived the first few winters. The growth data, however, shows great variation among plants in this zone, even those propagated from cuttings.

The cultivar's full ornamental potential was not observed at the sites tested.

## WRITTEN BY

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Christine Galipeau, Biologist

Table 1: **Frequency of winter damage observed in *Chamaecyparis pisifera* 'Boulevard', 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 59 | | | | | | | 5 | | 2 | | 34 | 41 |
| St. Clotilde | 15 | | | | | | | | | | | 85 | 85 |
| St. Hyacinthe | 75 | | | | | | | | | | | 25 | 25 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 31 | | | | | | | | | | | 69 | 69 |
| St. Foy | 26 | 23 | | | | | | 4 | | | | 47 | 74 |
| La Pocatière | 89 | 6 | | 1 | | | | | | | | 4 | 11 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 58 | | | | | | | 9 | | | | 33 | 42 |
| Kapuskasing | 0 | 40 | | 14 | | | | 30 | | | | 16 | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of types 3, 5, 6, 7, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of *Chamaecyparis pisifera* 'Boulevard' specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 67 | 19 | 17 | 16 | 0 | 100 | 20 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 |
| 11-20 | 33 | 81 | 50 | 42 | 11 | 0 | 80 | 100 | 67 | 17 | - | 79 | 17 | 0 | 0 |
| 21-30 | 0 | 0 | 33 | 42 | 56 | 0 | 0 | 0 | 33 | 42 | - | 21 | 83 | 58 | 0 |
| 31-40 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 41 | - | 0 | 0 | 42 | 42 |
| 41-50 | - | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 58 |
| 51-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 33 | 0 | 0 | 0 | 0 | 48 | 5 | 0 | 0 | 0 | 86 | 14 | 0 | 0 | 0 |
| 11-20 | 67 | 95 | 50 | 17 | 0 | 52 | 90 | 0 | 8 | 0 | 14 | 86 | 25 | 0 | 0 |
| 21-30 | 0 | 5 | 42 | 58 | 17 | 0 | 5 | 83 | 8 | 9 | 0 | 0 | 75 | 42 | 0 |
| 31-40 | 0 | 0 | 8 | 25 | 58 | 0 | 0 | 17 | 75 | 18 | 0 | 0 | 0 | 58 | 58 |
| 41-50 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 18 | 0 | 0 | 0 | 0 | 42 |
| 51-60 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 55 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 100 | 10 | 40 | 0 | 0 | 81 | 53 | 25 | 0 | 11 |
| 11-20 | 0 | 90 | 50 | 57 | 14 | 19 | 47 | 75 | 90 | 78 |
| 21-30 | 0 | 0 | 10 | 28 | 43 | 0 | 0 | 0 | 10 | 11 |
| 31-40 | 0 | 0 | 0 | 15 | 28 | - | - | - | - | - |
| 41-50 | 0 | 0 | 0 | 0 | 15 | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1994.

Table 3: **Breakdown of *Chamaecyparis pisifera* 'Boulevard' specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 42 | 25 | 0 | 100 | 100 | 83 | 17 | 0 | - | 32 | 0 | 0 | 0 |
| 021-040 | 0 | 0 | 58 | 75 | 89 | 0 | 0 | 17 | 83 | 75 | - | 68 | 75 | 67 | 42 |
| 041-060 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 25 | - | 0 | 25 | 33 | 58 |
| 061-080 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 43 | 0 | 0 | 0 | 100 | 10 | 0 | 0 | 0 | 100 | 57 | 0 | 0 | 0 |
| 021-040 | 0 | 57 | 100 | 92 | 50 | 0 | 90 | 8 | 8 | 9 | 0 | 43 | 100 | 25 | 0 |
| 041-060 | 0 | 0 | 0 | 8 | 50 | 0 | 0 | 92 | 50 | 9 | 0 | 0 | 0 | 75 | 83 |
| 061-080 | - | - | - | - | - | 0 | 0 | 0 | 42 | 36 | 0 | 0 | 0 | 0 | 17 |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 0 | 46 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 95 | 70 | 0 | 15 | 100 | 100 | 88 | 50 | 44 |
| 021-040 | 0 | 5 | 30 | 86 | 71 | 0 | 0 | 12 | 50 | 56 |
| 041-060 | 0 | 0 | 0 | 14 | 14 | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |

*Data were not collected in 1994.

# *CLETHRA ALNIFOLIA* L.

| | |
|---|---|
| **Family:** | Clethraceae |
| **English common name:** | Summer Sweet Clethra, Sweet Pepper Bush |
| **French common name:** | Cléthra à feuilles d'aulne |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This small, dense, erect shrub, irregularly globular in shape, can grow to 1.2 m tall and 2.0 m wide. The branches, pubescent when young, are erect and arching. The dark brown bark peels off in wide strips. It is slow growing.

The foliage is deciduous, dense and alder like. It is reddish green in spring, and turns dark green in summer and then orange yellow in fall. The alternate leaves, which are 4–10 cm long, are oval, with a sharply acuminate apex and 7–10 vein pairs. The leaves are exstipulate, with finely serrate margins, and smooth on both sites.

The perfect flowers are small, pinkish-white and 8.0 mm in diameter. They are borne in erect terminal spikes, 10–15 cm long, at the ends of the branches. The flowers bloom from July to September and are very fragrant.

The fruits are brownish, loculicidal, three-valved capsules and are attractive to birds.

The roots are creeping, shallow and lateral.

## ORIGIN AND DISTRIBUTION

*Clethra* is the Greek word for alder. The species, native to eastern North America, occurs in swamps and moist woods.

## USE

**Ornamental:** This species can be used alone as a specimen plant or massed in groups. In mass plantings of shrubs, it is usually planted in the foreground. It does best in a wet location. It is particularly suited to shady areas and acid soils, and takes readily to planting under conifers.

**Birds:** The fruits attract birds.

## REQUIREMENTS

The species does best in a semi-shady location but also tolerates full sun. It can be grown in a wide range of soils as long as the soil is deep and acid. It prefers a moist, well-drained site, and does not take well to drought or transplanting. It tolerates road salt. Pruning should be done in early spring.

## DISEASES AND INSECTS

At dry sites, the species is susceptible to red spider mites.

## PROPAGATION

**Seeds:** Sowing the seeds in spring in soil rich in organic matter and with a plant mulch will help protect seedlings from frost damage for several years and is the best way of obtaining a large number of seedlings. Germination is irregular.

**Cutting:** Cuttings taken in August and planted in a propagation bed will root within four weeks and can then be moved to a cold frame. Taking cuttings in winter from parent plants that have been forced is another option, but is labour intensive and on the whole unnecessary.

**Division:** Older shrubs can also be divided.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Gift of Roger Van den Hende, Oka, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** 400 cuttings (5 cm) were taken on July 14, 1993 from roughly four-year-old parent plants measuring 50 cm high and 20 cm wide. They were dipped for five seconds in a 5000 ppm IBA/50% ethanol solution and planted in plug trays in a Promix®-Turface® mixture (1:2; v:v), under an automatic mist unit (Mist-A-Matic®). A soluble fertilizer (10-52-10) was provided during the rooting period. The rooting rate was 40% after 30 days. On August 15, the plants in their trays were moved to the lath house and fertilized with a 10-52-10 solution. In November, the trays were moved to the cold store at 5°C. The following spring (early April 1994), budbreak began prematurely in the cold store so the plants were moved to the greenhouse to await shipping in late April.

**Inclusion in testing network:** Young plants 7 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

All the plants died at L'Assomption, La Pocatière and Kapuskasing, while 12 died at St. Hyacinthe, 5 at Normandin and 4 at Deschambault.

*Region 1*

At L'Assomption, all the plants died the first four winters (28%, 50%, 75% and 100%). In addition, the second and third winters, 42% and 25% had frost damage to the branch tips. The second winter, 8% froze down to the ground level.

At St. Hyacinthe, 42%, 40% and 15% of plants died the first three winters. The first winter, 35% had frost damage to the branch tips and 6% froze down to the ground level. The next winter, 10% froze down to the level of the snow cover.

*Region 2*

At Deschambault, the first four winters, 10–15% of specimens died and 50–80% suffered mechanical breakage. The first and last winters, 33% and 20% had frost damage to the branch tips. The first winter, 11% had frost damage to the previous year's shoots.

At St. Foy, 90% of specimens had mechanical breakage the third winter and all plants had frost damage to the branch tips the fourth winter.

At La Pocatière, 19% and 18% of specimens died the first two winters and the remainder succumbed the third and fourth winters. The first two winters, 13% and 18% had frost damage to the previous year's shoots and 6% and 18% froze down to the ground level. The first winter, 12% had frost damage to the branch tips and the third winter, 17% had mechanical breakage.

*Region 3*

At Normandin, 11%, 12% and 50% of specimens died the first three winters. Half the plants had mechanical breakage the third winter.

At Kapuskasing, all the plants died the first winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

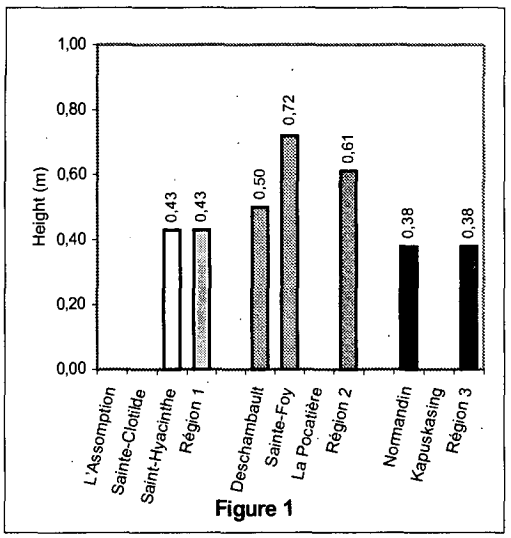


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

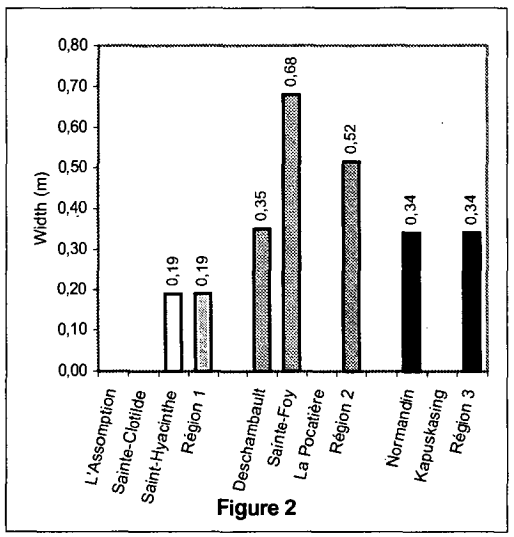


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Flowering

Since few plants survived, the information on flowering dates and duration is limited and partial.

In zone 5, only one plant produced flowers: when it was two years old, flowering duration was 35 days and, when it was three years old, 90 days. The first flowers appeared on July 20 or June 20 depending on the year.

In zone 4, flowering duration was 40–50 days and the first flowers appeared between August 5 and 15, or 40 days or so later than in region 1.

In zone 2b, flowering duration was much shorter, around 25 days. In plants with severe winter damage, flowering may only last 7–10 days, occurring on the new wood only.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

This species must be produced in containers and grown for at least two years to ensure adequate root development. In winter, plants must be protected with a mulch for at least two or three years.

## HARDINESS EVALUATION

The species is considered hardy to zone 5 in the literature. In the trials, however, no plants at the two zone 5 sites survived. In addition, all the plants died at the zone 4a sites and only a few plants survived in zones 4b and 2b. This suggests that winter survival is very problematic during the first three winters. In addition, older plants need a good snow cover to survive. Therefore, the species can survive as far as zone 4, given an adequate snow cover.

The species can be used only in hardiness zones with a good snow cover (4b and 2b), and only if the plants are older.

The species did not achieve its full ornamental potential at the sites tested.

**WRITTEN BY**

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Christine Galipeau, Biologist

Table 1: Frequency of winter damage observed in *Clethra alnifolia* L., 1995-99

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 18 | 17 | | | | | 2 | 63 | | | | 82 |
| St. Clotilde* | - | | | | | | | | | | | - |
| St. Hyacinthe | 70 | 7 | | | | 2 | 1 | 20 | | | | 30 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 23 | 11 | | 2 | | | | 11 | | 53 | | 77 |
| St. Foy | 62 | 20 | | | | | | | | 18 | | 38 |
| La Pocatière | 24 | 3 | | 7 | | | 6 | 55 | | 5 | | 76 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 75 | | | | | | | 15 | | 10 | | 25 |
| Kapuskasing | 0 | | | | | | | 100 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 5, 9 or 11 occurred in the plants tested.

* Shrubs were missing at planting time at St. Clotilde.

Table 2: **Breakdown of *Clethra alnifolia* L. specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 89 | 0 | 0 | 100 | - | - | - | - | - | - | 69 | - | - | - | - |
| 021-040 | 11 | 100 | 100 | 0 | - | - | - | - | - | - | 31 | - | - | - | - |
| 041-060 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 88 | 37 | 0 | 0 | 0 | 92 | 0 | 0 | 0 | 0 | 88 | 15 | 17 | 0 | - |
| 021-040 | 12 | 73 | 72 | 50 | 20 | 8 | 61 | 0 | 0 | 0 | 12 | 77 | 33 | 100 | - |
| 041-060 | 0 | 0 | 28 | 50 | 80 | 0 | 39 | 80 | 90 | 0 | 0 | 8 | 50 | 0 | - |
| 081-100 | - | - | - | - | - | 0 | 0 | 20 | 10 | 80 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | 0 | 0. | 0 | 0 | 20 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 0 | 17 | 0 | 0 | 100 | - | - | - | - |
| 021-040 | 0 | 100 | 66 | 0 | 33 | - | - | - | - | - |
| 041-060 | 0 | 0 | 17 | 100 | 67 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

Table 3: **Breakdown of *Clethra alnifolia* L. specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 100 | 100 | - | - | - | - | - | - | 100 | 100 | 83 | 20 | 50 |
| 021-040 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 17 | 60 | 50 |
| 041-060 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 |
| 061-080 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 |
| 081-100 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 |
| 101-120 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 20 | 0 |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 86 | 0 | 0 | 100 | 46 | 0 | 0 | 0 | 100 | 69 | 67 | 0 | - |
| 021-040 | 0 | 0 | 14 | 100 | 80 | 0 | 54 | 70 | 0 | 0 | 0 | 31 | 33 | 100 | - |
| 041-060 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 30 | 50 | 30 | - | - | - | - | - |
| 061-080 | - | - | - | - | - | 0 | 0 | 0 | 50 | 60 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 0 | 10 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 50 | 83 | 33 | 33 | 100 | - | - | - | - |
| 021-040 | 0 | 50 | 17 | 33 | 33 | - | - | - | - | - |
| 041-060 | 0 | 0 | 0 | 34 | 34 | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

# *CORNUS ALBA* 'ARGENTEO MARGINATA'

(1993 CONTROL)

The sections "Botanical Description", "Origin and Distribution", "Use", "Requirements," "Propagation" and "Bibliographic References" were published in the second series of fact sheets (publication 02-9303) produced in this project. The section on diseases and insects can be found in *Rusticité et croissance de plantes ligneuses ornementales au Québec*, Volume III (VT 008).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** 445 cuttings (12 cm) were taken on June 22, 1992 from roughly 20-year-old parent plants. They were dipped for five seconds in a 4000 ppm IBA/50% ethanol solution, rinsed under the tap, and then immersed in a Benomyl-Captan® fungicide solution. They were planted in plug trays in a peat-perlite mixture (2:3; v:v) and placed under an automatic mist unit (Mist-A-Matic®). The rooting rate was 98% after 42 days. The seedlings were potted up on August 3 in Fertil Pot® containers in a peat-perlite mixture (3:2; v:v) and treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until mid-September; the greenhouse was unheated at this time. In November, they were put in the cold store at -4°C in plastic bags perforated with a hatpin. In May 1993, the plants were wrapped and returned to the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 16 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, one specimen died the last winter. Frost damage to the branch tips occurred in 36% and 9% of specimens the second and fourth winters. The last year, 9 % had frost damage to the previous year's shoots.

At St. Clotilde, one plant died the first winter. No other damage occurred.

No damage was observed at St. Hyacinthe during the trials.

*Region 2*

At Deschambault, one specimen died the second winter. The last two winters, 27% and 45% had mechanical breakage from the weight of the snow.

At St. Foy, 20% of specimens had frost damage to the branch tips the first winter and 9% had mechanical breakage the third winter.

No winter damage occurred at La Pocatière.

*Region 3*

At Normandin, 17% of plants had mechanical breakage the fourth winter.

No damage was observed at Kapuskasing.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

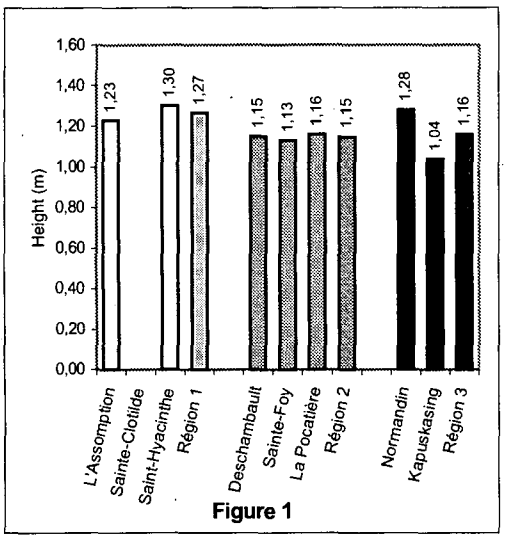


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

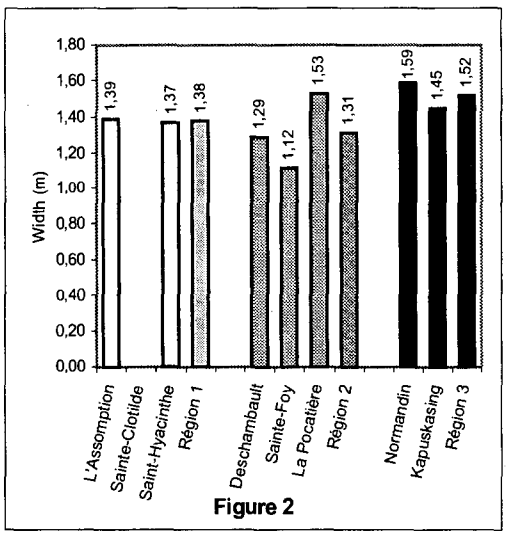


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

Height growth in this cultivar was very similar from region to region.

### Effect of pruning

Pruning consisted of cutting back plants by 10–40%, depending on the year and site. At St. Clotilde and Kapuskasing, growth was constant and regular and no pruning was required.

### Flowering

Flowering began the second growing season, generally around the second or third week of June. It was particularly regular at the region 2 and 3 sites, lasting 9–16 days depending on the year and region. At St. Hyacinthe, shrubs flowered earlier and flowering lasted up to two months.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

As in the 1991 and 1992 plantings, and unlike what was observed in previous years, almost all the plants took three growing seasons to exceed 0.61 m in height. Four growing seasons were required at Kapuskasing for all shrubs to reach this height.

## HARDINESS EVALUATION

As previous trials showed, the cultivar suffered no mortality in zone 2 and can probably survive as far as zone 1.

It can be used as far as zone 2 and can also achieve its full ornamental potential in this zone, with the proviso that plants may occasionally suffer frost damage to the branch tips.

**WRITTEN BY**

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Cornus alba* 'Argenteo-marginata'** (1993 control), **1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 87 | 9 | | 2 | | | | 2 | | | | 13 |
| St. Clotilde | 97 | | | | | | | 3 | | | | 3 |
| St. Hyacinthe | 100 | | | | | | | | | | | 0 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 84 | | | | | | | 2 | | 14 | | 16 |
| St. Foy | 94 | 4 | | | | | | | | 2 | | 6 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 97 | | | | | | | | | 3 | | 3 |
| Kapuskasing | 100 | | | | | | | | | | | 0 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 5, 6, 7, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of *Cornus alba* 'Argenteo-marginata' (1993 control) specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 53 | 6 | 0 | 0 | 0 | 80 | 0 | 0 | 0 | - | 100 | 0 | 0 | 0 | 0 |
| 041-080 | 47 | 65 | 36 | 0 | 0 | 20 | 92 | 25 | 8 | - | 0 | 100 | 83 | 0 | 0 |
| 081-120 | 0 | 29 | 64 | 27 | 46 | 0 | 8 | 75 | 42 | - | 0 | 0 | 17 | 58 | 25 |
| 121-160 | 0 | 0 | 0 | 73 | 45 | 0 | 0 | 0 | 50 | - | 0 | 0 | 0 | 42 | 75 |
| 161-200 | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 7 | 0 | 0 | 0 | 33 | 33 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 |
| 041-080 | 0 | 93 | 18 | 0 | 0 | 67 | 67 | 0 | 0 | 0 | 67 | 33 | 8 | 0 | 0 |
| 081-120 | 0 | 0 | 82 | 64 | 73 | 0 | 0 | 45 | 36 | 54 | 0 | 67 | 92 | 73 | 46 |
| 121-160 | 0 | 0 | 0 | 36 | 27 | 0 | 0 | 55 | 64 | 46 | 0 | 0 | 0 | 27 | 54 |
| 161-200 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 35 | 0 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 |
| 041-080 | 65 | 90 | 0 | 0 | 0 | 14 | 100 | 50 | 17 | 0 |
| 081-120 | 0 | 10 | 100 | 91 | 50 | 0 | 0 | 50 | 83 | 100 |
| 121-160 | 0 | 0 | 0 | 9 | 50 | - | - | - | - | - |
| 161-200 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected at St. Clotilde in 1997.

Table 3: **Breakdown of *Cornus alba* 'Argenteo-marginata' (1993 control) specimens by saleable height category, 1993-97**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 18 | 0 | 0 | 0 | 100 | 17 | 0 | 0 | - | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 82 | 45 | 0 | 0 | 0 | 83 | 25 | 8 | - | 0 | 100 | 83 | 67 | 0 |
| 101-150 | 0 | 0 | 45 | 64 | 72 | 0 | 0 | 75 | 50 | - | 0 | 0 | 17 | 33 | 83 |
| 151-200 | 0 | 0 | 10 | 36 | 28 | 0 | 0 | 0 | 42 | - | 0 | 0 | 0 | 0 | 17 |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 20 | 0 | 0 | 0 | 94 | 94 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 80 | 45 | 0 | 0 | 6 | 6 | 45 | 0 | 9 | 0 | 100 | 0 | 0 | 0 |
| 101-150 | 0 | 0 | 55 | 90 | 90 | 0 | 0 | 55 | 91 | 91 | 0 | 0 | 100 | 73 | 55 |
| 151-200 | 0 | 0 | 0 | 10 | 10 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 27 | 45 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 95 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 5 | 55 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 |
| 101-150 | 0 | 45 | 67 | 42 | 58 | 0 | 0 | 100 | 100 | 50 |
| 151-200 | 0 | 0 | 33 | 58 | 42 | 0 | 0 | 0 | 0 | 50 |

* Data were not collected at St. Clotilde in 1997.

# *CORNUS ALBA* 'ARGENTEO MARGINATA'

(1994 CONTROL)

The sections "Botanical Description", "Origin and Distribution", "Use", "Requirements," "Propagation" and "Bibliographic References" were published in the second series of fact sheets (publication 02-9303) produced in this project. The section on diseases and insects can be found in *Rusticité et croissance de plantes ligneuses ornementales au Québec*, Volume III (VT 008).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** 378 cuttings (12 cm) were taken on July 9, 1993 from roughly 25-year-old parent plants. They were dipped for five seconds in a 4000 ppm IBA/50% ethanol solution, rinsed under the tap, and then immersed in a Benomyl-Captan® fungicide solution. They were planted in plug trays in a peat-perlite mixture (2:3; v:v) and placed under an automatic mist unit (Mist-A-Matic®). They received a foliar fertilizer (20-20-20, 200 ppm N) every week during the rooting period. The rooting rate was 90% after roughly 30 days. Misting was discontinued in early August and the seedlings were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until mid-October. In November, they were removed from the plug trays and placed in the cold store at -2°C in plastic bags perforated with a hatpin. In May 1994, the plants were wrapped and returned to the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 11 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Very little winter damage was found in this cultivar.

*Region 1*

At L'Assomption, one seedling died the second winter. The fourth winter, 10% of plants had frost damage to the branch tips and 10%, to the previous year's shoots.

No damage occurred at St. Clotilde or St. Hyacinthe.

*Region 2*

At Deschambault, 17% and 8% of plants had mechanical breakage the third and fifth winters.

At St. Foy, frost damage to the previous year's shoots was found in one plant the first winter and mechanical breakage in 25% the third winter.

No damage occurred at La Pocatière.

*Region 3*

At Normandin, 25% of plants had mechanical breakage the third winter and 8% had damage to the old wood the last winter.

No damage was observed at Kapuskasing.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

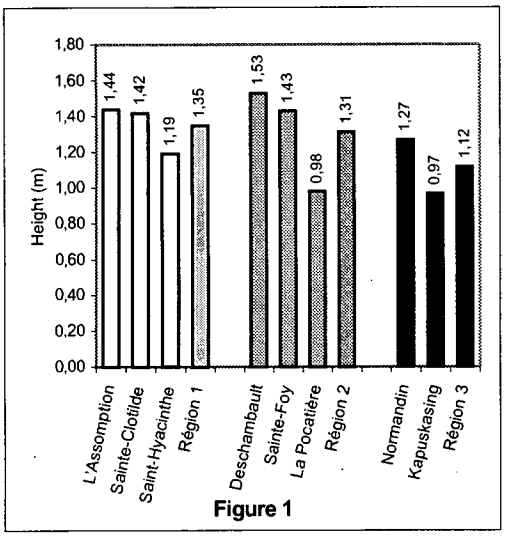


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

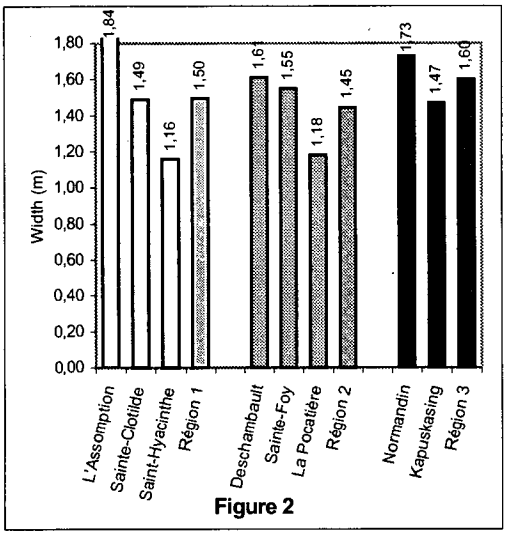


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

### Effect of pruning

Pruning consisted of cutting back plants by 10–40%, depending on the year and site. At St. Clotilde and Kapuskasing, growth was constant and regular and no pruning was required.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Growth was slow in the 1991 and 1992 plantings. In the 1994 planting, shrubs grew to over 81 cm tall after three growing seasons at the three region 1 sites and at Deschambault and St. Foy. A fourth year was required at La Pocatière, Normandin and Kapuskasing to reach a comparable height.

The cultivar can be produced at all region 1 and 2 sites.

## HARDINESS EVALUATION

As previous trials have shown, plants suffer no mortality in zone 2 and can probably survive as far as zone 1.

The cultivar can be used as far as zone 2 and can also achieve its full ornamental potential in this zone, with the proviso that plants may occasionally suffer frost damage to the branch tips.

## WRITTEN BY

Claude Richer, Agr.
Jacques-André Rioux, Agr.
Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Cornus alba* 'Argenteo-marginata'** (1994 control), **1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 95 | 2 | | 2 | | | | 1 | | | | 5 |
| St. Clotilde | 100 | | | | | | | | | | | 0 |
| St. Hyacinthe | 100 | | | | | | | | | | | 0 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 95 | | | | | | | | | 5 | | 5 |
| St. Foy | 94 | 1 | | | | | | | | 5 | | 6 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 93 | | | | 2 | | | | | 5 | | 7 |
| Kapuskasing | 100 | | | | | | | | | | | 0 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 6, 7, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of *Cornus alba* 'Argenteo-marginata' (1994 control) specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 0 | 0 | 0 | 0 | 100 | 5 | 0 | 0 | 0 | 100 | 5 | 0 | 0 | 0 |
| 041-080 | 0 | 85 | 18 | 27 | 0 | 0 | 68 | 18 | 10 | 0 | 0 | 95 | 10 | 0 | 0 |
| 081-120 | 0 | 15 | 73 | 73 | 9 | 0 | 27 | 82 | 45 | 10 | 0 | 0 | 90 | 100 | 82 |
| 121-160 | 0 | 0 | 9 | 0 | 82 | 0 | 0 | 0 | 45 | 90 | 0 | 0 | 0 | 0 | 18 |
| 161-200 | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 0 | 0 | 0 | 0 | 85 | 17 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | 0 |
| 041-080 | 0 | 90 | 0 | 0 | 0 | 15 | 73 | 17 | 16 | 0 | 5 | 67 | 90 | 18 | 0 |
| 081-120 | 0 | 10 | 83 | 25 | 25 | 0 | 10 | 83 | 67 | 8 | 0 | 33 | 10 | 82 | 100 |
| 121-160 | 0 | 0 | 17 | 75 | 75 | 0 | 0 | 0 | 17 | 75 | - | - | - | - | - |
| 161-200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 91 | 0 | 0 | 0 | 0 | 91 | 0 | 0 | 0 | 0 |
| 041-080 | 9 | 90 | 42 | 0 | 0 | 9 | 100 | 92 | 0 | 0 |
| 081-120 | 0 | 10 | 58 | 100 | 33 | 0 | 0 | 8 | 100 | 100 |
| 121-160 | 0 | 0 | 0 | 0 | 67 | - | - | - | - | - |
| 161-200 | - | - | - | - | - | - | - | - | - | - |

Table 3: **Breakdown of *Cornus alba* 'Argenteo-marginata' (1994 control) specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 55 | 0 | 0 | 0 | 100 | 26 | 0 | 0 | 0 | 100 | 20 | 0 | 0 | 0 |
| 051-100 | 0 | 45 | 27 | 46 | 0 | 0 | 74 | 55 | 37 | 10 | 0 | 80 | 90 | 46 | 27 |
| 101-150 | 0 | 0 | 73 | 54 | 18 | 0 | 0 | 45 | 27 | 36 | 0 | 0 | 10 | 54 | 73 |
| 151-200 | 0 | 0 | 0 | 0 | 46 | 0 | 0 | 0 | 36 | 54 | - | - | - | - | - |
| 201-250 | 0 | 0 | 0 | 0 | 36 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 5 | 0 | 0 | 0 | 100 | 5 | 8 | 0 | 0 | 100 | 9 | 0 | 0 | 0 |
| 051-100 | 0 | 95 | 0 | 0 | 0 | 0 | 90 | 42 | 8 | 0 | 0 | 91 | 82 | 0 | 0 |
| 101-150 | 0 | 0 | 100 | 75 | 42 | 0 | 5 | 50 | 66 | 34 | 0 | 0 | 18 | 100 | 100 |
| 151-200 | 0 | 0 | 0 | 25 | 58 | 0 | 0 | 0 | 26 | 66 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 14 | 0 | 0 | 0 |
| 051-100 | 0 | 76 | 25 | 0 | 0 | 0 | 86 | 83 | 8 | 0 |
| 101-150 | 0 | 24 | 75 | 75 | 0 | 0 | 0 | 17 | 67 | 58 |
| 151-200 | 0 | 0 | 0 | 25 | 100 | 0 | 0 | 0 | 25 | 42 |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

# *CORNUS ALBA* 'KESSELRINGII'

| | |
|---|---|
| **Family:** | Cornaceae |
| **English common name:** | Red-Bark Dogwood |
| **French common name:** | Cornouiller blanc 'Kesselringii' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This dense, bushy shrub, with upright branches, can grow to slightly over 2 m tall and wide.

The young branches, which are a very dark purplish red, turn greyish with age.

The dark green leaves have reddish margins and dark purplish-red veins and petioles. The foliage turns purplish red in fall. The opposite leaves, simple and entire, are elliptic in shape and have six pairs of veins. The blade is 4–8 cm long and the petiole, 1.0–2.5 cm long.

The small white flowers are tinged with purplish red and bloom in May. They occur in flattened cymes measuring 3.5–5.0 cm long.

The reddish drupes adorn the shrub from August to October.

## ORIGIN AND DISTRIBUTION

*Cornus alba* L., which ranges from Siberia to Manchuria (North Korea and northern China), was introduced into cultivation in 1740. The cultivar 'Kesselringii' was produced from seed from *Cornus alba* 'Sibirica' at the St. Petersburg Botanical Garden in Russia and was introduced around 1905.

## USE

**Ornamental:** The cultivar is prized for the colour of its branches, foliage and flowers. It can be used alone as a specimen plant or massed with other plants. Vigorous, it can be grown in clumps on lawns or used on the banks of ponds; its purplish-red branches are attractive in winter. The colour of the foliage is not as bright when grown in the shade.

**Birds:** The fruits attract birds.

## REQUIREMENTS

The cultivar does best in full sun but tolerates light shade. It is adapted to all types of soil, although a moist, well-drained soil is ideal. Shallow rooted, it transplants easily. It takes well to pruning and an occasional thinning allows the colour of the wood to be maintained.

## DISEASES AND INSECTS

Anthracnose (*Discula* sp.) and septoria leaf spot (*Septoria* sp.) are two diseases often found on dogwoods.

Dogwoods can also be infested with the western black flea beetle (*Phyllotreta pusilla*) and the redheaded flea beetle (*Systena frontalis*). Aphids and the willow leaf beetle (*Calligrapha multipunctata bigsbyana*) may occasionally attack the genus.

## PROPAGATION

**Cutting:** Hardwood cuttings taken from one-year-old shoots dry out easily if they are not kept under moist enough conditions.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** On July 1, 1992, 295 cuttings (12 cm) were taken from roughly 20-year-old parent plants. They were dipped for five seconds in a 4000 ppm IBA/50% ethanol solution, rinsed under the tap, and then immersed in a Benomyl-Captan® fungicide solution. They were planted in

plug trays in a peat-perlite mixture (2:3; v:v) and placed under an automatic mist unit (Mist-A-Matic®). The rooting rate was 54% after around 60 days. Misting was discontinued in early August and the plants were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until mid-September. In November, they were taken out of the plug trays and put in the cold store at -2°C in plastic bags perforated with a hatpin. In early May 1993, they were potted up in Fertil Pot® containers in a peat-perlite mixture (3:2; v:v) and placed in a tunnel greenhouse for a month, and then in a lightly shaded cold frame. The plants were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until late September. They were overwintered outside under a thick layer of snow. In early May 1994, the plants were wrapped and returned to the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 10 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 8% of plants suffered rodent damage the third winter and 9% had frost damage to the branch tips the fourth winter.

At St. Clotilde, one plant died the second winter. The first winter, one plant had frost damage to the previous year's shoots and another had frost damage to the branch tips the fourth winter.

At St. Hyacinthe, one seedling died the second winter.

*Region 2*

At Deschambault, mechanical breakage was observed during the last four winters in 12%, 83%, 75% and 25% of plants.

At St. Foy, 20% had damage to the branch tips the first winter.

No damage occurred at La Pocatière.

*Region 3*

At Normandin, all the shrubs froze down to the snow cover the second and fourth winters. In addition, 25% had mechanical breakage the third winter and one had frost damage to the old wood the last winter.

At Kapuskasing, single plants died the third and fourth winters. Frost damage to the previous year's shoots was found the first four winters in 6%, 12%, 8% and 37% of plants. One shrub froze down to the ground level the third winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

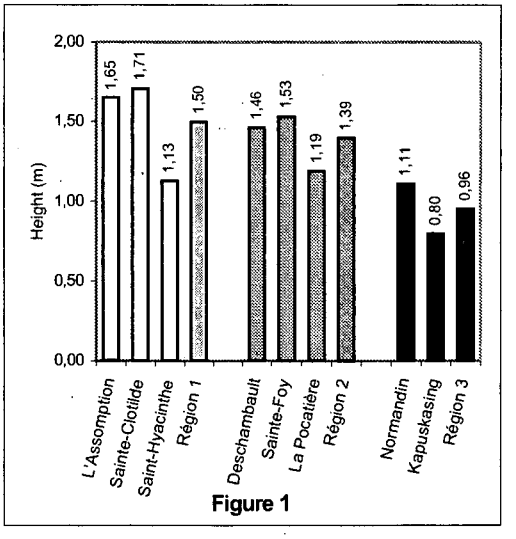


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

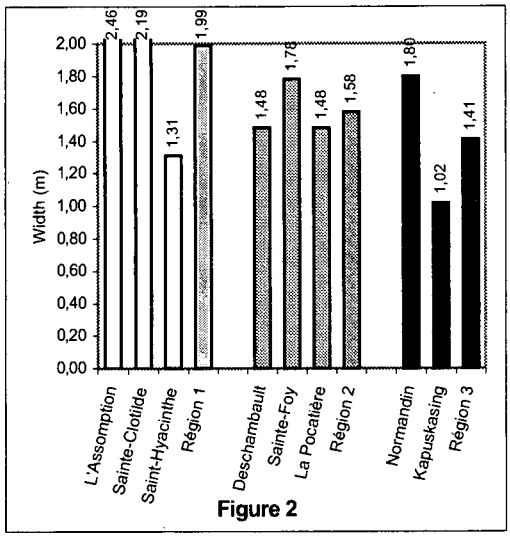


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

Width growth is greater than height growth in this cultivar.

### Effect of pruning

Pruning to eliminate 10–30% of the previous year's growth was done at all sites except St. Clotilde and St. Hyacinthe, where growth was continuous and regular.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

The cultivar can be produced at all sites tested. After three growing seasons, 83%, 92% and 100% of shrubs at Normandin, St. Foy and Deschambault were over one metre tall, while a fourth year was required for 83% and 100% of shrubs at St. Clotilde and La Pocatière to reach a comparable height and a fifth year at L'Assomption.

## HARDINESS EVALUATION

In the literature, the cultivar is rated hardy to zone 2. The trial results show conclusively that the cultivar can survive as far as zone 2a, given the low, sporadic mortality that occurred. However, plants that died in zone 2a did so in the third and fourth winters; this may have been due to the gradual weakening of the plants, suggesting that they are at the extreme limit of the range in which they can survive.

The cultivar can survive as far as zone 2a. However, in zones 2a and 2b, winter damage is more frequent and more variable, occasionally affecting fruit formation. Since the branches break easily, maintenance pruning is occasionally required.

The cultivar achieved its full ornamental expression in zones 4a, 4b, 5a and 5b.


## WRITTEN BY

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Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Cornus alba* 'Kesselringii', 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 96 | 2 | | | | | | | | | 2 | 4 |
| St. Clotilde | 96 | 2 | | 1 | | | | 1 | | | | 4 |
| St. Hyacinthe | 99 | | | | | | | 1 | | | | 1 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 61 | | | | | | | | | 39 | | 39 |
| St. Foy | 96 | 4 | | | | | | | | | | 4 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 53 | | | | 2 | 40 | | | | 5 | | 47 |
| Kapuskasing | 81 | | | 13 | | | 3 | 3 | | | | 19 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3 or 8 occurred in the plants tested.

Table 2: **Breakdown of *Cornus alba* 'Kesselringii' specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 7 | 0 | 0 | 0 | 87 | 7 | 0 | 0 | 0 | 100 | 6 | 0 | 0 | 0 |
| 051-100 | 0 | 84 | 33 | 25 | 0 | 13 | 54 | 27 | 9 | 0 | 0 | 94 | 75 | 33 | 42 |
| 101-150 | 0 | 6 | 67 | 75 | 9 | 0 | 32 | 45 | 45 | 18 | 0 | 0 | 25 | 67 | 58 |
| 151-200 | 0 | 0 | 0 | 0 | 91 | 0 | 6 | 28 | 46 | 82 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 56 | 0 | 0 | 0 | 0 | 47 | 0 | 0 | 0 | 0 | 87 | 0 | 0 | 0 | 0 |
| 051-100 | 44 | 50 | 0 | 0 | 0 | 53 | 47 | 8 | 42 | 0 | 13 | 73 | 67 | 17 | 0 |
| 101-150 | 0 | 50 | 100 | 92 | 66 | 0 | 53 | 92 | 50 | 25 | 0 | 27 | 33 | 83 | 100 |
| 151-200 | 0 | 0 | 0 | 8 | 34 | 0 | 0 | 0 | 8 | 75 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 67 | 0 | 0 | 0 | 0 | 88 | 6 | 8 | 9 | 10 |
| 051-100 | 33 | 93 | 17 | 58 | 33 | 12 | 94 | 83 | 64 | 70 |
| 101-150 | 0 | 7 | 83 | 42 | 67 | 0 | 0 | 9 | 27 | 20 |
| 151-200 | - | - | - | - | - | - | - | - | - | - |

Table 3: Breakdown of *Cornus alba* 'Kesselringii' specimens by saleable width category, 1994-98

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 53 | 0 | 8 | 0 | 100 | 20 | 0 | 0 | 0 | 100 | 100 | 75 | 0 | 17 |
| 101-200 | 0 | 47 | 100 | 92 | 0 | 0 | 80 | 83 | 83 | 54 | 0 | 0 | 25 | 100 | 83 |
| 201-300 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 17 | 17 | 36 | 0 | 0 | 0 | 0 | 0 |
| 301-400 | - | - | - | - | - | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 0 |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 75 | 0 | 0 | 8 | 100 | 7 | 0 | 25 | 0 | 100 | 73 | 8 | 0 | 0 |
| 101-200 | 0 | 25 | 100 | 100 | 92 | 0 | 93 | 100 | 75 | 92 | 0 | 27 | 92 | 100 | 100 |
| 201-300 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - |
| 301-400 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 27 | 8 | 0 | 0 | 100 | 100 | 16 | 18 | 50 |
| 101-200 | 0 | 73 | 92 | 100 | 100 | 0 | 0 | 84 | 82 | 50 |
| 201-300 | - | - | - | - | - | - | - | - | - | - |
| 301-400 | - | - | - | - | - | - | - | - | - | - |

# *CORNUS HEMSLEYII* 'NANA'

| | |
|---|---|
| **Family:** | Cornaceae |
| **English common name:** | Dwarf Dogwood |
| **French common name:** | Cornouiller nain |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This bushy shrub, which is not well known in Quebec, grew to 40 cm tall and 60 cm wide after ten years at the Roger Van den Hende Garden.

The pubescent branches turn red with age. The young shoots are very numerous.

The leaves are oval to round, with acuminate tips, and pubescent. They are light green on top and greyish below, with 6–8 brownish, pubescent veins. They are 5–7 cm long.

The small white flowers have blue anthers and occur in 5–7 cm wide cymes. They bloom in July.

The globose fruits, 6 mm in diameter, are initially blue but turn black as they ripen.

## ORIGIN AND DISTRIBUTION

The species form *Cornus hemsleyii* Schneid. and Wang. comes from Hupei, Sichuan (China) and was introduced in 1908. No information was found on the cultivar in the literature.

## USE

**Ornamental:** The cultivar can be used alone as a specimen plant or in mass plantings in rock gardens. It is prized for its foliage and habit.

## REQUIREMENTS

No information was found on the cultivar.

## DISEASES AND INSECTS

Anthracnose (*Discula* sp.) and septoria leaf spot (*Septoria* sp.) are two diseases often found on dogwoods.

Dogwoods can also be infested with the western black flea beetle (*Phyllotreta pusilla*) and the redheaded flea beetle (*Systena frontalis*). Aphids and the willow leaf beetle (*Calligrapha multipunctata bigsbyana*) may occasionally attack the genus.

## PROPAGATION

**Cutting:** Hardwood cuttings taken from one-year-old shoots dry out quickly if they are not kept in an area with adequate humidity.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** 368 cuttings (12 cm) were taken on July 1, 1992 from roughly ten-year-old parent plants. They were dipped for five seconds in a 4000 ppm IBA/50% ethanol solution, rinsed under the tap, and then immersed in a Benomyl-Captan® fungicide solution. They were planted in plug trays in a peat-perlite mixture (2:3; v:v) and placed under an automatic mist unit (Mist-A-Matic®). The rooting rate was 60% after 60 days. Misting was discontinued in early August and the seedlings were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until mid-September. In November, they were taken out of the plug trays, put in plastic bags perforated with a hatpin and moved to the cold store at -2°C. In early May 1993, they were potted up in Fertil Pot® containers in a peat-perlite mixture (3:2; v:v), put in a tunnel greenhouse for a month, and then moved to a lightly shaded cold

frame. The plants were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until late September. They were overwintered outside under a thick blanket of snow. In early May 1994, the plants were wrapped and returned to the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 12 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Several types of winter damage occurred in the cultivar. Mortality varied from site to site.

*Region 1*

At L'Assomption, one plant died the first winter. Frost damage to the branch tips was observed in 92%, 36%, 100% and 100% of plants the first winter and last three winters. In addition, 64% had sunscald and branch splitting the second winter.

At St. Clotilde, 10%, 33%, 17% and 40% of plants died the last four winters. The first and last winters, 30% and 60% had frost damage to the branch tips. The first two winters, 20% and 30% had frost damage to the previous year's shoots and the fourth winter, 33% had damage to the old wood.

At St. Hyacinthe, three plants died the first winter and, the following winter, 27% had frost damage to the branch tips.

*Region 2*

At Deschambault, 12% and 43% of specimens died the first and third winters. The second and last winters, 8% and 100% had frost damage to the branch tips. The second winter, 15% had mechanical breakage. Data for 1998 were not collected.

At St. Foy, 58% and 91% of shrubs had frost damage to the branch tips the second and last winters. In addition, the second and third winters, 8% and 100% had damage to the previous year's shoots. Data for 1998 were not collected.

At La Pocatière, 9%, 12% and 14% of plants died the first, third and fifth winters. The second and fifth winters, 30% and 57% had frost damage to the branch tips. The second and third winters, 40% and 75% froze down to the level of the snow cover. The third winter, 12% had frost damage to the previous year's shoots. All plants had mechanical breakage the fourth winter.

*Region 3*

At Normandin, 33% of specimens had frost damage to the branch tips the second winter. The fourth winter, 92% froze down to the snow cover and one plant died. The last winter, 73% had damage to the previous year's shoots.

At Kapuskasing, 8%, 18% and 77% of plants died the last three winters. Frost damage to the previous year's shoots was observed every winter (92%, 36%, 25%, 100% and 80% of plants). In addition, the second, third and last winters, 9%, 37% and 20% froze down to the ground level. The second winter, 36% had frost damage to the branch tips.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

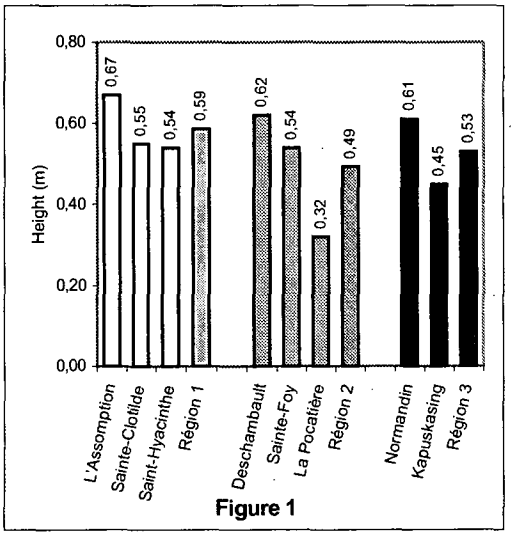


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

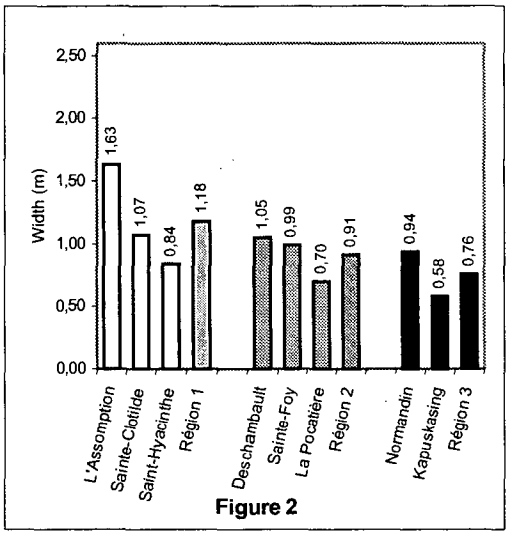


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

**Effect of pruning**

Pruning to eliminate 10–90% of plants' height was done at all sites except St. Clotilde.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

This dogwood can be produced at all region 1 and 2 sites (hardiness zones 4 and 5). Winter damage and growth rates were similar in all regions. Width growth is much greater and faster than height growth.

The cultivar can also be produced in hardiness zone 2b, but an additional year is required to produce shrubs of a comparable height.

## HARDINESS EVALUATION

No hardiness rating was found for this cultivar in the references consulted. The results of the trials show that it can survive as far as zone 2b (Normandin). However, mortality was fairly high at the zone 5a and 5b sites, as well as at the zone 4b (Deschambault) and 4a (La Pocatière) sites. This indicates that the cultivar will survive in Quebec in locations where the snow cover is laid down early and persists throughout the coldest winter months.

The cultivar, whose main ornamental characteristic is its foliage, can also be used as far as zone 2b.

The cultivar did not achieve its full ornamental potential at the sites tested.

## WRITTEN BY

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Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Cornus hemsleyii* 'Nana', 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 20 | 66 | | | | | | 2 | 12 | | | 80 |
| St. Clotilde | 45 | 18 | | 10 | 6 | | | 21 | | | | 55 |
| St. Hyacinthe | 91 | 5 | | | | | | 4 | | | | 9 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 54 | 22 | | | | | | 12 | | 12 | | 46 |
| St. Foy | 36 | 37 | | 27 | | | | | | | | 64 |
| La Pocatière | 30 | 18 | | 2 | | 8 | 15 | 7 | | 20 | | 70 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 59 | 6 | | 14 | | 18 | | 3 | | | | 41 |
| Kapuskasing | 0 | 7 | | 67 | | | 13 | 13 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3 or 11 occurred in the plants tested.

Table 2: **Breakdown of *Cornus hemsleyii* 'Nana' specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 33 | 0 | 0 | 0 | 0 | 70 | 0 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 |
| 21-40 | 67 | 27 | 0 | 0 | 0 | 30 | 20 | 34 | 17 | 20 | 14 | 100 | 41 | 25 | 8 |
| 41-60 | 0 | 73 | 55 | 36 | 10 | 0 | 80 | 33 | 67 | 40 | 0 | 0 | 59 | 75 | 75 |
| 61-80 | 0 | 0 | 45 | 64 | 90 | 0 | 0 | 33 | 16 | 40 | 0 | 0 | 0 | 0 | 17 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 15 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 55 | 0 | 0 | 0 | 14 |
| 21-40 | 85 | 15 | 10 | 0 | 0 | 50 | 83 | 0 | 19 | 9 | 45 | 100 | 38 | 14 | 58 |
| 41-60 | 0 | 85 | 80 | 50 | 50 | 0 | 17 | 27 | 81 | 63 | 0 | 0 | 62 | 86 | 28 |
| 61-80 | 0 | 0 | 10 | 50 | 50 | 0 | 0 | 73 | 0 | 28 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 87 | 0 | 0 | 0 | 0 | 18 | 9 | 0 | 0 | 0 |
| 21-40 | 13 | 100 | 0 | 8 | 0 | 82 | 91 | 85 | 80 | 0 |
| 41-60 | 0 | 0 | 84 | 92 | 55 | 0 | 0 | 15 | 20 | 100 |
| 61-80 | 0 | 0 | 16 | 0 | 45 | - | - | - | - | - |

Table 3: **Breakdown of *Cornus hemsleyii* 'Nana' specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 20 | 34 | 16 | 0 | 100 | 80 | 0 | 0 | 0 |
| 051-100 | 0 | 100 | 73 | 36 | 0 | 0 | 80 | 33 | 84 | 40 | 0 | 20 | 100 | 100 | 100 |
| 101-150 | 0 | 0 | 27 | 64 | 18 | 0 | 0 | 33 | 0 | 60 | - | - | - | - | - |
| 151-200 | 0 | 0 | 0 | 0 | 82 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 9 | 9 | 100 | 30 | 0 | 0 | 15 |
| 051-100 | 0 | 100 | 60 | 62 | 33 | 0 | 100 | 9 | 91 | 18 | 0 | 70 | 100 | 100 | 85 |
| 101-150 | 0 | 0 | 40 | 38 | 42 | 0 | 0 | 91 | 0 | 73 | - | - | - | - | - |
| 151-200 | 0 | 0 | 0 | 0 | 25 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 7 | 0 | 0 | 0 | 100 | 64 | 14 | 0 | 0 |
| 051-100 | 0 | 93 | 83 | 0 | 100 | 0 | 36 | 86 | 100 | 100 |
| 101-150 | 0 | 0 | 17 | 83 | 0 | - | - | - | - | - |
| 151-200 | 0 | 0 | 0 | 17 | 0 | - | - | - | - | - |

# *COTINUS COGGYGRIA* 'NOTCUTT'S VARIETY'

| | |
|---|---|
| **Family:** | Anacardiaceae |
| **English common name:** | Notcutt's Variety Smoketree, Purple Smoketree |
| **French common name:** | Arbre à perruque 'Notcutt', Arbre à perruque rouge |
| **Synonym:** | *C.c.* 'Foliis Purpureis' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This large, rounded shrub has upright branches that bow down with age. It can reach 3 m tall and wide at maturity. It is fast growing.

The bark of the branches and twigs is purplish red, glabrous and covered with prominent lenticels. The sapwood and sap are highly aromatic. The small solitary buds are sessile, and covered with a few dark brownish red imbricate scales.

The dense foliage consists of alternate, simple, entire leaves, oval to round in shape, with a slightly emarginate apex. They are glabrous, long petioled and 3–8 cm long. Purplish red in the spring, they then turn orange red and yellow in autumn, falling late in the season.

This shrub has small, inconspicuous pink flowers that occur in large, loose terminal panicles. Around late June, long peduncles covered with flesh-pink silky hairs develop at the base of the flowers. The resulting large (15–20 cm long), showy panicles make the shrub spectacular in June and July.

The fruits, small drupes, form in late summer (August or September). The long hairs on the peduncles form a mauve-white pubescent plume.

The shrub has fibrous roots.

## ORIGIN AND DISTRIBUTION

The name of the genus comes from the Greek word *coccyg*, or red. The Romans used the plant to make a red dye.

*Cotinus coggygria* occurs from southern Europe to central China and the northwest Himalayas. It has been cultivated since 1956 and is most common in Europe. The cultivar 'Notcutt Variety' comes from a clonal selection of *C.c.* 'Rubrifolius' and was created at Notcutt, Woodbridge, Great Britain in 1915.

## USE

**Ornamental:** The cultivar can be used alone as a specimen plant or in mass plantings. It is prized for the colour of the foliage and the spectacular panicles.

## REQUIREMENTS

The cultivar requires full sun and does best in light, fertile, well-drained chalky soils. It tolerates drought well.

It is not very hardy. Vigorous shoots can be obtained by pruning it back hard.

The species is shallow rooted and plants should be cut back extensively after transplanting, which favours their survival. Regular pruning improves the dark colour of the branches.

## DISEASES AND INSECTS

No reference to diseases in this species were found in the references consulted.

## PROPAGATION

**Seeds:** Smoketree cultivars should never be propagated from seed, since they often lose the flowered panicles and colour. In addition, propagation from seed may produce dioecious plants: plants with male flowers will not produce panicles.

**Cutting:** Softwood cuttings are taken from young shoots in early summer and are treated with a rooting hormone. Cuttings must be taken from parent plants with established characteristics to ensure attractive flowering.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Fruticetum, Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** 400 cuttings (25 cm) were taken on July 16 and 22, 1991 from four-year-old parent plants measuring 140 cm tall and 120 cm wide. They were dipped in a 4000 ppm IBA/50% ethanol solution, planted in plug trays in a perlite-Promix® mixture (2:2; v:v) and placed under an automatic mist unit operating for 30 seconds every 5 minutes. The rooted cuttings were moved to shaded beds on August 26; the rooting rate was 45%. The plants were overwintered in cold frames; the survival rate was 100%. On June 11, 1992, the shrubs were potted up in Fertil Pot® containers and grown in outdoor beds; they were treated weekly with a soluble fertilizer (20-20-20, 400 ppm N) until September 15. They were again overwintered in cold frames and were wrapped and shipped in May 1993.

**Inclusion in testing network:** Young plants 15 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

All the plants at Normandin died the first winter.

*Region 1*

At L'Assomption, 33%, 10%, 22% and 43% of specimens died the first four winters. In addition, the first and third winters, 40% and 11% froze down to the level of the snow cover. The first two winters, 27% and 90% of plants had frost damage to the branch tips. The third and fourth winters, 67% and 57% had damage to the previous year's shoots.

At St. Clotilde, 78% of plants died the first winter and the rest froze down to the snow cover. The second winter, all plants had frost damage to the old wood; the following winter, 29% died and the rest had frost damage to the previous year's shoots. Data were not compiled the last two winters.

At St. Hyacinthe, 40%, 11%, 25% and 14% of plants died the first four winters. Frost damage to the aerial portions above the snow cover occurred in 40%, 78% and 50% the first two winters and the last winter. In addition, the first winter, 13% froze down to the ground level and, the second winter, 11% had frost damage to the branch tips.

*Region 2*

At Deschambault, frost damage to the branch tips occurred every winter (affecting 63%, 75%, 100%, 67% and 100% of plants). Frost damage to the previous year's shoots was found in 25%, 19% and 33% the first two and fourth winters. The second winter, one shrub froze down to the ground level.

At St. Foy, 72% of plants died the first winter and the rest had frost damage to the old wood. The second winter, of the surviving plants, 67% had frost damage to the previous year's shoots and 16% froze down to the snow cover and 16%, to the ground level. The following two winters, 33% and 100% had frost damage to the branch tips. The third and fifth winters, 67% and 100% had damage to the previous year's shoots.

At La Pocatière, 44% of shrubs died the first year. The first two winters, 50% had frost damage to the aerial portions above the snow cover and 6% and 10% froze down to the ground level. The last four winters, 40%, 100%, 89% and

100% had frost damage to the branch tips. Lastly, 11% had frost damage to the previous year's shoots the fourth winter.

*Region 3*

At Normandin, all the plants died the first winter.

At Kapuskasing, 95% of the plants died the first winter and the remaining plant had frost damage down to the ground level every winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

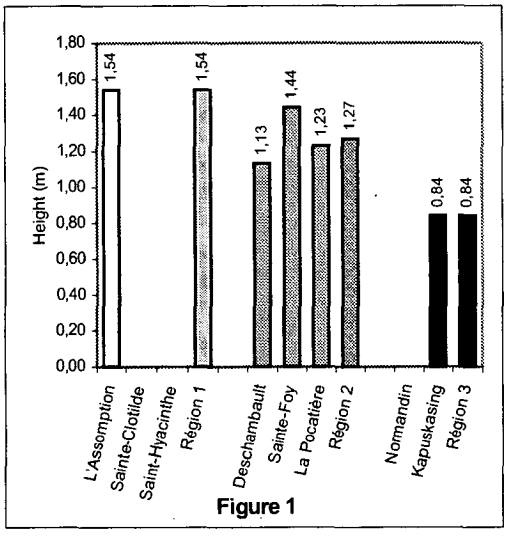


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

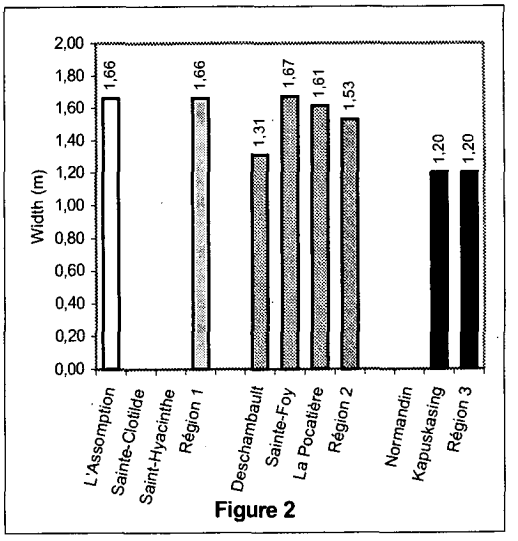


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Growth was stable and regular at St. Clotilde. At several sites, extensive pruning was required, cutting back 20–50% of plants' height. At La Pocatière, St. Foy and Kapuskasing, very severe pruning was done, removing up to 90% of the aerial portions of plants. However, this cultivar is capable of recovering quickly after pruning and attains the previous year's height in one growing season.

### Flowering

At the region 1 and 2 sites, flowering was sparse and began in mid-June. At St. Hyacinthe, shrubs only began to flower the fourth year of the trials, with flowers appearing a week earlier than at the other sites. Flowering duration was highly variable, ranging from 4 to 29 days. No flowering was observed at the region 3 sites.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Given the extensive winter damage that occurred in every hardiness zone, field production of this cultivar cannot be recommended in Quebec.

## HARDINESS EVALUATION

According to the authors consulted, the species is hardy to zone 5 or 5b. The trial results show conclusively that the cultivar cannot survive in zone 2 and suffers high mortality in zones 4 and 5, particularly during the first few winters. Although some plants can survive in zone 4, they must be protected by an adequate snow cover. During years with a very cold autumn and insufficient snow cover, high mortality is observed and almost all the branches are frost killed, leading plants to regenerate from the ground level. Therefore, the cultivar can survive as far as zone 5b.

More vigorous plants or those with particularly favourable growing conditions can develop an extensive root system and therefore adapt and survive even as far as zone 4b.

The plant can be used as far as zone 4b, with severe damage dealt with by pruning plants back hard in spring.

The cultivar did not achieve its full ornamental potential at the sites tested.

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**Table 1: Frequency of winter damage observed in *Cotinus coggygria* 'Notcutt's Variety', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 20 | 23 | | 25 | | 10 | | 22 | | | | 80 |
| St. Clotilde | 0 | | | 25 | 33 | 7 | | 35 | | | | 100 |
| St. Hyacinthe | 44 | 2 | | | | 33 | 3 | 18 | | | | 56 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 2 | 81 | | 15 | | | 2 | | | | | 98 |
| St. Foy | 0 | 27 | | 45 | 6 | 4 | 4 | 14 | | | | 100 |
| La Pocatière | 0 | 66 | | 2 | | 10 | 3 | 9 | | | | 100 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 0 | | | | | | | 100 | | | | 100 |
| Kapuskasing | 0 | | | | | | 9 | 91 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 9, 10 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of *Cotinus coggygria* 'Notcutt's Variety' specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 80 | 40 | 11 | 0 | 0 | 57 | 50 | 0 | 20 | - | 100 | 33 | 0 | 0 | - |
| 051-100 | 13 | 40 | 56 | 0 | 0 | 43 | 50 | 0 | 20 | - | 0 | 67 | 75 | 57 | - |
| 101-150 | 7 | 20 | 33 | 43 | 25 | 0 | 0 | 100 | 0 | - | 0 | 0 | 25 | 14 | - |
| 151-200 | 0 | 0 | 0 | 57 | 75 | 0 | 0 | 0 | 20 | - | 0 | 0 | 0 | 29 | - |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 40 | - | - | - | - | - | - |
| 251-300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 44 | 0 | 0 | 0 | 24 | 17 | 0 | 0 | 17 | 61 | 10 | 0 | 0 | 0 |
| 051-100 | 0 | 56 | 100 | 25 | 33 | 76 | 83 | 17 | 0 | 0 | 39 | 30 | 11 | 0 | 0 |
| 101-150 | 0 | 0 | 0 | 42 | 67 | 0 | 0 | 33 | 0 | 17 | 0 | 40 | 89 | 0 | 22 |
| 151-200 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 50 | 0 | 66 | 0 | 20 | 0 | 89 | 78 |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 84 | 0 | 0 | 0 | 0 | 11 | 0 |
| 251-300 | - | - | - | - | - | 0 | 0 | 0 | 16 | 0 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 50 | - | - | - | - | 100 | 100 | 100 | 0 | 0 |
| 051-100 | 50 | - | - | - | - | 0 | 0 | 0 | 100 | 100 |
| 101-150 | - | - | - | - | - | - | - | - | - | - |
| 151-200 | - | - | - | - | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |
| 251-300 | - | - | - | - | - | - | - | - | - | - |

* In 1997, data were not collected at St. Clotilde and St. Hyacinthe.

Table 3: **Breakdown of *Cotinus coggygria* 'Notcutt's Variety' specimens by saleable width category, 1993-97**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 93 | 60 | 11 | 0 | 0 | 100 | 50 | 0 | 0 | - | 100 | 55 | 0 | 29 | - |
| 051-100 | 7 | 30 | 44 | 0 | 0 | 0 | 50 | 50 | 40 | - | 0 | 45 | 100 | 29 | - |
| 101-150 | 0 | 10 | 45 | 43 | 0 | 0 | 0 | 50 | 0 | - | 0 | 0 | 0 | 42 | - |
| 151-200 | 0 | 0 | 0 | 57 | 100 | 0 | 0 | 0 | 60 | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 38 | 0 | 0 | 0 | 71 | 17 | 0 | 0 | 0 | 100 | 10 | 0 | 0 | 0 |
| 051-100 | 0 | 62 | 83 | 25 | 17 | 29 | 33 | 0 | 0 | 0 | 0 | 50 | 33 | 0 | 0 |
| 101-150 | 0 | 0 | 17 | 58 | 58 | 0 | 50 | 83 | 0 | 33 | 0 | 40 | 67 | 45 | 55 |
| 151-200 | 0 | 0 | 0 | 17 | 25 | 0 | 0 | 17 | 17 | 50 | 0 | 0 | 0 | 44 | 45 |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 83 | 17 | 0 | 0 | 0 | 11 | 0 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 69 | - | - | - | - | 100 | 100 | 100 | 0 | 0 |
| 051-100 | 31 | - | - | - | - | 0 | 0 | 0 | 100 | 100 |
| 101-150 | - | - | - | - | - | - | - | - | - | - |
| 151-200 | - | - | - | - | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

*In 1997, data were not collected at St. Clotilde and St. Hyacinthe.

# *COTONEASTER DAMMERI* 'ROYAL CARPET'

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Royal Carpet Bearberry Cotoneaster |
| **French common name:** | Cotonéastre 'Royal Carpet' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Creeping shrub |

## BOTANICAL DESCRIPTION

This creeping evergreen shrub, of prostrate habit, can grow to 0.35 m tall and over 2.0 m wide. Its branches, initially arching and then trailing, layer easily and are profuse. Growth tends to be slow; this cultivar is very similar to 'Coral Beauty'.

The fine twigs are pubescent when young and turn brownish red as they age. The buds, brown to grey in colour, are slightly imbricate, with two separate scales curved outward, revealing their downy interior.

The small, alternate, entire leaves, obovate and with small stipules, are 2–3 cm long. They are firm textured with a rounded apex and rolled margins. Both sides are glabrous, with 4–6 vein pairs. The blade is a beautiful glossy dark green which turns yellow in late fall.

The white flowers, nearly sessile and solitary (though sometimes grouped in pairs), are abundant. They are 1 cm in diameter. Flowering begins in late June.

The plentiful large, orange-red fruits are produced in fall, contrasting nicely with the yellow foliage. The globose drupe is 6–7 mm in diameter.

The shrub has prolific roots.

## ORIGIN AND DISTRIBUTION

*Cotoneaster dammeri* comes from central China and was found in Hou-Pei Province, at 2,000 m of altitude. It was introduced into cultivation in 1900. The cultivar 'Royal Carpet' was created in 1970 at Darthuizer Nursery in the Netherlands and is very similar to 'Coral Beauty', created in 1967 at the same nursery.

## USE

**Ornamental:** This groundcover plant, prized for its shape, flowers and fruits, can be used as a specimen plant, in mass plantings, in rock gardens as a ground cover, for bank plantings or to climb over a low wall. It does not tolerate dry soil well.

## REQUIREMENTS

This cultivar requires full sun. It tolerates all types of soil, including chalky ones, but prefers moist soil.

It prefers a microclimate sheltered from the cold. Container-grown plants recover quickly from transplanting. The cultivar takes well to light pruning after flowering.

## DISEASES AND INSECTS

Cedar rust diseases (*Gymnosporangium clavipes, Gymnosporangium juniperi-virginianae, Gymnosporangium globosum*) are fungal diseases that begin their life cycle on *Juniperus* and require an intermediate host to complete the cycle. The second phase of the disease occurs in many members of the Rosaceae family, including cotoneasters.

Septoria leaf spot (*Septoria* sp.) may occasionally cause damage in cotoneasters when conditions are favourable for its development.

This cultivar is highly susceptible to fireblight (*Erwinia amylovora*) when conditions are propitious for the disease.

Scale insects are attracted to cotoneasters, with oystershell scale (*Lepidosaphes ulmi*) causing the most damage. The

roundheaded apple tree borer (*Saperda candida*), a wood-boring insect, also attacks the species. In the trials, damage was observed on plants at all region 1 and 2 sites, resulting in the weakening and death of several plants.

## PROPAGATION

**Cutting:** Evergreen cuttings are taken in midsummer from the tips of semiripe shoots and placed in a propagation greenhouse. The best time for taking cuttings is early July; rooting will occur within four to six weeks.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Gift of Pépinière Plandorex, Orléans, France

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** 400 cuttings (10 cm) were taken on July 4, 1991 from five-year-old parent plants measuring 25 cm tall and 125 cm wide. They were dipped in a 4000 ppm IBA/50% ethanol solution, planted in plug trays in a perlite-Promix® mixture (1:1; v:v) and placed under an automatic mist unit operating for 30 seconds every 5 minutes. The rooted cuttings were moved to shaded beds on August 15; the rooting rate was 100%. The plants were overwintered in cold frames; the survival rate was 100%. On June 17, 1992, the shrubs were potted up in Fertil Pot® containers and grown in outdoor beds; they were treated weekly with a soluble fertilizer (20-20-20, 400 ppm N) until September 15. They were again overwintered in cold frames and were wrapped and shipped in May 1993.

**Inclusion in testing network:** Young plants 16 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

The most frequent winter damage found at the region 1 sites was foliage browning; in region 2, it was frost damage to the branch tips and to the aerial portions above the snow cover.

*Region 1*

At L'Assomption, one specimen died the fourth winter. The first and last winters, frost damage to the branch tips occurred in 67% and 45% of specimens and damage to the previous year's shoots in 10% and 36%. The second and fourth winters, 100% and 50% had foliage browning, and the third and fourth winters, 100% and 42% froze down to the level of the snow cover.

At St. Clotilde, the first winter, 64% of specimens froze down to the snow cover. The next two winters, 67% and 100% had foliage browning.

At St. Hyacinthe, 10% and 21% of plants died the first two winters. The first three winters, 43%, 79% and 100% had foliage browning.

*Region 2*

At Deschambault, frost damage to the branch tips occurred every winter (28%, 90%, 100%, 100% and 100% of plants). In addition, 72% of specimens had frost damage to the previous year's shoots the first winter.

At St. Foy, 100%, 90% and 33% of plants had frost damage to the entire aerial portion above the snow cover the first, second and fifth winters. The third and fourth winters, 8% and 42% had frost damage to the branch tips.

At La Pocatière, the first three winters, 95%, 33% and 100% of specimens had frost damage to the entire aerial portion

above the snow cover. The next winter, all the plants had frost damage to the branch tips.

*Region 3*

At Normandin, the first winter and last three winters, 57%, 100%, 8% and 100% of specimens had foliage browning.

At Kapuskasing, 8% and 27% of plants died the third and fourth winters. Frost damage to the previous year's shoots occurred every winter (25%, 100%, 8%, 73% and 100% of plants). The first and third winter, 14% and 58% had frost damage to the branch tips.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

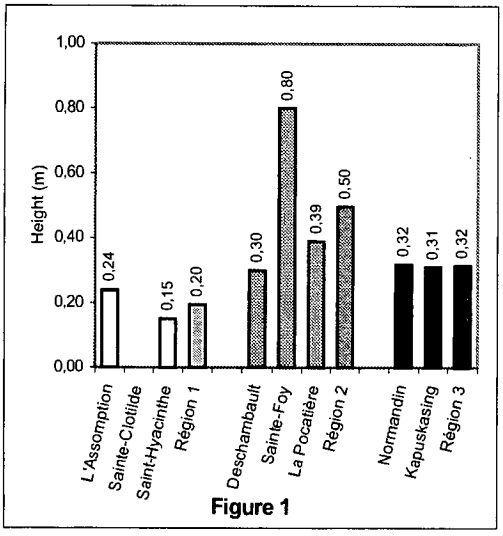


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

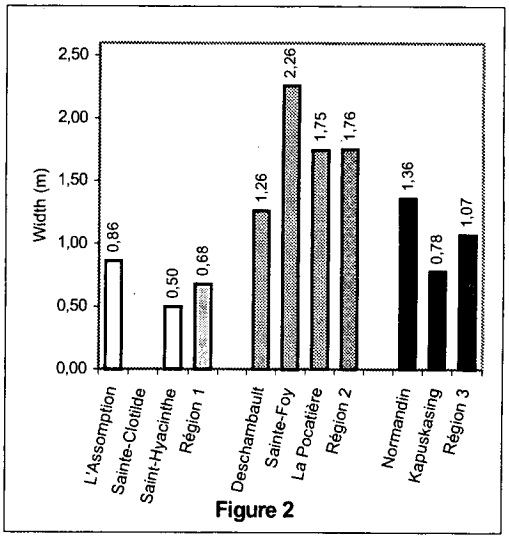


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Pruning to remove 20–60% of the previous year's growth was done at all sites. More extensive pruning was required (involving cutting back plants to as much as 2 cm from the ground) at La Pocatière and St. Hyacinthe.

### Flowering

The first flowers appeared between early and mid-June at the region 1 sites and at least two weeks later at the region 2 and 3 sites. The plants were in full bloom a few days later and flowering duration was 5–20 days depending on the year.

In general, flowering occurred at all sites every year.

## PRODUCTION RECOMMENDATIONS

Tables 2 indicates the percentage of saleable specimens obtained at each test site after each year by width category (widths are those obtained at the end of each year). Nursery operators will find this table useful for estimating annual production and the number of years needed to obtain a given width.

After three growing seasons, 75% of plants at Normandin and St. Foy and all plants at La Pocatière were over 1.01 m wide.

The widest plants at trial's end were found at St. Foy.

This cultivar can be produced at all the trial sites; mortality is minimal since the low-growing plants are protected by the snow cover. In zone 2a, however, the most frequent winter damage was to the previous year's shoots and plants needed extensive pruning every year.

## HARDINESS EVALUATION

According to the literature, the cultivar is hardy to zone 3. The trial results show that it can survive as far as zone 2a, since mortality was very low at Kapuskasing.

The cultivar can be used as far as zone 2, with the proviso that growth is much slower in colder areas. The snow cover, crucial in very cold areas, allows the plant to survive by providing natural protection.

The cultivar did not achieve its full ornamental potential at the sites tested.

**WRITTEN BY**

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**Table 1:** **Frequency of winter damage observed in *Cotoneaster dammeri* 'Royal Carpet', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 8 | 22 | | 10 | | 28 | | 2 | | | | 30 | 92 |
| St. Clotilde | 23 | | | | | 21 | | | | | | 56 | 77 |
| St. Hyacinthe | 49 | | | | | | | 4 | | | | 47 | 51 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 2 | 84 | | 14 | | | | | | | | | 98 |
| St. Foy | 45 | 10 | | | | 45 | | | | | | | 55 |
| La Pocatière | 34 | 20 | | | | 46 | | | | | | | 66 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 47 | | | | | | | | | | | 53 | 53 |
| Kapuskasing | 12 | 14 | | 67 | | | | 4 | | | | | 88 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning

No damage of types 3, 5, 7, 9, 10 or 11 occurred in the plants tested.

Table 2: Breakdown of *Cotoneaster dammeri* 'Royal Carpet' specimens by saleable width category, 1993-97

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 28 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | - | 100 | 100 | 18 | 9 | 55 |
| 051-100 | 0 | 72 | 100 | 92 | 73 | 0 | 100 | 50 | 0 | - | 0 | 0 | 82 | 82 | 45 |
| 101-150 | 0 | 0 | 0 | 8 | 27 | 0 | 0 | 50 | 0 | - | 0 | 0 | 0 | 9 | 0 |
| 151-200 | - | - | - | - | - | 0 | 0 | 0 | 67 | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 33 | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 81 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 52 | 5 | 0 | 0 | 0 |
| 051-100 | 0 | 19 | 92 | 0 | 0 | 0 | 100 | 25 | 0 | 0 | 48 | 95 | 0 | 0 | 0 |
| 101-150 | 0 | 0 | 8 | 100 | 92 | 0 | 0 | 75 | 25 | 0 | 0 | 0 | 100 | 33 | 0 |
| 151-200 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 75 | 0 | 0 | 0 | 0 | 67 | 100 |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 0 | 100 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 90 | 5 | 0 | 0 | 0 | 100 | 9 | 25 | 18 | 13 |
| 051-100 | 10 | 95 | 25 | 8 | 0 | 0 | 57 | 8 | 9 | 75 |
| 101-150 | 0 | 0 | 75 | 92 | 100 | 0 | 34 | 67 | 37 | 12 |
| 151-200 | - | - | - | - | - | 0 | 0 | 0 | 36 | 0 |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in St. Clotilde in 1997.

# *CRATAEGUS COCCINIOÏDES*

ASHE.

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Hawthorn |
| **French common name:** | Aubépine, Cenellier, Senellier |
| **Category:** | Deciduous plant |
| **Subdivision :** | Small tree |

## BOTANICAL DESCRIPTION

This small tree, with thorny twigs, bushy habit and multiple branches, can grow to 8–12 m tall and almost as wide. Its low, wide-spreading crown, somewhat rounded or sometimes flat topped, is reminiscent of an umbrella. The trunk diameter can reach 30 cm.

The trunk, often distinct and crooked, consists of hard, heavy wood. The bark is evenly separated into firm shreds that become loose at both ends. There are two types of shoots—long, straight ones and zigzag ones. The twigs are lustrous, pale grey to orange brown, with smooth, shiny, rigid and very sharp thorns. The thorns are straight and 3–5 cm long.

The terminal buds are broad, rounded, smooth and shiny reddish-brown, with 5–10 scales. The lateral buds are similar but slightly smaller, often occurring in groups of two or three; one develops into a thorn and the other into a new shoot bearing leaves or flowers or both. The leaf scars are narrow and somewhat elevated, with three vein scars.

The simple, alternate petiolate leaves are usually serrate and sometimes lobed (especially on young shoots). They are truncate and have two large, characteristic stipules at the base, often denticulate and glandular, and 4–10 cm long. The young leaves are reddish but turn greyish on top and brownish underneath with age. They turn orange-red in fall.

The flowers, each 2 cm wide, are borne on pedicels and occur in corymbs of 5–7 flowers. They have long bracts; 5–7 sepals often glandular, and entire or denticulate; 5 white petals and 20 pink stamens. The ovary consists of 1–5 carpels and 1–5 free styles, the terminal stigmata persisting on the ripe fruits. Flowering is in May and begins when trees are very young.

The fruits, which are called *haws*, are similar to a small apple. They are edible and measure 2.5 cm in diameter. The globose to spherical drupe is bright dark crimson in colour and ripens in early October. The pulp is usually dry and mealy. The seeds are enclosed in an endocarp with a ventral surface that is smooth or with longitudinal cavities. The fruits remain on the tree throughout the winter and are dispersed by fruit-eating birds and mammals.

## ORIGIN AND DISTRIBUTION

Introduced into cultivation in 1883, the species comes from the central United States. The name of the genus "*crataegos*" probably means "hardness of wood" in Greek.

Hawthorns occur from Europe to Asia Minor, the Himalayas, China, Japan and North America. In the early 20th century, many species were described, bringing the total number of species to over 1000. These divisions are now considered doubtful, because of the confusing nomenclature and distinctive characteristics. Researchers now recognize between 100 and 200 species.

## USE

**Ornamental:** The species has interesting ornamental characteristics, including its clusters of flowers, fall foliage and fruits that remain on the tree all winter.

**Birds and mammals:** Hawthorns provide shelter and a source of winter food (fruits, bark, shoots) to many species of birds and mammals.

**Cabinet making:** The hard wood is suitable for carving and turnery.

## REQUIREMENTS

The species tolerates moderate shade. It prefers a rich, alkaline soil. It has a taproot and must be transplanted when young.

## DISEASES AND INSECTS

Cedar rust diseases (*Gymnosporangium clavipes, Gymnosporangium juniperi-virginianae, Gymnosporangium globosum*) are fungal diseases that begin their life cycle on *Juniperus* and require an intermediate host to complete the cycle. The second phase of the disease occurs in many members of the Rosaceae family, hawthorns being the most susceptible. Other fungal diseases that may occur in the species include powdery mildew (*Podosphaera* sp.) and grey mould rot (*Botrytis cinerea*).

Hawthorns are also very susceptible to fireblight (*Erwinia amylovora*) when conditions are propitious for the disease.

The roundheaded apple tree borer (*Saperda candida*), a wood-boring insect, also attacks the species. Other pests include the eastern tent caterpillar (*Malacosoma americanum*) and Japanese beetle (*Popillia japonica*), which may cause temporary or permanent damage (death of part or all of the tree).

## PROPAGATION

**Seeds:** Propagation by seed is difficult in the species, since germination is influenced by a combination of tegument impermeability and embryo dormancy. Stratification in damp peat moss at a temperature of 21–27°C for 3–4 months and scarification with sulphuric acid are two effective means of achieving the first phase of dormancy release. These treatments must be followed by cold stratification at 4°C for four months.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Arboretum, Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** Fruits harvested on September 12, 1989 were stratified in peat moss at 20°C from November 3, 1989 to January 21, 1990 (79 days), and then at 5°C until May 15 (114 days). The seeds were sown 10 mm deep in a Promix®-sand mixture (1:2; v:v) and shaded with a cloth (63%). Emergence occurred over a two-year period and was very poor. Plants were kept in the bed until October 15, 1991, when 93 seedlings were dug up and heeled in for the winter. On May 20, 1992, they were moved to the nursery and treated with a granular fertilizer (15-15-15). On October 29, they were dug up, puddled and again heeled in for the winter. In mid-April 1993, they were wrapped and placed in the cellar to await shipping in May.

**Inclusion in testing network:** Young plants 25 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, the first winter and last three winters, 82%, 18%, 9% and 9% of plants had frost damage to the branch tips.

At St. Clotilde, 40% had frost damage to the branch tips the first winter.

At St. Hyacinthe, 27% had frost damage to the branch tips the first winter and 9% froze down to the level of the snow cover.

*Region 2*

At Deschambault, 14%, 7%, 8% and 8% of seedlings had frost damage to the branch tips the first two and last two winters. In addition, the last two winters, 67% and 42% had mechanical breakage.

At St. Foy, 79%, 86%, 42% and 25% had frost damage to the branch tips the first three winters and last winter. The first winter, 14% had damage to the previous year's shoots. The fourth winter, 92% had mechanical breakage.

At La Pocatière, one plant died the fourth winter. The first, second and fourth winters, 79%, 43% and 17% had frost damage to the branch tips. The first two winters, 7% had frost damage to the previous year's shoots and one plant had mechanical breakage the fourth winter.

*Region 3*

At Normandin, the first and fourth winters, 8% and 9% of plants died. The first and third winters, 58% and 82% had frost damage to the branch tips. The first, second and fourth winters, 25%, 36% and 27% had mechanical breakage.

At Kapuskasing, 10% of specimens died the fourth winter. The third and fourth winters, 10% and 60% had frost damage to the entire aerial portion above the ground level. The first, third and fourth winters, 50%, 90% and 30% had frost damage to the previous year's shoots. The first, second and fifth winters, 40%, 60% and 89% had frost damage to the branch tips.

**Height and trunk diameter growth**

Figures 1 and 2 show the mean height and trunk diameter of specimens after five years of testing for each site in the three regions.

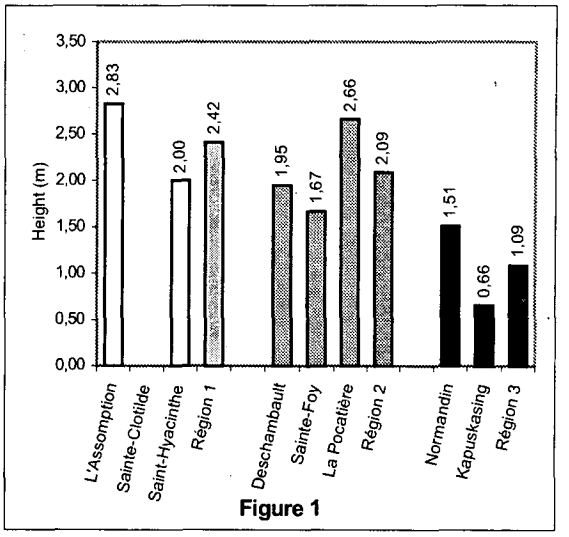


**Figure 1.** Mean height of trees at trial's end for each of the eight sites and three regions

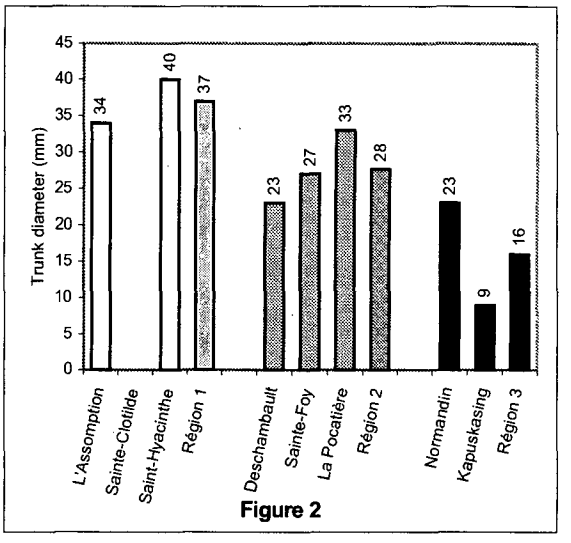


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the eight sites and three regions

**Effect of pruning**

Height growth was constant at all sites except Kapuskasing, where extensive pruning had to be done twice to remove over 60% of the previous growth, and Normandin, where annual pruning removing 30–50% of height was required.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and trunk diameter categories (heights and trunk diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

After four growing seasons, close to 80% of trees at L'Assomption and St. Clotilde, and 70% at St. Hyacinthe, reached a height of 2.01–3.00 m, while only the specimens at St. Clotilde had a trunk diameter of over 41 mm by this time, with the specimens at the other sites not attaining this size even by trial's end.

Production of the species is recommended as far as zone 2b.

## HARDINESS EVALUATION

In the literature, the species is considered hardy to zone 2b or USDA zone 5, depending on the author. According to our observations, zone 2b is the appropriate limit of hardiness. Even though mortality in zone 2a was not high thanks to the significant snow cover, plants had severe frost damage. In our opinion, plants could not survive long under such severe climatic conditions or would survive only as shrubs under the snow cover.

The species can be used as far as zone 2b given the excellent growth in that zone and the slight damage that occurred.

The species did not achieve its full ornamental potential at the test sites. It is less hardy than *C. submollis*. The seed tree at the Montreal Botanical Garden has not suffered any winter damage, but is probably the result of natural selection among a number of trees planted in the region.

**WRITTEN BY**

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**Table 1:** **Frequency of winter damage in *Crataegus coccinoïdes* Ashe., 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 76 | 24 | | | | | | | | | | 24 |
| St. Clotilde | 87 | 13 | | | | | | | | | | 13 |
| St. Hyacinthe | 91 | 5 | | | | 2 | | 2 | | | | 9 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 71 | 7 | | | | | | | | 22 | | 29 |
| St. Foy | 33 | 46 | | 3 | | | | | | 18 | | 67 |
| La Pocatière | 66 | 27 | | 3 | | | | 2 | | 2 | | 34 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 51 | 28 | | | | | | 3 | | 18 | | 49 |
| Kapuskasing | 12 | 38 | | 34 | | | 14 | 2 | | | | 88 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 5, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of *Crataegus coccinioïdes* Ashe. specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 82 | 64 | 9 | 0 | 0 | 100 | 30 | 0 | 0 | - | 100 | 82 | 0 | 0 | 0 |
| 101-200 | 18 | 36 | 82 | 18 | 18 | 0 | 70 | 100 | 10 | - | 0 | 18 | 90 | 30 | 20 |
| 201-300 | 0 | 0 | 9 | 82 | 27 | 0 | 0 | 0 | 90 | - | 0 | 0 | 10 | 70 | 80 |
| 301-400 | 0 | 0 | 0 | 0 | 55 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 100 | 71 | 17 | 0 | 0 | 86 | 14 | 0 | 0 | 17 | 86 | 14 | 8 | 0 | 0 |
| 101-200 | 0 | 29 | 83 | 83 | 42 | 14 | 86 | 100 | 58 | 59 | 14 | 79 | 67 | 26 | 0 |
| 201-300 | 0 | 0 | 0 | 17 | 58 | 0 | 0 | 0 | 42 | 16 | 0 | 7 | 25 | 66 | 91 |
| 301-400 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 8 | 9 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 83 | 18 | 0 | 9 | 9 | 100 | 100 | 30 | 50 | 67 |
| 101-200 | 17 | 82 | 36 | 27 | 91 | 0 | 0 | 70 | 50 | 33 |
| 201-300 | 0 | 0 | 64 | 64 | 0 | - | - | - | - | - |
| 301-400 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Clotilde were not collected in 1997

Table 3: **Breakdown of *Crataegus coccinioïdes* Ashe. specimens by saleable trunk diameter category, 1993-97**

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 36 | 9 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | - | 100 | 18 | 0 | 0 | 0 |
| 11-20 | 64 | 91 | 18 | 0 | 0 | 90 | 20 | 0 | 0 | - | 0 | 82 | 20 | 0 | 0 |
| 21-30 | 0 | 0 | 82 | 36 | 18 | 0 | 80 | 20 | 10 | - | 0 | 0 | 70 | 30 | 10 |
| 31-40 | 0 | 0 | 0 | 64 | 73 | 0 | 0 | 40 | 10 | - | 0 | 0 | 10 | 60 | 40 |
| 41-50 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 30 | 40 | - | 0 | 0 | 0 | 10 | 40 |
| 51-60 | - | - | - | - | - | 0 | 0 | 10 | 30 | - | 0 | 0 | 0 | 0 | 10 |
| 61-70 | - | - | - | - | - | 0 | 0 | 0 | 10 | - | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 100 | 57 | 8 | 0 | 0 | 100 | 7 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 |
| 11-20 | 0 | 43 | 92 | 58 | 33 | 0 | 93 | 42 | 8 | 8 | 14 | 100 | 83 | 8 | 0 |
| 21-30 | 0 | 0 | 0 | 42 | 50 | 0 | 0 | 58 | 84 | 75 | 0 | 0 | 17 | 84 | 27 |
| 31-40 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 8 | 17 | 0 | 0 | 0 | 8 | 64 |
| 41-50 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 9 |
| 51-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 67 | 0 | 0 | 0 | 9 | 100 | 30 | 0 | 10 | 67 |
| 11-20 | 33 | 100 | 91 | 36 | 18 | 0 | 70 | 100 | 80 | 33 |
| 21-30 | 0 | 0 | 9 | 64 | 64 | 0 | 0 | 0 | 10 | 0 |
| 31-40 | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - |
| 41-50 | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Clotilde were not collected in 1997

# *EUONYMUS FORTUNEI* 'CANADALE GOLD'

| | |
|---|---|
| **Family:** | Celastraceae |
| **English common name:** | Canadale Gold Euonymus |
| **French common name:** | Fusain 'Canadale Gold' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This cultivar, with a compact, creeping habit, has strong, erect branches and shiny, coriaceous leaves. It can grow to 0.6 m tall and 1.0 m wide. Growth is slow to moderate.

The young twigs are green, finely verrucose and almost round in cross section and put out aerial roots. The wide opposite leaves, 3-6 cm long, are oval to elliptic in shape and firm in texture. The veins are whitish above and protruding on the underside. The blade, with finely toothed margins, is of variable shape with a widely cuneate base and an acute to briefly acuminate tip. The new leaves are a golden yellow, turning pale green with golden yellow margins as they mature.

The small inconspicuous white flowers appear amidst the leaves in June or July, in the form of pedunculate axillary cymes borne on the previous year's shoots.

The fruits, inconspicuous reddish-pink dehiscent capsules, are 6.0 mm in diameter and split open to reveal orangey seeds. They remain on the plant until October or November.

## ORIGIN AND DISTRIBUTION

*Euonymus fortunei* was introduced from China in 1907. No information was found on the cultivar *Euonymus fortunei* 'Canadale Gold'.

## USE

**Ornamental:** The cultivar can be used in association with other plants in mass plantings or as a groundcover. It does best in a semi-shady site, where the foliage is a darker colour.

## REQUIREMENTS

Growth is similar whether in a sunny or semi-shady location. The cultivar prefers soils with fine to coarse particles and tolerates damp or even wet soils and a wide range of pHs. It is easy to grow and takes well to transplanting.

## DISEASES AND INSECTS

Crown gall (*Agrobacterim tumefasciens*) may cause serious damage to *Euonymus*.

Insect pests attacking the genus include spider mites, black vine weevil (*Otiorhynchus sulcatus*), strawberry root weevil (*Otiorhynchus ovatus*) and euonymus caterpillar (*Yponomeuta cagnagella*).

## PROPAGATION

**Cutting:** Sufficiently hardened-off cuttings can be planted in flats in the greenhouse in August. They will root quickly in a cool place and can then be moved out of the greenhouse to an outdoor bed, to overwinter in a deep, well-protected cold frame.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Purchased from the Pépinière Abbotsford, St. Paul d'Abbotsford, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** 400 cuttings (10 cm) were taken on August 15, 1992 from 30-cm-tall parent plants. The cuttings were dipped in a 4000 ppm IBA/50% ethanol solution, planted in plug trays in a perlite-Promix® mixture (1:1; v:v) and placed under an automatic mist unit operating for 30

seconds every 10 minutes. The rooted cuttings were then transferred to shaded beds in mid-September; the rooting rate was 85%. On June 19, 1993, the plants were potted up in Fertil Pot® containers and grown in outdoor beds. Weekly treatments of soluble fertilizer (20-20-20, 300 ppm N) were provided over the summer. The seedlings were overwintered in cold frames with an Astro-Foam® mulch; the survival rate was 100%. They were wrapped and shipped in May 1994.

**Inclusion in testing network:** Seedlings 10 cm high were planted at eight test sites throughout Quebec and in north-eastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

All the shrubs died during the first two or three winters at the region 3 sites and St. Clotilde.

*Region 1*

At L'Assomption, 5-15% of the specimens died during each of the first four winters, while 78%, 25% and 100% of the plants suffered frost damage to the aerial portions above the snow cover the second, third and fifth winters respectively. Frost damage to the branch tips occurred in 31% and 25% of the shrubs the first and third winters. One third had foliage browning the first winter. The third and fourth winters, 12% and 25% of the shrubs had frost damage to the old wood and 25% had damage to the previous year's shoots the fourth winter.

At St. Clotilde, 70%, 30% and 100% of the plants died the first three winters respectively. All the surviving plants had foliage browning.

At St. Hyacinthe, 41% and 20% of the shrubs died the second and third winters and 82% suffered foliage browning the first winter.

*Region 2*

At Deschambault, 10% and 23% of the specimens died the first two winters. Frost damage to the branch tips was found in 63%, 35%, 67%, 67% and 100% of the plants during the five years of the trials respectively. Frost damage to the previous year's shoots occurred in 5-15% of the specimens the first two winters and fourth winter. Mechanical breakage was observed in 17% and 11% of the plants the second and third winters.

At St. Foy, 9%, 22%, 44% and 40% of plants died the first four winters respectively. Frost damage to the branch tips occurred in 9%, 22% and 60% of the specimens the first two winters and fourth winter respectively. The first two winters, 19% and 38% of the shrubs had frost damage to the previous year's shoots, 9% and 17% to the old wood and 23% foliage browning. The third winter, 11% had mechanical breakage and, the last winter, all the plants had frost damage down to the level of the snow cover.

At La Pocatière, 49%, 50% and 100% of plants died the first, third and fourth winters respectively. The surviving plants suffered frost damage to the branch tips, damage to the aerial portions above the snow cover and damage to the aerial portions above the ground level in turn.

*Region 3*

At Normandin, 30% of the seedlings had foliage browning the first winter and all the plants died the next winter.

At Kapuskasing, all the plants had frost damage the first winter, 17% down to the soil level. All the plants died the following winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

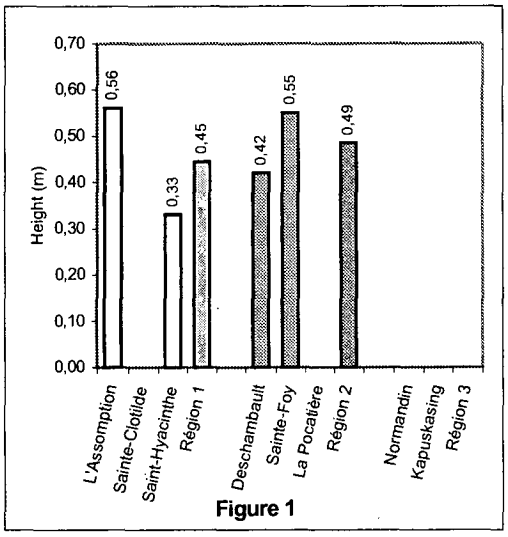


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

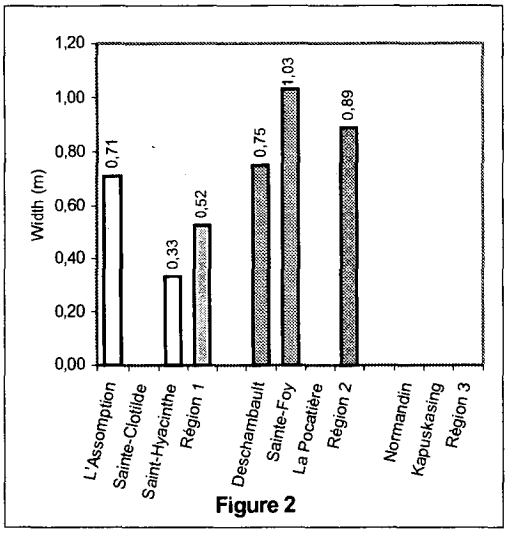


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Several subsequent prunings, which eliminated 30-60% of growth, were done at Deschambault, St. Hyacinthe and L'Assomption. At La Pocatière, all the seedlings had to be cut back to the ground level the third year.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

The tallest and widest plants at trial's end were produced at St. Foy (zone 4b). This is consistent with the intensity of damage observed; at this site, the snow provides protection from severe frost damage and the subsequent extensive pruning required.

The cultivar can be produced in containers given adequate winter protection.

## HARDINESS EVALUATION

In the literature, hardiness ratings for the cultivar range between zones 5 and 6, depending on the reference consulted. In the trials, many plants died in zones 2, 4 and 5, while a few survived in zones 4 and 5.

Once plants are well established, some may be able to survive in zones 4 and 5, sustaining winter damage of varying severity depending on winter conditions. Although some plants did survive in the trial, ratings for use and survival cannot be established with any certainty in the zones tested.

The cultivar did not achieve its full ornamental potential at the trial sites.

## WRITTEN BY

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Table 1: **Frequency of winter damage observed in *Euonymus fortunei* 'Canadale Gold', 1995-99**

| Trial site | No Damage | Percentage breakdown of damage WINTER DAMAGE[a] | | | | | | | | | | | Cumulative |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | damage |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 11 | 17 | | 6 | 8 | 41 | | 11 | | | | 6 | 89 |
| St. Clotilde (1) | 0 | | | | | | | 84 | | | | 16 | 100 |
| St. Hyacinthe | 71 | | | | | | | 12 | | | | 17 | 29 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 15 | 66 | | 7 | | | | 7 | | 5 | | | 85 |
| St. Foy | 14 | 18 | | 12 | 5 | 20 | | 23 | | 2 | | 6 | 86 |
| La Pocatière | 1 | | | 13 | | 7 | 10 | 69 | | | | | 99 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 0 | | | | | | | 85 | | | | 15 | 100 |
| Kapuskasing | 0 | | | | | | 10 | 90 | | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = foliage browning

No damage of types 3, 9 or 11 occurred in the plants tested.

Table 2: Breakdown of *Euonymus fortunei* 'Canadale Gold' specimens by saleable height category, 1994-98

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 68 | 27 | 0 | 43 | 0 | 100 | 33 | 0 | - | - | 82 | 35 | 0 | 0 | 0 |
| 21-40 | 32 | 73 | 75 | 57 | 0 | 0 | 67 | 100 | - | - | 18 | 65 | 100 | 100 | 100 |
| 41-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 61-80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 89 | 24 | 0 | 11 | - | 62 | 21 | 11 | 0 | 0 | 95 | 17 | 0 | 0 | - |
| 21-40 | 11 | 76 | 100 | 89 | - | 38 | 79 | 56 | 25 | 0 | 5 | 75 | 100 | 10 | - |
| 41-60 | - | - | - | - | - | 0 | 0 | 33 | 75 | 0 | 0 | 8 | 0 | 90 | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 100 | 17 | - | - | - | 80 | 75 | - | - | - |
| 21-40 | 0 | 83 | - | - | - | 20 | 25 | - | - | - |
| 41-60 | - | - | - | - | - | - | - | - | - | - |
| 61-80 | - | - | - | - | - | - | - | - | - | - |

Table 3: Breakdown of *Euonymus fortunei* 'Canadale Gold' specimens by saleable width category, 1994-98

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 67 | 13 | 14 | 0 | 100 | 100 | 0 | - | - | 94 | 24 | 40 | 0 | 25 |
| 021-040 | 0 | 33 | 87 | 86 | 0 | 0 | 0 | 0 | - | - | 6 | 76 | 60 | 75 | 50 |
| 041-060 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 100 | - | - | 0 | 0 | 0 | 25 | 25 |
| 061-080 | 0 | 0 | 0 | 0 | 67 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | 0 | 0 | 0 | 0 | 16 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 84 | 24 | 11 | 0 | 0 | 95 | 26 | 22 | 0 | 0 | 100 | 33 | 100 | 100 | - |
| 021-040 | 16 | 76 | 56 | 11 | 22 | 5 | 68 | 44 | 25 | 0 | 0 | 42 | 0 | 0 | - |
| 041-060 | 0 | 0 | 33 | 33 | 44 | 0 | 6 | 22 | 50 | 0 | 0 | 25 | 0 | 0 | - |
| 061-080 | 0 | 0 | 0 | 56 | 34 | 0 | 0 | 12 | 25 | 33 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | 0 | 0 | 0 | 0 | 34 | | | | | |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 0 | 50 | - | - | 86 | 50 | 50 | - | - |
| 021-040 | 0 | 100 | 50 | - | - | 14 | 50 | 50 | - | - |
| 041-060 | - | - | - | - | - | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

# *EUONYMUS FORTUNEI* 'E.T.'

| | |
|---|---|
| **Family:** | Celastraceae |
| **English common name:** | ET Gold Euonymus |
| **French common name:** | Fusain 'E.T.' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub, with dense foliage and a round habit, has erect, greenish branches. It is fast growing and can reach 1.2 m tall and 2.0 m wide.

The oval to elliptic, firm-textured leaves are 3-6 cm long and have finely toothed margins. The veins are whitish on the upperside and protruding below. Bright dark green in colour, the leaves have golden yellow margins and turn a beautiful pink in fall.

The whitish flowers occur in groups of four in pedunculate axillary cymes borne on the previous year's shoots.

The fruits, red or pinkish capsules, appear in fall.

## ORIGIN AND DISTRIBUTION

The species *Euonymus fortunei* comes from central China and was discovered in 1907. The cultivar 'ET' is very similar to 'Emerald Gaity'. It has wider leaves than 'Emerald Gold', from which it was developed by Ontario's Maple Leaf Nurseries in 1985.

## USE

**Ornamental:** The cultivar can be used in mass plantings with other plants or as a groundcover. It prefers a semi-shady location, where the dark colour of its foliage develops best.

## REQUIREMENTS

Growth is similar whether grown in a sunny or semi-shady site. The cultivar prefers soils with fine to medium particles and tolerates damp or even wet soils and a wide range of pHs. It takes well to transplanting.

## DISEASES AND INSECTS

Crown gall (*Agrobacterim tumefasciens*) may cause serious damage to *Euonymus*.

Among the insect pests attacking the genus, spider mites, black vine weevil (*Otiorhynchius sulcatus*), strawberry root weevil (*Otiorhynchus ovatus*) and euonymus caterpillar (*Yponomeuta cagnagella*) may cause significant damage.

## PROPAGATION

**Cutting:** Sufficiently hardened-off cuttings can be planted in flats in the greenhouse in August. They will root quickly in a cool place and can then be moved out of the greenhouse to overwinter in a deep, well-protected cold frame.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Purchased from the Pépinière Abbotsford, St. Paul d'Abbotsford, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** 404 cuttings (10 cm) were taken on July 23, 1992 from roughly 4-5 year old and 70-cm tall and wide container-grown parent plants. The cuttings were dipped for five seconds in a 5000 ppm IBA/50% ethanol solution, planted in fibre pots (30 cm x 15 cm x 8 cm) in a Promix®-Turface® mixture (1:1; v:v) and placed under an automatic mist unit operating for 6 seconds every 8 minutes. The heating cables were set at 25°C. The rooting rate was 100% after 31 days. A total of 274 seedlings were potted up in 10-cm plastic pots and placed in the lathhouse; the survival rate was 98%. The plants were treated with a soluble fertilizer (10-52-10) and were transferred to the

greenhouse in fall. On May 20, 1993, they were moved to an outside bed and treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until late August. In November, they were moved to the cold store and kept at 5°C. In April of the following year, premature budbreak occurred and the seedlings were moved into the greenhouse until May, when they were wrapped and shipped for the trials.

**Inclusion in testing network**: Seedlings 10 cm high were planted at eight test sites throughout Quebec and in north-eastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

High mortality occurred at the region 3 sites and La Pocatière and St. Clotilde.

*Region 1*

At L'Assomption, 19% and 42% of the plants died the first and third winters respectively. The second and fifth winters, all the shrubs had frost damage to the aerial portions above the snow cover. The third and fourth winters, frost damage occurred in all the specimens: 16% and 43% had damage to the previous year's shoots and 8% and 57% had damage to the old wood. In addition, the third winter, 33% of the shrubs had frost damage to the aerial portions above the snow cover and 14% had foliage browning.

At St. Clotilde, 14% and 100% of the specimens died the first two winters and 86% had foliage browning the first winter.

At St. Hyacinthe, 15% of the shrubs died the second winter, while 50% had foliage browning the first winter. The second winter, 67% of the plants had frost damage to the branch tips and 11% froze down to the level of the snow cover.

*Region 2*

At Deschambault, frost damage to the branch tips was observed in 44%, 63%, 38%, 88% and 87% of the specimens during each of the five years, while frost damage to the previous year's shoots occurred in 6%, 25%, 12%, 13% and 13% of the plants over the same period. One plant died the second winter.

At St. Foy, 12%, 95% and 10% of the shrubs died the second, third and fifth winters respectively. Frost damage to the branch tips occurred all five years of the trials (47%, 23%, 18%, 80% and 30% of shrubs). Frost damage to the previous year's shoots occurred in 17%, 53%, 10% and 10% of the shrubs the first two and last two winters respectively. Frost damage to the old wood was found in 11% of the specimens the first winter. The second winter, one plant suffered frost damage to the aerial portions above the snow cover and 10% of shrubs had mechanical breakage. The last winter, 40% of the shrubs had frost damage to the aerial portions above the snow cover.

At La Pocatière, 7%, 55%, 50% and 100% of the plants died the first four winters. In addition, the first two winters, 25% of the shrubs had frost damage to the previous year's shoots, 40% had frost damage down to the level of the snow cover and 7% had damage to the aerial portions above the ground level.

*Region 3*

At Normandin, 10%, 65% and 100% of the specimens died the first two winters and the fourth winter respectively. The first three winters, 90%, 21% and 100% of the shrubs had foliage browning.

At Kapuskasing, 53%, 87% and 100% of the shrubs died the first three years respectively. Frost damage to the branch tips was found in 5% of the shrubs the first winter and frost damage to the old wood occurred in 29% and

12% the first two winters. Frost damage to the aerial portions above the ground occurred in 7% of the shrubs the first winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

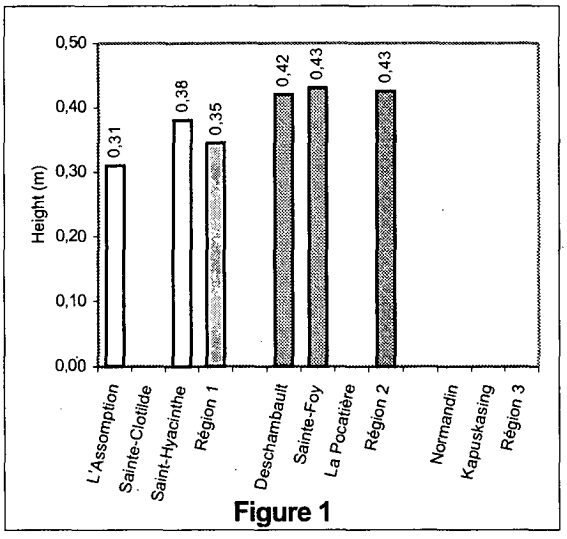


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

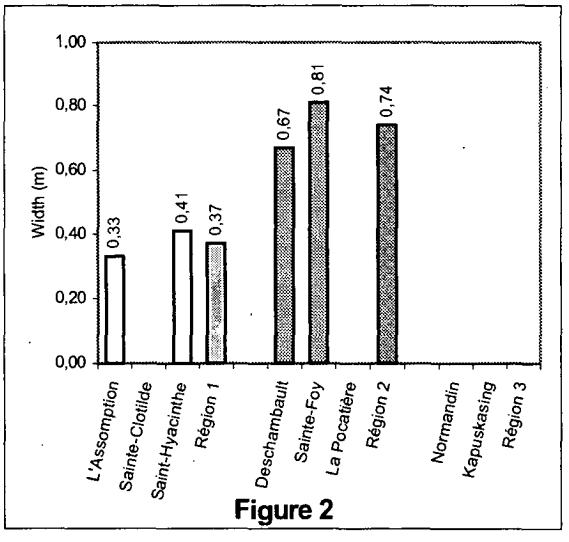


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Several subsequent prunings were required at all the sites. Depending on the severity of damage, 10-60% of height growth had to be cut back.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

The tallest and widest plants at trial's end were produced at St. Foy (zone 4b). This is consistent with the intensity of damage observed; at this site, the snow provides protection from severe frost damage.

The cultivar can be produced in containers given adequate winter protection or a sufficient snow cover.

## HARDINESS EVALUATION

In the literature, hardiness ratings for the cultivar range between zones 5 and 6, depending on the reference consulted. The trial results show that all the shrubs died in zones 2a, 2b, 4a and 5b (corresponding to the two coldest sites, the warmest site and the site in zone 4a where the snow arrives the latest in fall). In zone 2, this mortality can be attributed to the severe winter cold; at the warmest site, mortality occurred due to the freeze/thaw cycles associated with the sporadic snow cover.

The cultivar can survive as far as zone 4b given a continual snow cover, ideal growing conditions and the absence of intense cold too early in fall. Young plants must be produced in containers and protected during the first few winters, which will harden them off somewhat. Once they are well established, the shrubs can survive as far as zone

4, suffering only foliage browning during the most severe winters.

The cultivar can only be used in zones 4b and 5a, since a snow cover is essential to protect the young plants. However, frequent pruning will be required to remove damaged portions and plants will always be at risk.

The cultivar achieves its full ornamental potential in zones other than those tested.

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**Table 1: Frequency of winter damage observed in *Euonymus fortunei* 'ET', 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | damage |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 12 | | | 14 | 13 | 47 | | 12 | | | | 2 | 88 |
| St. Clotilde | 0 | | | | | | | 23 | | | | 77 | 100 |
| St. Hyacinthe | 72 | 13 | | | | 2 | | 3 | | | | 10 | 28 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 21 | 64 | | 14 | | | | 1 | | | | | 79 |
| St. Foy | 22 | 40 | | 16 | 5 | 8 | 2 | 5 | | 2 | | | 78 |
| La Pocatière | 18 | | | 5 | | 20 | 4 | 53 | | | | | 82 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 0 | | | | | | 4 | 43 | | | | 53 | 100 |
| Kapuskasing | 0 | 3 | | 13 | | | 4 | 80 | | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = foliage browning

No damage of types 3, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of *Euonymus fortunei* 'ET' specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 95 | 12 | 0 | 29 | 0 | 0 | 0 | - | - | - | 95 | 0 | 0 | 0 | 0 |
| 021-040 | 5 | 88 | 58 | 71 | 0 | 43 | 43 | - | - | - | 5 | 95 | 100 | 0 | 0 |
| 041-060 | 0 | 0 | 42 | 0 | 71 | 57 | 57 | - | - | - | 0 | 5 | 0 | 44 | 34 |
| 061-080 | 0 | 0 | 0 | 0 | 29 | - | - | - | - | - | - | - | - | 56 | 66 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 88 | 18 | 10 | 0 | 0 | 100 | 24 | 0 | 20 | 10 | 100 | 21 | 0 | 0 | - |
| 021-040 | 12 | 82 | 90 | 75 | 37 | 0 | 76 | 73 | 60 | 20 | 0 | 79 | 100 | 100 | - |
| 041-060 | 0 | 0 | 0 | 25 | 63 | 0 | 0 | 27 | 20 | 60 | - | - | - | - | - |
| 061-080 | - | - | - | - | - | 0 | 0 | 0 | 0 | 10 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 6 | 50 | - | - | 89 | 63 | 0 | - | - |
| 021-040 | 0 | 94 | 50 | - | - | 11 | 37 | 100 | - | - |
| 041-060 | - | - | - | - | - | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - |

Table 3: **Breakdown of *Euonymus fortunei* 'ET' specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 100 | 75 | 100 | 14 | 100 | 100 | - | - | - | 100 | 100 | 89 | 67 | 33 |
| 041-080 | 0 | 0 | 25 | 0 | 86 | 0 | 0 | - | - | - | 0 | 0 | 11 | 33 | 67 |
| 081-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 100 | 90 | 25 | 0 | 100 | 100 | 54 | 20 | 10 | 100 | 93 | 100 | 0 | - |
| 041-080 | 0 | 0 | 10 | 75 | 100 | 0 | 0 | 46 | 80 | 30 | 0 | 7 | 0 | 50 | - |
| 081-120 | - | - | - | - | - | 0 | 0 | 0 | 0 | 60 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 100 | 100 | - | - | 100 | 100 | 100 | - | - |
| 041-080 | - | - | - | - | - | - | - | - | - | - |
| 081-120 | - | - | - | - | - | - | - | - | - | - |

# *EUONYMUS HAMILTONIANUS* 'MAACKII'

| | |
|---|---|
| **Family:** | Celastraceae |
| **English common name:** | Spindle Tree |
| **French common name:** | Fusain |
| **Synonym:** | *Euonymus hamiltoniana* var. *maackii* |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This *Euonymus*, which has a rounded crown, can grow to 3-5 m tall.

The thin, arching branches and twigs are green initially and then turn reddish.

The deciduous leaves, elliptic to lanceolate in shape with an acuminate apex and serrate margins, are 5-10 cm long and 2-3 cm wide. The foliage, light green in summer, turns fuchsia pink in fall when exposed to the sun (like the other cultivars that turn light yellow). The leaves in the centre of the shrub, which are deprived of sun, turn pinkish yellow.

The inconspicuous greenish-yellow flowers are roughly 1 cm in diameter and occur in small, short cymes. Flowering is in June.

The fruits are pink, four-lobed capsules containing red seeds with orangey arils. They turn a bright fuchsia pink upon maturity, and remain on the shrub after the leaves fall.

This cultivar tends to lose its leaves at the base as it ages.

## ORIGIN AND DISTRIBUTION

This cultivar originates from the shores of the Amur River, in Manchuria, Korea. It was introduced in 1880.

## USE

**Ornamental:** The cultivar can be used in informal hedges, foundation plantings or mass plantings or as a specimen plant. Its shape and the beautiful colour of the foliage and fruit in fall make it much appreciated.

## REQUIREMENTS

No specific information on the cultivar was found in the references consulted.

## DISEASES AND INSECTS

Crown gall (*Agrobacterim tumefasciens*) may cause serious damage to *Euonymus*.

Among the insect pests attacking the genus, spider mites, black vine weevil (*Otiorhynchus sulcatus*), strawberry root weevil (*Otiorhynchus ovatus*) and euonymus caterpillar (*Yponomeuta cagnagella*) may cause significant damage.

## PROPAGATION

**Cutting:** Semiripe cuttings taken in June will root rapidly with the appropriate hormone treatment.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van de Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique**: 530 cuttings (12 cm) were taken on June 10, 1991 from roughly 20-year-old parent plants. The cuttings were dipped for five seconds in a 4000 ppm IBA/50% ethanol solution, rinsed under the tap and then immersed in a Benomyl-Captan® fungicide solution. They were planted in a peat-perlite mixture (2:3; v:v) and placed under an automatic mist unit (Mist-A-Matic®). The rooting rate was 47% after 125 days. In early October, misting was discontinued and a soluble fertilizer (20-20-20, 200 ppm N) was applied twice, one week apart. In November, the seedlings were removed from their rooting containers and

kept in the cold store at 0°C in plastic bags perforated with a straight pin. In May 1992, they were potted up in Fertil Pot® containers in a peat-perlite mixture (3:2; v:v) and put in a tunnel greenhouse for around a month, and then moved to lightly shaded cold frames outside. They were treated weekly with a soluble fertilizer (20-20-20, 400 ppm N) until mid-September. In November, the seedlings were moved to the cold store again and kept at -1°C. In early May 1993, the seedlings were wrapped and put back into the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young shrubs 10 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 28% of the specimens died the first winter, while 28%, 10% and 10% suffered frost damage to the branch tips the first winter and last two winters respectively. In addition, the last winter, 56% of the specimens had mechanical breakage.

At St. Clotilde, 28% of the shrubs had frost damage to the branch tips the second winter.

At St. Hyacinthe, 33% had frost damage to the branch tips the last winter.

*Region 2*

At Deschambault, frost damage to the branch tips occurred in 5% and 28% of specimens the first two winters. The last three winters, 8%, 100% and 100% of plants suffered mechanical breakage.

At St. Foy, 25%, 100% and 50% of the shrubs suffered frost damage to the branch tips the first three winters respectively. In addition, the first winter, 12% of plants froze down to the ground level. The fourth winter, all plants were damaged by the weight of the snow.

At La Pocatière, 12% of the plants died the first winter. Frost damage to the aerial portions above ground level occurred in 12%, 13% and 25% of the shrubs the first three winters respectively. The third winter, 17% of the specimens had frost damage to the branch tips and 17% had damage to the previous year's shoots. Mechanical breakage occurred in all plants the last winter.

*Region 3*

At Normandin, 33% and 10% of the specimens died the first and third winters. Frost damage to the branch tips occurred in 25% of the shrubs the first winter and all had mechanical breakage the fourth winter.

At Kapuskasing, 33%, 25% and 14% of the specimens died the first three winters. Plants suffered frost damage to the entire aerial portion every winter (33%, 17%, 14%, 17% and 17%). The third winter, frost damage to the branch tips was observed in 14% of the shrubs, while the same percentage had frost damage to the previous year's shoots. Lastly, the fourth winter, mechanical breakage occurred in 17% of the specimens.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

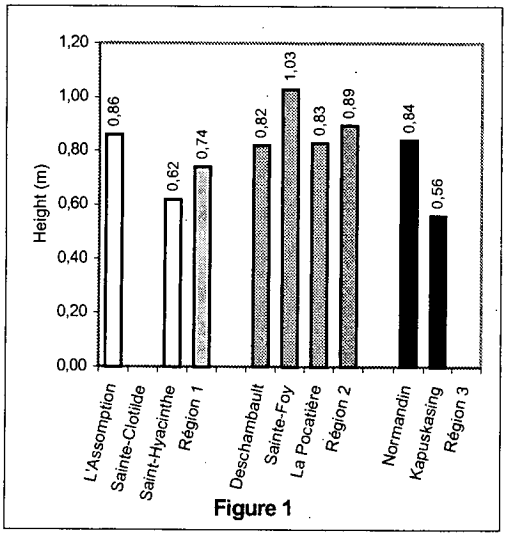


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

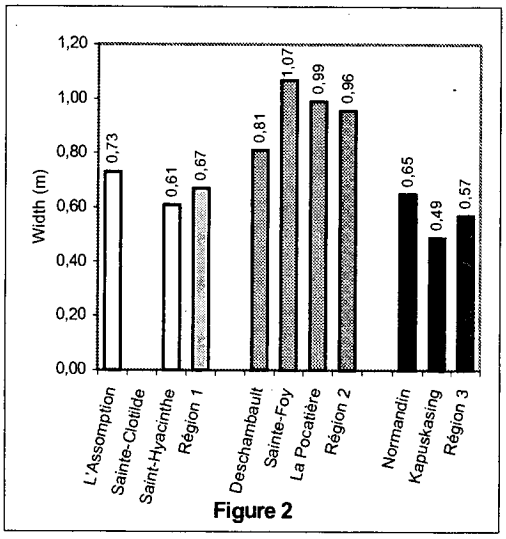


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Light pruning was done at Kapuskasing, La Pocatière and St. Hyacinthe to deal with mechanical breakage. Severe pruning, involving the removal of 50-90% of the height of plants, was done at Normandin, Deschambault and St. Foy.

### Flowering

The onset of flowering was observed between June 11 and 26 at the region 1 sites; the one exception was at St. Hyacinthe, where flowering began in late May the fourth spring of the trials. At the region 2 sites, the first flowers appeared the end of June. Flowering was later and more scanty at the region 3 sites, beginning mid-July.

The shrubs were in full bloom a few days after the first flowers appeared. Flowering lasted two to four weeks, depending on the year.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

After two growing seasons, 85-100% of seedlings had reached over 41 cm tall at all sites except Deschambault, Normandin and Kapuskasing. The first few years, plants at the region 2 sites were wider than those in other regions, but this difference disappeared with time. All shrubs were over 1 m tall after four years at L'Assomption, St. Clotilde and Deschambault. An additional year was required at St. Foy, La Pocatière and Normandin to obtain plants of comparable height.

This cultivar can be produced at all region 1 and 2 sites, but the high mortality in the colder regions precludes production there.

## HARDINESS EVALUATION

No hardiness ratings for the cultivar were found in the literature. The test results show that the cultivar can survive as far as zone 3 or 4, since mortality was significant at the zone 2a site and fairly significant at the zone 2b site the first winter.

The cultivar can be used as far as zone 3, since in colder areas, despite the fact that plants can survive with snow protection, flowering and fruit production are minimal and sporadic, greatly reducing the shrubs' attractiveness.

The cultivar did not achieve its full ornamental potential in the zones tested, since the plants in zone 5b suffered frost damage to the branch tips. The parent plant at the Roger Van den Hende Garden (zone 4b) has had no frost damage for a number of years, however.

**WRITTEN BY**

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1: Frequency of winter damage observed in *Euonymus hamiltonianus* 'Maackii', 1994-98**

| Trial site | No damage | Percentage breakdown of damage WINTER DAMAGE[a] | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 74 | 10 | | | | | | 6 | | 10 | | 26 |
| St. Clotilde* | 91 | 9 | | | | | | | | | | 9 |
| St. Hyacinthe | 93 | 7 | | | | | | | | | | 7 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 51 | 7 | | | | | | | | 42 | | 49 |
| St. Foy | 42 | 35 | | | | | 3 | | | 20 | | 58 |
| La Pocatière | 61 | 3 | | 3 | | | 10 | 2 | | 21 | | 39 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 66 | 5 | | | | | | 9 | | 20 | | 34 |
| Kapuskasing | 54 | 6 | 3 | | | | 19 | 14 | | 4 | | 46 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 5, 6, 9 or 11 occurred in the plants tested.

*Data were not collected after 1996.

**Table 2:** **Breakdown of *Euonymus hamiltonianus* 'Maackii' specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 23 | 0 | 0 | 0 | 0 | 44 | 0 | - | 0 | - | 83 | 0 | 0 | 0 | 0 |
| 021-040 | 47 | 15 | 0 | 0 | 0 | 50 | 0 | - | 0 | - | 17 | 0 | 0 | 0 | 0 |
| 041-060 | 30 | 54 | 20 | 0 | 10 | 6 | 80 | - | 0 | - | 0 | 65 | 25 | 0 | 0 |
| 061-080 | 0 | 31 | 60 | 20 | 20 | 0 | 20 | - | 0 | - | 0 | 35 | 42 | 58 | 42 |
| 081-100 | 0 | 0 | 20 | 60 | 60 | 0 | 0 | - | 34 | - | 0 | 0 | 33 | 33 | 58 |
| 101-120 | 0 | 0 | 0 | 20 | 10 | 0 | 0 | - | 58 | - | 0 | 0 | 0 | 9 | 0 |
| 121-140 | - | - | - | - | - | 0 | 0 | - | 8 | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 83 | 6 | 0 | 0 | 0 | 31 | 0 | 0 | 0 | 0 | 94 | 0 | 0 | 0 | 0 |
| 021-040 | 17 | 44 | 0 | 0 | 0 | 69 | 6 | 0 | 0 | 0 | 6 | 13 | 8 | 0 | 0 |
| 041-060 | 0 | 39 | 33 | 17 | 17 | 0 | 44 | 0 | 0 | 0 | 0 | 80 | 34 | 42 | 8 |
| 061-080 | 0 | 11 | 67 | 50 | 42 | 0 | 37 | 17 | 0 | 8 | 0 | 7 | 50 | 33 | 42 |
| 081-100 | 0 | 0 | 0 | 33 | 25 | 0 | 13 | 58 | 25 | 17 | 0 | 0 | 8 | 25 | 33 |
| 101-120 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 25 | 42 | 75 | 0 | 0 | 0 | 0 | 17 |
| 121-140 | - | - | - | - | - | 0 | 0 | 0 | 33 | 0 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 58 | 0 | 0 | 0 | 0 | 50 | 25 | 0 | 0 | 0 |
| 021-040 | 42 | 50 | 25 | 0 | 0 | 50 | 50 | 29 | 33 | 17 |
| 041-060 | 0 | 50 | 37 | 28 | 14 | 0 | 25 | 71 | 50 | 33 |
| 061-080 | 0 | 0 | 38 | 43 | 29 | 0 | 0 | 0 | 17 | 50 |
| 081-100 | 0 | 0 | 0 | 14 | 57 | - | - | - | - | - |
| 101-120 | 0 | 0 | 0 | 15 | 0 | - | - | - | - | - |
| 121-140 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1995 and 1997.

Table 3: Breakdown of *Euonymus hamiltoniana* 'Maackii' specimens by saleable width category, 1993-97

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 71 | 8 | 0 | 0 | 0 | 100 | 0 | - | 0 | - | 100 | 17 | 0 | 0 | 0 |
| 021-040 | 29 | 61 | 10 | 0 | 0 | 0 | 20 | - | 0 | - | 0 | 59 | 42 | 17 | 0 |
| 041-060 | 0 | 31 | 70 | 0 | 10 | 0 | 80 | - | 0 | - | 0 | 24 | 58 | 66 | 50 |
| 061-080 | 0 | 0 | 20 | 40 | 60 | 0 | 0 | - | 0 | - | 0 | 0 | 0 | 17 | 50 |
| 081-100 | 0 | 0 | 0 | 50 | 30 | 0 | 0 | - | 33 | - | - | - | - | - | - |
| 101-121 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | - | 50 | - | - | - | - | - | - |
| 121-140 | - | - | - | - | - | 0 | 0 | - | 17 | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 72 | 6 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 13 | 0 | 0 | 0 |
| 021-040 | 28 | 72 | 8 | 0 | 0 | 0 | 12 | 0 | 0 | 0 | 0 | 20 | 8 | 0 | 0 |
| 041-060 | 0 | 22 | 50 | 8 | 17 | 0 | 50 | 8 | 0 | 0 | 0 | 67 | 8 | 25 | 8 |
| 061-080 | 0 | 0 | 42 | 42 | 42 | 0 | 38 | 8 | 0 | 8 | 0 | 0 | 75 | 17 | 8 |
| 081-100 | 0 | 0 | 0 | 50 | 33 | 0 | 0 | 84 | 17 | 25 | 0 | 0 | 9 | 50 | 34 |
| 101-121 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 67 | 58 | 0 | 0 | 0 | 8 | 42 |
| 121-140 | - | - | - | - | - | 0 | 0 | 0 | 16 | 9 | 0 | 0 | 0 | 0 | 8 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 100 | 25 | 0 | 0 | 0 | 83 | 50 | 0 | 0 | 0 |
| 021-040 | 0 | 63 | 13 | 14 | 14 | 17 | 42 | 86 | 50 | 17 |
| 041-060 | 0 | 12 | 37 | 43 | 28 | 0 | 8 | 14 | 50 | 67 |
| 061-080 | 0 | 0 | 50 | 0 | 29 | 0 | 0 | 0 | 0 | 16 |
| 081-100 | 0 | 0 | 0 | 14 | 29 | - | - | - | - | - |
| 101-121 | 0 | 0 | 0 | 29 | 0 | - | - | - | - | - |
| 121-140 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1995 and 1997.

# *EUONYMUS NANUS* VAR. TURKESTANICUS DIECK.

| | |
|---|---|
| **Family:** | Celastraceae |
| **English common name:** | Dwarf Euonymus, Turkestan Euonymus |
| **French common name:** | Fusain nain, Fusain nain du Turkestan |
| **Synonym:** | *Euonymus nanus* var. *koopmannii* |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This small, erect shrub can grow to 0.5-0.8 m tall and 0.9 m wide in its native China. The branches are initially spreading, then grow erect as they age. The young twigs are angular and glabrous. The variety is slow growing.

The deciduous bluish-green foliage turns a vibrant bright red in fall. The flat leaves are alternate, and linear to lanceolate in shape, measuring 3-5 cm long and 3-6 mm wide.

The purplish flowers occur in clusters of 1-3 on a spindly peduncule, and are 4 mm in diameter. They bloom in spring.

The fruits, pinkish orangey capsules, are 2-3 cm in diameter and appear in August in small numbers. Fruiting occurs irregularly. The seeds are brown with an orangey-red aril.

## ORIGIN AND DISTRIBUTION

*Euonymus nanus* var. *turkestanicus* comes from the Altaï and Tianshan mountains. It was discovered in 1883.

## USE

**Ornamental:** The variety can be used with other plants in mass plantings or as a groundcover. It does well in semi-shady areas, where its foliage is darker.

## REQUIREMENTS

The variety requires a sunny exposure. It does well in a range of soil types, including rocky soils, but prefers drier sites.

This shallow-rooted shrub layers and transplants easily.

The shrub flourishes when planted under atmospheric nitrogen-fixing trees such as locusts and honey-locusts.

## DISEASES AND INSECTS

Crown gall (*Agrobacterim tumefasciens*) may cause serious damage to *Euonymus*.

Among the insect pests attacking the genus, spider mites, black vine weevil (*Otiorhynchus sulcatus*), strawberry root weevil (*Otiorhynchus ovatus*) and euonymus caterpillar (*Yponomeuta cagnagella*) may cause significant damage.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Gift from Québec Multiplants, St. Apollinaire, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** 400 cuttings (6-8 cm) were taken on June 29, 1992 from roughly 2-year old, 50-cm tall and 40-cm wide parent plants. The cuttings were dipped for five seconds in a 5000 ppm IBA/50% ethanol solution, planted in fibre pots (30 cm x 15 cm x 8 cm) in a Promix®-Turface® mixture (1:2; v:v) and placed under an automatic mist unit (Mist-A-Matic®). The heating cables were set at 25°C. The rooting rate was 98% after 27 days. In July, the rooted cuttings were placed in the lathhouse for hardening off, treated with a soluble fertilizer (10-52-10) and then moved to outside beds, where they remained until November. In November, they were put in the cold store in their rooting containers and kept at 5°C. On May 19, 1993, they were transplanted to the nursery and fertilized. The following November, they were dug up, heeled in and

protected with a thermal blanket over the winter. In early May 1994, they were wrapped and returned to the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young shrubs 20 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Mechanical breakage was common, particularly in regions 2 and 3.

*Region 1*

At L'Assomption, 5% of the plants died during each of the first two winters. Frost damage to the branch tips occurred in 50% and 9% of the specimens the second and third winters. The following winter, 9% of the shrubs had frost damage to the old wood and 18% had mechanical breakage.

One shrub died the first winter at St. Clotilde. No frost damage occurred at St. Hyacinthe during the trials.

*Region 2*

At Deschambault, 5% of the specimens died the first winter and 5% suffered frost damage to the branch tips. The following four winters, mechanical breakage was found in 21%, 100%, 58% and 25% of shrubs respectively.

At St. Foy, 40% and 92% of the shrubs suffered frost damage to the branch tips the first and fourth winters. The third winter, mechanical breakage was found in all the shrubs.

No frost damage was observed at La Pocatière.

*Region 3*

At Normandin, 58% of the shrubs had frost damage to the branch tips the last winter.

At Kapuskasing, mechanical breakage was observed in 8% of the shrubs the third and fourth winters.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

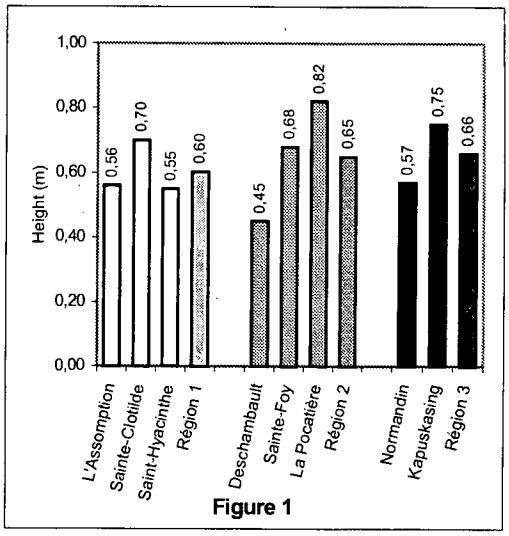


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

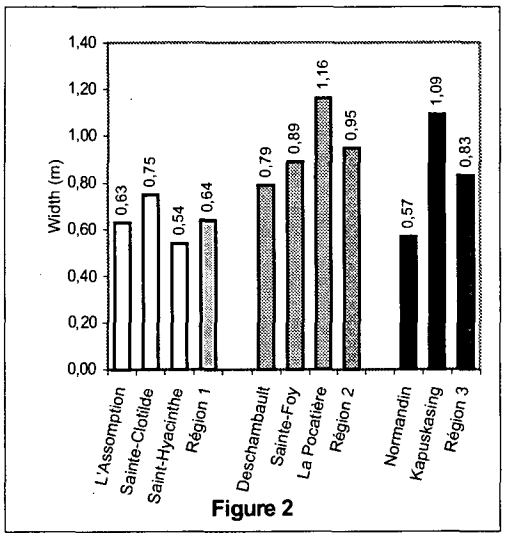


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

### Effect of pruning

Pruning to eliminate 40-50% of annual stem growth was carried out at St. Foy, Deschambault and Normandin to deal with damage from mechanical breakage. Only light pruning was required at St. Hyacinthe and L'Assomption.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

The tallest and widest plants at trial's end were produced at La Pocatière (zone 4a) and Kapuskasing (zone 2a). These results show conclusively that the variety can be produced in all the regions tested and that sites in the regions that are the coldest and with the most snow cover are at a greater advantage.

## HARDINESS EVALUATION

The variety is hardy to zone 2 according to the references consulted. In the trials, the plants behaved as expected. Mortality was null or occasional and occurred during the first few winters only, eliminating the weakest plants.

The cultivar can survive and be used as far as zone 2. It can also achieve its full ornamental potential as far as zone 2, setting aside damage from mechanical breakage.

## WRITTEN BY

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Jacques-André Rioux, Agr.
Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Euonymus nanus* var. *turkestanicus* Dieck., 1995-99**

| Trial site | No damage | Percentage breakdown of damage WINTER DAMAGE[a] | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 80 | 12 | | | 2 | | | 2 | | 4 | | 20 |
| St. Clotilde | 99 | | | | | | | 1 | | | | 1 |
| St. Hyacinthe | 100 | | | | | | | | | | | 0 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 57 | 1 | | | | | | 1 | | 41 | | 43 |
| St. Foy | 54 | 26 | | | | | | | | 20 | | 46 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 75 | 12 | | | | | | | | 13 | | 25 |
| Kapuskasing | 97 | | | | | | | | | 3 | | 3 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 4, 6, 7, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of *Euonymus nanus* var. *turkestanicus* Dieck. specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 10 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 89 | 32 | 33 | 16 | 8 |
| 021-040 | 50 | 21 | 27 | 64 | 0 | 85 | 0 | 0 | 0 | 0 | 11 | 68 | 58 | 75 | 75 |
| 041-060 | 35 | 68 | 63 | 36 | 82 | 10 | 60 | 17 | 50 | 42 | 0 | 0 | 9 | 9 | 17 |
| 061-080 | 5 | 11 | 10 | 0 | 18 | 0 | 40 | 75 | 50 | 50 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | 0 | 0 | 8 | 0 | 8 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 79 | 16 | 0 | 42 | 33 | 60 | 20 | 0 | 8 | 0 | 62 | 0 | 0 | 0 | 0 |
| 041-060 | 21 | 78 | 41 | 50 | 67 | 40 | 75 | 0 | 92 | 17 | 33 | 47 | 25 | 0 | 0 |
| 061-080 | 0 | 6 | 59 | 8 | 0 | 0 | 0 | 91 | 0 | 75 | 5 | 48 | 75 | 92 | 50 |
| 081-100 | - | - | - | - | - | 0 | 0 | 9 | 0 | 8 | 0 | 5 | 0 | 8 | 50 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 19 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 61 | 43 | 17 | 33 | 8 | 48 | 5 | 0 | 0 | 0 |
| 041-060 | 20 | 57 | 75 | 67 | 34 | 52 | 95 | 75 | 8 | 0 |
| 061-080 | 0 | 0 | 8 | 0 | 50 | 0 | 0 | 25 | 83 | 83 |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 9 | 17 |

Table 3: **Breakdown of *Euonymus nanus* var. *turkestanicus* Dieck. specimen by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 90 | 90 | 45 | 90 | 0 | 100 | 70 | 16 | 0 | 0 | 100 | 89 | 75 | 42 | 8 |
| 041-080 | 10 | 10 | 55 | 10 | 100 | 0 | 30 | 84 | 100 | 67 | 0 | 11 | 25 | 58 | 92 |
| 080-120 | - | - | - | - | - | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - |
| 121-140 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 95 | 63 | 0 | 0 | 0 | 100 | 10 | 0 | 8 | 0 | 100 | 5 | 0 | 0 | 0 |
| 041-080 | 5 | 37 | 83 | 92 | 59 | 0 | 90 | 83 | 92 | 17 | 0 | 95 | 50 | 0 | 0 |
| 080-120 | 0 | 0 | 17 | 8 | 41 | 0 | 0 | 17 | 0 | 83 | 0 | 0 | 50 | 92 | 75 |
| 121-140 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 8 | 25 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 67 | 41 | 25 | 17 | 95 | 33 | 0 | 0 | 0 |
| 041-080 | 0 | 33 | 59 | 66 | 83 | 5 | 67 | 100 | 0 | 8 |
| 080-120 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 100 | 50 |
| 121-140 | - | - | - | - | - | 0 | 0 | 0 | 0 | 42 |

# *HYDRANGEA PANICULATA* 'KYUSHU'

| | |
|---|---|
| **Family:** | Saxifragaceae |
| **English common name:** | Peegee hydrangea; Kyushu Hydrangea |
| **French common name:** | Hydrangée paniculé; Hydrangée 'Kyushu'; Hortensia |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub, with a bushy, rounded growth habit, can reach 2.00 m in height and 1.25 m in width. Its stems, thin and sparsely branching, reddish and downy when young, later turn brown and curve downward under the weight of flowers.

The rounded, globular, imbricated buds have 4 to 6 smooth, brown scales. This is a quick-growing cultivar.

The dense foliage is light green or dark green depending on the author consulted. The oval leaves, rounded or truncate at the base, acuminate at the apex, opposite or, more often, in whorls of 3, measure between 6.0 and 15.0 cm and half as wide. The lamina, finely dentate on the edges, is slightly downy on the reverse.

The flowers, clustered in long creamy white panicles, appear in August and last until the first frosts, at which time they turn pink, then bronze. Flowering is prolonged. Large conical panicles from 15.0 to 25.0 cm long spring from the tips of the one-year-old branches. The sterile flowers have 4 elliptical white sepals, which gradually turn pink.

The fruit is capsules of no real ornamental value.

The roots are fibrous and vary in number.

## ORIGIN AND DISTRIBUTION

The distribution of the species *H. paniculata* Siebold extends from eastern and southern China to Japan. It was discovered in 1874. *Hydrangea paniculata* 'Kyushu' stems from a seed collection by Collingwood at Ingram in Japan. The selection was done by the Kalmthout Arboretum in Belgium. The cultivar has been in the Bressingham catalogue since 1989.

## USE

**Ornamental:** This plant, whose attraction is its magnificent flowering, may be used in plantings or by itself.

## REQUIREMENTS

This plant prefers a medium moisture level, a sandy soil and relatively low pH. It is moderately resistant to de-icing salt.

Hydrangeas must be cut back in winter to obtain long stems with many flowers. Their roots lie close to the surface and they are quite easily planted.

## DISEASES AND INSECTS

Hydrangeas are subject to the fungal diseases oidium or powdery mildew (*Erysiphe* sp.) and grey mould (*Botrytis*).

The red-headed flea beetle (*Systena frontalis*) may, in some years, be a pest that is very harmful to hydrangeas' development.

## PROPAGATION

**Cutting:** Cuttings taken in summer, from June to August, on green shoots, are planted in cold-frames. Rooting is very quick, and the rooted seedlings should be left for a year without being transplanted, as the risk of loss is acute. This propagation process is well suited to sterile varieties with large inflorescences. The rooted cuttings grow slowly, rarely getting taller than 30 cm the first year. Shading, drenching and aeration need to be done with the

greatest care in the case of cuttings that will produce large-leaved plants, which for that very reason can wilt quickly. Excessive drenchings will cause immediate rot.

**Layering:** Soil layering is done by simply bending shoots to the ground in the spring so that only the tips are showing. The soil should be peaty or friable. The following spring, the layers can be split off and potted.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant :** A gift from Quebec Multiplants, St. Apollinaire, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Four hundred 20-cm cuttings were taken on July 12, 1991 from three-year-old parent plants 1.3 m tall. They were soaked in a 50% solution of 4000-ppm IBA and ethanol in multipots filled with perlite and Promix® (1:1; v:v), then misted for 30 seconds every 6 minutes. The seedlings were placed in shaded beds on August 15; the rooting rate was 75%. The plants were potted on May 11, 1992 in Fertil Pots® and grown in outdoor beds. During the summers of 1992 and 1993 they were fertilized every week with a soluble fertilizer (20-20-20 with nitrogen 400 pm). They were again overwintered in beds protected by an Astro-Foam® winter cover and panels; the survival rate was 100%. They were packed and shipped in May 1994.

**Inclusion in testing network:** Young 20-cm seedlings were planted at eight trial sites throughout Quebec and north-eastern Ontario. Their winter survival and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-1999)

### Winter damage

The frequency of winter damage observed over five years for this cultivar is shown in Table 1. Details of the main damage that occurred each winter at each of the sites are shown below.

The most severe damage occurred in Kapuskasing, where there were hard frosts right down to the ground.

*Region 1*

In L'Assomption, one seedling died the first winter. Frost damage was observed on stem tips the first four winters, on 95, 100, 73 and 27% of the seedlings. The third winter, 27% of them froze down to the snow cover and 73% suffered mechanical breakage the fourth winter.

In St. Clotilde, 5, 10 and 20% of the seedlings died the first, third and fourth winters, while 32, 61, 54 and 100% had frost damage to their stem tips the first three winters and the last. In addition, 39 and 37% were damaged on the previous year's shoots the second and third winters.

In St. Hyacinthe, two seedlings died during the first two winters, while 87, 60 and 10% suffered frost damage on stem tips the first three winters.

*Region 2*

In Deschambault, 100 and 42% of the seedlings had mechanical breakage the third and fourth winters. Frost damage to stem tips was observed on 58, 100, 58 and 100% of them the first two and the last two winters.

In St. Foy, 5% of the seedlings suffered frost damage to their stem tips the second winter and all suffered mechanical breakage the following winter.

In La Pocatière, 33% of the seedlings suffered frost damage to their stem tips the third winter and mechanical breakage was observed on 8 and 25% of them the last two winters.

*Region 3*

In Normandin, 43% of the seedlings froze down to the snow cover the second winter. The following winter, 33% had frost damage to the previous year's shoots and the same percentage suffered mechanical breakage. The last

winter, one third of the seedlings had damage to their stem tips, and another one third to old wood.

In Kapuskasing, the first winter, 37% of the seedlings had freezing of the previous year's shoots, 53% froze down to the ground, and 10% died. All froze down to the ground the following winter. The third and fourth winters, 17% of the seedlings had frost damage to their stem tips and 83% of them had freezing of the previous year's shoots. The last winter, all seedlings had damage to their stem tips.

### Height and width growth

Figures 1 and 2 show the average height and width of plants after five years of trials at each site in each of the regions.

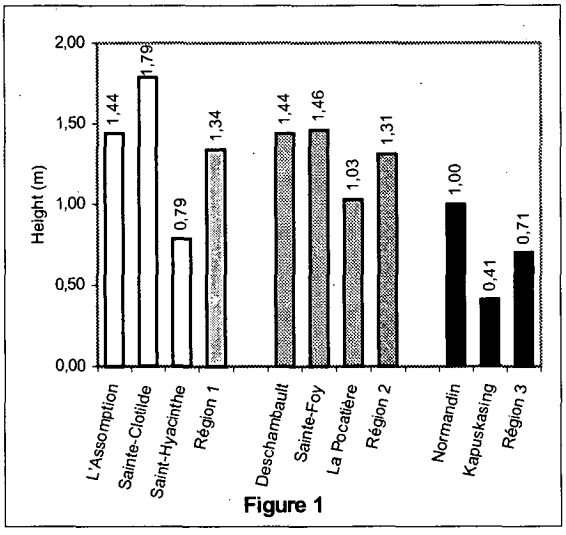


**Figure 1.** Average height of shrubs at trial's end for each of the sites and each of the three regions

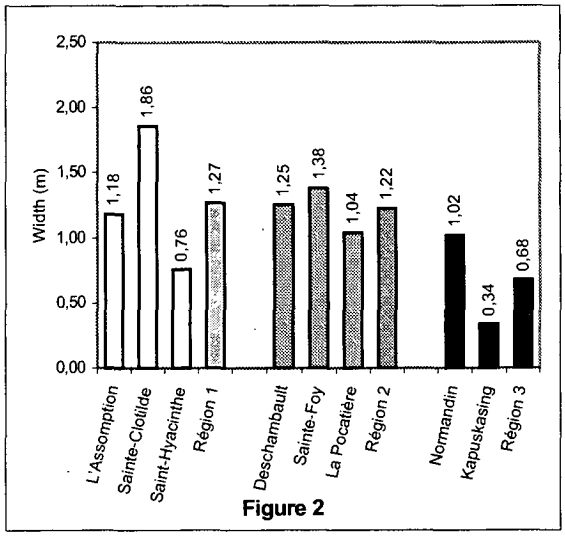


**Figure 2.** Average width of shrubs at trial's end for each of the sites and each of the three regions

### Effect of pruning

In St. Clotilde and La Pocatière the growth in height was stable and continuous. In L'Assomption, Normandin, Deschambault, St. Foy and St. Hyacinthe, pruning to eliminate between 20 and 50% of the annual growth was done several times. The pruning was more severe in Kapuskasing, i.e. by about 50 to 90% of the annual growth, sometimes levelling the seedlings to within 1 cm of the ground.

### Flowering

Flowering in this cultivar is spread over a period of about 125 days in the warmest zones and when the plants have not been too much weakened by frost the preceding winter. In zone 5, the first flowers appeared around June 30,whereas at the sites in zone 4b, flowering began between July 15 and August 10. In zone 4a, flowering started about the first week in August and lasted from 75 to 90 days.

At the sites in zone 2, the flowering period was much shorter. In zone 2b, flowers were present from the end of August to the end of September, and the date on which flowering began varied a lot from one year to the next

(between July 15 and September 2). It lasted between 25 and 30 days on average. In zone 2a, little or no flowering occurred.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category at each test site, for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height or width.

This hydrangea can be grown in climatic regions where snow protects the young plants, i.e. almost all climatic zones in the trial.

The tallest plants were observed at the warmest site, namely the one in zone 5b.

## HARDINESS EVALUATION

In Kapuskasing (zone 2a), most seedlings died during the evaluation period. This cultivar's hardiness zone rating in the literature is between 2b and 3b. The trial results confirm, therefore, that it can survive in zone 2b, with the proviso that seedlings in the warmest zone, where snow does not offer adequate protection during the coldest months, may succumb during the first few winters.

Its use potential extends into zone 2b, though the flowering period will be shorter in this zone.

The full ornamental potential was not achieved in the climatic zones of the trial.

## WRITTEN BY

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**Table 1.** **Frequency of winter damage observed on *Hydrangea paniculata* 'Kyushu', 1995-1999**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | damage |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 20 | 59 | | | | 6 | | 1 | | 14 | | 80 |
| St. Clotilde | 29 | 50 | | 15 | | | | 6 | | | | 71 |
| St. Hyacinthe | 66 | 32 | | | | | | 2 | | | | 34 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 8 | 63 | | | | | | | | 29 | | 92 |
| St. Foy | 79 | 1 | | | | | | | | 20 | | 21 |
| La Pocatière | 87 | 6 | | | | | | | | 7 | | 13 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 65 | 7 | | 6 | 7 | 8 | | | | 7 | | 35 |
| Kapuskasing | 0 | 27 | | 41 | | | 30 | 2 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3, 9 or 11 was sustained by the plants in the trial.

Table 2. Breakdown of specimens of *Hydrangea paniculata* 'Kyushu' by saleable height category, 1994-1998

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 11 | 19 | 18 | 0 | 100 | 0 | 0 | 0 | 0 | 69 | 60 | 20 | 10 | 0 |
| 051-100 | 0 | 89 | 45 | 82 | 0 | 0 | 55 | 0 | 0 | 0 | 31 | 40 | 80 | 90 | 100 |
| 101-150 | 0 | 0 | 36 | 0 | 63 | 0 | 45 | 91 | 90 | 25 | - | - | - | - | - |
| 151-200 | 0 | 0 | 0 | 0 | 37 | 0 | 0 | 9 | 10 | 75 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 100 | 17 | 0 | 0 | 0 | 100 | 25 | 50 | 0 | 0 | 100 | 100 | 84 | 50 |
| 101-150 | 0 | 0 | 83 | 100 | 75 | 0 | 0 | 75 | 50 | 67 | 0 | 0 | 0 | 16 | 50 |
| 151-200 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 19 | 0 | 0 | 0 | 100 | 100 | 100 | 50 | 83 |
| 051-100 | 0 | 81 | 42 | 50 | 58 | 0 | 0 | 0 | 50 | 17 |
| 101-150 | 0 | 0 | 58 | 50 | 42 | - | - | - | - | - |
| 151-200 | - | - | - | - | - | - | - | - | - | - |

Table 3. Breakdown of specimens of *Hydrangea paniculata* 'Kyushu' by saleable width category, 1994-1998

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 59 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 100 | 20 | 0 | 10 |
| 051-100 | 0 | 41 | 73 | 100 | 0 | 0 | 78 | 18 | 0 | 0 | 0 | 0 | 80 | 100 | 80 |
| 101-150 | 0 | 0 | 27 | 0 | 100 | 0 | 22 | 64 | 70 | 0 | 0 | 0 | 0 | 0 | 10 |
| 151-200 | - | - | - | - | - | 0 | 0 | 18 | 30 | 100 | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 100 | 75 | 25 | 0 | 0 | 89 | 0 | 42 | 0 | 0 | 100 | 92 | 8 | 50 |
| 101-150 | 0 | 0 | 25 | 75 | 100 | 0 | 11 | 100 | 59 | 92 | 0 | 0 | 8 | 92 | 50 |
| 151-200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 100 | 75 | 33 | 92 |
| 051-100 | 0 | 52 | 92 | 67 | 0 | 0 | 0 | 25 | 67 | 8 |
| 101-150 | 0 | 48 | 8 | 33 | 50 | - | - | - | - | - |
| 151-200 | - | - | - | - | - | - | - | - | - | - |

# *HYDRANGEA PANICULATA* 'UNIQUE'

| | |
|---|---|
| **Family:** | Saxifragaceae |
| **English common name:** | Unique Peegee hydrangea |
| **French common name:** | Hydrangée paniculé 'Unique' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub, with a bushy, rounded growth habit, can reach 2.0 m in height. Its numerous stems, thin and sparsely branching, are reddish and downy when young, but later turn brown. This is a quick-growing cultivar.

The dense, light green, shiny foliage is composed of opposite and often verticillate leaves, in groups of 3, oval, truncate at the base, acuminate and measuring between 6.0 and 15.0 cm in length and half as wide. The lamina, finely dentate on the edges, is slightly downy on the reverse.

The narrow inflorescences form panicles 15 to 25 cm long, springing from the tips of the one-year branches. They include white flowers, both fertile and sterile, that bloom in July and subsequently turn pink and purple. The flowering period lasts until the first frosts.

The root system is fibrous and shallow.

## ORIGIN AND DISTRIBUTION

The distribution of the species *H. paniculata* Siebold, discovered in 1874, extends from eastern and southern China to Japan.

The 'Unique' cultivar originated with a seed collection by Collingwood at Ingram in Japan. The selection was done by the Kalmthout Arboretum in Belgium. The cultivar has been in the Bressingham catalogue since 1989.

## USE

**Ornamental:** This plant, whose attraction is its magnificent flowering, may be used in plantings or by itself.

## REQUIREMENTS

This hortensia prefers rich, cool soil, but is evidently able to adapt to clayey soil. It is tolerant of damp soils and resistant to drought. This full-sun cultivar is quite tolerant of urban conditions. Hydrangeas must be cut back in winter to obtain long stems with many flowers. Their roots lie close to the surface and they are quite easily planted.

## DISEASES AND INSECTS

Hydrangeas' foliage is subject to the fungal diseases oidium or powdery mildew (*Erysiphe* sp.) and grey mould (*Botrytis*).

The redheaded flea beetle (*Systena frontalis*) may, in some years, be very harmful to the development of hydrangeas.

## PROPAGATION

**Cutting:** Cuttings taken in summer on green shoots and planted in coldframes take root very quickly but then grow very slowly. Transplantation of cuttings during the first year is not recommended, as losses are greater.

**Layering:** Soil layering, done in the spring, produces a good rooting rate. To promote quicker development of the root system, the soil must be peaty or specially prepared. The following spring, the layers are separated and processed as is done in the nursery.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** A gift from Québec multiplants, St. Apollinaire, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Two hundred and eighty 20-cm cuttings were taken on July 9, 1991 from parent plants 4 years old, measuring 1.30 m high and 1.10 m wide. They were soaked in a solution of IBA 4000 ppm and 50% ethanol. They were placed in multipots filled with a medium of perlite and Promix® (1:1; v:v), then misted for 30 seconds every 5 minutes. Rooted cuttings were placed in shaded beds on August 15; the rooting rate was 95%. The seedlings were grown in outdoor beds during the summer of 1992 and fertilized every week until September 15 with a soluble fertilizer (20-20-20, 400 ppm nitrogen). They were potted on August 28, 1992 in Fertil Pots® and wintered over in coldframes. The winter survival rate was 100%. They were packed and shipped in May 1993.

**Inclusion in testing network:** Young plants 32 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-1998)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of main damage that occurred each winter in each of sites is shown below.

The frost damage most often observed was to stem tips.

*Region 1*

In L'Assomption, one seedling died the first and third winters. Frost damage to stem tips was observed each winter on 95, 100, 83, 100 and 36% of the seedlings. The third winter, 8% froze down to the ground. The last winter, 10% were damaged by the weight of snow.

In St. Clotilde, half of the seedlings suffered frost damage on the previous year's shoot and the other half had damage to old wood the first winter. All had stem-end damage the second winter. The following winter, 67% froze to the level of the previous year's shoots. (Data not collated the last two winters.)

Frost damage to the tips of stems occurred on 57, 33 and 100% of the seedlings the first two winters and the fourth in St. Hyacinthe. In addition, there was freezing of the above-ground, above-snow-cover portion of stems on 43 and 33% of the seedlings the first and last winters.

*Region 2*

In Deschambault, 52 and 95% of the seedlings had frost damage to their stem tips the first two winters. In addition, 48% suffered damage on the previous year's shoot the first winter. Subsequently, 100 and 83% sustained mechanical breakage the last two winters.

In St. Foy, there was frost damage to stem tips on 33 and 100% of the seedlings the first two winters. Damage to old wood occurred on 67% the first winter. All of them had mechanical breakage the fourth winter.

In La Pocatière, one seedling died the fourth winter. Frost damage to stem tips was observed on 14, 33, 17 and 63% of the seedlings the first winter and the last three. In addition, frost damage to the previous year's shoots occurred on 86, 42 and 8% of them the first, third and fourth winters. Frost damage to the whole above-ground portion of stems (17 and 8%) and the portion located above the snow cover (8%) was observed the third and/or fourth winter. In addition, 8 and 36% sustained mechanical breakage the last two winters.

*Region 3*

In Normandin, 10% of the seedlings died, 65% suffered frost damage to their stem tips and 25% froze down to the snow cover the first winter. Subsequently, only mechanical breakage occurred the fourth winter on all seedlings.

In Kapuskasing, 24 and 12% of the seedlings died the first two winters. Frost damage to the previous year's shoots was observed on 25, 73 and 55% of them the second winter and the last two. Each winter, 76, 19, 100, 27, and 45% of

the seedlings froze right to the ground. In addition, 44% suffered frost damage to their stem tips the second winter.

### Height and width growth

Figures 1 and 2 show the average height and width of plants after five years of trials at each site in each of the regions.

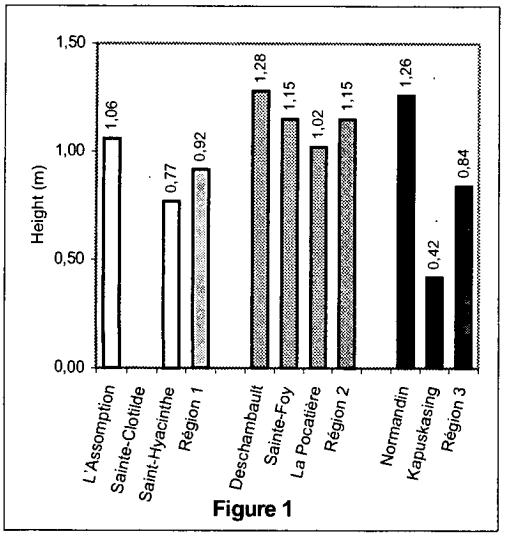


**Figure 1.** Average height of shrubs at the conclusion of the trial at each of the sites and in each of the three regions.

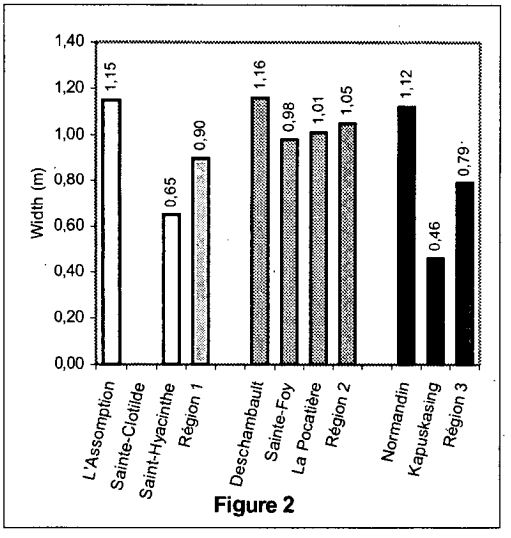


**Figure 2.** Average width of shrubs at the conclusion of the trial at each of the sites and in each of the three regions.

### Effect of pruning

The seedlings were cut back by 10 to 60% of their height, several times, at all sites except St. Clotilde, where no pruning was necessary. More drastic pruning was done on three occasions at the Normandin site, reducing the seedlings' height by 70 to 90%. In Kapuskasing, they were cut back twice, to within 1 cm of the ground.

### Flowering

Flowering was observed at all sites in region 1, beginning in late July or early August, depending on the site and the year, and continuing till late in the season (3 months). In region 2, the first flowers appeared between mid-July and mid-September, depending on the pruning carried out, the site and the year.

At the sites in the coldest region, only a few seedlings flowered in Normandin during the third and fourth years, between mid-August and mid-September. No flowering was observed in Kapuskasing.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category at each test site, for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height or width.

Annual growth is very variable from one year to the next, as winter damage reduces the seedlings' height each spring. After three years of cultivation, more than 80% of the seedlings in L'Assomption, St. Clotilde, Deschambault, St. Foy and Normandin were taller than 81 cm. In La Pocatière they reached a comparable height after the fifth year of cultivation, whereas in St. Hyacinthe and Kapuskasing they remained smaller.

This cultivar can be grown at sites where snow is abundant and falls early in the season, as well as at the

L'Assomption and St. Clotilde sites. Soil conditions in St. Hyacinthe, where the soil is clayey, contributed to the poor performance of seedlings at that site.

## HARDINESS EVALUATION

The hardiness zone rating of this cultivar is 2b or 3b depending on the reference consulted. However, a number of seedlings of this hydrangea survived at the Kapuskasing sites, as the weakest plants succumbed during the first two winters. The survival zone rating could be given as 2, with the proviso that, whatever the climatic zone, the weakest specimens and those having the least foothold will succumb during the first winters.

Winter damage was so severe that the seedlings had to be cut back each spring to the level of the snow cover or close to the soil surface. And in Normandin, even though seedlings grew quite tall, the sporadic flowering obtained detracts from the ornamental usefulness of this cultivar, which was developed for its spectacular flower. For that reason, use of this cultivar is recommended only in zone 4 and warmer zones.

The young plants did not achieve their full ornamental potential at the trial sites.

## WRITTEN BY

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Table 1. Frequency of winter damage observed on *Hydrangea paniculata* 'Unique', 1994-1998

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | damage |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 10 | 83 | | | | | 2 | 3 | | 2 | | 90 |
| St. Clotilde | 10 | 33 | | 40 | 17 | | | | | | | 90 |
| St. Hyacinthe | 47 | 38 | | | | 15 | | | | | | 53 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 24 | 29 | | 10 | | | | | | 37 | | 76 |
| St. Foy | 40 | 20 | | 7 | 13 | | | | | 20 | | 60 |
| La Pocatière | 20 | 26 | | 27 | | 1 | 5 | 2 | | 19 | | 80 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 60 | 13 | | | | 5 | | 2 | | 20 | | 40 |
| Kapuskasing | 0 | 9 | | 31 | | | 53 | 7 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3, 9 or 11 was sustained by the plants in the trial.

Table 2. **Breakdown of specimens of *Hydrangea paniculata* 'Unique' by saleable height category, 1993-1997**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 5 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | - | 91 | 29 | 0 | 0 | 0 |
| 041-080 | 95 | 85 | 17 | 0 | 0 | 50 | 86 | 0 | 0 | - | 9 | 71 | 100 | 33 | 58 |
| 081-120 | 0 | 15 | 83 | 18 | 91 | 0 | 14 | 100 | 0 | - | 0 | 0 | 0 | 67 | 42 |
| 121-160 | 0 | 0 | 0 | 82 | 9 | 0 | 0 | 0 | 100 | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 24 | 0 | 0 | 0 | 0 | 48 | 5 | 0 | 0 | 0 | 33 | 0 | 0 | 9 | 0 |
| 041-080 | 76 | 100 | 8 | 0 | 0 | 52 | 91 | 0 | 0 | 0 | 67 | 57 | 42 | 25 | 10 |
| 081-120 | 0 | 0 | 92 | 50 | 42 | 0 | 4 | 100 | 17 | 8 | 0 | 43 | 58 | 67 | 90 |
| 121-160 | 0 | 0 | 0 | 50 | 58 | 0 | 0 | 0 | 83 | 91 | 0 | 0 | 0 | 9 | 0 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 75 | 6 | 0 | 0 | 0 | 43 | 75 | 64 | 36 | 45 |
| 041-080 | 25 | 88 | 17 | 0 | 0 | 57 | 25 | 36 | 64 | 55 |
| 081-120 | 0 | 6 | 83 | 58 | 25 | - | - | - | - | - |
| 121-160 | 0 | 0 | 0 | 42 | 75 | - | - | - | - | - |

* Data not collected in 1997.

Table 3. **Breakdown of specimens of *Hydrangea paniculata* 'Unique' by saleable width category, 1993-1997**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 96 | 15 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | - | 100 | 71 | 0 | 0 | 0 |
| 041-080 | 4 | 85 | 25 | 0 | 0 | 5 | 79 | 0 | 0 | - | 0 | 29 | 100 | 67 | 83 |
| 081-120 | 0 | 0 | 75 | 46 | 82 | 0 | 21 | 63 | 0 | - | 0 | 0 | 0 | 33 | 17 |
| 121-160 | 0 | 0 | 0 | 54 | 18 | 0 | 0 | 37 | 100 | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 86 | 5 | 0 | 0 | 0 | 95 | 10 | 0 | 0 | 0 | 100 | 0 | 0 | 17 | 0 |
| 041-080 | 14 | 90 | 0 | 0 | 0 | 5 | 90 | 83 | 0 | 41 | 0 | 95 | 0 | 42 | 10 |
| 081-120 | 0 | 5 | 100 | 25 | 58 | 0 | 0 | 17 | 75 | 59 | 0 | 5 | 100 | 16 | 63 |
| 121-160 | 0 | 0 | 0 | 75 | 42 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 25 | 27 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 85 | 50 | 0 | 0 | 0 | 100 | 100 | 36 | 18 | 9 |
| 041-080 | 15 | 50 | 25 | 8 | 0 | 0 | 0 | 64 | 82 | 91 |
| 081-120 | 0 | 0 | 75 | 83 | 67 | - | - | - | - | - |
| 121-160 | 0 | 0 | 0 | 9 | 33 | - | - | - | - | - |

* Data not collected in 1997

# *HYDRANGEA SERRATA*

(THUNB.) MAK.

| | |
|---|---|
| **Family:** | Saxifragaceae |
| **English common name:** | Japanese hydrangea, Tea-of-Heaven Hortensia |
| **French common name:** | Hydrangée du Japon, Hortensia commun |
| **Synonym:** | *Hydrangea macrophylla* ssp. *serrata* |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This small shrub with a growth habit rounded may reach 1.0 m in height.

Its fine, glabrous branches bear opposite, oval, acuminate leaves, finely dentate and glabrous, measuring 5 to 15.0 cm long and 3.0 to 6.0 cm wide, with a petiole of from 1.0 to 3.0 cm. It has showy green leaves with red veins and borders.

The inflorescences, made up of fertile flowers, lavender-coloured at the centre, and sterile flowers with large pink sepals around the circumference, form umbels 4.0 to 8.0 cm wide. Occasionally, a few fertile white flowers with petals 2.0 to 3.0 mm long will form. The inflorescences are found at the tips of leafy shoots that appear on the stems from a previous year. Flowering occurs from mid-July until frost.

The fruits, capsules with 5 locules, are 2.5 to 6.0 mm in diameter.

## ORIGIN AND DISTRIBUTION

The word 'Hydrangea' comes from the Greek words 'hydro' (water) and 'aggeion' (vase) and refers to the shape of the fruits.

The typical species grows in coastal Japan south of Tokyo and on the neighbouring islands and is not directly related in its origin to the numerous cultivars of garden Hortensias. This shrub, with flat inflorescences and fertile pink or blue flowers surrounded by a few sterile, petaloid flowers, was introduced into Europe only in 1917. Modern Hortensia cultivars are probably derived from the 'Otaksa' variety grown in Japanese gardens, which was described by Thunberg under the name *Viburnum macrophyllum* and imported into France in 1790.

## USE

**Ornamental:** This magnificent species may be used by itself or in a massed planting for its summer flowering and its colourful foliage.

## REQUIREMENTS

No reference was found in the literature for this species.

## DISEASES AND INSECTS

Powdery mildew or oidium (*Erysiphe* sp.) and grey mould (*Botrytis*) may affect hydrangeas' foliage.

The redheaded flea beetle (*Systena frontalis*) is a pest that may in some years be very harmful to the development of hydrangeas.

## PROPAGATION

**Cutting:** Cuttings taken in summer on green shoots and planted in coldframes take root very quickly, but then grow very slowly. It is recommended that cuttings not be transplanted the first year, as failure is more likely.

**Layering:** Soil layering in the spring produces a good rooting rate. To promote quicker development of the root system, the soil must be peaty or specially prepared. The following spring, the layers are separated and processed as in the nursery.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Three hundred and twenty 20-cm cuttings were taken on July 9, 1991 from parent plants 4 years old measuring 100 cm in height and 50 cm in width. They were soaked in a 4000-ppm IBA solution and 50% ethanol. They were placed in multipots filled with perlite and Promix® (1:1; v:v), then misted for 30 seconds every 5 minutes. The rooted cuttings were placed in shaded beds on August 15; the rooting rate was 100%. The seedlings were potted up on August 27 in Fertil Pots.® They were wintered over in beds protected by coldframes and panels. The winter survival rate was 90%. During the summer of 1992 they were grown in outdoor beds and fertilized every week until September 15 with a soluble fertilizer (20-20-20, with 400 ppm of nitrogen). They were again wintered over in beds protected by coldframes and panels. They were wrapped and shipped in May 1993.

**Inclusion in testing network:** Young plants 24 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-1998)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of main damage that occurred each winter at each of the sites is shown below.

*Region 1*

In L'Assomption, seedlings died the first two winters and the fourth, eliminating 24, 6 and 22% of the specimens. Frost damage occurred each winter on all seedlings: freezing down to the snow cover was seen the first three winters on 33, 94 and 44% of them, freezing of the above-ground portion affected 29 and 43% the first and last winters, freezing of stem tips occurred on 14, 56 and 14% the first, third and fourth winters, and freezing of the previous year's shoots damaged 78 and 43% the last two winters.

In St. Clotilde, 76 and 20% of the seedlings died the first two winters. The four seedlings that survived the trial suffered frost damage to old wood, on the part of the stem that was above the snow cover, down to the ground, or on stem tips during the first three winters. No data were collated the last two winters.

In St. Hyacinthe, 68 and 50% of the seedlings died during the first two winters and the surviving seedlings suffered frost damage to the entire above-ground portion of their stems the first winter. No damage occurred during the third and fifth winters to the four surviving seedlings, but two shrubs had damage to their stem tips and two others froze down to the ground the fourth winter.

*Region 2*

In Deschambault, 10% of the seedlings died the first winter. Frost damage to stem tips was observed each winter on 28, 32, 33, 67 and 83% of the seedlings, as well as frost damage on the previous year's shoots in 24, 21, 67, 33 and 17% of cases. The first two winters, 38 and 10% of the seedlings froze down to the ground.

In St. Foy, the first winter, one seedling died and there was damage to all the other seedlings, affecting 19% of them on stem tips, 52% on the previous year's shoots and 24% on old wood. All the seedlings were damaged on the previous year's shoots the second winter and by the weight of the snow the fourth winter.

In La Pocatière, 14% of the seedlings died the first winter. Frost damage down to the snow cover occurred the first three winters on 5, 5 and 9% of the seedlings and damage to the whole above-ground portion on 5, 11 and 18%. In addition, 9 and 72% of them showed frost damage to the

previous year's shoots the first and third winters and 52 and 63% suffered frost damage to stem tips the first and fourth winters, while 36% were damaged by the weight of snow the last two winters.

*Region 3*

In Normandin, 55% of the seedlings died the first winter. There was frost damage to the stem tips of 45% of the seedlings the first and third winters. The entire above-ground portion of other seedlings froze the third winter. Damage in the form of mechanical breakage was observed on 55% of the seedlings the fourth winter.

In Kapuskasing, 65, 57 and 67% of the seedlings died during the first three winters, the surviving seedlings having frozen down to the ground. Only one seedling survived the trial.

**Height and width growth**

Figures 1 and 2 show the average height and width of plants after five years of trials at each site in each of the regions.

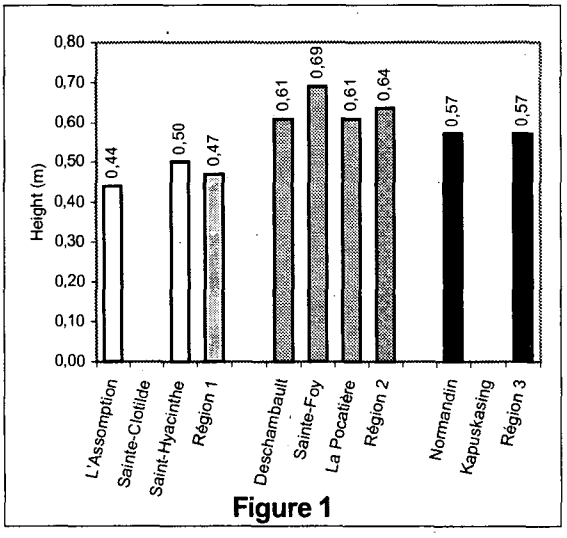


**Figure 1.** Average height of shrubs at the conclusion of the trial at each of the sites and in each of the three regions.

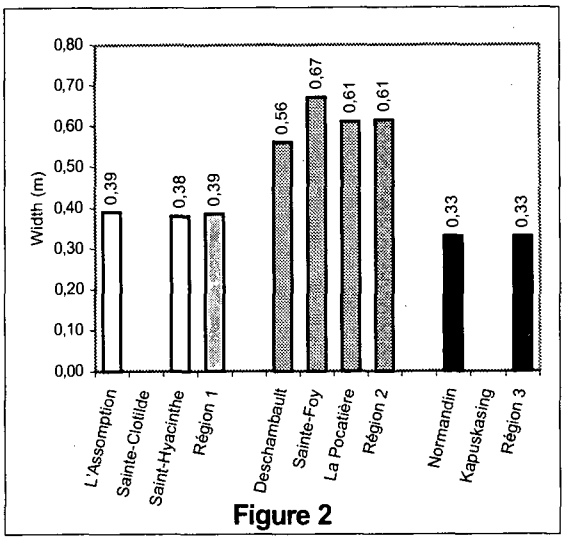


**Figure 2.** Average width of shrubs at the conclusion of the trial at each of the sites and in each of the three regions.

**Effect of pruning**

The seedlings were cut back to ground level twice at the Normandin site and thrice at the Kapuskasing site. Pruning that removed 30 to 70% of the seedlings' height was done each spring at all sites, except St. Clotilde, where no pruning was necessary.

**Flowering**

Only sparse and scattered flowering was observed at the sites in region 1. Seedlings did not flower until late in the season in L'Assomption. In region 2, the first flowers opened between July 15 and 31 and, in exceptional cases, in August. Flowering lasted 1 to 2 months, depending on the year and the site.

At sites in the coldest region, in Normandin, only three seedlings flowered during the second season, and only for four weeks in July. The surviving seedlings were too badly damaged thereafter.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category at each test site, for the final height and width obtained at the end of each year. Nursery growers

will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height or width.

Annual plant growth is very variable from one year to the next, as winter damage reduces the height each spring. After two years of cultivation, 81% of the seedlings in L'Assomption and more than 53% of those in Deschambault and La Pocatière were taller than 41 cm (between 41 and 60 cm). The seedlings in St. Clotilde, St. Foy and La Pocatière reached a comparable height after three years.

This species suffered heavy mortality at sites in Region 1 as well as in Normandin and Kapuskasing. Growing this species is especially recommended at sites where snow is abundant and falls early in the season. Preferably, plants of this species should be grown in climatic zone 4; elsewhere, a suitable winter cover will be needed.

## HARDINESS EVALUATION

This cultivar is rated as hardy in zone 6 according to the references consulted. However, this hydrangea survived at sites in climatic zone 4, the weakest plants having succumbed during the first winters. Its survival zone rating is 6, without snow cover, and 2b with much snow cover. Throughout Quebec, however, it is apt to succumb if winter protection is inadequate.

Winter damage is so extreme that the seedlings have to be cut back each spring to the level of the snow cover or close to the ground. Even though the species can grow as high as 1.0 m, none of the Normandin seedlings reached that height during the trial. The use rating for this species is zone 4b, as the seedlings did not flower in zone 2b.

The young plants' full ornamental potential was not achieved at the trial sites.

**WRITTEN BY**

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Christine Galipeau, Biol.

Table 1. **Frequency of winter damage observed on *Hydrangea serrata* (Thunb.) Mak., 1994-1998**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | damage |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 16 | 25 | | | | 34 | 15 | 10 | | | | 84 |
| St. Clotilde | 0 | 27 | | 33 | 3 | 4 | 1 | 32 | | | | 100 |
| St. Hyacinthe | 50 | 10 | | | | | 15 | 23 | | 2 | | 50 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 7 | 49 | | 32 | | | 10 | 2 | | | | 93 |
| St. Foy | 20 | 10 | | 45 | 4 | | | 1 | | 20 | | 80 |
| La Pocatière | 32 | 23 | | 16 | | 4 | 7 | 4 | | 14 | | 68 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 50 | 18 | | | | | 11 | 11 | | 10 | | 50 |
| Kapuskasing | 0 | | | | | | 53 | 47 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3 or 9 was sustained by the plants in the trial.

**Table 2.** **Breakdown of specimens of *Hydrangea serrata* (Thunb.) Mak. by saleable height category, 1993-1997**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 5 | 7 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | - | 5 | 25 | 25 | 0 | 0 |
| 021-040 | 90 | 12 | 22 | 0 | 43 | 95 | 80 | 0 | 0 | - | 95 | 75 | 75 | 0 | 25 |
| 041-060 | 5 | 81 | 67 | 11 | 43 | 5 | 0 | 100 | 0 | - | 0 | 0 | 0 | 75 | 75 |
| 061-080 | 0 | 0 | 11 | 89 | 14 | 0 | 0 | 0 | 67 | - | 0 | 0 | 0 | 25 | 0 |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 33 | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 5 | 21 | 0 | 0 | 0 | 5 | 5 | 0 | 0 | 0 | 9 | 6 | 0 | 0 | 0 |
| 021-040 | 95 | 26 | 8 | 0 | 0 | 90 | 70 | 0 | 0 | 0 | 91 | 33 | 0 | 0 | 9 |
| 041-060 | 0 | 53 | 42 | 8 | 0 | 5 | 25 | 17 | 0 | 8 | 0 | 55 | 27 | 18 | 18 |
| 061-080 | 0 | 0 | 50 | 92 | 58 | 0 | 0 | 50 | 17 | 92 | 0 | 6 | 73 | 55 | 73 |
| 081-100 | 0 | 0 | 0 | 0 | 42 | 0 | 0 | 33 | 67 | 0 | 0 | 0 | 0 | 27 | 0 |
| 101-120 | - | - | - | - | - | 0 | 0 | 0 | 16 | 0 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 10 | 0 | 0 | 0 | 0 | 15 | 71 | 100 | 100 | - |
| 021-040 | 90 | 78 | 11 | 0 | 0 | 85 | 29 | 0 | 0 | - |
| 041-060 | 0 | 22 | 78 | 78 | 78 | - | - | - | - | - |
| 061-080 | 0 | 0 | 11 | 22 | 22 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

* Data not collected in 1997.

Table 3. **Breakdown of specimens of *Hydrangea serrata* (Thunb.) Mak. by saleable width category, 1993-1997**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 81 | 18 | 0 | 0 | 0 | 100 | 20 | 0 | 0 | - | 96 | 87 | 25 | 0 | 25 |
| 021-040 | 19 | 68 | 34 | 0 | 57 | 0 | 80 | 67 | 33 | - | 4 | 13 | 75 | 75 | 0 |
| 041-060 | 0 | 14 | 66 | 100 | 43 | 0 | 0 | 33 | 33 | - | 0 | 0 | 0 | 25 | 75 |
| 061-080 | - | - | - | - | - | 0 | 0 | 0 | 34 | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 57 | 5 | 0 | 0 | 0 | 100 | 35 | 0 | 0 | 0 | 86 | 17 | 0 | 0 | 0 |
| 021-040 | 43 | 79 | 41 | 8 | 0 | 0 | 55 | 8 | 0 | 0 | 14 | 66 | 0 | 0 | 0 |
| 041-060 | 0 | 16 | 59 | 67 | 67 | 0 | 10 | 75 | 25 | 41 | 0 | 17 | 90 | 18 | 28 |
| 061-080 | 0 | 0 | 0 | 25 | 33 | 0 | 0 | 17 | 75 | 59 | 0 | 0 | 10 | 82 | 72 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 95 | 33 | 0 | 0 | 0 | 80 | 71 | 66 | 100 | - |
| 021-040 | 5 | 67 | 78 | 34 | 34 | 20 | 29 | 34 | 0 | - |
| 041-060 | 0 | 0 | 22 | 66 | 66 | - | - | - | - | - |
| 061-080 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - |

* Data not collected in 1997.

# *HYPERICUM KALMIANUM* L.

| | |
|---|---|
| **Family:** | Hypericaceae |
| **English common name:** | Kalm's St. John's Wort |
| **French common name:** | Millepertuis de Kalm |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This small bushy shrub, with semi-evergreen leaves, has a rounded growth habit, like a little mound. It may reach 1.0 m high and 0.9 m wide. It is slow-growing.

The branches and twigs are upright and squarish in section. The bark at the base of the stems eventually sloughs off. New branches are glabrous.

The foliage is light green above, silver-blue below. The simple, opposite leaves, linear and sessile, are 2.5 to 5.0 cm long and 3.0 to 9.0 mm wide. They have translucent glands at the base.

Abundant flowering begins in July and lasts until August or September. The plants are covered with bunches of bright yellow flowers with visible stamens. They are clustered 3 by 3 in cymes at the stem tips and the axils of the terminal leaves. These flowers are made up of 5 irregular sepals, 5 petals, numerous stamens and 3 styles. These are 12 to 25 mm in diameter.

The capsular fruits are attractive to birds.

This species has flexible, creeping roots.

## ORIGIN AND DISTRIBUTION

The area of distribution of this species extends from Ontario to Michigan. The species was named in 1759.

## USE

**Ornamental:** This species is the hardiest of the St. John's Worts. Its attraction is its bright yellow flowers, which bring a cheerful, colourful touch to the garden for several weeks in summer and fall. It is very easy to grow and may be used in massed plantings, on its own or in rock gardens.

**Naturalization:** *H. kalmianum* is found naturally along sandy or rocky shorelines and is well suited to renaturalization.

## REQUIREMENTS

*H. kalmianum* thrives in full sun but is tolerant of light shade. It prefers light soil and can adapt to poor soil. It is not averse to drought but to excess moisture. Its roots lie close to the surface and it is easily planted. Its stems can be bent back quite far.

## DISEASES AND INSECTS

No reference is made to this particular species in the plant health notices in MAPAQ'S notice system.

## PROPAGATION

**Seeds:** This propagation technique is used in spring. Seeds are sown on a fine-textured substrate. The seeds, as fine as dust, must not be covered with the potting medium or soil.

**Cutting:** Semi-hardwood cuttings are the best means of propagation. They are generally taken in July and treated as usual in propagating this type of cuttings.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Agriculture and Agri-Food Canada Experimental farm, L'Assomption, Quebec.

**Propagation site:** Agriculture and Agri-Food Canada Experimental farm, L'Assomption, Quebec.

**Propagation technique:** Four hundred 5-cm cuttings were taken on July 15, 1991 from parent plants about 10 years old, 75 cm tall and 50 cm wide. They were soaked in a 5000-ppm IBA solution and in 50% ethanol. They were placed in peat containers on a substrate of Promix® and

sand (1:2; v:v), then placed under a misting system controlled by an electronic leaf. The heating cable temperature was set at 25°C. Rooting was 95% after 21 days. The plants were placed in a shade house on July 23 to harden them off. A fertilizer solution (10-52-10) was applied at the recommended dose. They were subsequently fertilized every week with soluble fertilizer (20-20-20, 200 ppm nitrogen). On October 15 the plants were placed in cold storage at a temperature between 2 and 5°C. On May 15, 1992 they were transplanted into the nursery and recovery percentage was 79%. On October 25 the plants were pulled up, puddled and heeled in. In mid-April 1993, they were wrapped and placed in cold storage at 4°C until their shipment in May.

**Inclusion in testing network:** Young plants 21 **cm** tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-1998)

### Winter damage

The frequency of winter damage to this species observed over five years is presented in Table 1. Details of the main damage that occurred each winter at each of the sites are shown below.

Winter damage was insignificant with this species, except in Kapuskasing, where much mechanical breakage was observed. Between 8 and 10% of the plants died at the of St. Clotilde, St. Hyacinthe and Kapuskasing sites.

*Region 1*

No damage occurred in L'Assomption during the first three winters. The following winter, 92% of the seedlings sustained rodent damage. The last winter, 17% of the seedlings froze to the level of the previous year's shoots.

The first winter, one seedling died in St. Clotilde and two in St. Hyacinthe.

*Region 2*

In Deschambault, 10% of the seedlings suffered frost damage to their stem tips and 5% had damage to the previous year's shoots the first winter. There was mechanical breakage to 91 and 33% of the seedlings the last two winters.

No frost damage was observed in St. Foy.

In La Pocatière, frost damage to stem tips was observed the first winter on 37% of the seedlings, damage to the previous year's shoots on 21%, and to stems above the snow cover on 26%.

*Region 3*

In Normandin, 8% of the seedlings had mechanical breakage the fourth winter.

In Kapuskasing, frost damage to the previous year's shoots was observed each winter on 95, 67, 92, 100 and 100% of the seedlings. In addition, 6 and 33% suffered frost damage to their stem tips the first two winters. One seedling died the third winter.

### Height and width growth

Figures 1 and 2 show the average height and width of seedlings after five years of trials at each of the sites and in each of the regions

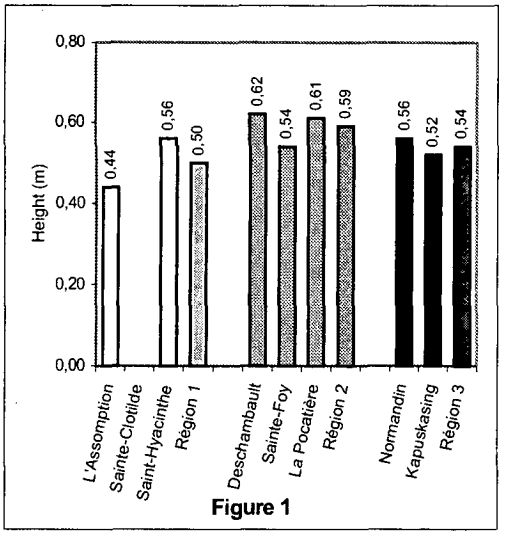


**Figure 1.** Average height of shrubs at the conclusion of the trial at each of the sites and in each of the three regions.

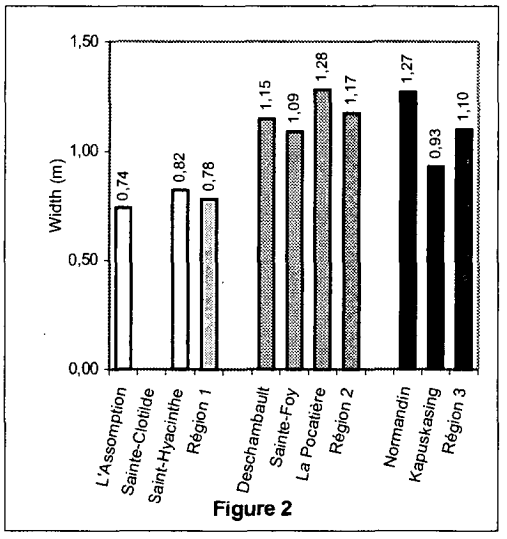


**Figure 2.** Average width of shrubs at the conclusion of the trial at each of the sites and in each of the three regions.

### Effect of pruning

Pruning that reduced plant height by 10 to 30% was carried out in St. Hyacinthe, Deschambault and St. Foy. More drastic pruning, cutting back the plants by around 50%, was done in Normandin and in Kapuskasing — because of freezing of the previous year's shoots — and in L'Assomption — because of mechanical breakage.

### Flowering

Regular flowering was observed for this species at all sites during the study.

The first flowers appeared at the end of June at sites in region 1, a week later in those in region 2, and two to three weeks later in those in region 3. Full flowering was generally achieved after about ten days. Altogether, flowering lasted some two months.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category, at each test site, for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

The growth in height of this species was similar at all sites in regions 1 and 2 and a little slower at sites in region 3. This species can be grown in all regions.

## HARDINESS EVALUATION

According to various authors, the hardiness zone rating of this species is only 3 or 4. However, the trial results clearly show that it can survive in zone 2a. It may be used in all zones covered by the trial, but flowering is generally more irregular in zone 2a.

Full ornamental potential is achieved into zone 2b.

## WRITTEN BY

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Christine Galipeau, Biol.

**Table 1. Frequency of winter damage observed on Hypericum kalmianum L., 1994-1998**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | damage |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 78 | | | 3 | | | | | | | 19 | 22 |
| St. Clotilde | 97 | | | | | | | 3 | | | | 3 |
| St. Hyacinthe | 98 | | | | | | | 2 | | | | 2 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 72 | 2 | | 1 | | | | | | 25 | | 28 |
| St. Foy | 100 | | | | | | | | | | | 0 |
| La Pocatière | 83 | 7 | | 4 | | 6 | | | | | | 17 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 98 | | | | | | | | | 2 | | 2 |
| Kapuskasing | 0 | 9 | | 90 | | | | 1 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3, 5, 7 and 9 was sustained by the plants in the trial.

Table 2. **Breakdown of specimens of *Hypericum kalmianum* L. by saleable height category, 1993-1997**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-015 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 016-030 | 11 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | - | 82 | 13 | 9 | 0 | 0 |
| 031-045 | 89 | 37 | 25 | 0 | 75 | 88 | 36 | 0 | 0 | - | 18 | 87 | 45 | 9 | 0 |
| 046-060 | 0 | 63 | 75 | 33 | 25 | 12 | 36 | 62 | 33 | - | 0 | 0 | 46 | 64 | 100 |
| 061-075 | 0 | 0 | 0 | 67 | 0 | 0 | 0 | 38 | 67 | - | 0 | 0 | 0 | 27 | 0 |
| 076-090 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-015 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 016-030 | 68 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 68 | 0 | 0 | 0 | 0 |
| 031-045 | 32 | 69 | 8 | 0 | 0 | 90 | 5 | 8 | 9 | 8 | 32 | 32 | 8 | 0 | 0 |
| 046-060 | 0 | 31 | 92 | 17 | 50 | 0 | 95 | 75 | 33 | 75 | 0 | 68 | 92 | 100 | 73 |
| 061-075 | 0 | 0 | 0 | 83 | 50 | 0 | 0 | 17 | 50 | 17 | 0 | 0 | 0 | 0 | 27 |
| 076-090 | - | - | - | - | - | 0 | 0 | 0 | 8 | 0 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-015 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| 016-030 | 44 | 17 | 0 | 0 | 0 | 78 | 33 | 0 | 0 | 0 |
| 031-045 | 56 | 83 | 92 | 0 | 0 | 17 | 67 | 83 | 55 | 9 |
| 046-060 | 0 | 0 | 8 | 75 | 83 | 0 | 0 | 17 | 45 | 73 |
| 061-075 | 0 | 0 | 0 | 25 | 17 | 0 | 0 | 0 | 0 | 18 |
| 076-090 | - | - | - | - | - | - | - | - | - | - |

* Data not collected in 1997.

**Table 3.** **Breakdown of specimens of *Hypericum kalmianum* L. by saleable width category, 1993-1997**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 0 |
| 021-040 | 47 | 0 | 0 | 0 | 9 | 19 | 18 | 0 | 0 | - | 76 | 13 | 0 | 0 | 0 |
| 041-060 | 53 | 42 | 8 | 0 | 33 | 81 | 27 | 0 | 0 | - | 0 | 80 | 18 | 19 | 0 |
| 061-080 | 0 | 53 | 84 | 17 | 0 | 0 | 55 | 50 | 0 | - | 0 | 7 | 82 | 36 | 45 |
| 081-100 | 0 | 5 | 8 | 42 | 58 | 0 | 0 | 50 | 50 | - | 0 | 0 | 0 | 45 | 45 |
| 101-120 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 50 | - | 0 | 0 | 0 | 0 | 10 |
| 121-140 | 0 | 0 | 0 | 16 | 0 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | - | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 90 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | 0 |
| 041-060 | 5 | 47 | 0 | 0 | 0 | 50 | 0 | 8 | 0 | 0 | 5 | 32 | 0 | 0 | 0 |
| 061-080 | 0 | 53 | 50 | 0 | 0 | 0 | 60 | 17 | 25 | 8 | 0 | 58 | 0 | 0 | 0 |
| 081-100 | 0 | 0 | 50 | 50 | 17 | 0 | 40 | 50 | 42 | 25 | 0 | 10 | 100 | 0 | 0 |
| 101-120 | 0 | 0 | 0 | 50 | 58 | 0 | 0 | 25 | 33 | 33 | 0 | 0 | 0 | 100 | 9 |
| 121-140 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 34 | 0 | 0 | 0 | 0 | 91 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 55 | 6 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 041-060 | 39 | 50 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 |
| 061-080 | 0 | 44 | 00 | 0 | 0 | 0 | 0 | 100 | 27 | 0 |
| 081-100 | 0 | 0 | 100 | 58 | 0 | 0 | 0 | 0 | 73 | 91 |
| 101-120 | 0 | 0 | 0 | 42 | 0 | 0 | 0 | 0 | 0 | 9 |
| 121-140 | 0 | 0 | 0 | 0 | 100 | - | - | - | - | - |

* Data not collected in 1997.

# *JUNIPERUS COMMUNIS* 'DEPRESSA AUREA'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Common juniper, Golden Prostrated Juniper |
| **French common name:** | Genévrier doré du Canada |
| **Synonym:** | *J. communis* var. *canadensis* Loud, *J. nana canadensis* Carr, *J. canadensis* Burgsd. |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This dwarf conifer, with a low, wide and spreading growth habit, has numerous more or less horizontal stems that turn up at the tip. In 10 years it can grow to 1.2 to 1.5 m in width and between 0.30 and 0.60 m in height.

The fine, sharp, needle-like leaves, unusually short and wide for a juniper, are 8 to 10 mm long and 1.5 mm wide. Verticillate on the stem, oval to lanceolate, ending in a long, thin, transparent tip, they are curved near the base and twisted as if to face the ground, hiding the white stomatic band that covers close to half of the upper face of the leaf. They grow very close to the stem, but irregularly.

The yellow-gold colour of this cultivar is more pronounced toward the end of May; then, in winter, it turns grey-bronze.

## ORIGIN AND DISTRIBUTION

The common juniper is present throughout the northern hemisphere; it is native to North America and also covers northern and central Europe, Korea and Japan. The cultivar 'Depressa Aurea' has changed names often: the first mention of it is in 1938, when it was given the name *Juniperus nana canadensis aurea*, which was changed to 'Aureospica' by Rheder and finally to 'Depressa Aurea'.

## USE

**Ornamental:** Recommended for rock gardens, it is used to contrast with other conifers in massed plantings.

## REQUIREMENTS

Common juniper requires a sunny spot to retain its golden colour. It can adapt to every type of soil, is tolerant of alkaline pH, prefers dry ground and is sensitive to excessive dampness.

To avoid browning of needles or frozen tips the plant must be completely covered with snow during the winter months. Pruning is necessary each spring to remove deadwood.

## PATHOLOGY AND INSECTS

Juniper blight (*Phomopsis juniperovora*) affects most junipers, but the cultivars or varieties derived from *Juniperus communis* are among the most resistant. Juniper rust (*Gymnosporangium clavipes*, *G. juniperi-virginianae* and *G. globosum*) is a fungal disease that needs a primary host to begin its reproductive cycle. Any juniper can serve as this primary host, but the cultivars or varieties derived from Juniperus communis are among the most susceptible. *Alternaria* and *Epicoccum* are two fungal diseases that may also cause serious damage.

Junipers may be attacked by scale insects, mites and spittlebugs.

## PROPAGATION

**Propagation by cuttings:** Heel cuttings taken from young plants in late July or August will root very well. A medium of fine peat and sand helps root development. Softwood cuttings taken before July (before the bark of the shoots turns brown) must be processed with a hormone (IBA, 0.8% on talc).

**Layering:** All cultivars with a creeping habit may be propagated by layering, but the quantity of plants obtainable

in this way is limited. Shoots, preferably laid in furrows filled with equal proportions of river sand, peat and earth, are watered regularly all summer and take root when they touch the ground.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant :** La Samarre Nursery, Plessisville, Quebec

**Propagation site:** La Samarre Nursery, Plessisville, Quebec

**Propagation technique:** Twelve-centimetre cuttings were taken in November 1992 from parent plants 8 years old, measuring about 40 cm tall and 80 cm wide. They were treated with a hormone powder, Seradix® No. 3, after being lightly bruised at the base of the stem. They were then placed on tables in a substrate of sand and peat (3:2). A manual misting was done twice a day. The heating cables' temperature was set at 22°C. Fungicidal treatments alternating between copper and a solution of Benomyl-Captan were done only as necessary. Rooting was 75% after 8 weeks. In May 1993, 170 cuttings rooted were potted in 4-cm containers and sent to the trial sites. This was the first batch of young plants bought and produced outside REPLOQ's 3 propagation centres.

**Inclusion in testing network:** Young plants 10 cm tall were planted in eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-1998)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of the main damage that occurred each winter at each of the sites are shown below.

A great number of plants died upon transplantation at the L'Assomption, St-Hyacinthe and Deschambault sites (40, 40 and 23 %, respectively).

*Region 1*

In L'Assomption, 54 and 17% of the plants died the first two winters. 46 and 40% of the plants suffered damage in the form of browning of foliage the first and fourth winters.

In St. Clotilde, 74% of the plants suffered damage in the form of browning of foliage the second winter.

In St. Hyacinthe, 73% of the plants died the first winter and the rest disappeared the following winter.

*Region 2*

In Deschambault, 23% of the plants died the first winter. All the other shrubs sustained browning on their evergreen foliage each winter.

In St. Foy, the last two winters, 17 and 8% of the plants showed damage in the form of browning of foliage.

No frost damage occurred in La Pocatière.

*Region 3*

In Normandin, one plant died during each of the first two winters and 5% of the plants had browning on their foliage the first winter.

In Kapuskasing, the second and third winters, 10% of the plants died. In addition, 5% of the plants suffered damage to the previous year's shoot the second winter.

### Growth in height and width

Figures 1 and 2 show the average height and width of plants after five years of trials at each site in each of the regions.

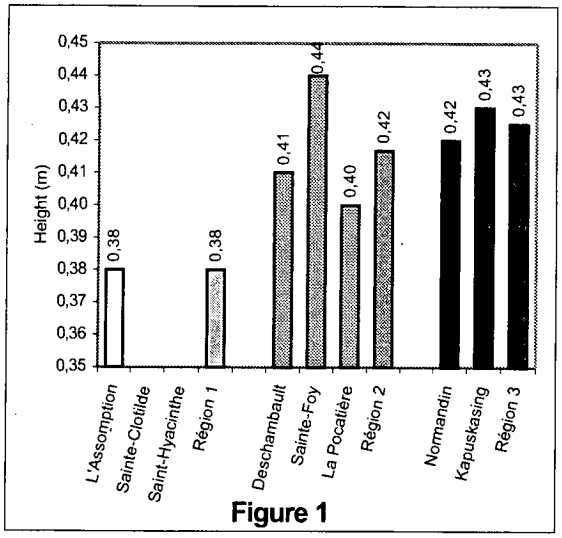


**Figure 1.** Average height of shrubs at the conclusion of the trial for each of the sites and each of the three regions

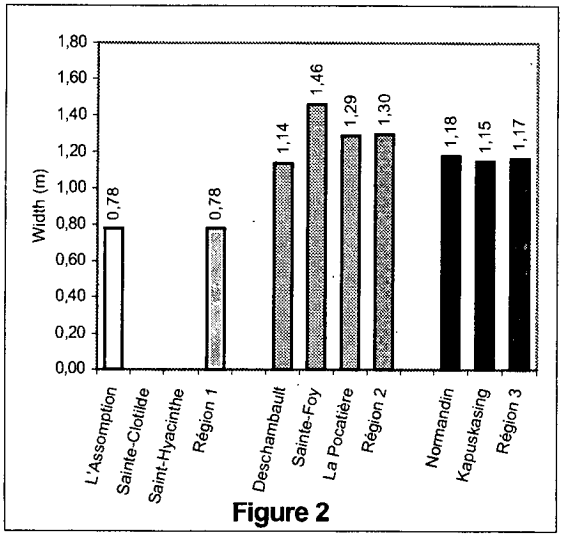


**Figure 2.** Average width of shrubs at the conclusion of the trial for each of the sites and each of the three regions

### Effect of pruning

No pruning was required for this cultivar.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable plants by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

This cultivar can be grown at all trial sites, as long as the soil is light or well drained and snow cover protects the young plants' root systems the first few winters. The plants in L'Assomption, however, remained small and undeveloped and all plants in region 3 had slower growth.

## HARDINESS EVALUATION

The hardiness rating assigned in the literature corresponds to zones 2b or 3b depending on the authors consulted. The mortality observed in this trial was very low, with the exception of the L'Assomption site, where all plants died during the trial, and the St. Hyacinthe site, where all the plants died as of the second winter. In these two sites, the rate of mortality on transplantation had been very high, indicating that the plants were in poor condition when received, that the transplantation stress was too great, thus reducing the plants' resistance, or, again, that the plots where the conifers were planted at these two sites were in a damper part of the property, which may explain the mortality that occurred.

The survival and use ratings are therefore set at zone 2a, as the Kapuskasing plants were as well developed as those at other sites at the end of the trial, with the proviso that a good snow cover is essential until the plants are well established.

The potential for full ornamental expression was attained at trial site 4a where snow covered the plants each winter.

## WRITTEN BY

Claude Richer, Agr.

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Christine Galipeau, Biol.

**Table 1.** **Frequency of winter damage observed on *Juniperus communis* 'Depressa Aurea', 1994-1998**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 69 | | | | | | | 14 | | | | 17 | 31 |
| St. Clotilde | 75 | | | | | | | | | | | 25 | 25 |
| St. Hyacinthe | 0 | | | | | | | 87 | | | | 13 | 100 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 5 | | | | | | | | | | | 95 | 95 |
| St. Foy | 95 | | | | | | | | | | | 5 | 5 |
| La Pocatière | 100 | | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 97 | | | | | | | 2 | | | | 1 | 3 |
| Kapuskasing | 96 | | | 2 | | | | 2 | | | | | 4 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage
14 = partial browning of evergreen foliage

No damage of type 2, 3, 5, 6, 7, 9, 10 or 11 was sustained by the plants in the trial.

**Table 2.** **Breakdown of specimens of *Juniperus communis* 'Depressa Aurea' by saleable height category, 1993-1997**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 7 | 0 | 0 | 0 | 0 | 47 | 5 | 0 | 0 | - | 60 | 0 | - | - | - |
| 11-20 | 93 | 43 | 0 | 0 | 0 | 53 | 63 | 28 | 9 | - | 40 | 100 | - | - | - |
| 21-30 | 0 | 57 | 20 | 40 | 0 | 0 | 32 | 45 | 27 | - | - | - | - | - | - |
| 31-40 | 0 | 0 | 80 | 40 | 60 | 0 | 0 | 27 | 18 | - | - | - | - | - | - |
| 41-50 | 0 | 0 | 0 | 20 | 40 | 0 | 0 | 0 | 46 | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 82 | 0 | 0 | 0 | 0 | 20 | 15 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 |
| 11-20 | 18 | 85 | 20 | 0 | 0 | 80 | 85 | 0 | 0 | 0 | 43 | 67 | 75 | 0 | 0 |
| 21-30 | 0 | 15 | 80 | 20 | 0 | 0 | 0 | 50 | 0 | 16 | 0 | 33 | 25 | 83 | 0 |
| 31-40 | 0 | 0 | 0 | 70 | 50 | 0 | 0 | 42 | 67 | 17 | 0 | 0 | 0 | 17 | 67 |
| 41-50 | 0 | 0 | 0 | 10 | 40 | 0 | 0 | 8 | 33 | 50 | 0 | 0 | 0 | 0 | 33 |
| 51-60 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 85 | 32 | 0 | 0 | 0 | 19 | 0 | 0 | 0 | 0 |
| 11-20 | 15 | 68 | 45 | 0 | 0 | 81 | 90 | 30 | 0 | 0 |
| 21-30 | 0 | 0 | 55 | 100 | 0 | 0 | 10 | 70 | 11 | 0 |
| 31-40 | 0 | 0 | 0 | 0 | 36 | 0 | 0 | 0 | 78 | 33 |
| 41-50 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 0 | 11 | 56 |
| 51-60 | | - | - | - | - | 0 | 0 | 0 | 0 | 11 |

* (Data not collected in 1997.)

Table 3. **Breakdown of specimens of *Juniperus communis* 'Depressa Aurea' by saleable width category, 1993-1997**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 100 | 0 | 0 | 0 | 100 | 47 | 9 | 9 | - | 100 | 100 | - | - | - |
| 041-080 | 0 | 0 | 100 | 40 | 60 | 0 | 53 | 81 | 45 | - | - | - | - | - | - |
| 081-120 | 0 | 0 | 0 | 60 | 40 | 0 | 0 | 10 | 36 | - | - | - | - | - | - |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 10 | - | - | - | - | - | - |
| 161-180 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 67 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 |
| 041-080 | 0 | 33 | 50 | 50 | 0 | 0 | 90 | 0 | 0 | 0 | 14 | 95 | 0 | 0 | 0 |
| 081-120 | 0 | 0 | 50 | 50 | 70 | 0 | 10 | 100 | 0 | 0 | 0 | 5 | 100 | 33 | 25 |
| 121-160 | 0 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 100 | 91 | 0 | 0 | 0 | 64 | 75 |
| 161-180 | - | - | - | - | - | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 95 | 5 | 0 | 0 | 0 | 81 | 5 | 0 | 0 | 0 |
| 041-080 | 5 | 95 | 100 | 0 | 0 | 19 | 95 | 60 | 22 | 11 |
| 081-120 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 40 | 78 | 45 |
| 121-160 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 44 |
| 161-180 | - | - | - | - | - | - | - | - | - | - |

* (Data not collected in 1997.)

# *JUNIPERUS SABINA* 'BLUE DANUBE' (1993 CONTROL)

The sections Botanical Description, Origin and Distribution, Use and Requirements, Pathology and Insects and Bibliographical references were previously published in the book *"Hardiness and Growth of Woody Ornamental Plants in Quebec"*, volume II (VR 221).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site**: Laval University, St. Foy, Quebec

**Propagation technique:** Three hundred and ninety 15-cm cuttings were taken on June 22, 1992 from parent plants about 25 years old. They were soaked for 5 seconds in an 8000-ppm IBA and 50% ethanol solution, then washed in tapwater. They were dipped in a fungicidal solution based on Benomyl-Captan®, misted (Mist-A-Matic®) and planted in compartments filled with a medium made up of peat and perlite (1:4; v:v). Rooting was 55% after 120 days. The plants were acclimatized by reducing the misting at the end of September, fertilized with a soluble fertilizer (20-20-20, 200 ppm nitrogen) and left in an unheated greenhouse. In November, they were stored in a coldroom at 0°C in plastic bags perforated with a straight pin. At the beginning of May 1993, they were wrapped and stored once again in a coldroom at 4°C, then shipped a few days later.

**Inclusion in testing network:** Young plants 13 cm tall were planted in eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-1998)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of the main damage that occurred each winter at each of the sites are shown below.

Most of the plants that died did so during the first two winters after planting. The mortality was most severe in Kapuskasing, where 9 plants died during the trial.

*Region 1*

In L'Assomption, 8% of the plants suffered damage — browning of foliage — the fourth winter.

In St. Clotilde, 10% of the plants died the second winter and no other damage occurred. Data were not collated the last two winters.

In St. Hyacinthe 10 and 6% of the plants died the first two winters.

*Region 2*

In Deschambault, 5% of the plants died the first winter. Mechanical breakage was sustained by 5, 8 and 20% of the plants the first, third and fourth winters. In addition, during the fourth winter, 8% of the plants showed damage in the form of browning of foliage.

In St. Foy, 8% of the plants sustained frost damage to stem tips the third winter.

No damage was observed in La Pocatière.

*Region 3*

In Normandin, the only damage was browning of foliage, observed on 5% of the plants the second winter.

Some plants died the first three winters in Kapuskasing, eliminating 5, 35 and 14% of the plants.

### Growth in height and width

Figures 1 and 2 show the average height and width of plants after five years of trials at each site in each of the regions.

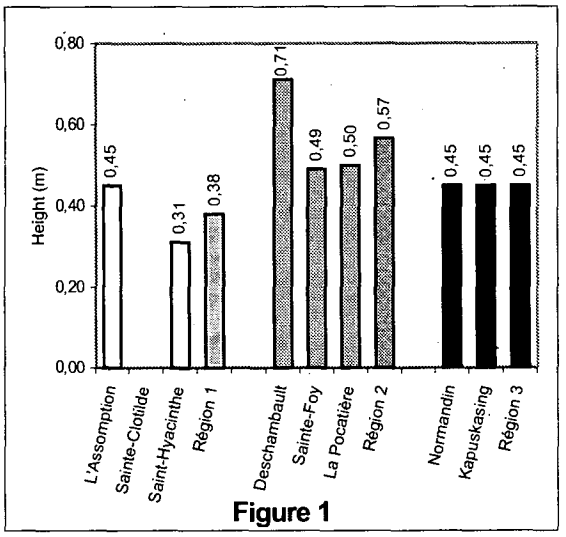


**Figure 1.** Average height of shrubs at the conclusion of the trial for each of the sites and each of the three regions

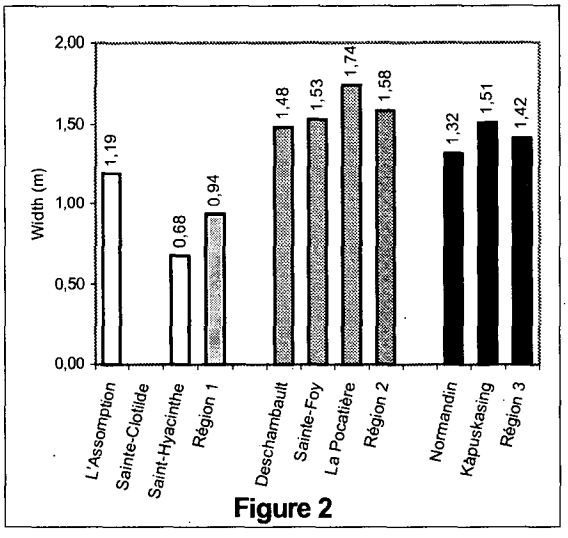


**Figure 2.** Average width of shrubs at the conclusion of the trial for each of the sites and each of the three regions

### Effect of pruning

Pruning for shaping was done at all sites.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable plants by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

After two years' growth, more than 95% of the plants had reached a height of between 21 and 40 cm, except at the L'Assomption and Kapuskasing sites. However, plant width for this same period was higher at the St. Clotilde, Deschambault and La Pocatière sites, where 80 to 100% of the plants had reached a width of between 51 and 100 cm.

This plant can be grown at all trial sites, but grows faster at the sites in region 2.

## HARDINESS EVALUATION

Mortality of plants in this lot is a little higher than in the 1994 lot. This may however be put down to the storage conditions for young plants before planting, which caused a more difficult recovery, particularly at the Kapuskasing site. In spite of this, the comparison of results of this trial with those of previous trials confirms that this cultivar can survive beyond zone 2, that the use potential lies within zone 2a, with the proviso that in this zone its growth will be slower and the plants will tend to be smaller.

The potential for full expression of the plants' ornamental character was attained in zones 2b, 4 and 5.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biol.

**Table 1.** **Frequency of winter damage observed on *Juniperus sabina* 'Blue Danube'** (Control 1993), **1994-1998**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 98 | | | | | | | | | | | 2 | 2 |
| St. Clotilde | 97 | | | | | | | 3 | | | | | 3 |
| St. Hyacinthe | 95 | | | | | | | 5 | | | | | 5 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 98 | 2 | | | | | | | | | | | 2 |
| St. Foy | 90 | | | | | | | 1 | | 8 | | 1 | 10 |
| La Pocatière | 100 | | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 99 | | | | | | | | | | | 1 | 1 |
| Kapuskasing | 89 | | | | | | | 11 | | | | | 11 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage
14 = partial browning of evergreen foliage

No damage of type 3, 4, 5, 6, 7, 9 and 11 was sustained by the plants in the trial.

Table 2. **Breakdown of specimens of *Juniperus sabina* 'Blue Danube' (Control 1993) by saleable height category, 1993-1997**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001- 020 | 0 | 0 | 0 | 0 | 0 | 67 | 0 | 0 | 0 | - | 100 | 78 | 9 | 0 | 0 |
| 021-040 | 100 | 90 | 91 | 17 | 25 | 33 | 86 | 90 | 20 | - | 0 | 22 | 91 | 100 | 100 |
| 041-050 | 0 | 10 | 9 | 83 | 75 | 0 | 14 | 10 | 80 | - | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001- 020 | 100 | 10 | 0 | 0 | 0 | 43 | 24 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 |
| 021-040 | 0 | 90 | 41 | 8 | 0 | 57 | 76 | 50 | 16 | 17 | 67 | 76 | 100 | 75 | 0 |
| 041-050 | 0 | 0 | 59 | 67 | 75 | 0 | 0 | 50 | 84 | 75 | 0 | 24 | 0 | 25 | 100 |
| 061-080 | 0 | 0 | 0 | 25 | 25 | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001- 020 | 34 | 10 | 0 | 25 | 0 | 95 | 0 | 0 | 0 | 0 |
| 021-040 | 64 | 90 | 42 | 58 | 17 | 5 | 100 | 100 | 84 | 33 |
| 041-050 | 0 | 0 | 58 | 17 | 83 | 0 | 0 | 0 | 16 | 67 |
| 061-080 | - | - | - | - | - | - | - | - | - | - |

* (Data not collected in 1997.)

**Table 3.** **Breakdown of specimens of *Juniperus sabina* 'Blue Danube'** (Control 1993) **by saleable width category, 1993-1997**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 100 | 0 | 0 | 0 | 100 | 86 | 0 | 0 | - | 100 | 100 | 0 | 0 | 30 |
| 051-100 | 0 | 0 | 75 | 0 | 0 | 0 | 14 | 70 | 0 | - | 0 | 0 | 90 | 20 | 70 |
| 101-150 | 0 | 0 | 25 | 17 | 8 | 0 | 0 | 30 | 50 | - | 0 | 0 | 10 | 80 | 0 |
| 151-200 | 0 | 0 | 0 | 83 | 92 | 0 | 0 | 0 | 50 | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 95 | 0 | 0 | 0 | 100 | 57 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 5 | 33 | 0 | 0 | 0 | 43 | 50 | 0 | 0 | 0 | 100 | 0 | 0 | 0 |
| 101-150 | 0 | 0 | 67 | 75 | 0 | 0 | 0 | 50 | 0 | 8 | 0 | 0 | 58 | 50 | 0 |
| 151-200 | 0 | 0 | 0 | 25 | 100 | 0 | 0 | 0 | 100 | 84 | 0 | 0 | 42 | 50 | 92 |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 8 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 86 | 25 | 8 | 0 | 100 | 70 | 0 | 0 | 0 |
| 051-100 | 0 | 14 | 75 | 0 | 0 | 0 | 30 | 86 | 0 | 0 |
| 101-150 | 0 | 0 | 0 | 92 | 83 | 0 | 0 | 14 | 100 | 33 |
| 151-200 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 67 |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

* (Data not collected in 1997.)

# *JUNIPERUS SABINA* 'BLUE DANUBE' (1994 CONTROL)

The sections Botanical Description, Origin and Distribution, Use and Requirements, Pathology and Insects and Bibliographical References were previously published in the book *"Hardiness and Growth of Woody Ornamental Plants in Quebec"*, volume II (VR 221).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** Four hundred and sixteen 15-cm cuttings were taken on June 26, 1993 from parent plants about 25 years old. They were soaked for 5 seconds in an 8000-ppm IBA and 50% ethanol solution, then washed in tapwater. They were dipped in a fungicidal solution based on Benomyl-Captan®, misted (Mist-A-Matic®) and planted in compartments filled with a medium made up of peat and perlite (2:3; v:v). They were fertilized every week with a 20-20-20 solution (200 ppm nitrogen) during the rooting period. The misting was stopped at the beginning of October, at which point rooting was 71%. In November, the plants were removed from the compartments and stored in a coldroom at -2°C in plastic bags perforated with a straight pin. At the beginning of May 1993, they were wrapped and stored once more in a coldroom at 4°C, then shipped a few days later.

**Inclusion in testing network:** Young plants 23 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-1999)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of the main damage that occurred each winter at each of the sites are shown below.

This cultivar was hardly damaged at all during the trial.

*Region 1*

In L'Assomption, the fourth winter, the only damage observed was browning of foliage on 92% of the plants.

In St. Hyacinthe, 33% of the plants were affected by the same type of damage the second winter.

No damage occurred in St. Clotilde.

*Region 2*

No damage was observed at the Deschambault and La Pocatière sites.

In St. Foy, 5% of the plants showed frost damage on the previous year's shoot the first winter and 34% of the plants sustained mechanical breakage the third winter.

*Region 3*

In Normandin, the only damage was mechanical breakage to 17% of the plants the third winter.

No damage occurred in Kapuskasing.

### Growth in height and width

Figures 1 and 2 show the average height and width of plants after five years of trials at each site in each of the regions.

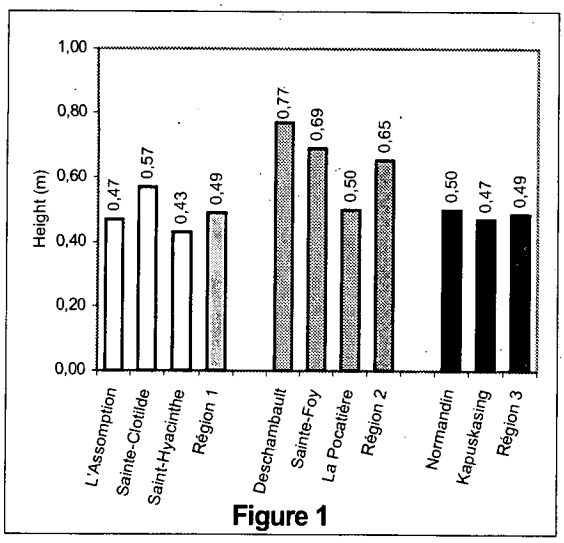


**Figure 1.** Average height of shrubs at the conclusion of the trial for each of the sites and each of the three regions

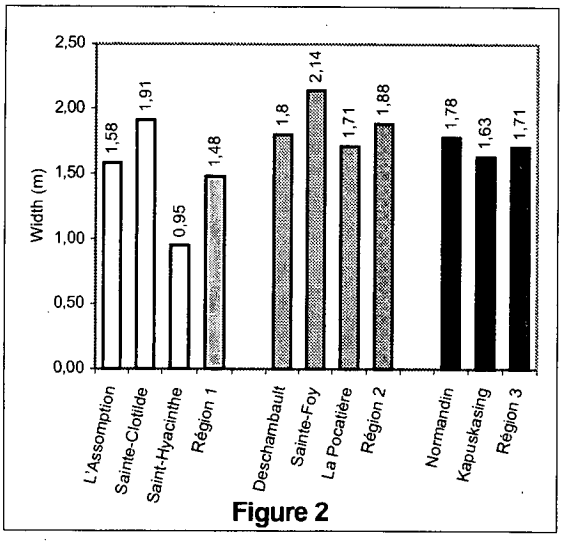


**Figure 2.** Average width of shrubs at the conclusion of the trial for each of the sites and each of the three regions

### Effect of pruning

Pruning for shaping was done at all sites.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable plants by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

After two years' growth, more than 95% of the plants had reached a height of between 21 and 40 cm at all sites, the growth of plants from the planting 1994 being quicker than that observed for the 1992 planting. However, plant width for this same period was greater at sites in climatic zones 4 and 5.

This plant can be grown at all trial sites, as it grows quickly.

## HARDINESS EVALUATION

The comparison of results of this trial with those of previous trials confirms that this cultivar can survive beyond zone 2, and that its potential for use lies within zone 2a, with the proviso that in this zone its growth will be slower and the plants will tend to be smaller.

Potential for full expression of ornamental character was attained in zones 2, 4 and 5.

## WRITTEN BY

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Christine Galipeau, Biol.

**Table 1. Frequency of winter damage observed on *Juniperus sabina* 'Blue Danube'** (Control 1994), **1995-1999**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 92 | | | | | | | | | | | 8 | 8 |
| St. Clotilde | 100 | | | | | | | | | | | | 0 |
| St. Hyacinthe | 92 | | | | | | | | | | | 8 | 8 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 100 | | | | | | | | | | | | 0 |
| St. Foy | 92 | 1 | | | | | | | | 7 | | | 8 |
| La Pocatière | 100 | | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 97 | | | | | | | | | 3 | | | 3 |
| Kapuskasing | 100 | | | | | | | | | | | | 0 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage
14 = partial browning of evergreen foliage

No damage of type 3, 4, 5, 6, 8, 9 or 11 was sustained by the plants in the trial.

Table 2. **Breakdown of specimens of *Juniperus sabina* 'Blue Danube' (Control 1994) by saleable height category, 1994-1998**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 0 | 0 | 0 | 8 | 0 | 5 | 0 | 34 | 33 | 0 | - | 5 | 0 | 0 | 0 |
| 021-040 | 90 | 75 | 58 | 75 | 0 | 95 | 71 | 58 | 34 | 0 | - | 95 | 83 | 92 | 50 |
| 041-060 | 10 | 25 | 42 | 17 | 100 | 0 | 29 | 8 | 33 | 67 | - | 0 | 17 | 8 | 42 |
| 061-080 | - | - | - | - | - | 0 | 0 | 0 | 0 | 33 | - | 0 | 0 | 0 | 0 |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 8 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| 021-040 | 95 | 45 | 0 | 0 | 0 | 76 | 24 | 25 | 8 | 0 | 95 | 0 | 58 | 25 | 0 |
| 041-060 | 5 | 55 | 83 | 67 | 0 | 24 | 76 | 67 | 67 | 17 | 0 | 57 | 42 | 75 | 100 |
| 061-080 | 0 | 0 | 17 | 33 | 75 | 0 | 0 | 8 | 25 | 75 | 0 | 43 | 0 | 0 | 0 |
| 081-100 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 90 | 100 | 100 | 67 | 33 | 100 | 95 | 75 | 33 | 17 |
| 041-060 | 0 | 0 | 0 | 33 | 50 | 0 | 5 | 25 | 67 | 83 |
| 061-080 | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Hyacinthe not collected in 1994.

Table 3. **Breakdown of specimens of *Juniperus sabina* 'Blue Danube' (Control 1994) by saleable width category, 1994-1998**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 40 | 0 | 8 | 0 | 100 | 5 | 0 | 0 | 0 | - | 14 | 0 | 0 | 0 |
| 051-100 | 0 | 60 | 83 | 50 | 0 | 0 | 95 | 33 | 0 | 0 | - | 86 | 50 | 100 | 75 |
| 101-150 | 0 | 0 | 17 | 42 | 25 | 0 | 0 | 67 | 42 | 0 | - | 0 | 50 | 0 | 25 |
| 151-200 | 0 | 0 | 0 | 0 | 75 | 0 | 0 | 0 | 58 | 67 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 25 | 0 | 0 | 0 | 100 | 29 | 0 | 0 | 0 | 100 | 14 | 0 | 0 | 0 |
| 051-100 | 0 | 75 | 83 | 0 | 0 | 0 | 71 | 0 | 0 | 0 | 0 | 86 | 25 | 0 | 0 |
| 101-150 | 0 | 0 | 17 | 100 | 0 | 0 | 0 | 58 | 58 | 0 | 0 | 0 | 75 | 25 | 0 |
| 151-200 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 42 | 42 | 8 | 0 | 0 | 0 | 75 | 100 |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 0 | 92 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 86 | 0 | 0 | 0 | 100 | 100 | 25 | 0 | 0 |
| 051-100 | 0 | 14 | 92 | 0 | 0 | 0 | 0 | 75 | 50 | 17 |
| 101-150 | 0 | 0 | 8 | 75 | 0 | 0 | 0 | 0 | 50 | 83 |
| 151-200 | 0 | 0 | 0 | 25 | 100 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Hyacinthe not collected in 1994.

# *JUNIPERUS SABINA* 'WAPITI'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Wapiti Juniper |
| **French common name:** | Sabinier 'Wapiti' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub, with a spreading growth habit and feathery, turned-up stem tips, may reach 0.3 m in height and more than 2.0 m wide. It is slow-growing.

The foliage, dark lime green in the summer, shows a bit of yellow and violet in winter. The needles are 4.0 mm long and the overlapping scales are between 1.0 and 2.0 mm long.

## ORIGIN AND DISTRIBUTION

*Juniperus sabina* originates in the mountains of south-central Europe, western Asia, Siberia and the Caucasus. The species has been cultivated since 1580, but no information has been found in the references consulted on this cultivar.

## USE

**Ornamental:** This cultivar may be used by itself or in massed plantings; it forms a low ground cover in a fine sunny location.

## REQUIREMENTS

It prefers moderately damp soil that is clayey, loamy, sandy or organic in texture. It tolerates all pH levels and de-icing salt so long as the soil is permeable.

## PATHOLOGY AND INSECTS

Juniper blight (*Phomopsis juniperovora*) attacks most junipers, but the cultivars or varieties derived from *Juniperus sabina* are among the most susceptible. Juniper rust (*Gymnosporangium clavipes*, *G. juniperi-virginianae* and *G. globosum*) is a fungal disease that needs a primary host to begin its reproductive cycle. Any juniper can serve as this primary host, but the cultivars or varieties derived from *Juniperus sabina* are among the least susceptible. *Alternaria* and *Epicoccum* are two fungal diseases that may also cause serious damage.

Junipers may be attacked by scale insects, mites and spittlebugs.

## PROPAGATION

**Cutting:** This cultivar multiplies very well by woody cuttings, and the rooting rate may be as high as 100%. A minimal hormonal processing with 100 ppm of IBA and supplementary light for 12 hours a day seem to be favourable conditions for rooting.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** Four hundred and seventy-eight 15-cm cuttings were taken on June 11, 1991 from parent plants about 15 years old. They were soaked for 5 seconds in an 8000-ppm IBA and 50% ethanol solution, then washed in tapwater. They were dipped in a fungicidal solution based on Benomyl-Captan®, misted (Mist-A-Matic®) and planted in compartments filled with a medium of peat and perlite (2:3; v:v). Rooting was 95% after 130 days. The misting was stopped at the beginning of October and the plants were fertilized with a soluble fertilizer (20-20-20, 200 ppm nitrogen) on two occasions a week apart. In November, the plants were taken out of rooting containers and stored in a coldroom at 0°C in plastic bags perforated with a straight pin. In May 1992, they were potted up in Fertil Pots® on a substrate of peat and perlite (3:2; v:v) and

placed in a tunnel greenhouse for about a month, then put outside in slightly shaded cold frames. They were fertilized every week with a soluble fertilizer (20-20-20, 200 ppm nitrogen) until mid-September. In November, they were again stored in a coldroom at -1°C. At the beginning of May 1993, they were wrapped and stored in a coldroom at 4°C, then shipped a few days later.

**Inclusion in testing network:** Young plants 24 cm tall were planted at eight trial sites throughout Quebec and north-eastern Ontario. Their winter survival and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-1998)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of the main damage that occurred each winter at each of the sites are shown below.

The most frequent winter damage is browning of foliage.

*Region 1*

In L'Assomption, 26, 14 and 20% of the plants died during the first three winters. Damage consisting of partial browning of foliage was observed on 11, 29 and 29% of the plants the first and the last two winters. In addition, mechanical breakage was sustained by 14% of the plants the last two winters.

In St. Clotilde, 7 and 5% of the plants died during the first two winters.

In St. Hyacinthe, 7 and 5% of the plants died during the first two winters and 32% of the plants were affected by browning of their foliage.

*Region 2*

In St. Foy, frost damage occurred the last three winters: on stem tips of 8 and 25% of the plants the third and fourth winters, with damage in the form of browning of foliage on 8 and 67% of the plants the fourth and fifth winters and in the form of mechanical breakage the fourth winter on 17% of the plants.

In Deschambault, 10, 17 and 8% of the plants sustained frost damage to their stem tips the first, fourth and fifth winters. In addition, 17% of the plants suffered mechanical breakage the fourth winter.

No damage occurred in La Pocatière.

*Region 3*

25% of the plants suffered damage in the form of browning of foliage the last winter in Normandin.

In Kapuskasing, 11, 9 and 10% of the plants died during the second, third and fourth winters. Frost damage to stem tips was observed on 9, 30 and 44% of the plants the last three winters. In addition, 9% of the plants froze to the level of the previous year's shoot the third winter.

### Growth in height and width

Figures 1 and 2 show the average height and width of plants after five years of trials at each site in each of the regions.

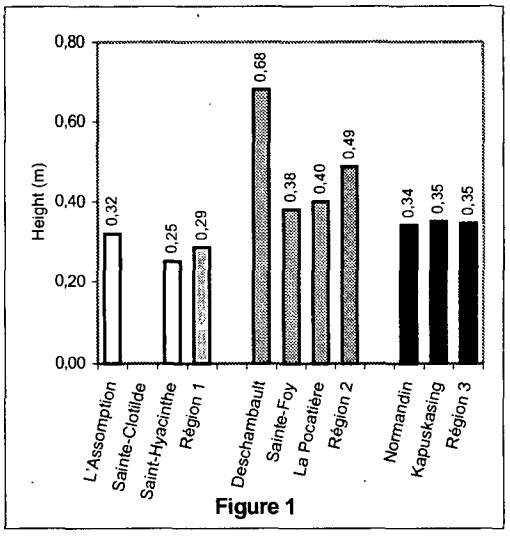


**Figure 1.** Average height of shrubs at the conclusion of the trial for each of the sites and each of the three regions

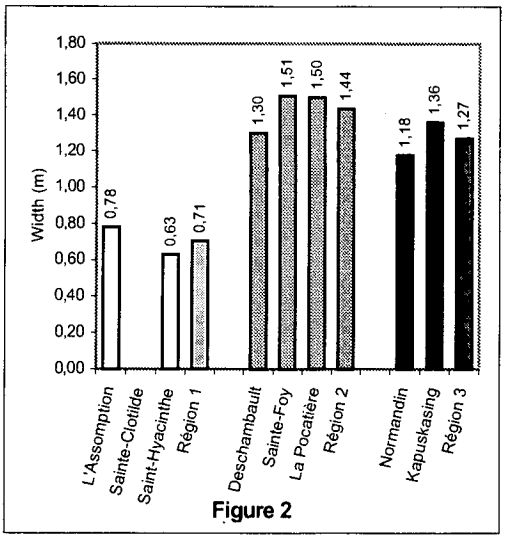


**Figure 2.** Average width of shrubs at the conclusion of the trial for each of the sites and each of the three regions

### Effect of pruning

Severe pruning was done twice at the L'Assomption site.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable plants by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

After two years' growth, all the plants in St. Foy and La Pocatière measured more than 41 cm in width. Growth was very uniform from one plant to the next. It took an additional year at the St. Clotilde, St. Hyacinthe, Normandin, Deschambault and Kapuskasing sites, whereas four years were required at the L'Assomption sites for all plants to reach this width.

The Deschambault site produced the tallest plants.

The trial results show that this cultivar can be grown at all sites provided it is adequately protected by snow cover during the coldest period.

## HARDINESS EVALUATION

Sherk and Buckley place the limit of hardiness of *Juniperus sabina* and its cultivars at zone 2. The mortality that occurred at the Kapuskasing site, especially after two or three years of implementation, demonstrates that this cultivar is at its extreme limit there and that its survival cannot be assured on that site. Again, at the Normandin site, in zone 2b, all plants survived and damage was insignificant. The survival rating of this cultivar is therefore set at zone 2b, but snow cover is an important survival factor during the first few winters, even in the warmest zones.

The use potential can also be set at zone 2b, whereas the full ornamental potential was attained in La Pocatière, in zone 4a.

This juniper must be protected by good snow cover, as the browning of foliage, reported at a number of sites, impairs the ornamental appearance of the plant for a few weeks in the spring.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biol.

**Table 1.** **Frequency of winter damage observed on *Juniperus sabina* 'Wapiti', 1994-1998**

| Trial site | No Damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 69 | | | | | | | 12 | | 6 | | 13 | 31 |
| St. Clotilde | 96 | | | 4 | | | | | | | | | 4 |
| St. Hyacinthe | 86 | | | | | | | 4 | | | | 10 | 14 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 90 | | | | | | | | | 3 | | 7 | 10 |
| St. Foy | 73 | 3 | | | | | | | | 10 | | 20 | 33 |
| La Pocatière | 100 | | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 95 | | | | | | | | | | | 5 | 5 |
| Kapuskasing | 76 | 17 | | 1 | | | | 6 | | | | | 24 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage
14 = partial browning of evergreen foliage

No damage of type 3, 4, 5, 6, 7, 9 or 11 was sustained by the plants in the trial.

Table 2. **Breakdown of specimens of *Juniperus sabina* 'Wapiti' by saleable height category, 1993-1997**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 53 | 21 | 25 | 0 | 15 | 16 | 34 | 25 | 0 | - | 11 | 55 | 42 | 0 | 0 |
| 021-040 | 26 | 64 | 63 | 86 | 71 | 84 | 58 | 50 | 100 | - | 84 | 45 | 50 | 59 | 84 |
| 041-060 | 21 | 15 | 12 | 14 | 14 | 0 | 8 | 25 | 0 | - | 5 | 0 | 8 | 41 | 8 |
| 061-080 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 90 | 70 | 0 | 0 | 0 | 94 | 94 | 25 | 41 | 75 | 89 | 74 | 83 | 92 | 83 |
| 041-060 | 0 | 30 | 91 | 67 | 17 | 6 | 0 | 75 | 59 | 25 | 11 | 26 | 17 | 8 | 17 |
| 061-080 | 0 | 0 | 9 | 33 | 83 | 0 | 6 | 0 | 0 | 0 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 5 | 5 | 0 | 25 | 0 | 21 | 6 | 9 | 0 | 0 |
| 021-040 | 50 | 95 | 100 | 75 | 100 | 79 | 94 | 91 | 70 | 100 |
| 041-060 | 45 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 30 | 0 |
| 061-080 | - | - | - | - | - | - | - | - | - | - |

Table 3. **Breakdown of specimens of *Juniperus sabina* 'Wapiti' by saleable width category, 1993-1997**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 72 | 25 | 0 | 15 | 100 | 41 | 0 | 0 | - | 100 | 89 | 0 | 0 | 8 |
| 041-080 | 0 | 28 | 37 | 57 | 29 | 0 | 59 | 50 | 14 | - | 0 | 11 | 84 | 34 | 92 |
| 081-120 | 0 | 0 | 38 | 14 | 56 | 0 | 0 | 50 | 0 | - | 0 | 0 | 16 | 58 | 0 |
| 121-160 | 0 | 0 | 0 | 29 | 0 | 0 | 0 | 0 | 86 | - | 0 | 0 | 0 | 8 | 0 |
| 161-200 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 95 | 25 | 0 | 0 | 0 | 78 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 041-080 | 5 | 75 | 83 | 0 | 0 | 22 | 83 | 25 | 0 | 0 | 0 | 95 | 0 | 0 | 0 |
| 081-120 | 0 | 0 | 17 | 91 | 100 | 0 | 17 | 67 | 25 | 0 | 0 | 5 | 92 | 8 | 0 |
| 121-160 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 8 | 75 | 75 | 0 | 0 | 8 | 92 | 84 |
| 161-200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 16 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 95 | 35 | 0 | 0 | 0 | 100 | 5 | 0 | 0 | 0 |
| 041-080 | 5 | 65 | 100 | 8 | 16 | 0 | 95 | 10 | 0 | 0 |
| 081-120 | 0 | 0 | 0 | 84 | 0 | 0 | 0 | 90 | 60 | 0 |
| 121-160 | 0 | 0 | 0 | 8 | 84 | 0 | 0 | 0 | 40 | 100 |
| 161-200 | - | - | - | - | - | - | - | - | - | - |

# *JUNIPERUS SQUAMATA* 'BLUE CARPET'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Singleseed Juniper |
| **French common name:** | Genévrier écailleux 'Blue Carpet' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This creeping, irregular-shaped juniper is slow-growing. It may reach 0.60 m in height and more than 1.50 m wide after 5 years.

One to two long main branches sometimes grow in the same direction, giving this conifer its irregular aspect. The young shoots, which are numerous, short and dense, pointing slightly upward, sag with age, totally hiding the branches.

This cultivar is characterized by its beautiful steel-blue foliage, which keeps its colour all year, deepening in the fall to a violet colour. The young verticillate leaves, in the shape of a star, are made up of small needles, overlapping like scales, adhering so closely to the shoots that they make them look like ropes, producing a foliage that is soft to the touch.

## ORIGIN AND DISTRIBUTION

## USE

**Ornamental:** This cultivar, which is very popular in the design of rock gardens, may also be used as a ground cover and atop low walls, as its foliage easily covers vertical surfaces.

## REQUIREMENTS

These junipers need direct sun. They adapt to all types of soil, poor and moderately alkaline, but absolutely require a well-drained soil.

They thrive well in conditions of great heat and drought such as are found in the urban environment.

## PATHOLOGY AND INSECTS

Juniper blight (*Phomopsis juniperovora*) attacks most junipers. Juniper rust (*Gymnosporangium clavipes, G. juniperi-virginianae* and *G. globosum*) is a fungal disease that needs a primary host to begin its reproductive cycle. Any juniper can serve as this primary host but the cultivars or varieties derived from *Juniperus squamata* are among the most susceptible. *Alternaria* and *Epicoccum* are two fungal diseases that also cause serious damage.

Among the insects that attack junipers, scale insects, mites and spittlebugs may cause harm.

## PROPAGATION

**Cutting:** Heel cuttings, taken from young plants at the end of July or August, will root very well. A medium of fine peat and sand fosters root development. Softwood cuttings taken before July (before the bark on the shoots turns brown) must be processed with a hormone (0.8% IBA on talc).

**Layering:** All cultivars with a creeping habit may be propagated by layering, but the quantity of plants obtainable in this way is limited. Shoots, preferably laid in furrows filled with equal proportions of river sand, peat and earth, are watered regularly all summer and take root when they touch the ground.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** La Samarre Nursery, Plessisville, Quebec

**Propagation site:** La Samarre Nursery, Plessisville, Quebec

**Propagation technique:** Cuttings less than 5 cm in length were taken in November 1991 from parent plants 5 years old, measuring 25 cm tall and 30 cm wide. They were treated with a hormone powder, Seradix® No. 3, after being lightly bruised at the base of the stem. They were placed on tables on a substrate of sand and peat (3:2; v:v) and misted twice a day. The heating cables' temperature was set at 22°C. Fungicidal treatments alternating between copper and a solution of Benomyl-Captan were done as necessary. Rooting was 76% after 8 weeks. In May 1992, 170 rooted cuttings were removed from the propagation table, wrapped in damp peat and sent to L'Assomption. Immediately upon receipt, they were potted in 10-cm containers and fertilized on July 24 and 31 with a soluble fertilizer (20-20-20). In April 1993, the plants were wrapped and placed in a coldroom until their shipment in May.

**Inclusion in testing network:** Young plants 11 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-1998)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of the main damage that occurred each winter at each of the sites are shown below.

Mortality was worse in region 1, where it affected 53% of the plants.

*Region 1*

In L'Assomption, 21, 27, 80 and 75% of the plants died during the first four winters. In addition, 21, 25 and 100% of the plants sustained damage in the form of browning of foliage the first, fourth and fifth winters.

In St. Clotilde, one plant died the first winter.

In St. Hyacinthe, 25 and 13% of the plants died during the first two winters and 25 and 60% of the plants suffered damage in the form of browning of foliage.

*Region 2*

In St. Foy, 75, 33, 34 and 100% of the plants suffered damage in the form of browning of foliage the last four winters. In addition, 66% of the plants had damage to the stem tips the third winter.

In La Pocatière, one plant died the first winter. The last winter, 50% of the plants showed browning on their foliage.

Damage in the form of browning of foliage occurred every winter in Deschambault, affecting 81, 33, 83, 100 and 100% of the plants.

*Region 3*

In Normandin, 9, 8 and 9% of the plants died the first, third and last winters. Browning of foliage was recurrent each winter, affecting 5, 37, 50, 100 and 73% of the plants.

In Kapuskasing, one plant died the third winter and little or no damage occurred during the first two winters. The following winters 75, 18 and 91% of the plants had damage to their stem tips, and 8, 82 and 9% of the plants had damage to the previous year's shoot.

### Growth in height and width

Figures 1 and 2 show the average height and width of plants after five years of trials at each site in each of the regions.

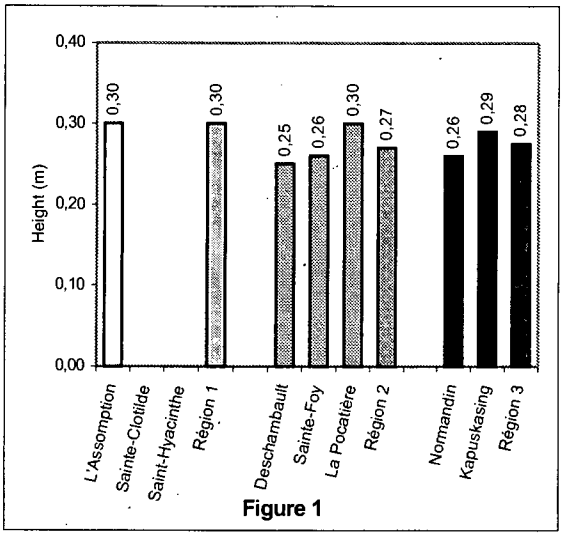


**Figure 1.** Average height of shrubs at the conclusion of the trial for each of the sites and each of the three regions

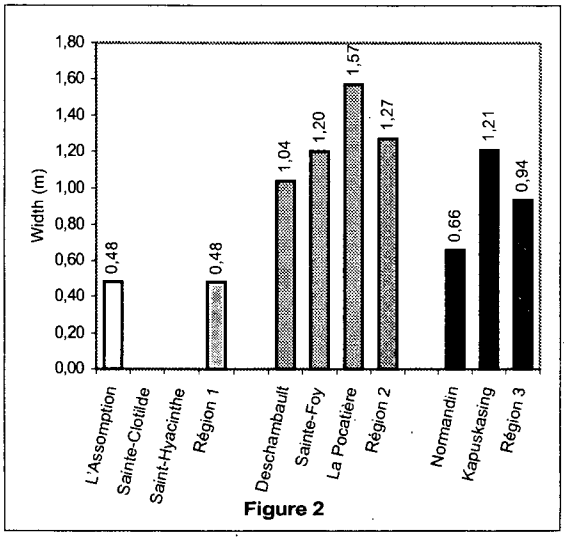


**Figure 2.** Average width of shrubs at the conclusion of the trial for each of the sites and each of the three regions

### Effect of pruning

Only very light pruning was required.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable plants by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

After two years' growth, more than 95% of the plants in St. Foy and La Pocatière had reached a width between 41 and 80 cm. Another year was necessary at the other sites for most of the plants to reach that size. The plants in L'Assomption, however, remained small and undeveloped.

This cultivar can be grown at all trial sites, so long as the soil is light or well drained and snow cover protects the young plants' root system the first winters.

## HARDINESS EVALUATION

The hardiness rating assigned to this cultivar in the literature corresponds to zones 2 or 2b, depending on the authors consulted. Mortality observed in this trial was very low, with the exception of the L'Assomption site, where all plants died during the trial. The plots where the conifers were planted at these two sites were in a damper part of the property, which may explain the mortality that occurred. In addition, a few plants died at the sites in the Montreal region, where the snow cover was probably inadequate the first few years.

Survival and use ratings have therefore been set at zone 2a, as the Kapuskasing plants were as well developed as those at the other sites at the end of the evaluation, with the proviso that a good snow cover is necessary until the plants are well established. Then, the dense foliage protects the roots like a mulch.

Potential for full ornamental expression was attained at the site in zone 5b. At the other sites, damage in the form of browning of foliage appeared almost every winter.

## WRITTEN BY

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Christine Galipeau, Biol.

**Table 1. Frequency of winter damage observed on *Juniperus squamata* 'Blue Carpet', 1994-1998**

| Trial site | No Damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 30 | | | | | | | 40 | | | | 30 | 70 |
| St. Clotilde | 98 | | | | | | | 2 | | | | | 2 |
| St. Hyacinthe | 59 | | | | | | | 13 | | | | 28 | 41 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 20 | | | | | | | | | | | 80 | 80 |
| St. Foy | 38 | 14 | | | | | | | | | | 48 | 62 |
| La Pocatière | 90 | | | | | | | 1 | | | | 9 | 10 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 42 | | | | | | | 5 | | | | 53 | 58 |
| Kapuskasing | 41 | 38 | | 20 | | | | 1 | | | | | 59 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage
14 = partial browning of evergreen foliage

No damage of type 2, 3, 5, 6, 7, 9, 10 or 11 was sustained by the plants in the trial.

Table 2. Breakdown of specimens of *Juniperus squamata* 'Blue Carpet' by saleable height category, 1993-1997

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 58 | 20 | 12 | 0 | 0 | 52 | 23 | 0 | 0 | - | 70 | 79 | 18 | 10 | 18 |
| 11-20 | 42 | 73 | 88 | 75 | 0 | 48 | 77 | 25 | 0 | - | 30 | 21 | 64 | 60 | 64 |
| 21-30 | 0 | 7 | 0 | 25 | 100 | 0 | 0 | 63 | 8 | - | 0 | 0 | 18 | 10 | 9 |
| 31-40 | - | - | - | - | - | 0 | - | 12 | 33 | - | 0 | 0 | 0 | 10 | 9 |
| 41-50 | - | - | - | - | - | 0 | 0 | 0 | 17 | - | 0 | 0 | 0 | 10 | 0 |
| 51-60 | - | - | - | - | - | 0 | 0 | 0 | 42 | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 67 | 33 | 0 | 0 | 0 | 45 | 10 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 |
| 11-20 | 33 | 67 | 58 | 58 | 17 | 55 | 90 | 25 | 50 | 25 | 67 | 30 | 100 | 33 | 0 |
| 21-30 | 0 | 0 | 42 | 33 | 58 | 0 | 0 | 50 | 42 | 58 | 0 | 65 | 0 | 67 | 50 |
| 31-40 | 0 | 0 | 0 | 9 | 25 | 0 | 0 | 25 | 8 | 17 | 0 | 5 | 0 | 0 | 50 |
| 41-50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 67 | 89 | 10 | 0 | 0 | 33 | 5 | 0 | 0 | 0 |
| 11-20 | 33 | 11 | 90 | 54 | 40 | 67 | 95 | 83 | 82 | 0 |
| 21-30 | 0 | 0 | 0 | 36 | 30 | 0 | 0 | 17 | 18 | 64 |
| 31-40 | 0 | 0 | 0 | 10 | 20 | 0 | 0 | 0 | 0 | 27 |
| 41-50 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 9 |
| 51-60 | - | - | - | - | - | - | - | - | - | - |

* (Data not collected in 1997.)

Table 3. **Breakdown of specimens of *Juniperus squamata* 'Blue Carpet' by saleable width category, 1993-1997**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 100 | 75 | 25 | 0 | 100 | 85 | 0 | 0 | - | 100 | 100 | 36 | 10 | 55 |
| 041-080 | 0 | 0 | 25 | 75 | 100 | 0 | 15 | 75 | 0 | - | 0 | 0 | 64 | 80 | 45 |
| 081-120 | - | - | - | - | - | 0 | 0 | 25 | 75 | - | 0 | 0 | 0 | 10 | 0 |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 25 | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 95 | 86 | 8 | 0 | 0 | 100 | 5 | 8 | 0 | 0 | 95 | 0 | 0 | 0 | 0 |
| 041-080 | 5 | 14 | 84 | 50 | 17 | 0 | 50 | 50 | 0 | 0 | 5 | 70 | 0 | 0 | 0 |
| 081-120 | 0 | 0 | 8 | 50 | 66 | 0 | 45 | 42 | 41 | 50 | 0 | 30 | 75 | 8 | 0 |
| 121-160 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 59 | 50 | 0 | 0 | 25 | 92 | 100 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 52 | 18 | 9 | 10 | 100 | 57 | 0 | 0 | 0 |
| 041-080 | 0 | 48 | 82 | 55 | 40 | 0 | 43 | 67 | 0 | 0 |
| 081-120 | 0 | 0 | 0 | 36 | 50 | 0 | 0 | 33 | 100 | 45 |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 0 | 55 |

* (Data not collected in 1997.)

# *JUNIPERUS SQUAMATA* 'BLUE STAR'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Singleseed Juniper |
| **French common name:** | Genévrier écailleux 'Blue Star', Genévrier du Népal 'Blue Star' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This dwarf shrub, with an irregular globular growth habit, becomes spreading with age and may reach 1.0 m of height and 1.0 to 2.0 m wide. It is slow-growing.

Its short, creeping branches have numerous more or less upright shoots.

The very dense foliage conceals the shoots. The leaves are needle-like, broad and very sharp, silvery on the inside and bluish-green on the outside.

## ORIGIN AND DISTRIBUTION

*Juniperus squamata* 'Blue Star' arose from a mutation in *J. squamata* 'Meyeri'. Its was produced at the Gebr. Hoogeveen nursery in Reeuwijk, Holland, and was introduced in 1950.

## USE

**Ornamental:** This small shrub may be used in rock gardens as a ground cover, by itself or in massed plantings. It is also used in bonsai culture.

## REQUIREMENTS

All junipers grow better in full sun and must be placed in rather damp soil, as they are sensitive to drought. This cultivar is tolerant of alkaline soil. It must be planted in a sheltered spot, as it absolutely requires winter protection.

## PATHOLOGY AND INSECTS

Juniper blight (*Phomopsis juniperovora*) attacks most junipers. Juniper rust (*Gymnosporangium clavipes, G. juniperi-virginianae* and *G. globosum*) is a fungal disease that needs a primary host to begin its reproductive cycle. Any juniper can serve as this primary host, but the cultivars derived from *Juniperus squamata* are among the most susceptible. *Alternaria* and *Epicoccum* are two fungal diseases that may also cause serious damage.

Scale insects (Fletcher scale), mites and spittlebugs are among the insects that attack junipers.

## PROPAGATION

**Cutting:** Propagation by woody cuttings taken during the winter is the most commonly used method.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Purchase from Lawyer Nurseries (US).

**Propagation site:** La Samarre Nursery, Plessisville, Quebec

**Propagation technique:** Ten- to fifteen-centimetre cuttings were taken on November 1, 1992 from parent plants 5 years old measuring 20 cm tall and 30 cm wide. They were soaked in Séradix® rooting powder No. 3 and planted in a substrate of sand and peat (9:1; v:v) in a greenhouse. The heating cables' temperature was set at 22°C. The cuttings were watered manually as necessary and rooting was 40% after 22 weeks. On May 26, 1993, 250 rooted cuttings were removed from the propagation table, wrapped in damp peat and sent to L'Assomption. Immediately upon receipt, the plants were transplanted to the nursery and fertilized with a solution of soluble fertilizer (10-52-10). In mid-November, they were pulled up and heeled in for the winter. In the spring of 1994, they were wrapped, puddled and placed in a coldroom at 5°C until their shipment a few days later.

**Inclusion in test network:** Young plants 7 cm tall were planted at eight trial sites throughout Quebec and north-eastern Ontario. Their winter survival and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-1999)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of the main damage that occurred each winter at each of the sites are shown below.

Browning of foliage was the damage most often observed. In addition, some plants died at all sites: 2 to 10 at the sites in region 1, 9 to 14 at the sites in region 2, and 8 to 20 at the sites in region 3.

*Region 1*

In L'Assomption, 20 and 78% of the plants died during the first and third winters. Half of them had frost damage to the previous year's shoot the last winter. In addition, 25, 11 and 100% of the plants suffered damage in the form of browning of foliage the second, third and fourth winters.

Damage occurred in St. Clotilde the first winter only, killing two shrubs and damaging the foliage of another.

Two plants died during the first winter in St. Hyacinthe. (Data not collated in 1997.)

*Region 2*

In Deschambault, 5, 38 and 14% of the shrubs died during the first two winters and the fourth. Damage in the form of browning of foliage affected 21, 44, 100, 71 and 50% of the shrubs each winter. In addition, 5% sustained mechanical breakage the third winter.

In St. Foy, 15, 40 and 33% of the plants died the second and the last two winters. Each winter, damage in the form of browning of foliage occurred on 5, 31, 100, 60 and 67% of the shrubs. The second winter, 37% of the plants showed frost damage to their stem tips.

In La Pocatière, 41 and 70% of the plants died during the first two winters. There was frost damage to the previous year's shoot on 17, 30, 67, 100 and 33% of the plants. In addition, 6% of the plants had damage to their old wood the first winter and 33% of the plants suffered browning of foliage the last winter.

*Region 3*

In Normandin, 45, 90 and 100% of the plants died the first three winters. Fifteen percent of the surviving plants suffered damage in the form of browning of foliage the first winter.

In Kapuskasing, 5, 5, 36 and 29% of the shrubs died the first three winters and the last. There was frost damage to stem tips on 11, 9 and 43% of the plants the second, third and fourth winters. In addition, 71% of the plants were affected by damage in the form of browning of foliage the last winter.

### Growth in height and width

Figures 1 and 2 show the average height and width of plants after five years of trials at each site in each of the regions.

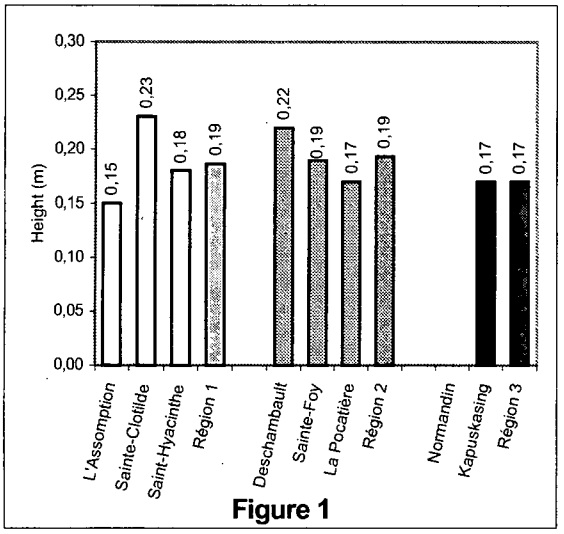


**Figure 1.** Average height of shrubs at the conclusion of the trial for each of the eight sites and each of the three regions

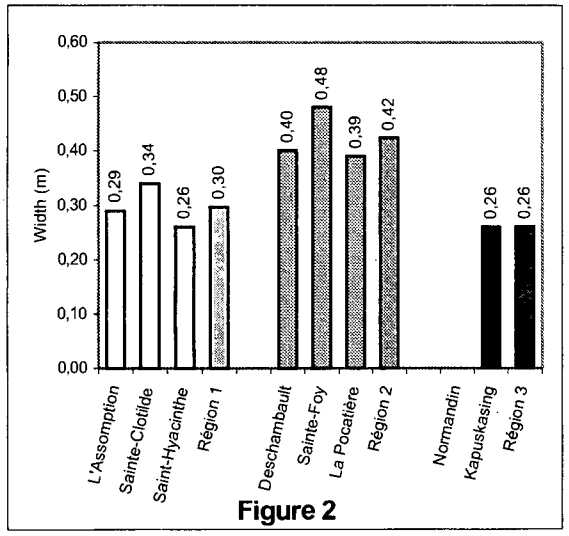


**Figure 2.** Average width of shrubs at the conclusion of the trial for each of the eight sites and each of the three regions

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable plants by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

This cultivar can be grown in containers in climatic zones 4 and 5, but the plants will need protection during the winter. Field production is risky, as the shrubs die in large numbers when winter temperatures fall too low too early in the fall, before a protective snow cover has fallen, or when snow is absent during the coldest months.

## HARDINESS EVALUATION

The survival potential of this cultivar varies between zones 5 and 5b according to the authors consulted. The mortality rate observed at the trial sites points to hardiness up to zone 5b, as plant mortality was total at the sites in zones 2a and 2b and very high at the sites in zones 5a and 4a.

The use potential of this cultivar may extend to zone 4 if the plants have survived the first few winters, are grown in the best possible conditions and are protected by snow early in the season.

The potential for full expression of the plants' ornamental character is seen in warmer zones than those in the trial.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biol.

**Table 1.** **Frequency of winter damage observed on *Juniperus squamata* 'Blue Star', 1995-1999**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 43 | | | 10 | | | | 20 | | | | 27 | 57 |
| St. Clotilde | 96 | | | | | | | | | | | 4 | 4 |
| St. Hyacinthe | 97 | | | | | | | 3 | | | | | 3 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 30 | | | | | | | 12 | | 1 | | 57 | 70 |
| St. Foy | 22 | 7 | | | | | | 18 | | | | 53 | 78 |
| La Pocatière | 20 | | | 49 | 1 | | | 14 | | | | 16 | 80 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 17 | | | | | | | 78 | | | | 5 | 83 |
| Kapuskasing | 58 | 13 | | | | | | 15 | | | | 14 | 42 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage
14 = partial browning of evergreen foliage

No damage of type 3, 6, 7, 9 or 11 was sustained by the plants in the trial.

Table 2. Breakdown of specimens of *Juniperus squamata* 'Blue Star' by saleable height category, 1994-1998

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-05 | 0 | 0 | 0 | 0 | 0 | 80 | 0 | 11 | 0 | 0 | - | 0 | 0 | 9 | 0 |
| 06-10 | 33 | 17 | 11 | 0 | 50 | 20 | 23 | 0 | 11 | 0 | - | 13 | 37 | 37 | 0 |
| 11-15 | 67 | 58 | 44 | 50 | 0 | 0 | 62 | 56 | 44 | 0 | - | 80 | 45 | 54 | 27 |
| 16-20 | 0 | 17 | 45 | 50 | 50 | 0 | 15 | 33 | 45 | 75 | - | 7 | 18 | 0 | 64 |
| 21-25 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 9 |
| 26-30 | - | - | - | - | - | 0 | 0 | 0 | 0 | 25 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-05 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 |
| 06-10 | 53 | 22 | 0 | 0 | 0 | 60 | 0 | 0 | 0 | 0 | 65 | 40 | 0 | 0 | 0 |
| 11-15 | 47 | 56 | 27 | 43 | 0 | 25 | 74 | 10 | 50 | 0 | 35 | 50 | 67 | 0 | 0 |
| 16-20 | 0 | 22 | 64 | 14 | 50 | 15 | 26 | 60 | 40 | 83 | 0 | 0 | 33 | 100 | 100 |
| 21-25 | 0 | 0 | 9 | 43 | 33 | 0 | 0 | 20 | 10 | 17 | - | - | - | - | - |
| 26-30 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 10 | 0 | 0 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-05 | 60 | 0 | 0 | - | - | 0 | 0 | 0 | 0 | 0 |
| 06-10 | 40 | 91 | 100 | - | - | 53 | 17 | 10 | 0 | 15 |
| 11-15 | 0 | 9 | 0 | - | - | 42 | 55 | 54 | 28 | 29 |
| 16-20 | - | - | - | - | - | 5 | 28 | 36 | 43 | 28 |
| 21-25 | - | - | - | - | - | 0 | 0 | 0 | 29 | 28 |
| 26-30 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Hyacinthe not collected in 1994.

Table 3. **Breakdown of specimens of *Juniperus squamata* 'Blue Star' by saleable width category, 1994-1998**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 40 | 0 | 0 | 0 | 0 | 100 | 23 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 |
| 11-20 | 60 | 92 | 33 | 50 | 0 | 0 | 54 | 78 | 33 | 0 | - | 67 | 27 | 55 | 9 |
| 21-30 | 0 | 8 | 67 | 0 | 50 | 0 | 23 | 22 | 67 | 38 | - | 33 | 54 | 45 | 91 |
| 31-40 | 0 | 0 | 0 | 50 | 50 | 0 | 0 | 0 | 0 | 62 | - | 0 | 19 | 0 | 0 |
| 41-50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 61-70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 16 | 6 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 24 | 10 | 0 | 0 | 0 |
| 11-20 | 84 | 72 | 9 | 0 | 0 | 85 | 5 | 0 | 0 | 0 | 76 | 80 | 0 | 0 | 0 |
| 21-30 | 0 | 22 | 73 | 43 | 16 | 0 | 79 | 20 | 10 | 0 | 0 | 10 | 100 | 0 | 0 |
| 31-40 | 0 | 0 | 18 | 43 | 50 | 0 | 16 | 30 | 20 | 20 | 0 | 0 | 0 | 100 | 33 |
| 41-50 | 0 | 0 | 0 | 14 | 17 | 0 | 0 | 40 | 50 | 20 | 0 | 0 | 0 | 0 | 67 |
| 51-60 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 10 | 10 | 60 | - | - | - | - | - |
| 61-70 | - | - | - | - | - | 0 | 0 | 0 | 10 | 0 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 60 | 9 | 0 | - | - | 21 | 0 | 0 | 0 | 0 |
| 11-20 | 40 | 91 | 100 | - | - | 79 | 67 | 45 | 14 | 28 |
| 21-30 | - | - | - | - | - | 0 | 33 | 55 | 43 | 29 |
| 31-40 | - | - | - | - | - | 0 | 0 | 0 | 43 | 43 |
| 41-50 | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - |
| 61-70 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Hyacinthe not collected in 1994.

# *JUNIPERUS SQUAMATA* 'MEYERI'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Singleseed Juniper, Fishtail Juniper |
| **French common name:** | Genévrier écailleux 'Meyeri', Genévrier du Népal 'Meyeri' |
| **Synonym:** | *J. squamata* var. *meyeri* Rehd. |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This large bushy shrub may reach 1.75 m in height and 1.25 m in width in the United States.

This shrub has a very characteristic look, with its collection of upward-pointing branches ending in drooping leaders and ramules.

The needle-like, glaucous foliage takes on a purplish colour in winter. The pointed needles are from 6 to 10 mm long and about 1.5 mm wide. This cultivar keeps its dead foliage for several years, giving an impression of lack of vigour, so it needs to be pruned regularly.

The elliptical cones, measuring 0.5 cm in length, are covered with pointed scales (3 to 6), reddish brown in colour, which turn black when ripe. The single ovoid seed is rigid, with 3 or 4 depressions on the bottom.

## ORIGIN AND DISTRIBUTION

*Juniperus squamata* comes from the Himalayas, in China, and was introduced in 1824. The 'Meyeri' cultivar was introduced into Europe and United States after 1914.

## USE

**Ornamental:** This cultivar is attractive in a massed planting when young, but over time it loses its attractiveness as the dried foliage remains on the plant, necessitating regular maintenance. This shrub may also be used in Asian-type gardens, as with suitable pruning it can look like a large bonsai.

## REQUIREMENT

All junipers prefer permeable soil with abundant sun. They are tolerant of alkaline or acid soil and are even tough enough to grow in dry, pebbly soil.

## PATHOLOGY AND INSECTS

Juniper blight (*Phomopsis juniperovora*) attacks most junipers. Juniper rust (*Gymnosporangium clavipes*, *G. juniperi-virginianae* and *G. globosum*) is a fungal disease that needs a primary host to begin its reproductive cycle. Any juniper can serve as this primary host and the cultivars or varieties derived from *Juniperus squamata* are among the most susceptible. *Alternaria* and *Epicoccum* are two fungal diseases that may also cause serious damage.

Scale insects (Fletcher scale), mites and spittlebugs may attack junipers.

## PROPAGATION

**Cutting:** Propagation by woody cuttings taken in winter is the most commonly used method.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Purchase from Lawyer Nurseries (US)

**Propagation site:** La Samarre Nursery, Plessisville, Quebec

**Propagation technique:** Ten- to fifteen-centimetre cuttings were taken on November 1, 1992 from parent plants 5 years old, measuring 40 cm tall and 30 cm wide. They were soaked in Séradix® No 3 rooting powder and planted in a substrate of sand and peat (9:1; v:v) in the greenhouse. The heating cables' temperature was set at 22°C. The cuttings were watered manually if necessary. Rooting was 75% after

22 weeks. On May 26, 1993, 250 cuttings 10 to 15 cm tall were removed from the propagation table, wrapped in damp peat and sent to L'Assomption. Immediately upon receipt, the plants were transplanted in the nursery and fertilized with a solution of soluble fertilizer (10-52-10). In mid-November they were pulled up and heeled in for the winter. In the spring of 1994 they were wrapped, puddled and placed in a coldroom at 5°C until their shipment a few days later.

**Inclusion in testing network:** Young plants 21 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-1999)

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of the main damage that occurred each winter at each of the sites are shown below.

### Winter damage

The browning of evergreen foliage is the type of damage that occurred most often on this cultivar.

*Region 1*

In L'Assomption, 4, 5 and 18% of the plants died during the first three winters. Damage in the form of browning of foliage was observed on 48, 54, 89 and 11% of the plants the first and the three last winters.

In St. Clotilde, one plant died the third winter and one plant showed damage in the form of browning of foliage the following winter.

In St. Hyacinthe, one plant died the second winter, while 30% of the plants suffered damage in the form of browning of foliage the first two winters. (Data not collated in 1997.)

*Region 2*

Damage in the form of browning of foliage was observed each winter in Deschambault on 20, 5, 8, 8 and 100% of the plants. In addition, 10 and 8% of the plants sustained mechanical breakage the second and fourth winters. (Data not collated in 1999.)

The first two winters, 10 and 5% of the plants died and 14 and 5% of the plants had damage to their stem tips at the St. Foy site. Damage in the form of browning of foliage affected 5, 10, 67, 83 and 33% of the shrubs each winter.

In La Pocatière, one plant died and two suffered browning of foliage the first winter.

*Region 3*

In Normandin, browning of foliage occurred on 14, 5, 25 and 67% of the plants the first two and the last two winters.

In Kapuskasing, 24, 6, 20, 12 and 43% of the shrubs died each winter during the trial. Frost damage to stem tips was observed on 9 to 37% of the plants the first four winters. Frost damage to the previous year's shoot affected 10% of the plants the first, third and fourth winters. 57% of the plants suffered browning of foliage the last winter.

### Growth in height and width

Figures 1 and 2 show the average height and width of plants after five years of trials at each site in each of the regions.

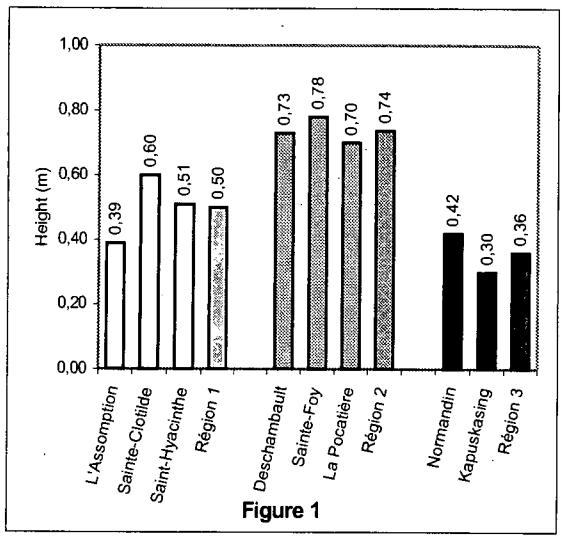


**Figure 1.** Average height of shrubs at the conclusion of the trial for each of the sites and each of the three regions

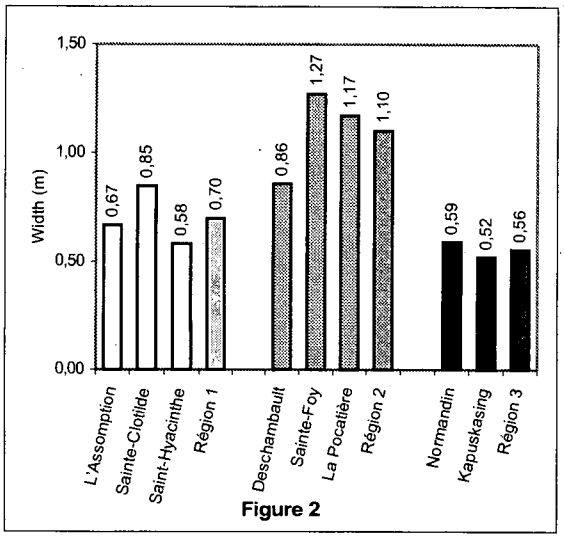


**Figure 2.** Average width of shrubs at the conclusion of the trial for each of the sites and each of the three regions

### Effect of pruning

Pruning that reduced the shrubs' height by 10 to 40% was carried out at the L'Assomption, St. Foy, Deschambault and Normandin sites.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable plants by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

This cultivar had little mortality, and the weakest plants were eliminated from the trials during the first two winters. It is possible to grow this cultivar right into zone 2b, though the increase in plant width was faster at sites in climatic zone 4 than in zones 5 and 2.

## HARDINESS EVALUATION

This cultivar, like all cultivars of *J. squamata*, is hardy into zone 5 according to the references consulted. However, trial results show that in fact it is hardy into zone 2b so long as snow covers the plants and provides protection before very cold winter temperatures damage the stems. In colder zones, mortality occurs each winter.

Potential use of this cultivar extends to zone 2b.

The potential for full expression of its ornamental character was not attained at the trial sites.

## WRITTEN BY

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Jacques-André Rioux, Agr.

Christine Galipeau, Biol.

**Table 1.** **Frequency of winter damage observed on *Juniperus squamata* 'Meyeri', 1995-1999**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 54 | | | | | | | 6 | | | | 40 | 46 |
| St. Clotilde | 96 | | | | | | | 2 | | | | 2 | 4 |
| St. Hyacinthe | 90 | | | | | | | 1 | | | | 9 | 10 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 85 | | | | | | | | | 6 | | 9 | 15 |
| St. Foy | 53 | 4 | | 4 | | | | | | | | 39 | 47 |
| La Pocatière | 97 | | | | | | | 1 | | | | 2 | 3 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 76 | | | | | | | 2 | | | | 22 | 24 |
| Kapuskasing | 40 | 21 | | 8 | | | | 21 | | | | 10 | 60 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoot affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage
14 = partial browning of evergreen foliage

No damage of type 3, 5, 6, 7, 9 or 11 was sustained by the plants in the trial.

Table 2. **Breakdown of specimens of *Juniperus squamata* 'Meyeri' by saleable height category, 1994-1998**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 76 | 5 | 18 | 0 | 12 | 100 | 35 | 8 | 0 | 0 | - | 10 | 0 | 10 | 0 |
| 021-040 | 24 | 95 | 73 | 100 | 44 | 0 | 65 | 67 | 73 | 0 | - | 85 | 64 | 63 | 0 |
| 041-060 | 0 | 0 | 9 | 0 | 33 | 0 | 0 | 25 | 27 | 82 | - | 5 | 36 | 27 | 100 |
| 061-080 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 18 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 55 | 5 | 0 | 0 | 0 | 28 | 0 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | 0 |
| 021-040 | 40 | 90 | 42 | 0 | 0 | 82 | 90 | 17 | 0 | 0 | 5 | 85 | 70 | 10 | 10 |
| 041-060 | 5 | 5 | 58 | 67 | 8 | 0 | 10 | 75 | 58 | 16 | 0 | 15 | 30 | 90 | 90 |
| 061-080 | 0 | 0 | 0 | 33 | 75 | 0 | 0 | 8 | 42 | 34 | - | - | - | - | - |
| 081-100 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 50 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 95 | 63 | 8 | 0 | 0 | 90 | 56 | 30 | 12 | 14 |
| 021-040 | 5 | 37 | 92 | 58 | 58 | 10 | 44 | 70 | 88 | 86 |
| 041-060 | 0 | 0 | 0 | 42 | 42 | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |

* Data not collected in 1994.

Table 3. **Breakdown of specimens of *Juniperus squamata* 'Meyeri' by saleable width category, 1994-1998**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 80 | 9 | 0 | 0 | 100 | 40 | 17 | 0 | 0 | - | 50 | 0 | 10 | 0 |
| 021-040 | 0 | 20 | 54 | 89 | 11 | 0 | 60 | 83 | 45 | 0 | - | 50 | 27 | 18 | 10 |
| 041-060 | 0 | 0 | 37 | 11 | 22 | 0 | 0 | 0 | 45 | 0 | - | 0 | 73 | 63 | 36 |
| 061-080 | 0 | 0 | 0 | 0 | 55 | 0 | 0 | 0 | 10 | 27 | - | 0 | 0 | 9 | 54 |
| 081-100 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 73 | - | - | - | - | - |
| 101-120 | 0 | 0 | 0 | 0 | 12 | - | - | - | - | - | - | - | - | - | - |
| 121-140 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 141-160 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 95 | 40 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 | 95 | 15 | 0 | 0 | 0 |
| 021-040 | 5 | 60 | 58 | 0 | 0 | 14 | 63 | 0 | 0 | 0 | 5 | 80 | 10 | 0 | 0 |
| 041-060 | 0 | 0 | 42 | 33 | 0 | 0 | 37 | 0 | 0 | 0 | 0 | 5 | 20 | 10 | 0 |
| 061-080 | 0 | 0 | 0 | 42 | 33 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 70 | 10 | 0 |
| 081-100 | 0 | 0 | 0 | 25 | 50 | 0 | 0 | 67 | 8 | 8 | 0 | 0 | 0 | 60 | 20 |
| 101-120 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 84 | 17 | 0 | 0 | 0 | 20 | 30 |
| 121-140 | - | - | - | - | - | 0 | 0 | 0 | 8 | 58 | 0 | 0 | 0 | 0 | 50 |
| 141-160 | - | - | - | - | - | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 0 | 0 | 0 | 100 | 44 | 10 | 0 | 0 |
| 021-040 | 0 | 0 | 92 | 17 | 17 | 0 | 56 | 70 | 38 | 43 |
| 041-060 | 0 | 0 | 8 | 17 | 41 | 0 | 0 | 20 | 25 | 14 |
| 061-080 | 0 | 0 | 0 | 66 | 42 | 0 | 0 | 0 | 37 | 43 |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |
| 121-140 | - | - | - | - | - | - | - | - | - | - |
| 141-160 | - | - | - | - | - | - | - | - | - | - |

* Data not collected in 1994.


AAC/CRDH

*Acer saccharinum* L.


AAC/CRDH

*Acer saccharinum* L.


AAC/CRDH

*Acer saccharinum* L.


AAC/CRDH

*Acer saccharinum* L.


AAC/CRDH

*Acer saccharinum* L.

AAC/CRDH

*Rosa* 'Captain Samuel Holland'

AAC/CRDH

*Rosa* 'Captain Samuel Holland'

AAC/CRDH

*Rosa* 'Captain Samuel Holland'

Jacques-André Rioux

*Chamaecyparis obtusa* 'Nana'

Jacques-André Rioux

*Cornus hemsleyii* 'Nana'

AAC/Raynald Drapeau

*Cotoneaster dammeri* 'Royal Carpet'

AAC/Raynald Drapeau

*Cotoneaster dammeri* 'Royal Carpet'

AAC/CRDH

*Rosa* 'Henry Hudson'

AAC/CRDH

*Rosa* 'Henry Hudson'

AAC/CRDH

*Rosa* 'Henry Hudson'

AAC/CRDH

*Hydrangea paniculata* 'Unique'

AAC/CRDH

*Hydrangea serrata* (Thunb.) Mak.

AAC/CRDH

*Rosa* 'Jens Munk'

AAC/CRDH

*Rosa* 'Jens Munk'

AAC/CRDH

*Rosa* 'Jens Munk'

AAC/CRDH

*Rosa* 'Jens Munk'

Jacques-André Rioux

*Juniperus squamata* 'Blue Carpet'

Jacques-André Rioux

*Juniperus sabina* 'Blue Danube'

Jacques-André Rioux

*Juniperus sabina* 'Wapiti'

Jacques-André Rioux

*Juniperus communis* 'Depressa Aurea'

Jacques-André Rioux

*Liriodendron tulipifera* L.

Jacques-André Rioux

*Malus baccata* à fleurs doubles

AAC/CRDH

*Malus baccata* (L.) Borkh.

AAC/CRDH

*Malus baccata* (L.) Borkh.

AAC/CRDH

*Rosa* 'Marie Victorin'

AAC/CRDH

*Rosa* 'Marie Victorin'

AAC/CRDH

*Rosa* 'Marie Victorin'

AAC/CRDH

*Rosa* 'Marie Victorin'

AAC/CRDH

*Microbiota decussata* Komar.

AAC/CRDH

*Rosa* 'Morden Centennial'

AAC/CRDH

*Rosa* 'Morden Centennial', maladies du feuillage

AAC/CRDH

*Rosa* 'Morden Centennial'

Jacques-André Rioux

*Picea abies* 'Argenteospica'

Jacques-André Rioux

*Picea abies* 'Argenteospica'

Jacques-André Rioux

*Picea abies* 'Argenteospica'

Jacques-André Rioux

*Picea abies* 'Argenteospica'

Jacques-André Rioux

*Picea pungens* 'Aurea'

AAC/CRDH

*Potentilla fruticosa* 'Red Ace'

AAC/CRDH

*Potentilla fruticosa* 'Hachmann's Giant'

AAC/CRDH

*Prunus virginiana* L.

AAC/CRDH

*Prunus virginiana* L.

Jacques Allard

*Rhododendron* 'Ramapo'

Jacques-André Rioux

*Salix fragilis* 'Bullata'

Jacques-André Rioux

*Salix fragilis* 'Bullata'

AAC/Raynald Drapeau

*Spiraea nipponica var. tosaensis* (Yatabe) Mak.

AAC/Raynald Drapeau

*Spiraea nipponica var. tosaensis* (Yatabe) Mak.

Jacques Allard

*Symphoricarpos albus* (L.) S. F. Blake

AAC/CRDH

*Thuja occidentalis* L.

Jacques Allard

*Ulmus americana* L.

Jacques Allard

*Ulmus americana* L.

Jacques Allard

*Ulmus americana* L.

AAC/CRDH

*Weigela florida* 'Foliis Purpureus'

AAC/CRDH

*Weigela florida* 'Foliis Purpureus'

# *LIRIODENDRON TULIPIFERA* L.

| | |
|---|---|
| **Family:** | Magnoliaceae |
| **English common name:** | Tulip tree, Yellow poplar |
| **French common name:** | Tulipier de Virginie |
| **Category:** | Deciduous plant |
| **Subdivision:** | Large tree |

## BOTANICAL DESCRIPTION

This straight tree with a conical growth habit becomes ovoid with age and may grow as tall as 35 m in its natural habitat, but never more than 10 m in Quebec. Its growth rate is moderate.

The straight trunk is covered with a grey bark that becomes finely ridged over time and has orange grooves. The irregularly arranged branches are ascending at first and droop with age.

The shiny brownish twigs, with leaf scars completely encircled by a row of stipule scars, have a flattened terminal bud 12–14 mm long with two external scales, the ends of which touch. The lateral buds are much smaller. The rounded, raised leaf scars are marked by many vein scars.

The dense, shiny, dark green foliage turns beautiful shades of yellow in fall. The deciduous, simple, alternate leaves are 7–12 cm long and almost as wide. These unusally shaped leaves have four, and sometimes six, lobes, with the upper lobe notched. The stipules are noticeable in spring. The petiole is slender and generally longer than the blade.

The strongly scented tulip-like flowers are rarely produced in our climate. They are solitary and greenish-yellow with orange spots at the base. They measure 5 cm across, have six petals 4–6 cm long and appear in mid-June at shoot tips on older trees.

The winged fruits, 3–5 cm long, are aggregated in spindle-shaped cones 5–7 cm long. When ripe, the fruits fall away from the central stalk of the cone, which remains at the end of the branch. In favourable conditions, there is a good seed crop.

The deep, wide-spreading roots include several taproots.

## ORIGIN AND DISTRIBUTION

This native species covers North America from southern Ontario down to Florida and west to the Mississippi. It grows on the south shore of Lake Huron, the north shore of Lake Erie and the Niagara Peninsula. There are only two species in the genus; the other is a small tree that originated in China.

## USE

**Ornamental:** The species may be used alone or in a grouping for its unusual flowers and pleasing shape. It is not easily transplanted and must be protected from prevailing winter winds.

**Wildlife:** The seeds are eaten by birds and small mammals.

**Bees:** The flowers are a source of nectar for bees.

## REQUIREMENTS

The species needs a sunny exposure, rich, deep, slightly acidic soil (avoid chalky soil), prefers moist, but not too wet, locations, and does better in very well protected situations. It is not very resistant to pollution.

Pruning is needed mainly in spring to remove branches that have frozen.

## DISEASES AND INSECTS

There is no particular information on this species in the Réseau d'Avertissements Phytosanitaires [Quebec Department of Agriculture, Fisheries and Agri-food Plant Health Warning System].

## PROPAGATION

**Seeding:** In excellent conditions, seeding may be done in fall after the harvest. Otherwise, seeds must be sown in spring after they have been stratified. Seed density must be high, because even with the best seed, the germination rate at three weeks ranges from 10 to 15%. It is best to pot on after the first two leaves have formed and to pot on again the next spring, just before growth begins, because that is the most active period of root system development. Growth in height is about 15 cm the first year, and more rapid after that. Seedlings are very sensitive to frost, but become somewhat hardier with age.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Private property, St. Romuald, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** The seeds were harvested in the fall of 1990 from an adult tree, sown in cold frames shortly afterward and covered with a deep layer of snow all winter. They germinated in May 1991 and in May 1992 at a rate of 20% each year. In June 1992, the seedlings were potted up into 10-cm pots filled with a peat-perlite mixture (3:2; v:v). They were kept in tunnels all summer and treated with a soluble fertilizer (20-20-20, 200 ppm N) every week until mid-September. In November, they were dug up, placed in plastic bags perforated with a straight pin, and put in cold storage at -2°C. In 1993, they were repotted and grown and stored in the same conditions as the preceding year. In early May 1994, they were wrapped and put back in the cold store at 4°C until they were shipped a few days later.

**Inclusion in testing network:** Seedlings 18 cm tall were planted at eight trial sites across Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

This species sustained many types of winter damage. The mortality rate was high at several sites and all the trees died at St. Hyacinthe.

*Region 1*

At L'Assomption, 10% of trees died the second winter. Frost damage to branch tips occurred on 40, 30 and 50% of specimens the first two and fourth winters, while 12% suffered mechanicial breakage the fourth winter. The second and third winters, 30 and 75% of plants had frost damage to old wood; 20 and 25% died back to the ground.

At St. Clotilde, 20, 28 and 40% of trees were killed the first three winters. In addition, 10% of plants froze down to the snow cover the first winter and 33% had frost damage to the shoots of the previous year the last winter.

At St. Hyacinthe, one tree died the third winter and all of the rest died the following winter. Two thirds of them had sustained frost damage to the branch tips the second winter.

*Region 2*

At Deschambault, the first two winters, 12 and 57% of specimens died and 37 and 14% were killed to the ground. Frost damage to the branch tips was observed after the first four winters on 37, 14, 100 and 33% of plants. Frost on the previous year's shoots was observed the first three winters on 12, 14 and 67% of trees. In addition, the last winter, 33% suffered mechanical injury.

At St. Foy, 22 and 11% of trees died the first two winters. The first and last two winters, 11–35% had frost damage to the branch tips. The first two and last two winters, 33, 22,

75 and 62% of plants suffered frost damage to the shoots of the previous year. Frost damage to old wood was observed on 33% of trees the second winter and 33% of them froze down to the snow cover. The next winter, all the trees sustained mechanical breakage.

At La Pocatière, some 30% of plants died each of the first three winters. In addition, 50 and 67% of trees had frost damage to the branch tips the third and fifth winters. Frost damage to the previous year's shoots occurred on 22 and 33% of specimens the first and fourth winters. One tree died down to the snow cover the second winter and another the fifth winter. In addition, 44, 40, 25 and 67% froze to the ground the first four winters.

*Region 3*

At Normandin, 50 and 40% of plants died the first two winters, while 60% were killed to the ground the second winter and all suffered mechanical injury the next. The fourth winter, 33% of trees had frost damage to the branch tips and the rest suffered frost to the shoots of the previous year.

At Kapuskasing, between 25 and 40% of specimens died each of the first four winters. In addition, 30–75% of trees froze to the ground each year, 20 and 50% had frost damage to the previous year's shoots the first and last winters and 10% suffered damage to the branch tips the first winter.

**Height and trunk diameter growth**

Figures 1 and 2 show the mean height and trunk diameter of the trees after five years at each site in the three regions.

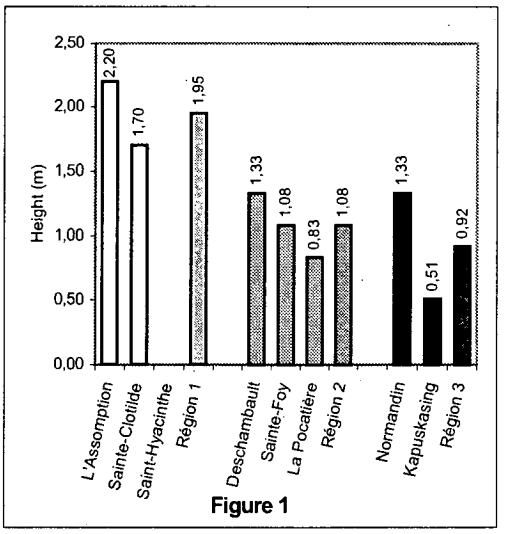


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

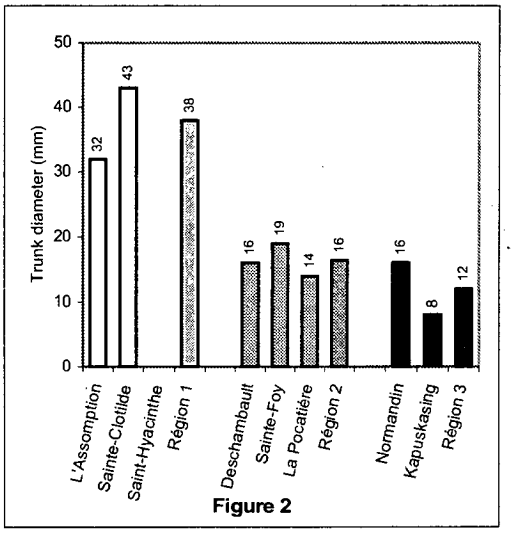


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the sites and three regions

**Effect of pruning**

Hard pruning was done at the sites in the coldest region; the trees at Normandin were cut back to 1 cm from the ground once and those at Kapuskasing twice. At Normandin, pruning to remove 50% of the height was done twice.

At L'Assomption in region 1, trees were pruned three times to remove 20–60% of their total height. In region 2,

annual pruning, removing anywhere from 20 to 90% of the height, was done.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and trunk diameter categories (heights and diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

The trees with the largest trunk diameter were at the two sites in zone 5 (St. Clotilde and St. Hyacinthe), while the tallest were at L'Assomption, in zone 5a.

Production of this tree is a constant challenge; plants grown from seed are susceptible to frost and very strong selection occurs in the early years. Field production of the species is therefore not recommended.

## HARDINESS EVALUATION

According to the literature, this species is hardy to zone 5 or 5b. Although the seeds used came from a tree that grew normally near Quebec City (St. Romuald), very severe damage to many young plants was observed at the sites in region 3 (zones 2a and 2b) and frequently at the sites in regions 1 and 2 (zones 4a, 4b and 5).

The species can survive in zone 4b, but may become shrubby if frost damage to the branches is too severe.

It can be used to zone 4, in the knowledge that serious damage may occur occasionally when fall or winter conditions are harsher, as the seedlings are more fragile. Strong selection occurs from the time of sowing, and only the best-adapted seedlings, with the most favourable growing conditions in a protected setting, may develop normally.

In zones 4b, 5a and 5b, some well-established adult trees flower spectacularly, but they are mature, isolated specimens.

The tree did not achieve its full ornamental potential during the trial.

## WRITTEN BY

Claude Richer, Agr.
Jacques-André Rioux, Agr.
Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Liriodendron tulipifera* L., 1995–99**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | |
| | 1 | 2 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | |
| L'Assomption | 34 | 26 | 6 | 21 | | 9 | 2 | | 2 | | 66 |
| St. Clotilde | 74 | | 6 | | 2 | | 18 | | | | 26 |
| St. Hyacinthe | 50 | 19 | | | | | 31 | | | | 50 |
| **REGION 2** | | | | | | | | | | | |
| Deschambault | 13 | 37 | 18 | | | 10 | 14 | | 8 | | 87 |
| St. Foy | 0 | 15 | 38 | 13 | 6 | | 8 | | 20 | | 100 |
| La Pocatière | 0 | 24 | 11 | | 10 | 37 | 18 | | | | 100 |
| **REGION 3** | | | | | | | | | | | |
| Normandin | 30 | 6 | 12 | | | 12 | 20 | | 20 | | 70 |
| Kapuskasing | 2 | 14 | | | | 58 | 26 | | | | 98 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 3, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of specimens of *Liriodendron tulipifera* L. by saleable height category, 1994–98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 25 | 0 | 0 | 0 | 75 | 0 | 0 | 0 | - |
| 051-100 | 0 | 78 | 12 | 25 | 0 | 0 | 37 | 20 | 33 | 0 | 25 | 75 | 75 | 33 | - |
| 101-150 | 0 | 22 | 38 | 0 | 12 | 0 | 25 | 80 | 33 | 67 | 0 | 25 | 25 | 67 | - |
| 151-200 | 0 | 0 | 50 | 75 | 13 | 0 | 13 | 0 | 34 | 0 | - | - | - | - | - |
| 201-250 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - |
| 251-300 | 0 | 0 | 0 | 0 | 25 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 88 | 0 | 0 | 0 | 0 | 55 | 0 | 0 | 0 | 25 | 100 | 67 | 50 | 0 | 33 |
| 051-100 | 12 | 57 | 0 | 0 | 0 | 45 | 11 | 0 | 0 | 12 | 0 | 33 | 50 | 67 | 33 |
| 101-150 | 0 | 43 | 0 | 33 | 0 | 0 | 44 | 62 | 100 | 63 | 0 | 0 | 0 | 33 | 34 |
| 151-200 | 0 | 0 | 100 | 67 | 100 | 0 | 45 | 38 | 0 | 0 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 251-300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 20 | 0 | 0 | 0 | 100 | 100 | 100 | 67 | 50 |
| 051-100 | 0 | 80 | 33 | 67 | 0 | 0 | 0 | 0 | 33 | 50 |
| 101-150 | 0 | 0 | 67 | 33 | 100 | - | - | - | - | - |
| 151-200 | - | - | - | - | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |
| 251-300 | - | - | - | - | - | - | - | - | - | - |

Table 3: **Breakdown of specimens of *Liriodendron tulipifera* L. by saleable trunk diameter category, 1994–98**

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 78 | 50 | 50 | 12 | 100 | 25 | 0 | 0 | 0 | 100 | 100 | 25 | 0 | - |
| 021-040 | 0 | 22 | 50 | 50 | 75 | 0 | 62 | 80 | 33 | 33 | 0 | 0 | 25 | 34 | - |
| 041-060 | 0 | 0 | 0 | 0 | 13 | 0 | 13 | 20 | 34 | 67 | 0 | 0 | 50 | 0 | - |
| 061-080 | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 33 | - |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 33 | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 67 | 100 | 67 | 100 | 67 | 75 | 38 | 62 | 100 | 100 | 100 | 100 | 67 |
| 021-040 | 0 | 0 | 33 | 0 | 33 | 0 | 33 | 25 | 62 | 38 | 0 | 0 | 0 | 0 | 33 |
| 041-060 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 100 | 67 | 67 | 100 | 100 | 100 | 100 | 100 |
| 021-040 | 0 | 0 | 0 | 33 | 33 | - | - | - | - | - |
| 041-060 | - | - | - | - | - | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |

# *LONICERA GYNOCHLAMYDEA*

HEMSL.

| | |
|---|---|
| **Family:** | Caprifoliaceae |
| **English common name:** | Honeysuckle |
| **French common name:** | Chèvrefeuille |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This erect honeysuckle can grow up to 1.5 m tall. Its low branches are virtually horizontal.

The light green foliage is pubescent and reddish at first leafing. The entire, opposite leaves, oblong to lanceolate and acuminate with a rounded base, are 5–10 cm long.

The fragrant yellowish-white flowers are bilabiate tubular corollas with a wide base, 8–12 mm long. They are paired and appear in early June.

The globular berries are purple.

## ORIGIN AND DISTRIBUTION

The genus is named *Lonicera* after Adam Lonicer, or Lonitzer, a German physician and naturalist (1528–86). It comprises close to 200 species around the world. The species *gynochlamydea* comes from western China.

## USE

**Ornamental:** This variety can be used alone, in mass plantings or in hedges, for its foliage, fragrant flowers and fruits.

## REQUIREMENTS

Like all the honeysuckles, this variety requires a sunny exposure. It is not very demanding with regard to soil and adapts to moist or dry soil. It grows slowly.

## DISEASES AND INSECTS

*Septoria* sp., powdery mildew and grey mould (*Botrytis*) are fungal diseases that may strike honeysuckles.

Aphids may also damage the plant.

## PROPAGATION

**Cutting:** Honeysuckles may be propagated by softwood cuttings taken from new shoots treated with a hormone solution of 3000 ppm IBA or by semihardwood cuttings treated with a hormone solution of 5000 ppm IBA.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Four hundred 20-cm cuttings were taken on June 6 and 8, 1992, from metre-high, three-year-old parent plants. They were soaked in a 4000-ppm IBA/50% ethanol solution, placed in multipots filled with a perlite-Promix® medium (1:1; v:v), then misted for 30 seconds every six minutes. The rooted cuttings were planted in shaded beds in late August; the rooting rate was over 90%. On June 8, 1993, they were transplanted into Fertil Pots® and cultivated in the outdoor beds. Over the summer, they were treated weekly with a soluble fertilizer (20-20-20, containing 400 ppm N). They once again overwintered under Astro-Foam® mulch in a cold frame. The winter survival rate was 100%. They were wrapped and shipped in May 1994.

**Inclusion in testing network:** Seedlings 16 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

A few plants died at all the sites, in most cases, during the first two winters.

*Region 1*

At L'Assomption, 6% of shrubs died during the first two winters. In addition, frost damage to the branch tips occurred on 10% of plants the fourth winter.

No damage was observed at St. Clotilde or St. Hyacinthe.

*Region 2*

At Deschambault, 12 and 21% of shrubs died during the first two winters and 6 and 14% of them had frost damage to the branch tips. In addition, the second winter, 7% of plants were frozen down to the ground. After that, 81, 54 and 9% of specimens suffered mechanical breakage the last three winters.

At St. Foy, one plant died in each of the first and third winters, while 50% of shrubs had frost damage to the branch tips the first winter. In addition, the third winter, 90% sustained mechanical injury.

At La Pocatière, two plants died the first winter and four the next.

*Region 3*

At Normandin, one specimen died in the first winter and another the third, while 83% of shrubs sustained mechanical breakage the third winter and 18% suffered frost damage to the branch tips the last winter.

At Kapuskasing, the first two winters, 17 and 7% of plants died, 64 and 21% suffered damage to the branch tips and 5 and 14% had frost damage to the previous year's shoots. In addition, 7% of shrubs froze down to the ground the second winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of the shrubs after five years at each site in the three regions.

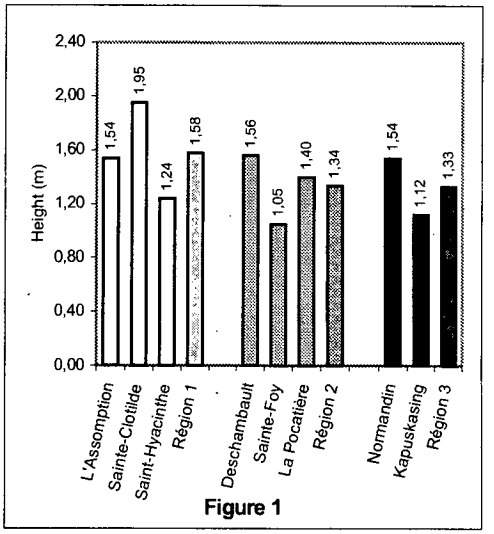


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

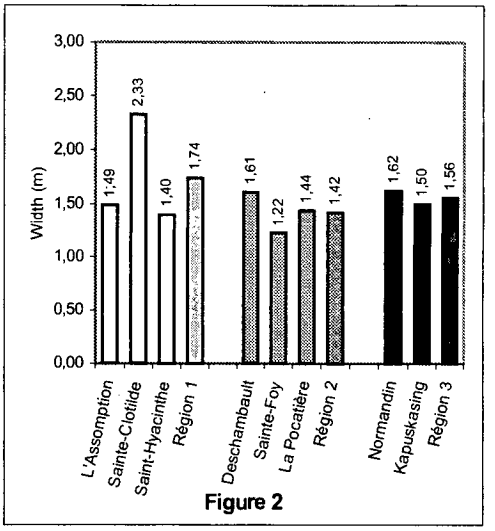


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

### Effect of pruning

Pruning was done at St. Foy, Deschambault, St. Hyacinthe and Normandin to eliminate 20–50% of total height.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

This honeysuckle grew most quickly at the warmest site; after three growing seasons, all the shrubs at St. Clotilde (zone 5b) were more than 1.01 m tall, although a fourth year was necessary at Deschambault and La Pocatière for 80% of them to reach a comparable height.

The growth of this honeysuckle is similar to that of *L. tatarinovii*. The species can be grown at all the trial sites, except in zone 2a.

## HARDINESS EVALUATION

The species is hardy to U.S. zone 5. Aside from mechanical breakage, most frost damage occurred in the first two or three winters, which shows that the young plants are more susceptible to harsh winters.

The species can survive to zone 2b; a large proportion of specimens died the fifth winter at the coldest site (2a) and frost damage was more frequent and intense.

The species can be used to zone 2b. Growth of honeysuckles there is similar to that in the warmest regions.

The species achieved its full ornamental potential at all the sites in zones 5a and 5b.

**WRITTEN BY**

Claude Richer Agr.

Jacques-André Rioux Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Lonicera gynochlamydea* Hemsl., 1995–99**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 95 | 2 | | | | | | 3 | | | | 5 |
| St. Clotilde | 100 | | | | | | | | | | | 0 |
| St. Hyacinthe | 100 | | | | | | | | | | | 0 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 59 | 4 | | | | | 2 | 6 | | 29 | | 41 |
| St. Foy | 67 | 10 | | | | | | 3 | | 20 | | 33 |
| La Pocatière | 92 | | | | | | | 8 | | | | 8 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 77 | 3 | | | | | | 2 | | 18 | | 23 |
| Kapuskasing | 72 | 17 | | 4 | | | 2 | 5 | | | | 28 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 3, 5, 6, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of specimens of *Lonicera gynochlamydea* Hemsl. by saleable height category, 1994–98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 6 | 10 | 10 | 0 | 100 | 0 | 0 | 0 | 0 | 94 | 6 | 0 | 28 | 0 |
| 051-100 | 0 | 81 | 60 | 30 | 0 | 0 | 100 | 0 | 0 | 0 | 6 | 94 | 50 | 18 | 54 |
| 101-150 | 0 | 13 | 30 | 60 | 50 | 0 | 0 | 91 | 10 | 0 | 0 | 0 | 50 | 54 | 46 |
| 151-200 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 9 | 90 | 100 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 86 | 23 | 10 | 33 | 0 | 94 | 7 | 0 | 0 | 0 |
| 051-100 | 0 | 100 | 18 | 9 | 9 | 14 | 77 | 80 | 55 | 45 | 6 | 93 | 57 | 14 | 0 |
| 101-150 | 0 | 0 | 82 | 91 | 73 | 0 | 0 | 10 | 12 | 55 | 0 | 0 | 43 | 86 | 86 |
| 151-200 | 0 | 0 | 0 | 0 | 18 | - | - | - | - | - | 0 | 0 | 0 | 0 | 14 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 94 | 12 | 0 | 9 | 0 | 76 | 14 | 0 | 0 | 0 |
| 051-100 | 6 | 81 | 50 | 27 | 10 | 24 | 86 | 46 | 27 | 27 |
| 101-150 | 0 | 7 | 50 | 64 | 36 | 0 | 0 | 54 | 73 | 73 |
| 151-200 | 0 | 0 | 0 | 0 | 54 | - | - | - | - | - |

Table 3: Breakdown of specimens of *Lonicera gynochlamydea* Hemsl. by saleable width category, 1994–98

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 38 | 10 | 10 | 0 | 100 | 0 | 0 | 0 | 0 | 81 | 32 | 0 | 27 | 0 |
| 051-100 | 0 | 62 | 70 | 80 | 10 | 0 | 63 | 0 | 0 | 0 | 19 | 68 | 60 | 9 | 0 |
| 101-150 | 0 | 0 | 20 | 10 | 30 | 0 | 37 | 36 | 0 | 0 | 0 | 0 | 40 | 64 | 82 |
| 151-200 | 0 | 0 | 0 | 0 | 60 | 0 | 0 | 64 | 90 | 9 | 0 | 0 | 0 | 0 | 18 |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 10 | 64 | - | - | - | - | - |
| 251-300 | - | - | - | - | - | 0 | 0 | 0 | 0 | 27 | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 14 | 0 | 0 | 0 | 93 | 0 | 10 | 11 | 0 | 88 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 86 | 45 | 0 | 0 | 7 | 69 | 80 | 33 | 22 | 12 | 100 | 14 | 0 | 0 |
| 101-150 | 0 | 0 | 55 | 45 | 27 | 0 | 31 | 10 | 56 | 67 | 0 | 0 | 86 | 100 | 57 |
| 151-200 | 0 | 0 | 0 | 55 | 73 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 43 |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 251-300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 88 | 19 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 12 | 69 | 33 | 19 | 18 | 0 | 79 | 18 | 0 | 0 |
| 101-150 | 0 | 12 | 58 | 45 | 10 | 0 | 21 | 82 | 73 | 46 |
| 151-200 | 0 | 0 | 9 | 36 | 72 | 0 | 0 | 0 | 27 | 54 |
| 201-250 | - | - | - | - | - | - | - | - | - | - |
| 251-300 | - | - | - | - | - | - | - | - | - | - |

# *LONICERA MAXIMOWICZIANA* VAR. *SACHALINENSIS* FR. SCHMIDT.

| | |
|---|---|
| **Family:** | Caprifoliaceae |
| **English common name:** | Sakhalin Honeysuckle |
| **French common name:** | Chèvrefeuille de Sakhalin |
| **Synonym:** | *L. sachalinensis* E. Wolf |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This erect shrub may reach 3.0 m in height.

The glabrous reddish stems have entire, elliptical or oval opposing leaves, glabrous on top and 3–7 cm long. The leaves, reddish when new, turn dark green with a distinctly bluish underside. The *sachalinensis* variety produces wider leaves than are typical of the species.

The purplish-red flower buds, darker than those typical of the species, open into magnificent pink flowers in May or June. They are 13–18 mm long.

The red berries are elongated.

## ORIGIN AND DISTRIBUTION

The genus is named *Lonicera* after Adam Lonicer, or Lonitzer, a German physician and naturalist (1528–86). It comprises close to 200 species around the world. The species originates in northern Japan, from Sakhalin to Hondo, and Korea and was introduced into North America in 1917.

The variety, which developed spontaneously, is more decorative than the species.

## USE

**Ornamental:** This variety can be used alone, in mass plantings or in hedges, for its foliage, fragrant flowers and abundant fruits.

## REQUIREMENTS

Like all the honeysuckles, this variety requires a sunny exposure. It is not very demanding with regard to soil and adapts to moist or dry soil. It grows slowly and is easy to transplant.

## DISEASES AND INSECTS

*Septoria* sp., powdery mildew and grey mould (*Botrytis*) are fungal diseases that may strike honeysuckles.

Aphids may also damage the plant.

## PROPAGATION

**Cutting:** Honeysuckles may be propagated by softwood cuttings taken from new shoots treated with a hormone solution of 3000 ppm IBA or by semihardwood cuttings treated with a hormone solution of 5000 ppm IBA.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Four hundred 20-cm cuttings were taken on June 29, 1992, from metre-high, three-year-old parent plants. They were soaked in a 4000-ppm IBA/50% ethanol solution, placed in multipots filled with a perlite-Promix® medium (1:1; v:v), then misted for 30 seconds every six minutes. The rooted cuttings were planted in shaded beds on August 3; the rooting rate was 75%. On June 9, 1993, they were transplanted into Fertil Pots® and cultivated in the outdoor beds. Over the summer, they were treated weekly with a soluble fertilizer

(20-20-20, containing 400 ppm N). They once again overwintered under Astro-Foam® mulch in a cold frame. The winter survival rate was 100%. They were wrapped and shipped in May 1994.

**Inclusion in testing network:** Seedlings 21 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the variety over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

A few plants died during the trial.

*Region 1*

At L'Assomption, 5% of shrubs died the second winter and 8% the third winter. Frost damage to the branch tips was observed on 40, 35, 25 and 65% of specimens the first four winters. In addition, the fourth winter, 17% of plants had frost damage to the previous year's shoots and 10% suffered mechanical injury.

At St. Clotilde, one specimen died the fourth winter. In addition, 100, 33 and 67% of shrubs had frost damage to the branch tips the first three winters.

At St. Hyacinthe, two plants died the fourth winter.

*Region 2*

At Deschambault, one specimen died the fourth winter. The first winter, 90% of shrubs suffered frost injury to the branch tips and 5% had damage to the previous year's shoots. The next four winters, 10, 100, 78 and 12% sustained mechanical breakage.

At St. Foy, 81 and 100% of plants had frost damage to the branch tips the first two winters. All suffered mechanical injury the third winter.

At La Pocatière, 33% of shrubs suffered frost injury to the branch tips the second winter.

*Region 3*

At Normandin, 42, 14 and 17% of shrubs died the last three winters. The third winter, 58% sustained mechanical breakage and the last winter, 17% had frost damage to old wood.

At Kapuskasing, the previous year's shoots froze on 6% of specimens the first winter.

### Effect of pruning

Light to medium pruning was done at St. Foy, Deschambault, Normandin and St. Hyacinthe.

### Height and width growth

Figures 1 and 2 show the mean height and width of the shrubs after five years at each site in the three regions.

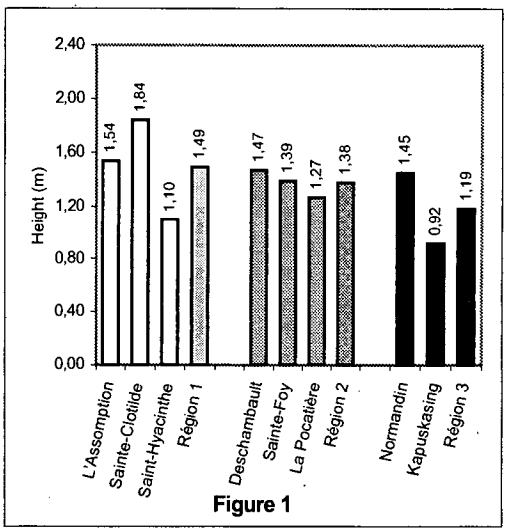


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

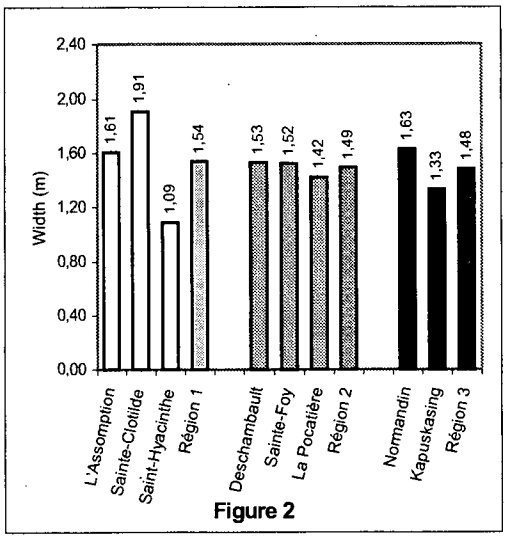


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Like *L. gynochlamydea*, this honeysuckle grew best at the warmest site; some of the plants at St. Clotilde (zone 5b) were more than 2.01 m tall by the end of the trial.

Production of this variety is possible at all the trial sites, but a major risk of mortality may affect production in the region 3 sites. After three growing seasons, 100, 92 and 83% of shrubs at St. Foy, L'Assomption and Deschambault had reached more than 1.01 m in height, but a fourth year was needed at St. Clotilde and La Pocatière before at least 90% of the shrubs were of comparable height. This height was not attained by any specimens at the sites in the coldest region (zones 2a and 2b).

## HARDINESS EVALUATION

Depending on the author, this variety is rated hardy to between zone 2b (Canadian) and zone 4 (U.S.). Yet die-off occurred the last three winters, which was not the case for the other honeysuckles planted at the same time, specimens of which died the first year of the trial. This difference shows that mortality is not due to the young age of the plants, but to the lack of hardiness of the variety.

The variety will survive to beyond zone 2b, as there was heavy mortality in the last three winters at Normandin, and although none of the plants in zone 2a died, they did not grow above the snow cover, and that is what protected them.

The variety can be used to zone 3.

Full ornamental potential was achieved at the sites in zones 5a and 4a, as snow was an important factor in the survival of the shrubs, especially the root system.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Lonicera maximowicziana* var. *sachalinensis* F. Schmidt, 1995–99**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 59 | 35 | | 3 | | | | 1 | | 2 | | 41 |
| St. Clotilde | 58 | 40 | | | | | | 2 | | | | 42 |
| St. Hyacinthe | 97 | | | | | | | 3 | | | | 3 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 38 | 18 | | 1 | | | | 2 | | 41 | | 62 |
| St. Foy | 44 | 36 | | | | | | | | 20 | | 56 |
| La Pocatière | 93 | 7 | | | | | | | | | | 7 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 71 | | | | 3 | | | 14 | | 12 | | 29 |
| Kapuskasing | 99 | | | 1 | | | | | | | | 1 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 3, 6, 7, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of specimens of *Lonicera maximowicziana* var. *sachalinensis* F. Schmidt by saleable height category, 1994–98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 100 | 8 | 0 | 0 | 0 | 95 | 25 | 0 | 0 | 0 | 100 | 75 | 33 | 90 |
| 101-150 | 0 | 0 | 92 | 100 | 37 | 0 | 5 | 75 | 75 | 0 | 0 | 0 | 25 | 67 | 10 |
| 151-200 | 0 | 0 | 0 | 0 | 63 | 0 | 0 | 0 | 25 | 91 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 5 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 100 | 17 | 0 | 0 | 0 | 95 | 0 | 17 | 0 | 0 | 100 | 83 | 9 | 0 |
| 101-150 | 0 | 0 | 83 | 91 | 64 | 0 | 0 | 100 | 83 | 84 | 0 | 0 | 17 | 91 | 100 |
| 151-200 | 0 | 0 | 0 | 9 | 36 | 0 | 0 | 0 | 0 | 16 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 89 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 95 | 100 | 72 | 0 | 11 | 100 | 100 | 75 | 75 |
| 101-150 | 0 | 5 | 0 | 28 | 83 | 0 | 0 | 0 | 25 | 25 |
| 151-200 | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

Table 3: **Breakdown of specimens of *Lonicera maximowicziana* var. *sachalinensis* F. Schmidt by saleable width category, 1994–98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 30 | 0 | 0 | 0 | 100 | 5 | 0 | 0 | 0 | 100 | 52 | 0 | 0 | 0 |
| 051-100 | 0 | 70 | 92 | 37 | 0 | 0 | 95 | 0 | 0 | 0 | 0 | 48 | 100 | 75 | 50 |
| 101-150 | 0 | 0 | 8 | 63 | 45 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 0 | 25 | 30 |
| 151-200 | 0 | 0 | 0 | 0 | 45 | 0 | 0 | 50 | 83 | 91 | 0 | 0 | 0 | 0 | 20 |
| 201-250 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 17 | 9 | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 10 | 0 | 0 | 0 | 100 | 5 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 90 | 17 | 10 | 0 | 0 | 95 | 25 | 41 | 0 | 0 | 100 | 58 | 8 | 8 |
| 101-150 | 0 | 0 | 83 | 55 | 54 | 0 | 0 | 75 | 59 | 42 | 0 | 0 | 42 | 75 | 58 |
| 151-200 | 0 | 0 | 0 | 35 | 46 | 0 | 0 | 0 | 0 | 58 | 0 | 0 | 0 | 17 | 34 |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 100 | 58 | 28 | 0 | 0 | 100 | 83 | 0 | 0 |
| 101-150 | 0 | 0 | 42 | 72 | 17 | 0 | 0 | 17 | 100 | 75 |
| 151-200 | 0 | 0 | 0 | 0 | 83 | 0 | 0 | 0 | 0 | 25 |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

# *LONICERA ORIENTALIS* LAM.

| | |
|---|---|
| **Family:** | Caprifoliaceae |
| **English common name:** | Honeysuckle |
| **French common name:** | Chèvrefeuille oriental |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This erect shrub can grow as tall as 3.0 m.

The stems and the branches are glabrous. The foliage is dark green on top and greyish below. The leaves, with pubescent veined glabrous blades, are ovate to lanceolate and acuminate. They have a rounded base and are 4–10 cm long. The petiole is 6–10 mm long.

The violet-pink tubular flowers, single or paired, are 1.0–1.2 cm long and borne on a peduncle 1–2 cm long. Flowering begins in May or June.

The elongated berries are almost black.

## ORIGIN AND DISTRIBUTION

The genus is named *Lonicera* after Adam Lonicer, or Lonitzer, a German physician and naturalist (1528–86). It comprises close to 200 species around the world. *Lonicera orientalis* originates in Asia minor and has not been grown in North America, although the variety *caucasica* is known.

## USE

**Ornamental:** This rare species may be used by itself, in mass plantings or in hedges, for its foliage, fragrant flowers and fruits.

## REQUIREMENTS

Like all the honeysuckles, this variety requires a sunny exposure. It is not very demanding with regard to soil and adapts to moist or dry soil. It grows slowly.

## DISEASES AND INSECTS

*Septoria* sp., powdery mildew and grey mould (*Botrytis*) are fungal diseases that may strike honeysuckles.

Aphids may also damage the plant.

## PROPAGATION

**Cutting:** Honeysuckles may be propagated by softwood cuttings taken from new shoots treated with a hormone solution of 3000 ppm IBA or by semihardwood cuttings treated with a hormone solution of 5000 ppm IBA.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Four hundred 15-cm cuttings were taken on June 30, 1992, from three-year-old parent plants 75 cm tall. They were soaked in a 4000-ppm IBA/50% ethanol solution, placed in multipots filled with a perlite-Promix® medium (1:1; v:v), then misted for 30 seconds every six minutes. The rooted cuttings were planted in shaded beds in late August; the rooting rate was 100%. On June 9, 1993, they were transplanted into Fertil Pots® and cultivated in the outdoor beds. Over the summer, they were treated weekly with a soluble fertilizer (20-20-20, containing 400 ppm N). They once again overwintered under Astro-Foam® mulch in a cold frame. The winter survival rate was 100%. They were wrapped and shipped in May 1994.

**Inclusion in testing network:** Seedlings 15 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 5% of shrubs died the second winter. Frost damage to the branch tips occurred on 90, 61 and 27% of plants the first three winters. In addition, the first winter, 5% were killed to the ground. The third winter, 10% of specimens suffered damage to the previous year's shoots and 27% froze down to the snow cover. The fourth winter, 18% sustained mechanical injury.

At St. Clotilde, frost damage to the branch tips occurred the first three and last winters to 33, 50, 40 and 40% of plants. In addition, the first winter, 17% of specimens suffered frost damage to the previous year's shoots and, the fourth winter, one shrub died down to the snow cover.

At St. Hyacinthe, two plants died the first winter and another the third winter.

*Region 2*

Frost damage to the branch tips was observed on 28, 44 and 83% of specimens the first three winters at Deschambault, and the next two winters, 81 and 10% of shrubs suffered mechanical breakage.

At St. Foy, 10% of plants died the first winter. Frost damage to the branch tips occurred on 41 and 73% the first two winters. The next winter, 36% of shrubs froze down to the snow cover and 54% suffered mechanical breakage.

None of the shrubs at La Pocatière was damaged during the trials.

*Region 3*

At Normandin, one plant died each of the first two winters. The next winter, 60% of shrubs suffered mechanical breakage. The last winter, 30% had frost damage to the branch tips and 10% had frost damage to the previous year's shoots.

At Kapuskasing, one shrub died each of the first two winters. Frost damage to the branch tips was observed each spring on 25–57% of plants. The second, third and fourth winters, 25–50% of specimens also had frost damage to the previous year's shoots. One plant was killed to the ground the first winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of the shrubs after five years at each site in the three regions.

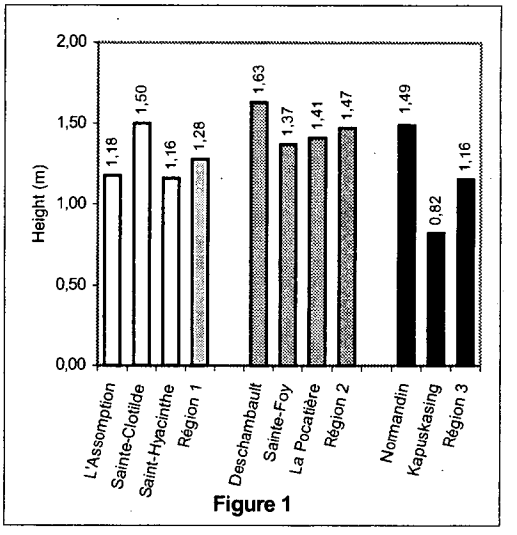


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

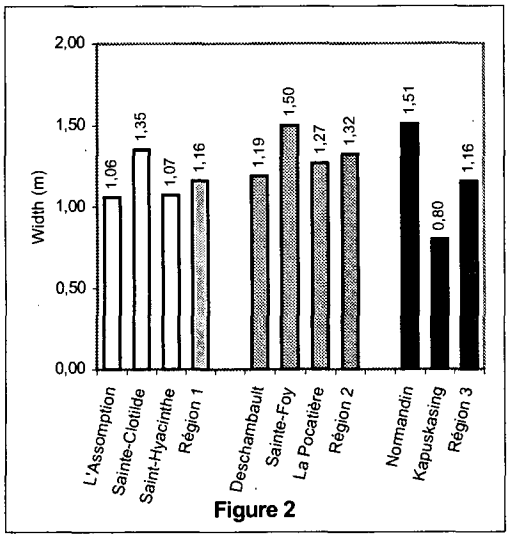


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

### Effect of pruning

Plants at L'Assomption, St. Foy, Normandin and St. Hyacinthe were pruned lightly.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

The shrubs reached their maximum height in zone 4b (Deschambault): some measured over 2.01 m by the end of the trial. The greatest number of wide plants was at St. Foy and Normandin.

After three growing seasons, 73 of plants at St. Foy and 92% at La Pocatière were more than 1.01 m tall, while a fourth year was required at Deschambault and Normandin to obtain the same proportion of shrubs of comparable height.

Growth of this species is similar to that of *L. tatarinovii*. It could be produced in all the trial zones, except 2a.

## HARDINESS EVALUATION

The species is rated hardy to U.S. zone 4, but the results of the trial confirm that the mortality rate is quite low at all the sites. The plants that died did so the first two winters, which suggests that the weakest specimens were eliminated. The species can survive to zone 2, as snow acts as insulation at the coldest sites.

At the warmest sites (zones 5a and 5b), many types of damage may occur each winter, so the use of this honeysuckle may be limited by lack of snow during the coldest periods. At the sites in zone 4, damage was slight to nonexistent. This species is easy to use. At the zone 2a sites, the species suffers too much damage to make its use worthwhile. It is therefore rated for use in zone 2b.

Full ornamental potential was achieved at the sites in zones 5a and 4a.

## WRITTEN BY

Claude Richer, Agr.
Jacques-André Rioux, Agr.
Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Lonicera orientalis* Lam., 1995–99**

| Trial sites | No Damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 51 | 36 | | 2 | | 5 | 1 | 2 | | 3 | | 49 |
| St. Clotilde | 62 | 33 | | 3 | | 2 | | | | | | 38 |
| St. Hyacinthe | 96 | | | | | | | 4 | | | | 4 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 50 | 32 | | | | | | | | 18 | | 50 |
| St. Foy | 57 | 24 | | | | 6 | | 3 | | 10 | | 43 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 78 | 6 | 2 | | | | | 2 | | 12 | | 22 |
| Kapuskasing | 20 | 44 | | 20 | | | 3 | 13 | | | | 80 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 5, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of specimens of *Lonicera orientalis* Lam. by saleable height category, 1994–98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 76 | 19 | 9 | 0 | 100 | 25 | 0 | 0 | 0 | 100 | 56 | 8 | 0 | 0 |
| 051-100 | 0 | 24 | 81 | 91 | 18 | 0 | 75 | 50 | 30 | 10 | 0 | 44 | 42 | 45 | 36 |
| 101-150 | 0 | 0 | 0 | 0 | 72 | 0 | 0 | 50 | 60 | 50 | 0 | 0 | 50 | 55 | 54 |
| 151-200 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 10 | 40 | 0 | 0 | 0 | 0 | 10 |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 28 | 8 | 0 | 0 | 92 | 27 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 72 | 34 | 17 | 8 | 8 | 73 | 27 | 54 | 18 | 5 | 100 | 8 | 0 | 0 |
| 101-150 | 0 | 0 | 58 | 50 | 33 | 0 | 0 | 63 | 46 | 45 | 0 | 0 | 92 | 100 | 25 |
| 151-200 | 0 | 0 | 0 | 33 | 42 | 0 | 0 | 10 | 0 | 37 | 0 | 0 | 0 | 0 | 75 |
| 201-250 | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 18 | 10 | 0 | 0 | 100 | 100 | 25 | 25 | 0 |
| 051-100 | 0 | 82 | 80 | 10 | 0 | 0 | 0 | 75 | 75 | 100 |
| 101-150 | 0 | 0 | 10 | 90 | 50 | - | - | - | - | - |
| 151-200 | 0 | 0 | 0 | 0 | 50 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

Table 3: Breakdown of specimens of *Lonicera orientalis* Lam. by saleable width category, 1994–98

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 86 | 45 | 73 | 0 | 100 | 25 | 0 | 0 | 0 | 94 | 67 | 8 | 0 | 0 |
| 051-100 | 0 | 14 | 55 | 27 | 36 | 0 | 75 | 75 | 37 | 30 | 6 | 33 | 92 | 46 | 37 |
| 101-150 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 25 | 63 | 50 | 0 | 0 | 0 | 54 | 53 |
| 151- 200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 10 |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 50 | 17 | 0 | 0 | 94 | 0 | 0 | 0 | 0 | 100 | 5 | 0 | 0 | 0 |
| 051-100 | 0 | 50 | 67 | 25 | 17 | 6 | 74 | 82 | 45 | 9 | 0 | 95 | 91 | 0 | 0 |
| 101-150 | 0 | 0 | 16 | 75 | 83 | 0 | 26 | 18 | 55 | 36 | 0 | 0 | 9 | 100 | 100 |
| 151- 200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 55 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 6 | 0 | 0 | 0 | 100 | 80 | 25 | 25 | 0 |
| 051-100 | 0 | 88 | 60 | 0 | 0 | 0 | 20 | 75 | 25 | 75 |
| 101-150 | 0 | 6 | 40 | 90 | 60 | 0 | 0 | 0 | 50 | 25 |
| 151- 200 | 0 | 0 | 0 | 10 | 40 | - | - | - | - | - |

L

# *LONICERA TATARINOVII*

MAXIM.

| | |
|---|---|
| **Family:** | Caprifoliaceae |
| **English common name:** | Honeysuckle |
| **French common name:** | Chèvrefeuille |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This erect honeysuckle can reach 1.5 m in height.

Its glabrous branches bear a greyish-green foliage. Its entire, opposite leaves, oblanceolate and acuminate, glabrous above and pubescent below, are 3–7 cm long and borne on 2–5 mm petioles.

Its sweet-smelling, paired tubular pink flowers appear in early June. The peduncles are 1–2 cm long and the corolla is 8 mm in diameter. The stamens and style are pubescent and shorter than the petals.

The globular bright red berries ripen in late summer.

## ORIGIN AND DISTRIBUTION

The genus is named *Lonicera* after Adam Lonicer, or Lonitzer, a German physician and naturalist (1528–86). It comprises close to 200 species around the world. The species *tatarinovii*, which ranges from northern China to Korea, was introduced to North America in 1913.

## USE

**Ornamental:** This variety can be used alone, in mass plantings or in hedges, for its foliage, fragrant flowers and fruits.

## REQUIREMENTS

Like all the honeysuckles, this variety requires a sunny exposure. It is not very demanding with regard to soil and adapts to moist or dry soil. It grows slowly and is easy to transplant.

## DISEASES AND INSECTS

*Septoria* sp., powdery mildew and grey mould (*Botrytis*) are fungal diseases that may strike honeysuckles.

Aphids may also damage the plant.

## PROPAGATION

**Cutting:** Honeysuckles may be propagated by softwood cuttings taken from new shoots treated with a hormone solution of 3000 ppm IBA or by semihardwood cuttings treated with a hormone solution of 5000 ppm IBA.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Four hundred 20-cm cuttings were taken July 6, 1992, from metre-high three-year-old parent plants. They were soaked in a 4000-ppm IBA/50% ethanol solution, placed in multipots filled with a perlite-Promix® medium (1:1; v:v), then misted for 30 seconds every six minutes. The rooted cuttings were planted in shaded beds in late August; the rooting rate was 90%. On June 8, 1993, they were transplanted into Fertil Pots® and cultivated in the outdoor beds. Over the summer, they were treated weekly with a soluble fertilizer (20-20-20, containing 400 ppm N). They once again overwintered under Astro-Foam® mulch in a cold frame. The winter survival rate was 90%. They were wrapped and shipped in May 1994.

**Inclusion in testing network:** Seedlings 19 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

The most common type of damage in all zones was frost on the branch tips. In addition, up to seven specimens died at each of the sites, except St. Hyacinthe and Deschambault, where not a single one perished.

*Region 1*

At L'Assomption, 10% of shrubs died the second winter and 30% the third. Frost damage to the branch tips was observed on 40, 90 and 30% of plants the first three winters. In addition, 20% had frost damage damage to the previous year's shoots the third winter. The next winter, 33% suffered mechanical breakage and 17% sustained rodent damage.

At St. Clotilde, two plants died the fourth winter. The first winter, frost damaged the branch tips of 70% of shrubs and the rest had frost injury to the previous year's shoots.

The honeysuckles at St. Hyacinthe were not damaged during the trials.

*Region 2*

At Deschambault, 5, 100, 100 and 83% of shrubs sustained mechanical injury the last four winters. In addition, 90 and 25% suffered frost damage to the branch tips the first two winters.

At St. Foy, 10, 17 and 15% of plants died the first three winters, 85 and 83% were damaged by frost to the branch tips the first two winters and 5% had frost damage to the previous year's shoots the first winter. The third winter, 11% of specimens froze down to the snow cover and the rest suffered mechanical breakage.

At La Pocatière, one shrub died the third winter. Frost damage to the previous year's shoots occurred on 5% of plants the first winter and 5% had frost injury to the entire above-ground portion. The next winter, 70% of shrubs suffered frost damage to the branch tips.

*Region 3*

At Normandin, 9, 5 and 27% of specimens died the first three winters. In addition, 73% suffered mechanical injury the third winter, while 37% had frost damage to the branch tips and 37% suffered damage to the previous year's shoots the fifth winter.

At Kapuskasing, 17, 7 and 20% of shrubs died the first two and last winters, while 5, 67 and 20% had frost damage to the branch tips. Another 7% of plants froze down to the ground the first winter, 33% suffered mechanical breakage the third winter and 11% had frost damage to the previous year's shoots the fourth winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of the shrubs after five years at each site in the three regions.

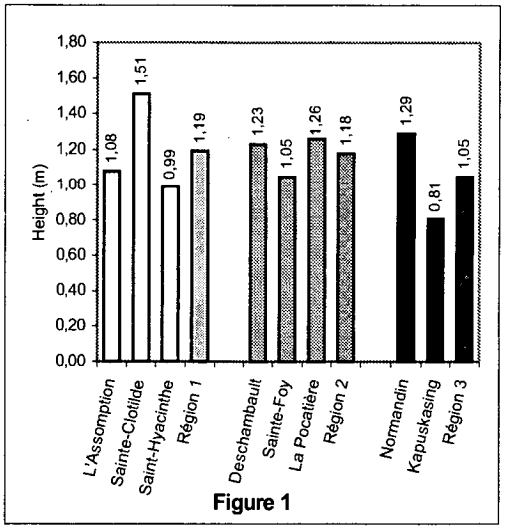


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

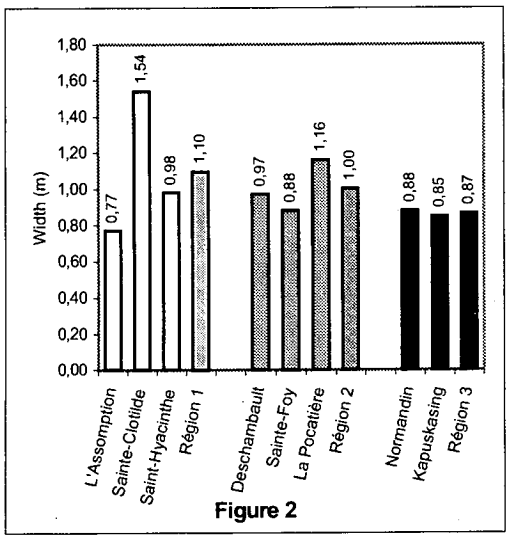


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

Growth in height was very uniform throughout region 2.

### Effect of pruning

Shrubs at L'Assomption and St. Hyacinthe were lightly pruned during the trials. More severe pruning, removing 20–60% of the total height of the plants, was done at St. Foy, Deschambault and Normandin.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Growth of all specimens of this honeysuckle was greater at the warmest site. Nonetheless, after two growing seasons, 80–95% of shrubs at all the sites except Kapuskasing were over 51 cm tall, while those at La Pocatière, Normandin and Kapuskasing were the widest during the same period.

It is thus possible to produce this cultivar at all the trial sites, except in zone 2a.

## HARDINESS EVALUATION

Rehder rates this species as hardy to U.S. zone 5, but the Montreal Botanical Garden has had the parent plants for many years and they have not sustained any significant winter damage. The survival potential of the species is difficult to determine exactly, given that plants died in all the zones in the trial, especially in the third and fourth winters, even though the root system had had time to get established. Adult shrubs can survive to zone 2a, although die-off may occur in especially cold winters, winters without snow or thaws in the coldest months.

The species can be used to zone 2, but must be pruned frequently to eliminate wood that has frozen.

Full ornamental expression was achieved at St. Hyacinthe, in zone 5a.


## WRITTEN BY

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Table 1: **Frequency of winter damage observed in *Lonicera tatarinovii* Maxim., 1995–99**

| Trial sites | No Damage | Percentage breakdown of damage WINTER DAMAGE[a] | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 46 | 32 | | 4 | | | | 8 | | 6 | 4 | 54 |
| St. Clotilde | 76 | 14 | | 6 | | | | 4 | | | | 24 |
| St. Hyacinthe | 100 | | | | | | | | | | | 0 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 19 | 23 | | | | | | | | 58 | | 81 |
| St. Foy | 40 | 34 | | 1 | | 2 | | 10 | | 13 | | 60 |
| La Pocatière | 82 | 14 | | 1 | | | 1 | 2 | | | | 18 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 62 | 7 | | 7 | | | | 10 | | 14 | | 38 |
| Kapuskasing | 62 | 19 | | 2 | | | 2 | 9 | | 6 | | 38 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 3, 5 or 9 occurred in the plants tested.

**Table 2:** **Breakdown of specimens of *Lonicera tatarinovii* Maxim. by saleable height category, 1994–98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 95 | 5 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 71 | 0 | 0 | 0 | 0 |
| 051-100 | 5 | 95 | 80 | 71 | 34 | 0 | 100 | 17 | 0 | 0 | 29 | 100 | 50 | 67 | 67 |
| 101-150 | 0 | 0 | 20 | 29 | 66 | 0 | 0 | 83 | 75 | 60 | 0 | 0 | 50 | 33 | 33 |
| 151-200 | - | - | - | - | - | 0 | 0 | 0 | 25 | 40 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 5 | 0 | 0 | 0 | 100 | 18 | 0 | 0 | 0 | 100 | 5 | 0 | 0 | 0 |
| 051-100 | 0 | 95 | 75 | 16 | 16 | 0 | 82 | 90 | 85 | 34 | 0 | 85 | 19 | 30 | 10 |
| 101-150 | 0 | 0 | 25 | 84 | 84 | 0 | 0 | 10 | 15 | 56 | 0 | 10 | 81 | 70 | 90 |
| 151-200 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 72 | 0 | 0 | 0 | 0 | 78 | 13 | 10 | 11 | 11 |
| 051-100 | 28 | 79 | 82 | 75 | 25 | 22 | 87 | 90 | 89 | 89 |
| 101-150 | 0 | 21 | 18 | 25 | 63 | - | - | - | - | - |
| 151-200 | 0 | 0 | 0 | 0 | 12 | - | - | - | - | - |

Table 3: **Breakdown of specimens of *Lonicera tatarinovii* Maxim. by saleable width category, 1994–98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 100 | 10 | 14 | 33 | 100 | 45 | 0 | 0 | 0 | 100 | 52 | 0 | 0 | 0 |
| 041-080 | 0 | 0 | 90 | 86 | 17 | 0 | 55 | 83 | 8 | 0 | 0 | 48 | 92 | 50 | 8 |
| 081-120 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 17 | 74 | 10 | 0 | 0 | 8 | 50 | 92 |
| 121-160 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 18 | 50 | - | - | - | - | - |
| 161-200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 40 | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 85 | 0 | 0 | 0 | 100 | 78 | 60 | 14 | 0 | 100 | 25 | 0 | 0 | 0 |
| 041-080 | 0 | 15 | 100 | 33 | 17 | 0 | 22 | 40 | 71 | 28 | 0 | 75 | 72 | 0 | 0 |
| 081-120 | 0 | 0 | 0 | 67 | 75 | 0 | 0 | 0 | 15 | 72 | 0 | 0 | 28 | 90 | 60 |
| 121-160 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 40 |
| 161-200 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 0 | 46 | 50 | 0 | 100 | 27 | 10 | 0 | 11 |
| 041-080 | 0 | 100 | 36 | 25 | 50 | 0 | 73 | 90 | 33 | 11 |
| 081-120 | 0 | 5 | 18 | 25 | 37 | 0 | 0 | 0 | 67 | 78 |
| 121-160 | 0 | 0 | 0 | 0 | 13 | - | - | - | - | - |
| 161-200 | - | - | - | - | - | - | - | - | - | - |

# *LONICERA XYLOSTEUM* 'COMPACTA'

| | |
|---|---|
| **Family:** | Caprifoliaceae |
| **English common name:** | European Fly Honeysuckle |
| **French common name:** | Chèvrefeuille d'Europe, Chèvrefeuille nain |
| **Synonym:** | *Lonicera xylosteum* 'Emerald Mound,' *Lonicera xylosteum* 'Nana' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub, with its rounded, almost hemispheric growth habit, has a dense crown more compact than that of the species. It may be up to 0.8 m high and 1.5 m wide. This slow-growing cultivar branches extensively.

The wide, simple, opposite oval leaves are pubescent on both sides. They are 3–6 cm long. The bluish-green foliage, from which the cultivar derives its alternate name 'Emerald Mound,' comes very early and turns a purplish yellow in fall.

The yellowish-white flowers turn yellow as they age. They open in late May or early June. The externally pubescent tubular corolla, 1 cm in length, is yellowish white, sometimes with a hint of red. The axillary flowers are borne on a peduncle 1.0–1.5 cm long.

The small, globular dark red berries may be toxic. They form towards the end of August or in September.

The roots are shallow and numerous.

## ORIGIN AND DISTRIBUTION

The genus is named *Lonicera* after Adam Lonicer, or Lonitzer, a German physician and naturalist (1528–86). It comprises close to 200 species around the world. *Lonicera xylosteum* ranges through Europe, the Caucasus, Siberia and near the Amur River in China. It grows wild in forests and thickets and along woodland edges.

The cultivar 'Compacta' was selected and named by A. Wroblewski at the arboretum in Kornik, Poland, in 1931. It is probably identical to the cultivar 'Emerald Mound,' which has been grown for 30 years at the Morton Arboretum in Lisle, Illinois.

## USE

**Ornamental:** The cultivar is of interest mainly for its shape. It can be used towards the front of massed shrubs, by itself, in rock gardens, in mass plantings or in low hedges for its foliage, fragrant flowers and fruits.

**Birds:** The berries attract birds.

## REQUIREMENTS

The cultivar must be planted in full sun. It likes dry, well-drained ground and tolerates compacted soil and the salt spread to melt ice.

It is fairly easy to transplant. It does not need pruning, as its natural form is very decorative.

## DISEASES AND INSECTS

This cultivar sustained very little damage during the trial, although generally speaking, honeysuckles may be attacked by *Septoria* sp., powdery mildew and grey mould (*Botrytis*).

Aphids may also damage the plant.

## PROPAGATION

**Cutting:** Honeysuckles may be propagated by softwood cuttings taken from new shoots treated with a hormone solution of 3000 ppm IBA or by semihardwood cuttings treated with a hormone solution of 5000 ppm IBA.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Four hundred 12-cm cuttings were taken on July 15, 1992, from three-year-old parent plants measuring 60 cm. They were soaked in a 4000-ppm IBA/50% ethanol solution, placed in multipots filled with a perlite-Promix® medium (1:1; v:v), then misted for 30 seconds every six minutes. The rooted cuttings were planted in shaded beds in late August; the rooting rate was 80%. On June 8, 1993, they were transplanted into Fertil Pots® and cultivated in the outdoor beds. Over the summer, they were treated weekly with a soluble fertilizer (20-20-20, containing 400 ppm N). They once again overwintered under Astro-Foam® mulch in a cold frame. The winter survival rate was 100%. They were wrapped and shipped in May 1994.

**Inclusion in testing network:** Seedlings 14 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

One shrub died the third winter at L'Assomption and another the fourth winter at St. Hyacinthe.

All survived undamaged at St. Clotilde.

*Region 2*

At Deschambault, 100 and 67% of plants suffered mechanical injury the third and fourth winters.

No damage was observed at St. Foy or La Pocatière.

*Region 3*

At Normandin, 17% of specimens sustained mechanical breakage the third winter. In addition, the last winter, 17% of shrubs had frost damage to the previous year's shoots.

At Kapuskasing, 5% of plants died the first winter and 17% the fourth, while 5 and 25% had frost damage to the previous year's shoots. Frost damage to the branch tips was seen every winter; it affected 83, 100, 100, 58 and 10% of specimens.

### Height and width growth

Figures 1 and 2 show the mean height and width of the shrubs after five years at each site in the three regions.

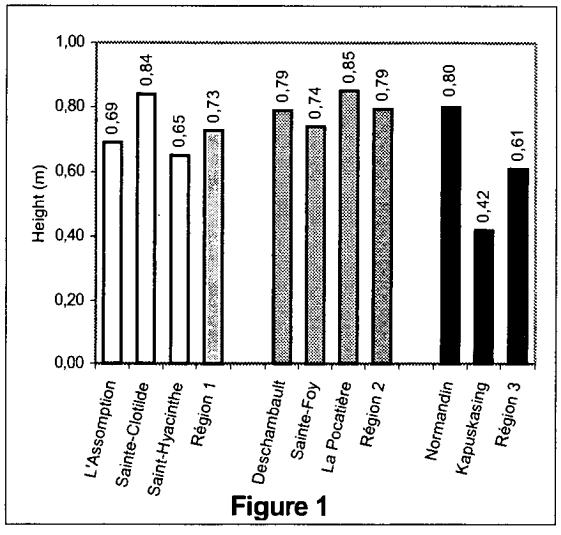

Figure 1

**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

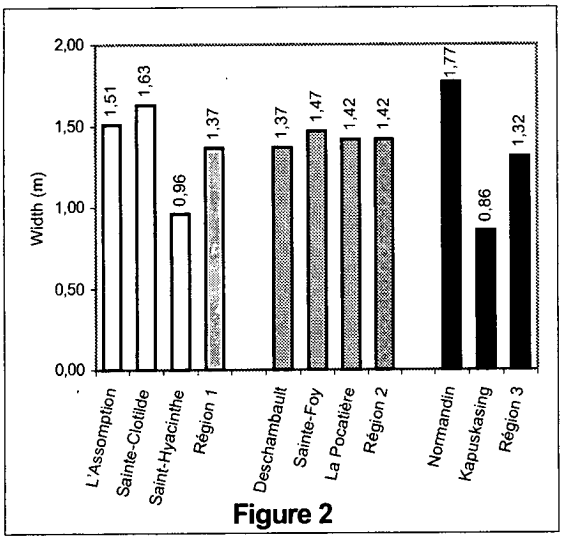


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

### Effect of pruning

The honeysuckles at Deschambault, Normandin and Kapuskasing were pruned lightly.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Growth of this honeysuckle was most rapid at the warmest site; after two growing seasons, 93% of plants at St. Clotilde (zone 5b) were more than 41 cm high, although it took one more year at all the other sites except Kapuskasing and St. Hyacinthe to obtain shrubs of comparable height.

Despite claims that this cultivar is difficult to transplant, only two of the eight sites lost specimens on planting.

This cultivar can be grown in all the zones exception 2a.

## HARDINESS EVALUATION

There is a great deal of conflicting information on this cultivar; depending on the author, it is hardy to Canadian zone 2 or 4, even U.S. zone 5. Our results show that it is hardy to zone 2a, with a possible loss of shrubs due to harsh weather conditions.

The cultivar can be used to zone 2b and its full ornamental expression was achieved at the sites in zones 4a, 4b, 5a and 5b.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Lonicera xylosteum* 'Compacta,' 1995–99**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 98 | | | | | | | 2 | | | | 2 |
| St. Clotilde | 100 | | | | | | | | | | | 0 |
| St. Hyacinthe | 98 | | | | | | | 2 | | | | 2 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 65 | 2 | | | | | | | | 33 | | 35 |
| St. Foy | 100 | | | | | | | | | | | 0 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 93 | | | 3 | | | | | | 4 | | 7 |
| Kapuskasing | 19 | 70 | | 6 | | | | 5 | | | | 81 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 3, 5, 6, 7, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of specimens of *Lonicera xylosteum* 'Compacta' by saleable height category, 1994–98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 62 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 021-040 | 38 | 62 | 0 | 0 | 0 | 57 | 7 | 0 | 0 | 0 | 0 | 76 | 23 | 0 | 0 |
| 041-060 | 0 | 38 | 83 | 82 | 27 | 0 | 93 | 25 | 25 | 0 | 0 | 24 | 77 | 85 | 25 |
| 061-080 | 0 | 0 | 17 | 18 | 54 | 0 | 0 | 75 | 75 | 25 | 0 | 0 | 0 | 15 | 75 |
| 081-100 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 75 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 43 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 48 | 0 | 0 | 0 | 0 |
| 021-040 | 57 | 29 | 0 | 0 | 0 | 91 | 29 | 0 | 0 | 0 | 52 | 52 | 0 | 0 | 0 |
| 041-060 | 0 | 71 | 25 | 25 | 8 | 0 | 71 | 50 | 67 | 0 | 0 | 48 | 75 | 50 | 0 |
| 061-080 | 0 | 0 | 75 | 75 | 50 | 0 | 0 | 50 | 33 | 100 | 0 | 0 | 25 | 50 | 33 |
| 081-100 | 0 | 0 | 0 | 0 | 42 | - | - | - | - | - | 0 | 0 | 0 | 0 | 58 |
| 101-120 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 9 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 60 | 0 | 0 | 0 | 0 | 33 | 6 | 0 | 0 | 10 |
| 021-040 | 40 | 65 | 0 | 0 | 0 | 67 | 65 | 33 | 8 | 30 |
| 041-060 | 0 | 35 | 100 | 67 | 0 | 0 | 29 | 67 | 92 | 60 |
| 061-080 | 0 | 0 | 0 | 33 | 67 | - | - | - | - | - |
| 081-100 | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

Table 3: Breakdown of specimens of *Lonicera xylosteum* 'Compacta' by saleable width category, 1994–98

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 33 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 90 | 0 | 0 | 0 |
| 051-100 | 0 | 67 | 75 | 73 | 0 | 0 | 100 | 87 | 12 | 0 | 0 | 10 | 54 | 8 | 0 |
| 101-150 | 0 | 0 | 25 | 27 | 55 | 0 | 0 | 13 | 76 | 25 | 0 | 0 | 46 | 92 | 100 |
| 151-200 | 0 | 0 | 0 | 0 | 45 | 0 | 0 | 0 | 12 | 75 | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 10 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 90 | 67 | 8 | 0 | 0 | 100 | 0 | 25 | 0 | 0 | 100 | 17 | 0 | 0 |
| 101-150 | 0 | 0 | 33 | 92 | 75 | 0 | 0 | 100 | 75 | 75 | 0 | 0 | 83 | 100 | 83 |
| 151-200 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 17 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 25 | 0 | 0 | 0 | 100 | 23 | 0 | 0 | 0 |
| 051-100 | 0 | 75 | 33 | 0 | 0 | 0 | 77 | 100 | 50 | 80 |
| 101-150 | 0 | 0 | 67 | 75 | 0 | 0 | 0 | 0 | 50 | 20 |
| 151-200 | 0 | 0 | 0 | 25 | 100 | - | - | - | - | - |

# *MALUS BACCATA*

(L.) BORKH. (CONTROL 1993)

The sections "Botanical Description," "Origin and Distribution," "Use," "Requirements" and "Propagation" can be found in the first series of fact sheets (02-9227), and "Diseases and Insects" in the *Hardiness and Growth of Woody Ornamental Plants in Quebec*, Volume III (VT 008).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** The fruits were harvested in October 1990 from parent plants about 40 years old and in very good condition. The fleshy pericarp was removed from the seeds and they were sown in early November in outdoor cold frames. They germinated in May 1991. The seedlings were dug up in fall and heeled in. In May 1992, 200 of them were transplanted into a nursery. In spring 1993, they were dug up and wrapped, then shipped in May.

**Inclusion in testing network:** Seedlings 50 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-1998)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

No damage occurred during the trial at L'Assomption or St. Clotilde. Data for St. Clotilde were not collated the last two winters.

At St. Hyacinthe, 8, 18 and 11% of plants died during the second, third and fifth winters. In addition, 25% froze down to the snow cover the first winter.

*Region 2*

At Deschambault, the only damage to the trees was mechanical injury the last two winters, which affected 33 and 16% of them.

At St. Foy, one plant died the third winter. The first two winters, 7% of trees had frost damage to the branch tips, and mechanical breakage caused by the weather was observed on 45 and 18% of them the two last winters.

Two specimens died at La Pocatière the fourth winter and none suffered any frost damage.

*Region 3*

At Normandin, 10% of trees died the last three winters. In addition, the first winter, 8% of them had frost damage to the branch tips, while 15 and 18% suffered mechanical injury the first and fourth winters.

At Kapuskasing, 29% of specimens suffered frost damage to the branch tips the first winter and one tree died the third winter.

### Height and trunk diameter growth

Figures 1 and 2 show the mean height and trunk diameter of the trees after five years at each site in the three regions.

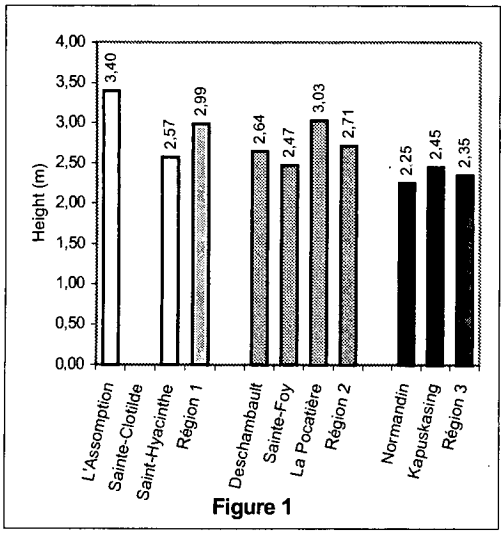


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

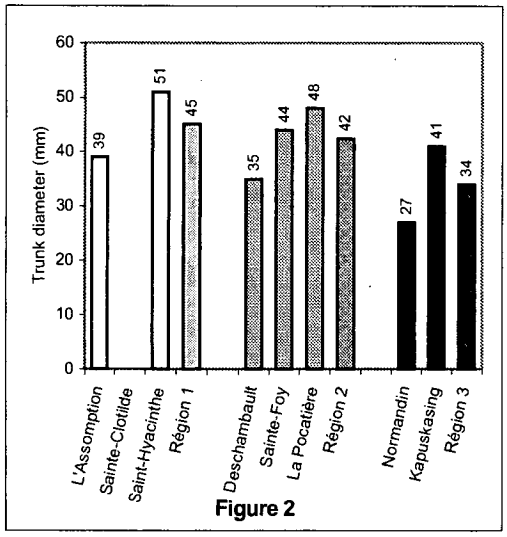


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the sites and three regions

Trunk diameter was especially homogeneous at the sites in regions 1 and 2.

### Effect of pruning

No pruning was done during the trial.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and trunk diameter categories (heights and diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

After three growing seasons, 73–100% of trees at L'Assomption, St. Clotilde, St. Hyacinthe, St. Foy and La Pocatière had a trunk diameter between 21 and 40 mm, while a fourth year was needed at Deschambault and Normandin for the trees to achieve a comparable size. Trunk diameter growth was a little slower than for the previous plantings.

After four growing seasons, over 80% of trees were more than 2.0 m tall at L'Assomption, St. Clotilde, St. Hyacinthe, La Pocatière and Kapuskasing.

## HARDINESS EVALUATION

As in the earlier trials, *Malus baccata* plants sustained very little damage and were very frost-resistant. The species is rated for survival and use to zone 2a, but it can be used without risk of serious damage across Quebec and northeastern Ontario, even in zone 1b.

The species generally achieves its full ornamental expression to zone 4a, but this lot of crabapples experienced a little more die-off than those of earlier plantings.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Malus baccata* (L.) Borkh. (Control 1993), 1994–98**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 100 | | | | | | | | | | | 0 |
| St. Clotilde | 100 | | | | | | | | | | | 0 |
| St. Hyacinthe | 87 | | | | | 5 | | 8 | | | | 13 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 90 | | | | | | | | | 10 | | 10 |
| St. Foy | 83 | 3 | | | | | | 2 | | 12 | | 17 |
| La Pocatière | 97 | | | | | | | 3 | | | | 3 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 86 | 2 | | | | | | 6 | | 6 | | 14 |
| Kapuskasing | 91 | 6 | | | | | | 3 | | | | 9 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 3, 4, 5, 7, 9 or 11 occurred in the plants tested.

**Table 2:** **Distribution of specimens of *Malus baccata* (L.) Borkh. (Control 1993) by saleable height category, 1993–97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 79 | 7 | 0 | 0 | 0 | 100 | 25 | 0 | 0 | - | 100 | 17 | 0 | 0 | 0 |
| 101-200 | 21 | 93 | 41 | 8 | 0 | 0 | 75 | 75 | 17 | - | 0 | 83 | 82 | 22 | 22 |
| 201-300 | 0 | 0 | 59 | 75 | 17 | 0 | 0 | 25 | 75 | - | 0 | 0 | 28 | 78 | 44 |
| 301-400 | 0 | 0 | 0 | 17 | 83 | 0 | 0 | 0 | 8 | - | 0 | 0 | 0 | 0 | 34 |
| 401-500 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 85 | 0 | 0 | 0 | 0 | 78 | 21 | 8 | 0 | 19 | 25 | 0 | 0 | 0 | 0 |
| 101-200 | 15 | 100 | 50 | 42 | 8 | 22 | 72 | 41 | 36 | 9 | 75 | 41 | 17 | 8 | 0 |
| 201-300 | 0 | 0 | 50 | 58 | 75 | 0 | 7 | 51 | 54 | 36 | 0 | 59 | 66 | 50 | 50 |
| 301-400 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 10 | 36 | 0 | 0 | 17 | 42 | 40 |
| 401-500 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 10 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 85 | 8 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 |
| 101-200 | 15 | 92 | 33 | 27 | 20 | 14 | 100 | 71 | 0 | 0 |
| 201-300 | 0 | 0 | 67 | 73 | 80 | 0 | 0 | 29 | 100 | 100 |
| 301-400 | - | - | - | - | - | - | - | - | - | - |
| 401-500 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Clotilde were not collected in 1997.

**Table 3:** **Distribution of specimens of *Malus baccata* (L.) Borkh. (Control 1993) by saleable trunk diameter category, 1993–97**

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 14 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | - | 92 | 8 | 0 | 0 | 0 |
| 11-20 | 86 | 50 | 0 | 0 | 0 | 50 | 67 | 0 | 0 | - | 8 | 83 | 27 | 0 | 0 |
| 21-30 | 0 | 50 | 58 | 8 | 0 | 0 | 33 | 50 | 33 | - | 0 | 9 | 45 | 11 | 0 |
| 31-40 | 0 | 0 | 42 | 58 | 25 | 0 | 0 | 50 | 42 | - | 0 | 0 | 28 | 33 | 22 |
| 41-50 | 0 | 0 | 0 | 34 | 50 | 0 | 0 | 0 | 25 | - | 0 | 0 | 0 | 56 | 11 |
| 51-60 | 0 | 0 | 0 | 0 | 25 | - | - | - | - | - | 0 | 0 | 0 | 0 | 55 |
| 61-70 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 12 |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 77 | 8 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |
| 11-20 | 23 | 84 | 50 | 17 | 8 | 50 | 36 | 17 | 0 | 0 | 92 | 17 | 0 | 0 | 0 |
| 21-30 | 0 | 8 | 50 | 50 | 33 | 0 | 64 | 25 | 27 | 18 | 0 | 83 | 33 | 0 | 0 |
| 31-40 | 0 | 0 | 0 | 33 | 25 | 0 | 0 | 58 | 18 | 18 | 0 | 0 | 33 | 58 | 50 |
| 41-50 | 0 | 0 | 0 | 0 | 34 | 0 | 0 | 0 | 55 | 27 | 0 | 0 | 34 | 9 | 10 |
| 51-60 | - | - | - | - | - | 0 | 0 | 0 | 0 | 37 | 0 | 0 | 0 | 25 | 10 |
| 61-70 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 8 | 30 |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 69 | 8 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 |
| 11-20 | 31 | 85 | 58 | 27 | 20 | 43 | 100 | 43 | 0 | 0 |
| 21-30 | 0 | 7 | 42 | 45 | 40 | 0 | 0 | 57 | 33 | 0 |
| 31-40 | 0 | 0 | 0 | 28 | 40 | 0 | 0 | 0 | 67 | 50 |
| 41-50 | - | - | - | - | - | 0 | 0 | 0 | 0 | 50 |
| 51-60 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Clotilde were not collected in 1997.

# *MALUS BACCATA (DOUBLE FLOWERED)*

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Siberian Crabapple |
| **French common name:** | Pommetier de Sibérie à fleurs doubles |
| **Category:** | Deciduous plant |
| **Subdivision:** | Medium-sized tree |

## BOTANICAL DESCRIPTION

This little tree with a rounded crown may grow to be 5 m tall at maturity.

The bark is reddish brown, turning dark grey with age. The young shoots are glabrous and the height of the first branches depends on training in the nursery.

The dense foliage, red in spring, turns reddish green over the summer. The simple, alternate, oval, fine-toothed leaves taper to a point. The petiole is 3–5 cm long.

Many big, sweet-smelling, pinkish double flowers appear after the leaves, covering the whole tree.

The small globular fruits, 1 cm in diameter, develop a dark red colour in fall and remain on the tree for part of the winter.

## ORIGIN AND DISTRIBUTION

This cross comes from Ottawa. It was given to Roger Van den Hende by Dr. Svejda and it has been growing in the Roger Van den Hende Garden since 1966 without any problems. It has not yet been assigned a cultivar name.

## USE

**Ornamental:** This clone was selected for its flowers. It can be used by itself or in mass plantings. It is very suitable for city gardens.

## REQUIREMENTS

This fast-growing selection adapts well to many different types of soil and environments. It prefers well-drained ground and moderate moisture, with pH ideally between 5 and 6.

Extensive branching necessitates frequent thinning, otherwise the tree soon starts to look untidy.

## DISEASES AND INSECTS

This crabapple clone is susceptible to scab (*Venturia inaequalis*), a fungal disease that may attack the foliage.

Other diseases, such as powdery mildew (*Podosphaera* sp.), crown gall tumour (*Agrobacterium tumefasciens*) and grey mould (*Botrytis*) may appear and cause serious damage.

In addition, some insects may appear periodically and cause damage, including aphids and the roundheaded apple tree borer (*Saperda candida*), apple oystershell scale (*Lepidosaphes ulmi*), spider mites, leafhoppers, eastern tent caterpillar (*Malacosoma americanum*), apple ermine moth (*Yponomeuta malinellus*), fall webworm (*Hyphantria cunea*) and Japanese beetle (*Popillia japonica*).

## PROPAGATION

**Grafting:** Propagation is usually by T-budding on a *Malus baccata* seedling.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Scion: Roger Van den Hende Garden, St. Foy, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** Rootstocks were two-year-old trees with trunks the diameter of a pencil, grown at the experimental farm in L'Assomption. The grafts were taken on August 21, 1991, from year-old parent plants 1.2 m tall and 5 mm in diameter at the Montreal Botanical Garden. The

parent plants were whips grown from scions taken the preceding year at the Roger Van den Hende Garden in St. Foy. On August 22, 300 specimens were T-budded. The survival rate observed the following spring was only 40%, due to immature buds and a late frost. In May 1992, the rootstocks were cut back to 1 cm above the union. The scions were staked and tied during the growing season and their bases cleaned weekly. On October 29, they were dug up and heeled in. In mid-April 1993, they were wrapped and stored in a cellar until they were shipped in May.

**Inclusion in testing network:** Seedlings 75 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the selection over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 67 and 58% of trees suffered frost damage to the branch tips the first and fourth winters, while 17% froze down to the snow cover the first winter. In addition, 8% of plants sustained mechanical injury the last winter.

The first winter, frost damage to the branch tips affected 33% of specimens at St. Clotilde. Data were not collated after the last two winters.

At St. Hyacinthe, one tree died the second winter. The first winter, 13% of plants had frost damage to the branch tips and 20% died back to the snow cover. In addition, mechanical injury was observed on 17% the last winter.

*Region 2*

At Deschambault, frost damage to the branch tips occurred on 54% of trees the first winter and 8% the next. The second and fourth winters, 23 and 50% suffered mechanical breakage.

At St. Foy, 27% of specimens died the first winter and 9% had frost damage to the previous year's shoots. The first three winters, 64, 75 and 87% of trees suffered frost damage to the branch tips. In addition, all sustained mechanical injury the fourth winter.

At La Pocatière, 33 and 13% of plants died the third and fourth winters, while 67% suffered frost damage to the branch tips the first winter.

*Region 3*

At Normandin, 9, 20, 25 and 50% of trees died the last four winters. The first and third winters, 54 and 20% of plants had frost damage to the branch tips. Frost damage to the previous year's shoots occurred on 18% of specimens the first winter. The first, second and fourth winters, 9, 18 and 38% suffered mechanical breakage. In addition, 17% sustained rodent damage the last winter.

At Kapuskasing, 30, 14 and 17% of plants died the first, third and fourth winters. The second winter, frost damage to the branch tips ends occurred on 57% of trees. Frost injury to the previous year's shoots was observed each winter on 60, 29, 86, 84 and 40% of specimens. In addition, the first winter, 10% were killed to the ground.

### Height and trunk diameter growth

Figures 1 and 2 show the mean height and trunk diameter of the trees after five years at each site in the three regions.

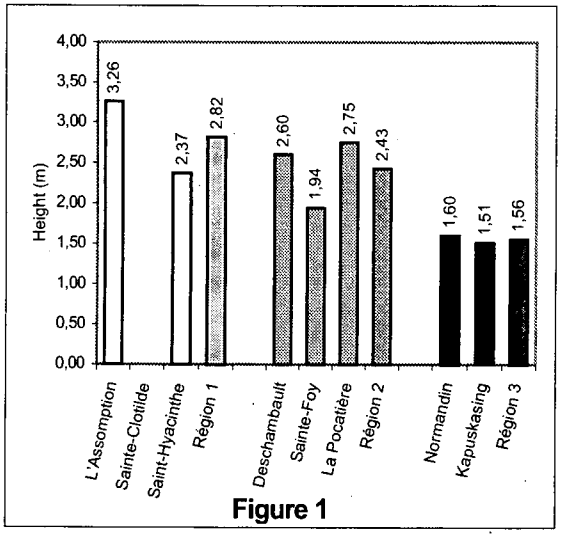


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

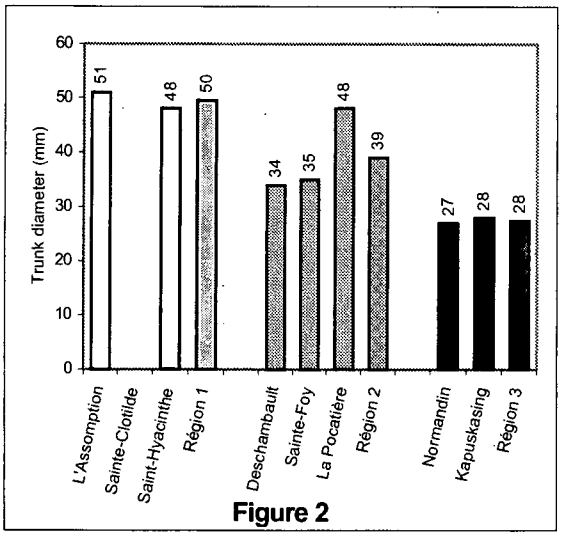


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the sites and three regions

Height increased regularly at all the sites in region 1. The strongest growth occurred the third and fourth years.

### Effect of pruning

Severe pruning was needed at St. Hyacinthe and at the sites in region 3.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and trunk diameter categories (heights and diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

All the trees had attained a trunk diameter greater than 21 mm after two years at St. Clotilde, three at St. Hyacinthe and La Pocatière and four at L'Assomption, Deschambault and St. Foy.

All the seedlings were over 2.0 m tall after three growing seasons at La Pocatière and four at L'Assomption. The serious damage to the trees at the other sites limited height growth there.

This selection requires too much training to compete with the cultivars already on the market, but small-scale production is possible in all the sites in regions 1 and 2.

## HARDINESS EVALUATION

This selection is not as hardy as the species (*Malus baccata)* in general. The most common winter damage was frost injury to the branch tips and mechanical injury caused by heavy snow. Mortality was greatest at Normandin, La Pocatière and Kapuskasing, so the tree can only be rated to survive to zone 4a. Although some plants survived in zone 2, they were small and slow growing, and their long-term survival potential is quite low.

This selection can be used to zone 4a, but in the knowledge that it may sustain slight damage the first few years after planting. Fertilization may promote later acquisition of cold tolerance.

The selection did not achieve its full ornamental expression during the trial. On the other hand, the parent plant growing in the Roger Van den Hende Garden has suffered no damage in over 20 years.

**WRITTEN BY**

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Malus baccata* (double flowered), 1994–98**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 70 | 25 | | | | 4 | | | | 1 | | 30 |
| St. Clotilde | 89 | 11 | | | | | | | | | | 11 |
| St. Hyacinthe | 89 | 3 | | | | 5 | | 1 | | 2 | | 11 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 27 | 45 | | 1 | | | | 2 | | 25 | | 73 |
| St. Foy | 73 | 12 | | | | | | | | 15 | | 27 |
| La Pocatière | 77 | 13 | | | | | | 10 | | | | 23 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 44 | 15 | | 4 | | | | 21 | | 12 | 4 | 56 |
| Kapuskasing | 15 | 11 | | 60 | | | 2 | 12 | | | | 85 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 3, 5 or 9 occurred in the plants tested.

**Table 2:** **Breakdown of specimens of *Malus baccata* (double-flowered) by saleable height category, 1993–97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 17 | 0 | 0 | 0 | 0 | 33 | 17 | 0 | 0 | 0 | 40 | 27 | 0 | 0 | 0 |
| 101-200 | 73 | 100 | 33 | 0 | 0 | 67 | 66 | 25 | 8 | 0 | 60 | 67 | 92 | 34 | 17 |
| 201-300 | 0 | 0 | 67 | 25 | 33 | 0 | 17 | 75 | 50 | 0 | 0 | 6 | 8 | 66 | 83 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 62 | 8 | 9 | 0 | 0 | 55 | 37 | 12 | 0 | 0 | 8 | 0 | 0 | 0 | 0 |
| 101-200 | 38 | 84 | 83 | 42 | 34 | 45 | 50 | 63 | 25 | 50 | 92 | 50 | 0 | 13 | 15 |
| 201-300 | 0 | 8 | 8 | 58 | 66 | 0 | 13 | 25 | 62 | 50 | 0 | 50 | 100 | 63 | 56 |
| 301-400 | - | - | - | - | - | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 24 | 29 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 27 | 9 | 0 | 13 | 17 | 60 | 14 | 0 | 0 | 20 |
| 101-200 | 73 | 82 | 40 | 25 | 50 | 40 | 86 | 71 | 67 | 60 |
| 201-300 | 0 | 9 | 60 | 62 | 33 | 0 | 0 | 29 | 33 | 20 |
| 301-400 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: Breakdown of specimens of *Malus baccata* (double-flowered) by saleable trunk diameter category, 1993–97.

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 |
| 11-20 | 42 | 8 | 9 | 0 | 0 | 27 | 0 | 0 | 0 | 0 | 87 | 67 | 0 | 0 | 0 |
| 21-30 | 58 | 67 | 8 | 8 | 8 | 73 | 64 | 0 | 0 | 0 | 6 | 33 | 50 | 0 | 0 |
| 31-40 | 0 | 25 | 50 | 17 | 0 | 0 | 36 | 25 | 8 | 0 | 0 | 0 | 50 | 50 | 25 |
| 41-50 | 0 | 0 | 33 | 33 | 42 | 0 | 0 | 75 | 33 | 0 | 0 | 0 | 0 | 50 | 25 |
| 51-60 | 0 | 0 | 0 | 42 | 25 | 0 | 0 | 0 | 34 | 0 | 0 | 0 | 0 | 0 | 50 |
| 61-70 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 25 | 0 | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 15 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 11-20 | 77 | 77 | 17 | 0 | 0 | 91 | 62 | 38 | 0 | 0 | 100 | 8 | 0 | 0 | 0 |
| 21-30 | 8 | 23 | 83 | 42 | 25 | 0 | 38 | 38 | 50 | 25 | 0 | 67 | 33 | 0 | 0 |
| 31-40 | 0 | 0 | 0 | 50 | 67 | 0 | 0 | 24 | 38 | 63 | 0 | 25 | 58 | 37 | 28 |
| 41-50 | 0 | 0 | 0 | 8 | 8 | 0 | 0 | 0 | 12 | 12 | 0 | 0 | 9 | 50 | 29 |
| 51-60 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 13 | 43 |
| 61-70 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 10 | 10 | 10 | 0 | 0 | 0 | 14 | 0 | 0 | 0 |
| 11-20 | 54 | 45 | 0 | 12 | 0 | 100 | 71 | 29 | 17 | 20 |
| 21-30 | 36 | 45 | 90 | 75 | 100 | 0 | 15 | 71 | 83 | 60 |
| 31-40 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | 0 | 0 | 20 |
| 41-50 | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | | - | - | - | - |
| 61-70 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

# *MICROBIOTA DECUSSATA KOMAR*

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Russian arborvitae, Siberian Cypress |
| **French common name:** | Microbiota, Cyprès de Russie; Cyprès de Sibérie |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This wide-spreading, flat-topped dwarf shrub with a regular growth habit can be up to 0.6 m high with a spread of 1.5 m. Its prostrate form makes it look like a creeping juniper. It grows slowly.

The flat, spreading branches, like those of *Thuja*, bear leaves resembling overlapping scales with a very smooth texture. Yet on young plants, or those growing in the shade, the leaves on twigs are needle-like.

The soft, fern-like foliage, shiny yellowish green in spring, turns bright green in summer and coppery bronze in winter.

The obovate cones are not very apparent.

## ORIGIN AND DISTRIBUTION

The species, which originates in eastern Siberia, has been available on the market for about 15 years. It was introduced by the Trompenburg Arboretum in Rotterdam, Holland, in 1968. This little shrub was discovered in 1921 in the Olga River valley near Vladivostock, Russia. It grows in mountainous regions close to the tree line.

## USE

**Ornamental:** This little conifer can be used by itself in rock gardens, as ground cover, on slopes or in mass plantings.

## REQUIREMENTS

This shrub likes a sunny or partially shady exposure. It appears to be even more shade-tolerant than the dwarf junipers. It needs medium-moist, loamy soil, but tolerates dry, chalky soil. It is moderately tolerant of winter salt. No pruning is required. It is very resistant to pollution and urban conditions, as well as to foot traffic.

## DISEASES AND INSECTS

There is no particular information on this species in the Réseau d'Avertissements Phytosanitaires [Quebec Department of Agriculture, Fisheries and Agri-food Plant Health Warning System].

## PROPAGATION

No references were found to propagation techniques used with this species.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Gift of W. H. Perron, Boisbriand, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** Four hundred cuttings 5–7 cm in length were taken on December 21, 1992, from parent plants measuring 55 cm high with a 25 cm spread, grown in pots. They were soaked for five seconds in a 5000-ppm IBA/50% ethanol solution, after slight wounding to the base of the stem. They were planted in multipots (45 cells) filled with a Promix®-perlite medium (1:2; v:v), then misted for 10 seconds every hour. The heating-cable temperature was set at 20°C and that of the greenhouse at 15°C. A Benomyl®-based fungicide solution was applied weekly for the entire rooting period. The rooting rate was 37% at two months. In mid-April 1993, 147 plants were potted in a Promix®-Turface® mixture (1:2; v:v). They were treated with a soluble fertilizer (10-52-10), then planted in an outdoor bed, where they continued to grow. They

overwintered in the bed, protected by a cold frame. The survival rate was 100%. In early May 1994, they were wrapped and put back in the cold store at 4°C until being shipped a few days later.

**Inclusion in testing network:** Seedlings 12 cm high were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

### Winter damage

The most common type of winter damage to this species was foliage browning. Mortality was highest at L'Assomption, where seven shrubs died; one died at St. Foy, another at La Pocatière and two at Normandin.

*Region 1*

At L'Assomption, 22 and 27% of specimens died the first and third winters. In addition, 9 and 88% of shrubs suffered foliage browning the third and fourth winters.

At St. Clotilde, one plant died and one suffered foliage browning the first winter.

Foliage browning was observed the first two winters at St. Hyacinthe on 11 and 95% of plants. The 1997 data were not collated.

*Region 2*

All the shrubs had foliage browning the first two winters and 17% were affected the third winter at Deschambault.

At St. Foy, one shrub died the fourth winter. In addition, the second winter, 20% of plants had damage to the branch tips and 13% suffered foliage browning.

At La Pocatière, a single specimen suffered frost damage to the previous year's shoots the first winter.

*Region 3*

At Normandin, two plants died the first winter. All the shrubs had foliage browning the second and third winters and damage to the previous year's shoots the last winter.

No damage occurred at Kapuskasing.

### Height and width growth

Figures 1 and 2 show the mean height and width of the shrubs after five years at each site in the three regions.

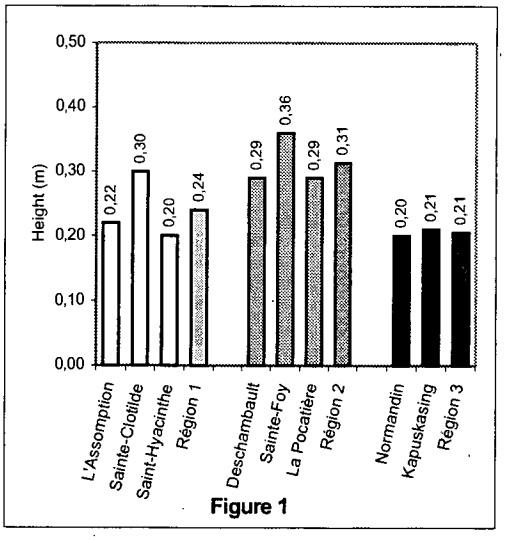


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

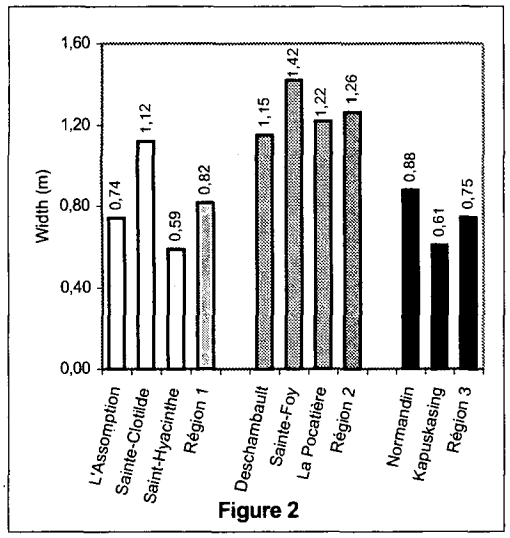


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

### Effect of pruning

Very light pruning was done at a few sites, including Normandin. The poor height growth of shrubs in region 3 was not due to pruning.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

This species develops more in width than in height. After two growing seasons, 82 and 94% of shrubs at Deschambault and La Pocatière had attained a width of 41–80 cm, but a third year was necessary at all the other sites in regions 1 and 2 and a fourth at the two zone 2 sites to achieve comparable growth.

The shrubs grew tallest in the three sites in zone 4, as weather conditions are important factors in plant development, with lots of snow early in the winter and no thaw in January or February.

## HARDINESS EVALUATION

According to the literature, the species is hardy to zone 2, and the results of this trial confirm that it can survive in zone 2a or an even colder zone, as the shrubs in zone 2a suffered no damage, although they grew more slowly.

The species can be used to zone 2; plant growth is regular and the shrubs develop more in width than in height at all sites.

Full ornamental expression was observed at the sites in zones 2a, 4a and 5b.

## WRITTEN BY

Claude Richer, Agr.
Jacques-André Rioux, Agr.
Christine Galipeau, Biologist

Table 1: **Frequency of winter damage observed in *Microbiota decussata* Komar., 1995–99**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 71 | | | | | | | 10 | | | | 19 | 29 |
| St. Clotilde | 98 | | | | | | | 1 | | | | 1 | 2 |
| St. Hyacinthe | 74 | | | | | | | | | | | 26 | 26 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 57 | | | | | | | | | | | 43 | 43 |
| St. Foy | 92 | 4 | | | | | | 2 | | | | 2 | 8 |
| La Pocatière | 99 | | | 1 | | | | | | | | | 1 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 48 | | | 20 | | | | 2 | | | | 40 | 62 |
| Kapuskasing | 100 | | | | | | | | | | | | 0 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = persistent partial foliage browning

No damage of type 3, 5, 6, 7, 9, 10 or 11 occurred in the plants tested.

Table 2: **Distribution of specimens of *Microbiota decussata* Komar. by saleable height category, 1994–98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 22 | 0 | 0 | 0 | 0 | 6 | 7 | 0 | 0 | 0 | - | 12 | 0 | 8 | 8 |
| 11-20 | 72 | 72 | 72 | 50 | 50 | 63 | 93 | 84 | 100 | 8 | - | 88 | 75 | 75 | 42 |
| 21-30 | 6 | 28 | 28 | 50 | 50 | 31 | 0 | 16 | 0 | 58 | - | 0 | 25 | 17 | 50 |
| 31-40 | - | - | - | - | - | 0 | 0 | 0 | 0 | 34 | - | - | - | - | - |
| 41-50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 29 | 0 | 0 | 0 | 0 | 27 | 7 | 0 | 0 | 0 | 18 | 6 | 0 | 0 | 0 |
| 11-20 | 65 | 72 | 41 | 25 | 0 | 73 | 73 | 16 | 25 | 0 | 82 | 70 | 28 | 10 | 10 |
| 21-30 | 6 | 18 | 59 | 67 | 58 | 0 | 20 | 75 | 67 | 0 | 0 | 24 | 72 | 60 | 60 |
| 31-40 | 0 | 0 | 0 | 0 | 42 | 0 | 0 | 9 | 8 | 81 | 0 | 0 | 0 | 30 | 30 |
| 41-50 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 19 | 6 | 0 | 0 | 0 | 0 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 69 | 22 | 9 | 0 | 10 | 29 | 29 | 10 | 0 | 0 |
| 11-20 | 25 | 78 | 91 | 63 | 54 | 71 | 71 | 70 | 60 | 60 |
| 21-30 | 6 | 0 | 0 | 37 | 36 | 0 | 0 | 20 | 40 | 30 |
| 31-40 | - | - | - | - | - | 0 | 0 | 0 | 0 | 10 |
| 41-50 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Hyacinthe were not collected in 1994.

Table 3: Distribution of specimens of *Microbiota decussata* Komar. by saleable width category, 1994–98

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 100 | 27 | 13 | 0 | 100 | 100 | 33 | 17 | 0 | - | 73 | 17 | 34 | 25 |
| 041-060 | 0 | 0 | 73 | 87 | 75 | 0 | 0 | 58 | 42 | 8 | - | 17 | 66 | 66 | 66 |
| 081-120 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 9 | 41 | 50 | - | 0 | 17 | 0 | 9 |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 0 | 42 | - | - | - | - | - |
| 161-200 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 94 | 18 | 0 | 0 | 0 | 100 | 87 | 0 | 0 | 0 | 94 | 6 | 0 | 0 | 0 |
| 041-060 | 6 | 82 | 100 | 33 | 0 | 0 | 13 | 42 | 17 | 0 | 6 | 94 | 18 | 10 | 10 |
| 081-120 | 0 | 0 | 0 | 67 | 58 | 0 | 0 | 58 | 83 | 18 | 0 | 0 | 82 | 90 | 30 |
| 121-160 | 0 | 0 | 0 | 0 | 42 | 0 | 0 | 0 | 0 | 72 | 0 | 0 | 0 | 0 | 60 |
| 161-200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 10 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 85 | 36 | 0 | 0 | 100 | 86 | 50 | 0 | 0 |
| 041-060 | 0 | 15 | 64 | 37 | 27 | 0 | 14 | 50 | 90 | 80 |
| 081-120 | 0 | 0 | 0 | 63 | 63 | 0 | 0 | 0 | 10 | 20 |
| 121-160 | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - |
| 161-200 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Hyacinthe were not collected in 1994.

# *PICEA ABIES* 'ARGENTEOSPICA'

| | |
|---|---|
| **Family:** | Pinaceae |
| **English common name:** | Golden Norway Spruce |
| **French common name:** | Épinette de Norvège dorée |
| **Synonym:** | *P. excelsa argenteo-spica* Hesse or *argenteo-spicata* Beiss. |
| **Category:** | Evergreen plant |
| **Subdivision:** | Large tree |

## BOTANICAL DESCRIPTION

This tree with its conical crown has a graceful, regular growth habit. It may reach 40 m in height and 130 cm in trunk diameter, with a spread of 8–12 m.

The wrinkled or smooth bark comes off in papery shreds. It is reddish brown at first, becoming a dark purplish brown with age, and covered with small, hard, rounded scales.

The spreading branches have upturning ends and the branchlets are drooping in adult trees. The creamy green twigs turn a light orange-brown; they are shiny and mostly hairless.

The four-sided needles are 1.2–2.5 cm long. Tightly arranged on the branch, they last several years. The creamy white of the new shoots is a particularity of this cultivar; they turn dark green during the season.

The conical, reddish to pale brown buds, blunt-pointed and non-resinous, are covered with tight-fitting scales. The outer scales sometimes have spreading tips.

The male strobili form yellowish catkins in May. The red or pink female strobili then produce pendulous cylindrical cones that turn brown when ripe. They can reach 16 cm in length and persist on the tree all winter. They are found mainly at the top of the tree.

The root system is composed of creeping roots and deep lateral roots.

## ORIGIN AND DISTRIBUTION

The Norway spruce comes from northern and central Europe and Asia, but we were unable to find any information on the origin of this magnificent cultivar.

## USE

**Ornamental:** The cultivar's creamy new shoots make it look like a Christmas tree decorated with candles; they gradually turn light green. This conifer is suitable for wide-open spaces and parks and may be used as an ornamental alone or in a screen.

## REQUIREMENTS

The Norway spruce adapts to various types of soil, with the exception of poorly drained sites. It needs lots of moisture and a sandy-silty texture with acid, neutral or alkaline pH. It is sensitive to drought and frost and fairly tolerant of shade.

New shoots (often called candles) can be pruned in June to obtain more compact forms.

## DISEASES AND INSECTS

Although there are no particular notes on this cultivar, spruces are susceptible to aphids and the species is particularly affected by the eastern spruce gall aphid (*Adelges abietis*) and the spruce gall adelgid (*Pineus similis*). The white pine weevil (*Pissodes strobis*) is generally fond of *Picea abies*. Pine needle scale sometimes attacks the species.

## PROPAGATION

**Grafting:** Several grafting techniques are used. Summer grafting is done when the twigs are completely mature (from mid-August to late September). Scions are leading shoots with a well-developed terminal bud and generally three or four lateral buds. Before grafting, the lower part of

the scion is stripped of needles. The rootstock must be two or three years old. One possible method is to remove the veneer from the rootstock that covers the base of the scion. The cambium of the scion and that of the rootstock must fit together perfectly. The callus forms first at the lower section of the scion, which, for this reason, must be cut very carefully. The second method is to make a small cut on the front of the scion and bind the tongue on top with rubber or waxed twine.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant: Scion:** Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** The rootstocks, which were two-year-old seedlings produced by the Pépinière Forestière de Berthierville nursery in Berthierville, Quebec, were received in L'Assomption in December 1990. They were potted up into 10-cm pots filled with a Promix®-sand mixture (1:2; v:v). The scions were taken on February 11, 1991, from roughly 35-year-old parent plants 8–12 m tall. On February 14, 665 rootstocks were veneer grafted without wax. They were placed under a polyethylene film in a greenhouse kept at 15°C. Despite mould growth, the 27% of the scions had taken 29 days later. In June, the grafted plants were placed outside in a lathhouse and soaked in water once an hour for the first two weeks. The above-ground portion of the rootstock was reduced by a third. The plants overwintered in the lathhouse, lying on their sides. On June 9, they were potted on into 1-L containers. The medium was a mixture of Promix®, sand and compost (1:2:1; v:v:v). The rest of the above-ground portion of the rootstock was removed. The plants overwintered in an unprotected bed. In mid-April 1993, they were wrapped and placed in the cold store at 4°C until being shipped in May.

**Inclusion in testing network:** Seedlings 31 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Trees died at all the sites, especially the first three winters.

*Region 1*

At L'Assomption, two trees died during the trial, the second and fifth winters, while 11% of specimens suffered partial foliage browning the third winter and 44% had frost damage to the branch tips the next winter.

At St. Clotilde 9, 7 and 20% of specimens died the first three winters. The data were not collated in 1997 and 1998.

At St. Hyacinthe, 36% of trees died the first winter and 11% the next; similarly, 36 and 33% suffered foliage browning during the same period.

*Region 2*

At Deschambault, 25% of specimens died the first winter and 11% suffered mechanical breakage the fourth winter.

At St. Foy, one tree died the first winter and 8% of plants had frost damage to the branch tips the third winter.

At La Pocatière, 6% died the first winter.

*Region 3*

At Normandin, 16% of plants died the first winter and 6% the next.

At Kapuskasing, 53, 33 and 25% of trees suffered frost damage to the branch tips the first three winters, while 13, 7 and 12% had damage to the previous year's shoots the first, second and fourth winters.

### Height and width growth

Figures 1 and 2 show the mean height and width of the trees after five years at each site in the three regions.

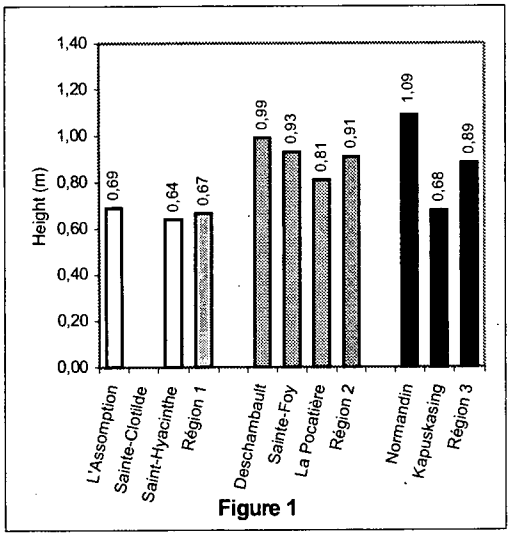


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

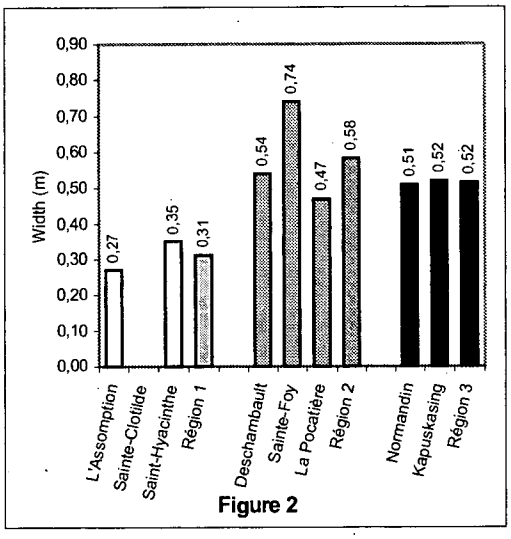


**Figure 2.** Mean width of trees at trial's end for each of the sites and three regions

Height growth was constant and regular at all sites, but the greatest at Normandin.

### Effect of pruning

No pruning was necessary for this cultivar.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable trees obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Fifty percent of the trees at St. Foy and Normandin were more than 80 cm tall after four years of growth, while a fifth year was not sufficient at the other sites to obtain a similar number of plants of comparable height.

Grafting required a good union to prevent losses in the first year of the trial.

This cultivar, very rare on the market, would be worthwhile producing. It is easy to grow once the graft has taken.

## HARDINESS EVALUATION

According to the literature, the species and its cultivars are hardy to zone 2. The trial results confirm that the cultivar can survive to zone 2a, as the mortality rate was no higher there. It is essential that survival be assured by favourable soil and climate conditions, for the few plants that died during the trial did so within the first few years of planting.

The cultivar can be used to zone 2a, the borderline zone where frost damage starts to occur.

The cultivar achieved its potential for full ornamental expression at the sites in zones 2b to 4a; the trees in zone 5 had foliage browning, which was not seen in the other climate zones and which does not occur on the parent plant in the Montreal Botanical Garden.

**WRITTEN BY**

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Picea abies* 'Argenteospica,' 1994–98**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 85 | 9 | | | | | | 4 | | | | 2 | 15 |
| St. Clotilde | 88 | | | | | | | 12 | | | | | 12 |
| St. Hyacinthe | 61 | | | | | | | 16 | | | | 23 | 39 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 93 | | | | | | | 5 | | 2 | | | 7 |
| St. Foy | 97 | 2 | | | | | | 1 | | | | | 3 |
| La Pocatière | 97 | | | | | | | 3 | | | | | 3 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 96 | | | | | | | 4 | | | | | 4 |
| Kapuskasing | 64 | 22 | | 7 | | | | 7 | | | | | 36 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of type 3, 5, 6, 7, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of specimens of *Picea abies* 'Argenteospica' by saleable height category, 1993–97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 77 | 54 | 33 | 0 | 0 | 88 | 40 | 33 | 0 | - | 93 | 78 | 25 | 0 | 0 |
| 041-080 | 23 | 46 | 67 | 89 | 89 | 12 | 60 | 67 | 62 | - | 7 | 22 | 75 | 100 | 75 |
| 081-120 | 0 | 0 | 0 | 11 | 11 | 0 | 0 | 0 | 38 | - | 0 | 0 | 0 | 0 | 25 |
| 121-160 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 22 | 0 | 0 | 0 | 77 | 17 | 9 | 0 | 0 | 100 | 67 | 36 | 9 | 0 |
| 041-080 | 0 | 78 | 100 | 89 | 11 | 23 | 83 | 91 | 50 | 25 | 0 | 33 | 64 | 82 | 64 |
| 081-120 | 0 | 0 | 0 | 11 | 89 | 0 | 0 | 0 | 50 | 67 | 0 | 0 | 0 | 9 | 36 |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 89 | 56 | 9 | 0 | 0 | 64 | 60 | 50 | 38 | 0 |
| 041-080 | 11 | 44 | 91 | 54 | 9 | 36 | 40 | 50 | 50 | 62 |
| 081-120 | 0 | 0 | 0 | 46 | 63 | 0 | 0 | 0 | 12 | 38 |
| 121-160 | 0 | 0 | 0 | 0 | 28 | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: **Breakdown of specimens of *Picea abies* 'Argenteospica' by saleable width category, 1993–97**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 100 | 92 | 22 | 22 | 33 | 100 | 100 | 0 | 0 | - | 100 | 78 | 37 | 50 | 0 |
| 021-040 | 0 | 8 | 67 | 45 | 67 | 0 | 0 | 77 | 37 | - | 0 | 22 | 63 | 38 | 88 |
| 041-060 | 0 | 0 | 11 | 33 | 0 | 0 | 0 | 23 | 63 | - | 0 | 0 | 0 | 12 | 12 |
| 061-080 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 100 | 78 | 22 | 0 | 0 | 69 | 25 | 0 | 0 | 0 | 100 | 60 | 0 | 0 | 0 |
| 021-040 | 0 | 22 | 78 | 67 | 0 | 31 | 58 | 42 | 17 | 0 | 0 | 40 | 91 | 73 | 27 |
| 041-060 | 0 | 0 | 0 | 33 | 89 | 0 | 17 | 58 | 67 | 25 | 0 | 0 | 9 | 27 | 64 |
| 061-080 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 16 | 33 | 0 | 0 | 0 | 0 | 9 |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 0 | 42 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 84 | 44 | 36 | 0 | 0 | 100 | 80 | 50 | 25 | 0 |
| 021-040 | 16 | 56 | 64 | 64 | 9 | 0 | 20 | 37 | 50 | 50 |
| 041-060 | 0 | 0 | 0 | 36 | 82 | 0 | 0 | 13 | 12 | 25 |
| 061-080 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 13 | 12 |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 0 | 13 |

* Data were not collected in 1997.

# *PICEA PUNGENS* 'AUREA'

| | |
|---|---|
| **Family:** | Pinaceae |
| **English common name:** | Golden Colorado Spruce |
| **French common name:** | Épinette du Colorado dorée, Épicea du Colorado dorée |
| **Category:** | Evergreen plant |
| **Subdivision:** | Large tree |

## BOTANICAL DESCRIPTION

The Colorado spruce, with a fairly wide, very regular conical growth habit, may reach 20–30 m in height and 5 m in width. It grows at a slow to moderate rate.

The straight trunk is covered with a purplish-grey to greyish-brown or reddish-brown bark, which divides into large scaly plates that lift slightly off the trunk.

The spreading branches, slightly ascending at the top of the tree, are descending at the bottom. The stout, shiny, hairless yellowish-brown branches have thin, sturdy whitish to greyish-brown twigs. The rounded to blunt-pointed non-resinous buds measure 10 mm and are covered with papery scales.

The four-sided needles are 1.5–3.0 cm long. The cultivar 'Aurea' can be distinguished by its sulphur yellow needles. Stiff and sharp-pointed, they curve inward and are arranged brush-like all around the twig. They remain on the branch about five years before dropping.

The cylindrical cones are often covered in resin and begin to open in the second week of May. The orange male cones are found all over the tree, while the cylindrical, pointed female cones, which are 5–12 cm long, are mainly found at the top of the tree. The shiny, chestnut-brown scales are thin, flexible and loosely fitted, with a wavy edge, tapering slightly to a jagged tip. The cones ripen the year of pollination and hang at maturity. The 4-mm seeds have a terminal wing that detaches from the seed on dissemination.

The root system consists of creeping roots and deep lateral roots.

## ORIGIN AND DISTRIBUTION

The species comes from the U.S. Rockies and is rarely grown, as it has been pushed out by cultivars with colourful needles. The origin of this cultivar is not specified in the literature consulted.

## USE

**Ornamental:** The golden Colorado spruce can be used in wide open spaces for its magnificent coloration or in contrast with other conifers.

## REQUIREMENTS

This full-sun tree thrives in deep, moist soil, but tolerates light, dry soil if well watered in the first few years so that the root system has a chance to develop. It also adapts fairly well to poor, non-chalky soil. High humidity is very good for it.

It is best to protect the plants the first few winters and prune them to obtain a regular, bushy shape.

## DISEASES AND INSECTS

Canker caused by the fungus *Cytospora kunzei* affects chiefly the Colorado spruce and Norway spruce.

## PROPAGATION

**Grafting**: Several grafting techniques are used. Summer grafting is done when the twigs are completely mature (from mid-August to late September). Scions are leading shoots with a well-developed terminal bud and generally three or four lateral buds. Before grafting, the lower part of the scion is stripped of needles. The rootstock must be two or three years old. One possible method is to remove the veneer from the rootstock that covers the base of the scion. The cambium of the scion and that of the rootstock must fit together perfectly. The callus forms first at the lower

section of the scion, which, for this reason, must be cut very carefully. The second method is to make a small cut on the front of the scion and bind the tongue on top with rubber or waxed twine.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant**: Scion: Montreal Botanical Garden, Montreal, Quebec

**Propagation site**: Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique**: The rootstocks, which were two-year-old seedlings produced by the Pépinière Forestière de Berthierville nursery in Berthierville, Quebec, were received in L'Assomption on October 31. They were potted up into 10-cm pots filled with a Promix®-sand mixture (1:2; v:v). The scions were taken on February 13, 1991, from roughly 35-year-old parent plants 6–8 m tall. On February 14, 312 rootstocks were veneer grafted without wax. They were placed under a polyethylene film in a greenhouse kept at 15°C. Despite mould growth, 30% of the scions had taken 27 days later. In June, the grafted plants were placed outside in a lathhouse and soaked in water once an hour the first two weeks. The above-ground portion of the rootstock was reduced by a third. The plants overwintered in the lathhouse. On June 9, 1992, they were potted into 1-L containers. The medium was composed of Promix®, sand and compost (1:2:1; v:v:v). The rest of the above-ground portion of the rootstock was removed. The plants overwintered in an unprotected bed. In mid-April 1993, they were wrapped and placed in the cold store at 4°C until being shipped in May.

**Inclusion in test network:** Seedlings 25 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

Very few plants were evaluated; of the 12 transplanted at the start of the trial at each site, between 5 and 10 died. The statistical means for frequency of damage were high and the sample small.

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption and St. Clotilde, 28 and 50% of trees died during the first and third winters (three out of seven plants). In addition, at L'Assomption, one plant in four (25%) suffered mechanical injury the fourth winter, while 67% of specimens suffered the same type of damage the third winter at St. Clotilde.

At St. Hyacinthe, 75% of trees died the first winter (six out of eight) and another died the third winter. Foliage browning was seen on one plant each of the first two winters.

*Region 2*

At Deschambault, two plants survived being transplanted; one froze down to the ground the first winter. No further damage to the two trees was observed after that.

At St. Foy, one of the three trees that survived transplanting had foliage browning the first winter.

At La Pocatière, two of the seven specimens that had survived transplanting died the first winter.

*Region 3*

At Normandin, 64% of specimens died the first winter (9 out of 14) and one tree suffered foliage browning. The next winter, 20% of them died.

The first winter, at Kapuskasing, one of the four plants died, another had frost damage to the previous year's shoots and the other two froze down to the snow cover. No damage was observed after that.

### Height and width growth

Figures 1 and 2 show the mean height and width of the trees after five years at each site in the three regions.

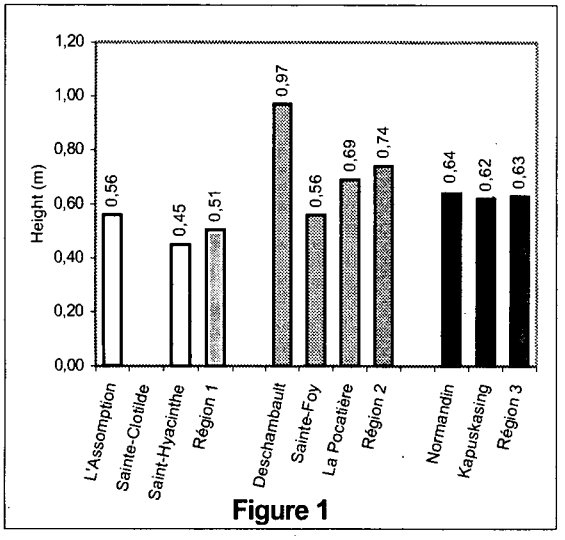


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

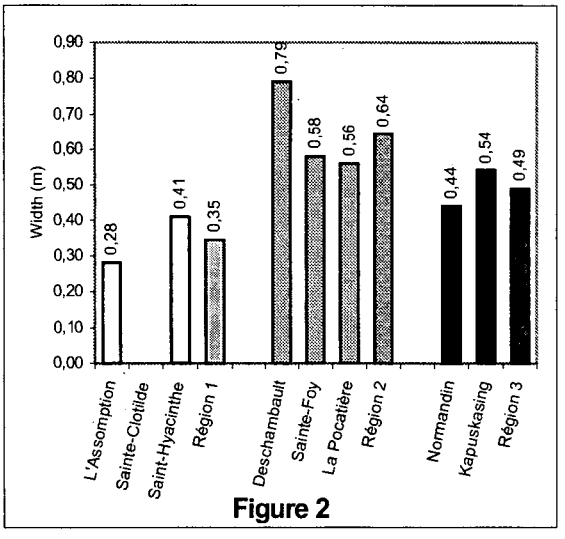


**Figure 2.** Mean width of trees at trial's end for each of the sites and three regions

The cultivar's height growth was constant and regular at all sites during the trial.

### Effect of pruning

At Deschambault and Kapuskasing, pruning was necessary after the first winter, reducing the trees' height by a third.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable trees obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

It is very difficult to recommend production of this cultivar, given the low number of specimens that survived transplanting. Production of the cultivar must take into account the difficulty these trees have in growing in nursery conditions, regardless of the soil type or climate zone.

After two growing seasons, no damage was observed. Plant growth was homogeneous. The cultivar should preferably be grown in pots for the first two years.

## HARDINESS EVALUATION

The literature consulted did not rate this cultivar's hardiness. The trial results confirm that survival of the cultivar is assured in zone 2a, as the mortality rate was no higher there; the plants that died did so during the first few winters, never having properly recovered from being transplanted.

The cultivar can be used to zone 2a, the borderline zone where frost damage begins to occur.

The cultivar did not achieve its full ornamental expression during the trial, although the trees in zone 4 were only slightly damaged. Furthermore, the parent plant at the

Montreal Botanical Garden has not sustained any particular damage in many years.

**WRITTEN BY**

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**Table 1:** **Frequency of winter damage observed in *Picea pungens* 'Aurea,' 1994–98**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 79 | | | | | | | 16 | | 5 | | | 21 |
| St. Clotilde | 60 | | | | | | | 18 | | | | 22 | 40 |
| St. Hyacinthe | 43 | | | | | | | 44 | | | | 13 | 57 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 90 | | | | | | 10 | | | | | | 10 |
| St. Foy | 93 | | | | | | | | | | | 7 | 7 |
| La Pocatière | 93 | | | | | | | 7 | | | | | 7 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 82 | | | | | | | 17 | | | | 1 | 18 |
| Kapuskasing | 80 | | | 5 | | 10 | | 5 | | | | | 20 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of type 2, 3, 5, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of specimens of *Picea pungens* 'Aurea' by saleable height category, 1993–97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 22 | 0 | 25 | 0 | - | 43 | 50 | 0 | 0 | 0 |
| 021-040 | 71 | 60 | 60 | 25 | 25 | 78 | 75 | 25 | 25 | - | 57 | 50 | 100 | 100 | 0 |
| 041-060 | 29 | 40 | 40 | 50 | 50 | 0 | 25 | 50 | 75 | - | 0 | 0 | 0 | 0 | 100 |
| 061-080 | 0 | 0 | 0 | 25 | 25 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 |
| 021-040 | 100 | 100 | 0 | 0 | 0 | 67 | 67 | 67 | 33 | 0 | 86 | 100 | 80 | 20 | 0 |
| 041-060 | 0 | 0 | 100 | 50 | 0 | 33 | 33 | 33 | 67 | 67 | 0 | 0 | 20 | 80 | 0 |
| 061-080 | 0 | 0 | 0 | 50 | 50 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 100 |
| 081-100 | 0 | 0 | 0 | 0 | 50 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 29 | 20 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 |
| 021-040 | 64 | 60 | 50 | 0 | 0 | 75 | 67 | 100 | 67 | 0 |
| 041-060 | 7 | 20 | 50 | 100 | 50 | 25 | 0 | 0 | 33 | 67 |
| 061-080 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 0 |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 0 | 33 |

* Data were not collected in 1997.

Table 3: Breakdown of specimens of *Picea pungens* 'Aurea' by saleable width category, 1993–97

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-20 | 100 | 100 | 100 | 0 | 25 | 100 | 100 | 100 | 75 | - | 100 | 100 | 50 | 100 | 0 |
| 21-40 | 0 | 0 | 0 | 75 | 75 | 0 | 0 | 0 | 25 | - | 0 | 0 | 50 | 0 | 0 |
| 41-60 | 0 | 0 | 0 | 25 | 0 | - | - | - | - | - | 0 | 0 | 0 | 0 | 100 |
| 61-80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-20 | 100 | 0 | 0 | 0 | 0 | 100 | 67 | 33 | 0 | 0 | 100 | 100 | 20 | 0 | 0 |
| 21-40 | 0 | 100 | 100 | 0 | 0 | 0 | 33 | 67 | 33 | 33 | 0 | 0 | 80 | 40 | 0 |
| 41-60 | 0 | 0 | 0 | 100 | 50 | 0 | 0 | 0 | 67 | 0 | 0 | 0 | 0 | 60 | 60 |
| 61-80 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 67 | 0 | 0 | 0 | 0 | 40 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-20 | 100 | 100 | 100 | 0 | 0 | 100 | 100 | 100 | 0 | 0 |
| 21-40 | 0 | 0 | 0 | 100 | 50 | 0 | 0 | 0 | 67 | 0 |
| 41-60 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 33 | 67 |
| 61-80 | - | - | - | - | - | 0 | 0 | 0 | 0 | 33 |

* Data were not collected in 1997.

# *POTENTILLA FRUTICOSA* 'HACHMANN'S GIANT'

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Hachmann's Giant Shrubby Cinquefoil |
| **French common name:** | Potentille 'Hachmann's Giant' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub has an erect growth habit, but the ends of the branches droop. It may grow up to 1.2 m tall and 1.5 m wide, and has extensive branching. The brown bark peels off as it ages.

The greenish-grey young foliage turns light green with maturity and in fall turns a brownish green that is not of much ornamental interest. The dense foliage consists of alternate leaves composed of three to seven silky, sessile, curl-edged leaflets measuring 1–3 cm. They are elliptical to linear-oblong and pennate.

An abundance of large blooms early in the flowering period characterizes this cultivar. The light yellow flowers are 4–5 cm wide and appear on the year's new growth. They cover the shrub from May to October. The flowers have five petals, five sepals and many stamens.

The numerous achenes look like hard little nuts and they drop off one by one.

This cultivar grows slowly.

## ORIGIN AND DISTRIBUTION

*Potentilla fruticosa* is native to North America and grows naturally in Quebec in wet, open places, along rivers or lakes, on bare, sometimes alpine rocks, and in bogs, fields and meadows.

The cultivar 'Hachmann's Giant' is a cross between *P. f.* 'Elizabeth' and *P. f.* 'Klondike' first produced by J. Hachmann in 1967.

## USE

**Ornamental:** The long-lasting flowers and the general dense appearance of the cultivar are its chief ornamental characteristics.

## REQUIREMENTS

The species in general prefers soil with controlled moisture and a neutral to acid pH. The cultivar tolerates winter salt. It prefers a sunny or partially sunny exposure; the flowers fade if the sun is too direct. The roots are shallow and the cultivar survives transplanting easily.

## DISEASES AND INSECTS

Powdery mildew (*Sphaerotheca macularis*) is a fungus that causes damage under the right temperature and humidity conditions. Cinquefoils can also be attacked by spider mites, spittlebugs and the red-headed flea beetle (*Systena frontalis*).

## PROPAGATION

**Cutting:** The cuttings of young shoots, taken in early summer and planted in cold frames, grow very well. Growth may occur even before rooting has taken place, so cuttings must be kept cool.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Dominique Savio Nursery, St. Hilaire, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** On June 13, 1991, 455 cuttings 15-cm long were taken from roughly five-year-old parent plants. They were soaked in an 8000-ppm IBA/50% ethanol

solution, then plunged into a Benomyl®-based fungicide solution. They were placed in a Mist-A-Matic® mister and planted in plug trays filled with a perlite-peat medium (3:1; v:v). The rooting rate was 90% at 80 days. The plants were hardened off by reducing the misting at the end of September, treated with a soluble fertilizer (20-20-20, 200 ppm N) and left in an unheated greenhouse. In November, they were placed in the cold store at 5°C. In mid-April 1992, they were planted in the nursery. A granular fertilizer (15-15-15) was applied in spring. On October 25, the plants were dug up, puddled and heeled in. In mid-April 1993, they were wrapped and placed in the cold store at 4°C, then shipped in May.

**Inclusion in testing network:** Seedlings 17 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, the only damage was frost injury to the branch tips of 40 and 8% of shrubs the first and fourth winters.

At St. Clotilde, 92% of specimens suffered frost damage to the branch tips the third winter and 8% of specimens died.

At St. Hyacinthe, 33% of plants had frost damage to the branch tips the first winter.

*Region 2*

There was no damage to any of the shrubs at Deschambault.

At St. Foy, 33% of plants sustained mechanical injury due to the weather the fourth winter.

Rodent damage affected 25% of specimens the last winter at La Pocatière.

*Region 3*

At Normandin, 67% of shrubs suffered mechanical injury the fourth winter.

No damage occurred at Kapuskasing.

### Height and width growth

Figures 1 and 2 show the mean height and width of the shrubs after five years at each site in the three regions.

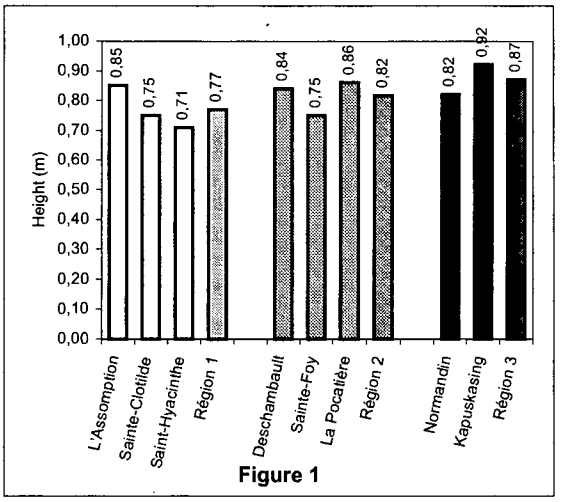


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

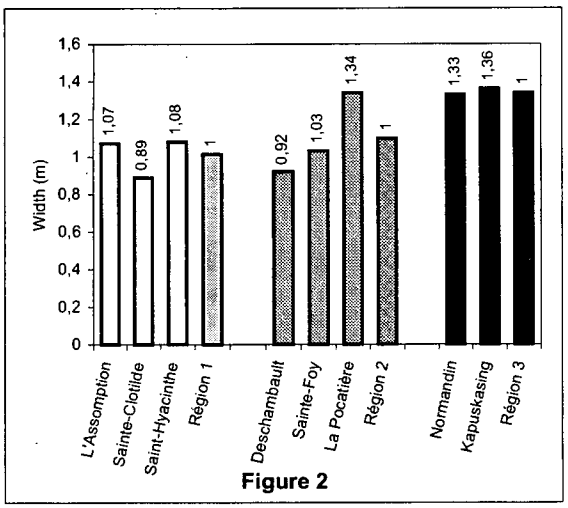


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

### Effect of pruning

Heavy pruning eliminating 60% of the total height of the plants had to be done once at Normandin because of severe mechanical injury.

### Flowering

The shrub bloomed for about 50 days in the year of planting. At some sites, the flowering period lasted 125 days, which is the mean for region 1.

At the sites in regions 2 and 3, the mean period was more like 105–115 days, with a few exceptional peaks of 130 days.

Flowering generally began between June 15 and 20 at all the sites, but, in zones 2a and 2b, it was delayed until July 2 or 3 July, while in zone 5a (St. Hyacinthe), it twice started in late May or early June.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable shrubs obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Growth of plants of this cultivar was similar at all the sites, except Deschambault and St. Hyacinthe, where the soil was heavier. Shrubs at those two sites were smaller in both height and width than those at the other sites. In fact, 92–100% of specimens were between 61 and 80 cm tall after three growing seasons, while at those two sites, only 75% were of comparable size. After three growing seasons, the shrubs with the greatest spread were at Normandin.

It is thus possible to produce this cultivar at all the trial sites.

## HARDINESS EVALUATION

The species is hardy to zone 2, but the cultivar is not rated in the literature. The very slight damage to the shrubs at the three sites in the warmest region and the mechanical injury seen at the sites with heavy snowfall are the only limitations on this cultivar. It can therefore survive, be used and achieve its full ornamental expression in zone 2.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Potentilla fruticosa* 'Hachmann's Giant,' 1994–98**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 90 | 10 | | | | | | | | | | 10 |
| St. Clotilde | 67 | 31 | | | | | | 2 | | | | 33 |
| St. Hyacinthe | 93 | 7 | | | | | | | | | | 7 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 100 | | | | | | | | | | | 0 |
| St. Foy | 93 | | | | | | | | | 7 | | 7 |
| La Pocatière | 95 | | | | | | | | | | 5 | 5 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 87 | | | | | | | | | 13 | | 13 |
| Kapuskasing | 100 | | | | | | | | | | | 0 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 3, 4, 5, 6, 7 or 9 occurred in the plants tested.

Table 2: Breakdown of specimens of *Potentilla fruticosa* 'Hachmann's Giant' by saleable height category, 1993–97

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 95 | 0 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | - | 100 | 5 | 0 | 0 | 0 |
| 041-060 | 5 | 75 | 0 | 0 | 0 | 5 | 100 | 0 | 0 | - | 0 | 90 | 25 | 0 | 0 |
| 061-080 | 0 | 25 | 100 | 42 | 25 | 0 | 0 | 100 | 100 | - | 0 | 5 | 75 | 83 | 0 |
| 081-100 | 0 | 0 | 0 | 50 | 75 | - | - | - | - | - | 0 | 0 | 0 | 17 | 92 |
| 101-120 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 |
| 121-140 | 0 | 0 | 0 | 8 | 0 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 14 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 86 | 0 | 0 | 0 | 0 | 95 | 10 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | 0 |
| 041-060 | 0 | 95 | 25 | 0 | 0 | 5 | 85 | 8 | 0 | 0 | 5 | 24 | 8 | 0 | 0 |
| 061-080 | 0 | 5 | 75 | 100 | 8 | 0 | 5 | 92 | 8 | 100 | 0 | 76 | 92 | 25 | 17 |
| 081-100 | 0 | 0 | 0 | 0 | 92 | 0 | 0 | 0 | 92 | 0 | 0 | 0 | 0 | 75 | 83 |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 121-140 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 5 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| 021-040 | 71 | 0 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | 0 |
| 041-060 | 24 | 81 | 8 | 0 | 0 | 0 | 43 | 0 | 0 | 0 |
| 061-080 | 0 | 19 | 75 | 33 | 50 | 0 | 57 | 75 | 25 | 8 |
| 081-100 | 0 | 0 | 17 | 67 | 50 | 0 | 0 | 25 | 75 | 84 |
| 101-120 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 |
| 121-140 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: **Breakdown of specimens of *Potentilla fruticosa* 'Hachmann's Giant' by saleable width category, 1993–97**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | 5 | 0 | 0 | 0 | 0 |
| 021-040 | 100 | 0 | 0 | 0 | 0 | 52 | 0 | 0 | 0 | - | 67 | 0 | 0 | 0 | 0 |
| 041-060 | 0 | 60 | 0 | 0 | 0 | 48 | 86 | 0 | 0 | - | 28 | 14 | 0 | 0 | 0 |
| 061-080 | 0 | 35 | 25 | 0 | 0 | 0 | 14 | 0 | 27 | - | 0 | 86 | 100 | 8 | 0 |
| 081-100 | 0 | 5 | 33 | 33 | 25 | 0 | 0 | 100 | 55 | - | 0 | 0 | 0 | 92 | 17 |
| 101-120 | 0 | 0 | 42 | 25 | 75 | 0 | 0 | 0 | 18 | - | 0 | 0 | 0 | 0 | 75 |
| 121-140 | 0 | 0 | 0 | 42 | 0 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 |
| 141-160 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 57 | 0 | 0 | 0 | 0 | 71 | 5 | 0 | 0 | 0 | 24 | 0 | 0 | 0 | 0 |
| 041-060 | 43 | 28 | 8 | 0 | 0 | 29 | 33 | 0 | 0 | 0 | 76 | 0 | 0 | 0 | 0 |
| 061-080 | 0 | 72 | 92 | 8 | 0 | 0 | 62 | 58 | 8 | 0 | 0 | 38 | 0 | 0 | 0 |
| 081-100 | 0 | 0 | 0 | 92 | 17 | 0 | 0 | 42 | 83 | 33 | 0 | 62 | 92 | 0 | 0 |
| 101-120 | 0 | 0 | 0 | 0 | 75 | 0 | 0 | 0 | 9 | 58 | 0 | 0 | 8 | 67 | 0 |
| 121-140 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 33 | 100 |
| 141-160 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 38 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 0 | 0 |
| 041-060 | 62 | 0 | 0 | 0 | 0 | 57 | 0 | 0 | 0 | 0 |
| 061-080 | 0 | 52 | 0 | 0 | 0 | 0 | 24 | 0 | 0 | 0 |
| 081-100 | 0 | 43 | 42 | 0 | 9 | 0 | 71 | 8 | 17 | 8 |
| 101-120 | 0 | 5 | 50 | 42 | 8 | 0 | 5 | 92 | 83 | 0 |
| 121-140 | 0 | 0 | 8 | 17 | 42 | 0 | 0 | 0 | 0 | 67 |
| 141-160 | 0 | 0 | 0 | 41 | 41 | 0 | 0 | 0 | 0 | 25 |

* Data were not collected in 1997.

# *POTENTILLA FRUTICOSA* 'RED ACE'

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Red Ace Shrubby Cinquefoil |
| **French common name:** | Potentille 'Red Ace' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This dwarf shrub, with a creeping, spreading growth habit, has short, stubby branches. It can attain a height of 0.6 m and spread of 1.2 m. The brown bark shreds finely with age.

The dark green foliage is dense and stiff. The elliptical to oblong linear, sessile leaflets, ciliate on top and silky underneath, are 1–3 cm long and have a curled margin.

This is the first red-flowered cultivar developed. The orangey-red 3-cm flowers with yellow centres are abundant between May and August. They are composed of five petals, five sepals and many stamens. The coloration of the petals fades in very hot weather.

The numerous achenes look like hard little nuts and they drop off one by one.

This cultivar grows slowly.

## ORIGIN AND DISTRIBUTION

*Potentilla fruticosa* is native to North America and grows naturally in Quebec in wet, open places, along rivers or lakes, on bare, sometimes alpine rocks, and in bogs, fields and meadows.

The 'Red Ace' cultivar was originally grown from seed by Hopleys Plants, in Much Hadham, Hertfordshire, England. It was selected by Dr. Barker and introduced onto the market in 1976 by A. Bloom of Bressingham Gardens, Diss, England.

## USE

**Ornamental:** A long flowering period and dense appearance are this little shrub's chief ornamental characteristics. It is good in rock gardens or can be used in mass plantings.

## REQUIREMENTS

The species in general prefers soil with controlled moisture and a neutral to acid pH. The cultivar tolerates winter salt. It prefers a sunny or partially sunny exposure, because the flowers fade if the sun is too direct. The roots are shallow and the cultivar survives transplanting easily.

## DISEASES AND INSECTS

Powdery mildew (*Sphaerotheca macularis*) is a fungus that causes damage under the right temperature and humidity conditions. In addition, cinquefoils can also be attacked by spider mites, spittlebugs and the red-headed flea beetle (*Systena frontalis*).

## PROPAGATION

**Cutting:** The cuttings of young shoots, taken in early summer and planted in flats, grow very well. Growth may occur even before rooting has taken place, so cuttings must be kept cool.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Three hundred and twenty 15-cm cuttings were taken on July 21, 1992, from parent plants approximately five years old, measuring 40 cm tall and 30 cm wide. They were soaked in a 4000-ppm IBA/50% ethanol solution, then planted in plug trays filled with a perlite-Promix® medium (1:1; v:v) and

misted for 30 seconds every six minutes. The rooting rate was 95% at 35 days and the plants were transferred into lathhouses. On June 9, 1993, they were placed in Fertil Pots® and put back in the beds for the entire growing season. All summer they were treated with a soluble fertilizer (20-20-20, 400 ppm N). They overwintered outdoors under Astro Foam® blankets in cold frames covered by wooden panels; the survival rate was 80%. In May 1994, the plants were wrapped and shipped to the trial sites.

**Inclusion in testing network:** Seedlings 15 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Plants died at all the sites except Deschambault and Normandin, with by far the highest mortality rate at the coldest site, Kapuskasing.

*Region 1*

At L'Assomption, a single shrub died the first winter.

At St. Clotilde, 10% of specimens died the first winter and 17% the third. Frost struck every winter, damaging the branch tips of 60, 66, 67, 8 and 100% of shrubs. In addition, the fourth winter, 25% of plants suffered frost damage to old wood.

At St. Hyacinthe, 6 and 27% of plants died the first and fourth winters.

*Region 2*

At Deschambault, 25% of shrubs suffered frost injury to the branch tips the first winter. In addition, 5, 10 and 8% had frost damage to the previous year's shoots the first three winters. The second, third and fourth winters, 5, 8 and 33% of specimens sustained mechanical breakage.

At St. Foy, 14% of plants died the first winter. The third winter, 18% had frost damage to the branch tips and 64% suffered mechanical injury.

At La Pocatière, three plants died the first winter.

*Region 3*

At Normandin, 42% of specimens sustained mechanical injury the third winter and 33% had frost damage to the previous year's shoots the last winter.

At Kapuskasing, 20, 25 and 42% of shrubs died during the first three winters. The first and last two winters, 7, 25 and 25% of specimens had frost damage to the branch tips, frost damage to the previous year's shoots affected 17 and 50% the second and fifth winters, and 8% sustained mechanical injury the second winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of the shrubs after five years at each site in the three regions.

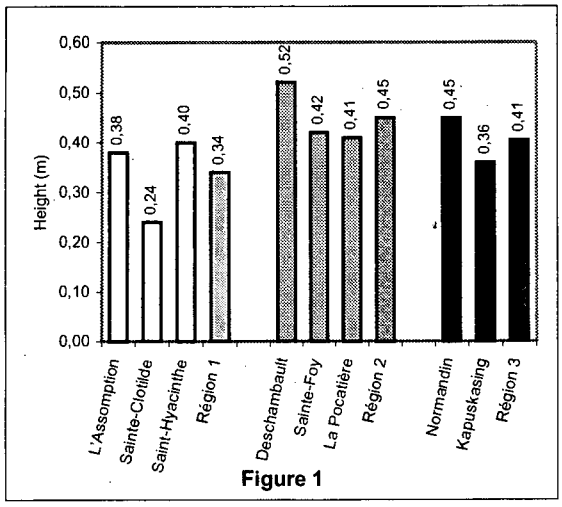


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

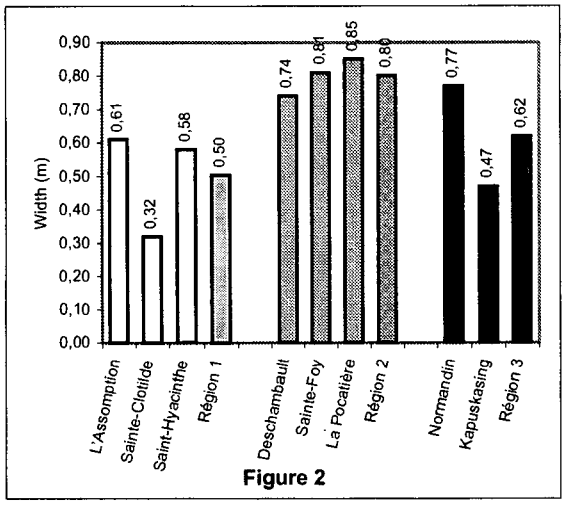


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

### Effect of pruning

Severe pruning, eliminating 10–50% of the total height of the shrubs, was done at Normandin, Deschambault and St. Foy.

### Flowering

The longest flowering period for this cultivar is 160 days in optimum growing conditions. When the winter cold affects the plants too much, new growth is delayed and flowering does not last as long. At L'Assomption, in zone 5a, flowering lasted 150–160 days each year, while at St. Hyacinthe, it only lasted 100–122 days. In zone 4b, the shrubs were in bloom a mean of 115–140 days, while at Normandin, in zone 2b, the plants flowered for only 90 days and in zone 2a, 60–90 days.

The first blossoms appeared between May 27 and June 5 at the site in zone 5, between June 10 and 15, that is10 days later, at the three sites in zones 4a and 4b and between June 16 and August 4, depending on the year, at the sites in zones 2b and 2a.

The shrubs bloomed longest after three growing seasons in the field; the youngest plants had the shortest flowering period. But in zone 2a, the flowering period grew shorter over time.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable shrubs obtained at each trial site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

A few plants at Deschambault exceeded the potential maximum height of the cultivar. Curiously, several of the shrubs at this site were much more upright than at the other sites, yet not etiolated.

After two growing seasons, 95 and 73% of specimens at the sites at St. Clotilde and St. Hyacinthe were between 31 and 50 cm tall, although the proportion was closer to 50–68% at the other sites. It took a third year at all the other sites,

with the exception of Kapuskasing, for most of the shrubs to attain a comparable height.

The total height of the shrubs increased gradually over time, but winter damage kept a number of them below mean height.

Spread development was similar, although these shrubs are wider than they are tall.

The cultivar can be produced anywhere where snow will protect it and there is little chance of freezing and thawing. Growth is more rapid at the warmest sites, but many of the plants can be killed off by severe frost without snow.

## HARDINESS EVALUATION

The species is hardy to zone 2, but the cultivar is rated hardy to zone 3 or not rated at all, depending on the references consulted. The very high cumulative mortality rate seen the first three winters at the site in zone 2a places its survival rating at zone 2b.

At St. Hyacinthe, however, a large number of plants died the fourth winter, indicating a lack of hardiness and a significant possibility of frozen roots even after several years of growth when there is little snow during very cold periods. The cultivar is very susceptible to the weather during its first winter.

Despite the botanical description, which states that the branches are short and stiff, a great deal of mechanical damage was observed for a ground cover plant. The cultivar must be protected from mechanical breakage caused by the weight of snow or ice. It can be rated for use between zones 2b and 5a.

Full ornamental expression was achieved in zones 4a or 5a; snow was an important factor in the shrub's survival.

**WRITTEN BY**

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Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Potentilla fruticosa* 'Red Ace,' 1994–98**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 99 | | | | | | | 1 | | | | 1 |
| St. Clotilde | 33 | 60 | | | 5 | | | 2 | | | | 67 |
| St. Hyacinthe | 93 | | | | | | | 7 | | | | 7 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 81 | 5 | | 5 | | | | | | 9 | | 19 |
| St. Foy | 81 | 3 | | | | | | 3 | | 13 | | 19 |
| La Pocatière | 97 | | | | | | | 3 | | | | 3 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 85 | | | 7 | | | | | | 8 | | 15 |
| Kapuskasing | 56 | 12 | | 13 | | | | 18 | | 1 | | 44 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 3, 6, 7, 9 or 11 occurred in the plants tested.

Table 2: Breakdown of specimens of *Potentilla fruticosa* 'Red Ace' by saleable height category, 1994–98

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-010 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 |
| 011-020 | 75 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 8 | 29 | 41 | 0 | 0 | 0 | 0 |
| 021-030 | 12 | 53 | 8 | 25 | 8 | 45 | 5 | 42 | 33 | 45 | 53 | 27 | 10 | 36 | 13 |
| 031-040 | 7 | 47 | 58 | 75 | 58 | 45 | 45 | 50 | 34 | 28 | 6 | 47 | 72 | 54 | 37 |
| 041-050 | 0 | 0 | 34 | 0 | 34 | 0 | 50 | 8 | 17 | 14 | 0 | 26 | 18 | 10 | 37 |
| 051-060 | - | - | - | - | - | 0 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 13 |
| 061-070 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 071-080 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-010 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 58 | 0 | 0 | 0 | 0 |
| 011-020 | 68 | 5 | 0 | 0 | 0 | 14 | 0 | 0 | 0 | 0 | 37 | 6 | 0 | 0 | 0 |
| 021-030 | 27 | 27 | 17 | 17 | 0 | 86 | 33 | 10 | 73 | 0 | 5 | 44 | 18 | 9 | 18 |
| 031-040 | 0 | 68 | 33 | 33 | 17 | 0 | 67 | 18 | 27 | 45 | 0 | 44 | 73 | 91 | 45 |
| 041-050 | 0 | 0 | 42 | 50 | 25 | 0 | 0 | 63 | 0 | 55 | 0 | 6 | 9 | 0 | 18 |
| 051-060 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 19 |
| 061-070 | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - | - | - | - | - | - |
| 071-080 | 0 | 0 | 8 | 0 | 0 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-010 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 |
| 011-020 | 83 | 5 | 0 | 9 | 9 | 53 | 17 | 0 | 0 | 0 |
| 021-030 | 17 | 72 | 0 | 0 | 0 | 27 | 25 | 43 | 25 | 50 |
| 031-040 | 0 | 23 | 83 | 58 | 33 | 13 | 58 | 57 | 50 | 25 |
| 041-050 | 0 | 0 | 17 | 25 | 33 | 0 | 0 | 0 | 25 | 25 |
| 051-060 | 0 | 0 | 0 | 8 | 25 | - | - | - | - | - |
| 061-070 | - | - | - | - | - | - | - | - | - | - |
| 071-080 | - | - | - | - | - | - | - | - | - | - |

Table 3: **Breakdown of specimens of *Potentilla fruticosa* 'Red Ace' by saleable width category, 1994–98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 0 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | 29 | 6 | 0 | 0 | 0 | 0 |
| 021-040 | 0 | 73 | 8 | 34 | 0 | 5 | 50 | 33 | 33 | 14 | 94 | 40 | 0 | 19 | 0 |
| 041-060 | 0 | 27 | 67 | 58 | 42 | 0 | 50 | 67 | 67 | 43 | 0 | 53 | 54 | 36 | 63 |
| 061-080 | 0 | 0 | 25 | 8 | 58 | 0 | 0 | 0 | 0 | 14 | 0 | 7 | 36 | 45 | 37 |
| 081-100 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 10 | 0 | 0 |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 10 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| 021-040 | 90 | 63 | 0 | 0 | 9 | 93 | 17 | 0 | 18 | 0 | 89 | 12 | 0 | 0 | 0 |
| 041-060 | 0 | 37 | 33 | 33 | 0 | 0 | 83 | 27 | 64 | 0 | 6 | 81 | 9 | 9 | 0 |
| 061-080 | 0 | 0 | 67 | 67 | 58 | 0 | 0 | 73 | 18 | 36 | 0 | 7 | 82 | 36 | 27 |
| 081-100 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 64 | 0 | 0 | 9 | 55 | 63 |
| 101-120 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 10 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 72 | 0 | 0 | 0 | 0 | 27 | 8 | 0 | 0 | 0 |
| 021-040 | 28 | 28 | 0 | 0 | 0 | 73 | 33 | 57 | 25 | 50 |
| 041-060 | 0 | 67 | 8 | 0 | 8 | 0 | 59 | 43 | 75 | 25 |
| 061-080 | 0 | 5 | 92 | 25 | 42 | 0 | 0 | 0 | 0 | 25 |
| 081-100 | 0 | 0 | 0 | 58 | 42 | - | - | - | - | - |
| 101-120 | 0 | 0 | 0 | 17 | 0 | - | - | - | - | - |

# *PRUNUS VIRGINIANA* L.

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Common Chokecherry |
| **French common name:** | Cerisier de Virginie, Cerisier à grappes, Cerisier sauvage |
| **Category:** | Deciduous plant |
| **Subdivision:** | Large tree |

## BOTANICAL DESCRIPTION

This narrow, irregular little tree may grow to be 9.0 m tall, with a 6.0-m spread and trunk diameter of 15 cm.

The slender trunk, often inclined and twisted, is covered with a dark greyish-brown bark when young, which becomes almost black with age. Smooth or covered with small, prominent lenticels, the bark gives off an unpleasant odour when broken.

The many slender but sturdy branches bear upright, slightly spreading and flexible twigs. The sharp-pointed buds, diverging slightly from the twig, are covered in dark brown scales with pale edges; they are 3–4 mm long.

The fine-toothed, slender, oval to obovate leaves are pointed at both ends, especially the short tip; they are 8–10 cm long. The leaves are dull green on top and lighter green underneath. They sometimes have tufts of hair at junctions of veins.

The fragrant white flowers, 8–15 mm in diameter, are borne in erect, elongated, dense, cylindrical clusters. Flowering takes place in early spring.

The fruits, edible drupes 6–12 mm in diameter, hang in elongated bunches. The crimson to black cherries ripen in August or early September.

## ORIGIN AND DISTRIBUTION

The common chokecherry is native to Canada. It is virtually transcontinental, being absent only on the British Columbia coast.

This little tree commonly grows in open areas with rich, moist soil, such as along fence lines and streams, on cleared land and bordering wooded areas.

## USE

**Ornamental:** This little tree can be used in mass plantings or by itself.

**Naturalization:** This native member of the plum family is very useful in renaturalization projects.

**Wildlife:** It is a good source of browse and berries for a number of birds and mammals.

## REQUIREMENTS

The common chokecherry prefers a sunny exposure. It is not very demanding with regard to soil texture, but prefers moderate moisture and a neutral or alkaline pH. It is not very tolerant of compacted soil but is resistant to winter salt.

Its rooting is intermediate. The roots are prone to suckering and may be a nuisance. It is easy to transplant.

## DISEASES AND INSECTS

This plum is particularly susceptible to fungal diseases like shot hole (*Cocomyces*), black knot (*Agiosporina morbosa*) and grey mould (*Botrytis*). Fire blight (*Erwinia amylovora*) may also strike.

Many insects are fond of these trees: eastern tent caterpillar (*Malacosoma americanum*), fall webworm (*Hyphantria cunea*), red-headed flea beetle (*Systena frontalis*), peach tree borer (*Sanninoidea exitiosa*) and lesser peach tree borer (*Synanthedon pictipes*). The Japanese beetle (*Popillia japonica*) attacks the aerial portions of Prunus species.

## PROPAGATION

**Seeds:** The stones are harvested in late summer. They should preferably be stratified.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** The stones were harvested in the fall of 1990 from a parent plant approximately 45 years old. They were sown immediately in flats placed outdoors. In spring 1991, 220 plants were potted up into Fertil Pots® and placed in beds, where they spent the winter in cold frames covered with wooden panels. Throughout the summer, they were treated weekly with a soluble fertilizer (20-20-20; 400 ppm N). The winter survival rate was 100%. They spent the summer of 1992 in the same conditions. They were wrapped and shipped in May 1993.

**Inclusion in testing network:** Seedlings 15 cm tall were planted at eight trial sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Mortality was highest the fourth winter.

*Region 1*

At L'Assomption and St. Clotilde, no frost damage was observed. The data for St. Clotilde were not collated in 1997 and 1998.

At St. Hyacinthe, one tree died the first winter and another the fourth.

*Region 2*

At Deschambault, 5% of specimens suffered frost damage to the branch tips the first two winters. In addition, 33 and 25% of specimens sustained mechanical injury the last two winters.

At St. Foy, 8 and 45% of trees died the third and fifth winters. Frost damage to the branch tips was observed on 14% of specimens the first winter, while 55% of specimens suffered mechanical damage the fourth winter.

None of the plants at La Pocatière suffered frost injury.

*Region 3*

One tree died the fourth winter at each of the two sites in this region.

At Kapuskasing, 5 and 8% of trees suffered frost damage to the branch tips the first and third winters. The first winter, 5% froze down to the ground. The fifth winter, 5 and 9% sustained mechanical injury.

Height and trunk diameter growth

Figures 1 and 2 show the mean height and the trunk diameter of the trees after five years at each site in the three regions.

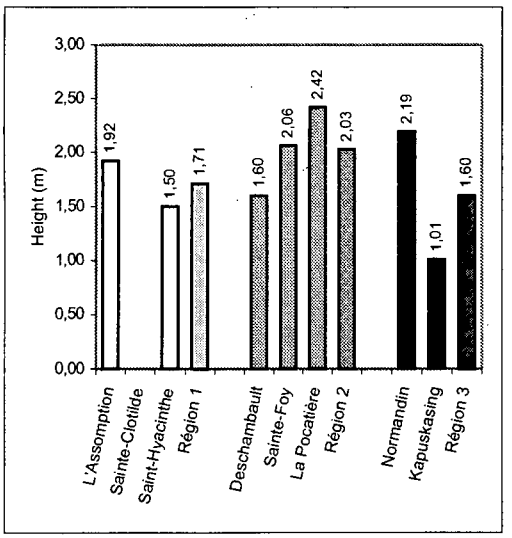


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

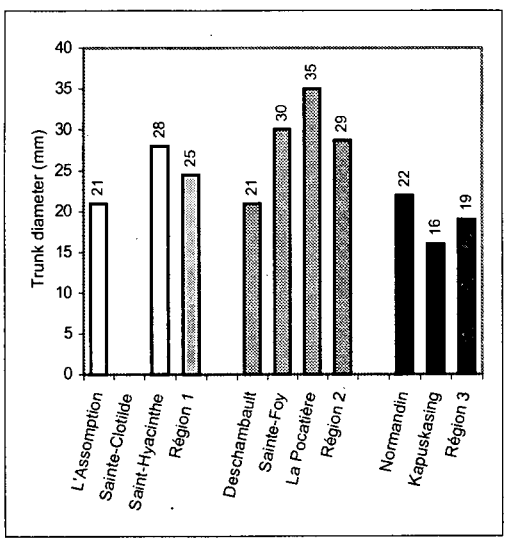


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the sites and three regions

Growth increased progressively each year at all the sites except Kapuskasing. The final trunk diameters were especially homogenous for this species at all the sites.

### Effect of pruning

Light pruning was done at St. Foy and Normandin, which had no effect on the height growth of the plants.

### Flowering

Sparse flowering was seen at all sites. The flowering period lasted no more than a week. In region 1, the first blooms appeared around mid-May at St. Hyacinthe and at the end of the month at L'Assomption. At the region 2 sites, the first blossoms were seen in early June and they opened a few days later in region 3.

Full flowering occurred two or three days after the first blooms opened.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of marketable trees obtained at each trial site after each year by height and trunk diameter categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

After three growing seasons, 100, 83 and 92% of trees at St. Hyacinthe, La Pocatière and Normandin were 1–2 m tall. Another year was needed to obtain similar heights at the other sites.

With regard to trunk diameter, only the trees at St. Hyacinthe attained a diameter above 21 mm after three growing seasons. Another year or two were needed at all the other sites except Kapuskasing to obtain trees of comparable calibre.

The species can be produced at the sites in regions 1 and 2, but taller trees with larger diameters were obtained at St. Hyacinthe after three years. The annual growth of these plants, grown from seed, was highly variable. Production is not recommended for region 3, especially zone 2a.

## HARDINESS EVALUATION

According to the literature, the species is hardy to zone 2, and the trial results show that the tree can survive to zone 2a. The mortality seen after four or five years can be

explained by the tree's lower tolerance of nursery growing conditions (continued training and fertilization), which stimulated growth, thus delaying the early hardening of this native plant. Die-off was seen chiefly at the sites in the warmest region, where the growing season was longest. It is possible that the trees that suffered mechanical injury were attacked by insects.

This tree can be used to zone 2a without severe damage.

Full ornamental expression was achieved in zones 4a and 5. In a natural setting, however, the species suffers little or no damage in Quebec's southern zone, its natural habitat.

**WRITTEN BY**

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Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Prunus virginiana* L., 1994–98**

| Trial sites | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 100 | | | | | | | | | | | 0 |
| St. Clotilde | 100 | | | | | | | | | | | 0 |
| St. Hyacinthe | 94 | | | | | | | 6 | | | | 6 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 86 | 2 | | | | | | | | 12 | | 14 |
| St. Foy | 75 | 3 | | | | | | 22 | | | | 25 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 96 | | | | | | | 2 | | 2 | | 4 |
| Kapuskasing | 93 | 2 | | | | | 1 | 4 | | | | 7 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of type 3, 4, 5, 6, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of specimens of *Prunus virginiana* L. by saleable height category, 1993–97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 86 | 14 | 0 | 0 | 0 | 95 | 38 | 0 | 0 | - | 10 | 90 | 17 | 0 | 0 |
| 051-100 | 14 | 52 | 50 | 0 | 0 | 0 | 38 | 33 | 17 | - | 90 | 10 | 50 | 25 | 20 |
| 101-150 | 0 | 29 | 33 | 50 | 8 | 5 | 24 | 33 | 25 | - | 0 | 0 | 33 | 50 | 10 |
| 151-200 | 0 | 5 | 17 | 33 | 50 | 0 | 0 | 34 | 8 | - | 0 | 0 | 0 | 17 | 40 |
| 201-250 | 0 | 0 | 0 | 17 | 42 | 0 | 0 | 0 | 50 | - | 0 | 0 | 0 | 8 | 30 |
| 251-300 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 301-350 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 30 | 8 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | 100 | 10 | 0 | 0 | 0 |
| 051-100 | 0 | 70 | 50 | 25 | 8 | 62 | 10 | 0 | 10 | 0 | 0 | 43 | 17 | 0 | 0 |
| 101-150 | 0 | 0 | 42 | 68 | 17 | 5 | 76 | 8 | 0 | 27 | 0 | 43 | 33 | 8 | 0 |
| 151-200 | 0 | 0 | 0 | 7 | 67 | 0 | 14 | 50 | 18 | 18 | 0 | 4 | 42 | 50 | 17 |
| 201-250 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 34 | 36 | 27 | 0 | 0 | 8 | 42 | 33 |
| 251-300 | - | - | - | - | - | 0 | 0 | 8 | 18 | 10 | 0 | 0 | 0 | 0 | 42 |
| 301-350 | - | - | - | - | - | 0 | 0 | 0 | 18 | 18 | 0 | 0 | 0 | 0 | 8 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 10 | 0 | 0 | 0 | 100 | 76 | 50 | 8 | 0 |
| 051-100 | 0 | 71 | 0 | 0 | 0 | 0 | 24 | 50 | 75 | 36 |
| 101-150 | 0 | 19 | 25 | 0 | 0 | 0 | 0 | 0 | 17 | 64 |
| 151-200 | 0 | 0 | 75 | 50 | 9 | - | - | - | - | - |
| 201-250 | 0 | 0 | 0 | 50 | 54 | - | - | - | - | - |
| 251-300 | 0 | 0 | 0 | 0 | 37 | - | - | - | - | - |
| 301-350 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

**Table 3:** **Breakdown of specimens of *Prunus virginiana* L. by saleable trunk diameter category, 1993–97**

**REGION 1***

| Diameter | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 100 | 48 | 8 | 0 | 0 | 86 | 14 | 0 | 0 | - | 100 | 95 | 25 | 0 | 0 |
| 11-20 | 0 | 52 | 83 | 75 | 33 | 14 | 86 | 42 | 42 | - | 0 | 5 | 75 | 45 | 30 |
| 21-30 | 0 | 0 | 9 | 25 | 67 | 0 | 0 | 50 | 8 | - | 0 | 0 | 0 | 36 | 30 |
| 31-40 | - | - | - | - | - | 0 | 0 | 8 | 50 | - | 0 | 0 | 0 | 19 | 20 |
| 41-50 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 20 |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 100 | 95 | 42 | 17 | 0 | 95 | 0 | 0 | 10 | 0 | 100 | 24 | 0 | 0 | 0 |
| 11-20 | 0 | 5 | 58 | 75 | 50 | 5 | 100 | 17 | 0 | 10 | 0 | 76 | 67 | 8 | 0 |
| 21-30 | 0 | 0 | 0 | 8 | 50 | 0 | 0 | 75 | 45 | 45 | 0 | 0 | 33 | 42 | 25 |
| 31-40 | - | - | - | - | - | 0 | 0 | 8 | 36 | 27 | 0 | 0 | 0 | 42 | 50 |
| 41-50 | - | - | - | - | - | 0 | 0 | 0 | 9 | 18 | 0 | 0 | 0 | 8 | 25 |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 95 | 57 | 0 | 0 | 0 | 100 | 86 | 67 | 8 | 0 |
| 11-20 | 5 | 43 | 100 | 33 | 27 | 0 | 14 | 33 | 92 | 82 |
| 21-30 | 0 | 0 | 0 | 67 | 55 | 0 | 0 | 0 | 0 | 18 |
| 31-40 | 0 | 0 | 0 | 0 | 18 | - | - | - | - | - |
| 41-50 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

# *RHODODENDRON CALENDULACEUM* (MICHX.) TORR.

| | |
|---|---|
| **Family:** | Ericaceae |
| **English common name:** | Flame Azalea |
| **French common name:** | Rhododendron |
| **Synonym:** | *Azalea calendulacea* Michx. |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This bushy shrub of erect habit has grown to 1 m high and roughly 70 cm wide in over 15 years at the Roger Van den Hende Garden, but reaches a maximum of 3 m in its native habitat.

The often glabrous winter buds are borne on slightly pubescent branches. The deciduous leaves, 4–8 cm long, are widely oblong and are slightly pubescent on the top and more densely pubescent below. A dull light green, they turn light yellow, sometimes tinged with orangey brown, in the fall.

The orange flowers, which occur in terminal clusters, appear shortly after leaf-out. Each inflorescence has 5–7 visible flowers. The tubular-shaped corolla ranges in colour from yellow to orange to red and is 15 mm long, with 2.5 cm lobes. The species blooms in late May and early June. The flowers have an unpleasant scent.

## ORIGIN AND DISTRIBUTION

This native North American species comes from the east-central US. It has been cultivated since 1800 and was introduced in Great Britain in 1806.

## USE

**Ornamental:** This shrub, with its extraordinary flowers, can be used as a specimen plant, in mass plantings of acid-loving plants or in association with other shrubs.

## REQUIREMENTS

The species prefers full sun but will tolerate partial shade. It requires a humic soil with a pH of 4.5–6.0. It does best in a moist but well-drained site. Transplantation is often problematic and it is better to use container-grown or balled and burlapped plants. Deadheading the spent flowers is recommended.

## DISEASES AND INSECTS

Plants in the genus are often affected by fungal diseases such as botrytis blight (*Botrytis*), root and crown rots (*Phytophtora*, *Sclerotinia* or *Pythium*) and powdery mildew.

Good horticultural practices will reduce the incidence of weevils, which often attack the plant.

## PROPAGATION

**Cutting:** Greenwood cuttings seem to be the most common technique used and the most successful. Semi-woody cuttings treated with an auxin compound, placed under a mist unit and provided with bottom heat, also provide good results.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** 564 cuttings (8 cm) were taken on June 23, 1992 from parent plants over 15 years old. They were dipped for five seconds in a 4000 ppm IBA/50% ethanol solution, rinsed under the tap and then immersed in a Benomyl-Captan® fungicide solution. They were planted in plug trays in a peat perlite mixture (2:3; v:v)

under an automatic mist unit (Mist-A-Matic®). The rooting rate was 48% after more than 120 days. Misting was discontinued in early October and the plants were treated twice, at a one-week interval, with a soluble fertilizer (20-20-20, 200 ppm N). In November, they were removed from the plug trays and put in the cold store at -2°C in plastic bags perforated with a hat pin. In May 1993, they were potted up in Fertil Pot® containers in a peat-perlite mixture (3:2; v:v) and placed in the tunnel greenhouse, where they were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until late September. In November, they were returned to the cold store. In May 1994, they were wrapped and returned to the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 10 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

In region 3, all the plants died during the trials; they took two years to succumb at St. Clotilde and three years at La Pocatière.

*Region 1*

At L'Assomption, two plants died the first and third winters. In addition, 14% and 66% of specimens had frost damage to the branch tips the third and fourth winters. The flower buds of all specimens froze the last winter.

At St. Clotilde, 44% of plants died the first winter and the remaining plants died the following winter.

At St. Hyacinthe, 28% and 80% of specimens died the first two winters. Frost damage to the branch tips occurred in 57%, 20% and 100% the first three winters.

*Region 2*

At Deschambault, 25% of specimens died the second winter. The first four winters, frost damage to the branch tips occurred in 12%, 25%, 66% and 67% of plants. Mechanical breakage occurred in 25% the first two winters and the same proportion suffered rodent damage the second winter. The last winter, 67% had frost damage to the flower buds.

At St. Foy, 10% of specimens died the fourth year. Frost damage to the aerial portions above the ground was observed in 10% of plants the first winter and, the second winter, one shrub had frost damage to the flower buds.

At La Pocatière, 70% of specimens died the second winter and the rest of the plants the following winter. The first winter, 10% had damage to the branch tips and, the second winter, an equal percentage had damage to the previous year's shoots.

*Region 3*

All the plants at Normandin died the first four winters (eliminating 10%, 66%, 67% and 100% respectively). Frost damage down to the ground occurred in 11% the second winter and 33% had mechanical breakage the third winter.

At Kapuskasing, all the plants died shortly after transplanting.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

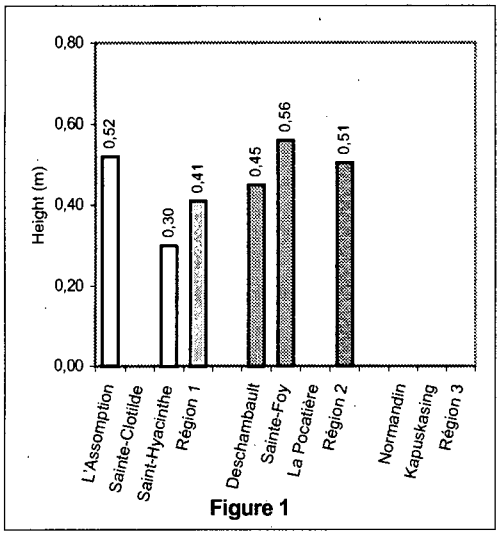


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

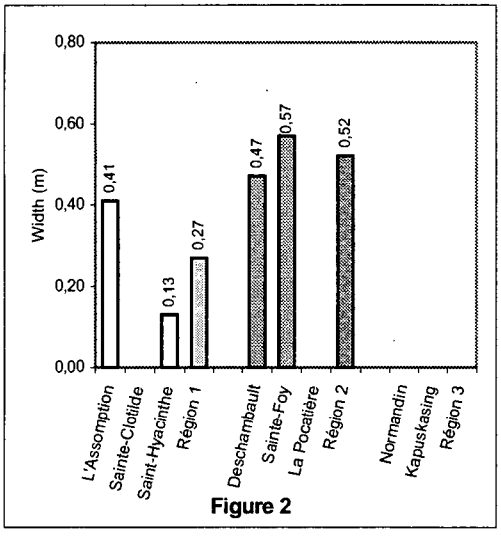


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

The only pruning done was for training purposes and to remove frost-injured portions.

### Flowering

The species only flowered at three of the eight sites. Only a few plants flowered at Deschambault; at St. Foy and L'Assomption, all plants produced flowers, but only two or three times. Flowering did not occur at all at the warmest and coldest sites.

At L'Assomption, the onset of flowering was between May 15 and 25, depending on the year, and flowering duration was 12 or 13 days. In the Quebec City area, where plants were protected by the snow cover, flowering began 4–5 days later.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Mortality occurred in all regions the first four winters, except for Kapuskasing, where it occurred immediately after transplanting. Although mortality can be partly attributed to transplanting shock, given the extended period over which mortality occurred, it is also due to shrubs' lack of hardiness and the unfavourable growing conditions.

The production of the species requires good root development, suitable soil and adequate winter protection, particularly in the Montreal region, where the snow cover can disappear during the winter.

## HARDINESS EVALUATION

The species is hardy to zone 6 or 7 (USDA system) according to Rehder (1990). Mortality was very high at the zone 5b sites and complete at the zone 2 sites.

The results show clearly that the species cannot survive in very cold areas and is very frost prone in areas without a continuous snow cover, such as the zone 5 sites. However, at the zone 4 sites, where the snow cover was fairly abundant and acted as a mulch, mortality was still complete in zone 4a.

Therefore, survival is limited to zone 4b, with the proviso that the species is difficult to transplant, delicate when young and often suffers damage when unprotected in winter.

Its use is favoured in zone 4b, with the proviso that the specimens at the Ericacetum (heath garden) at the Roger Van den Hende Garden occasionally suffer winter damage.

The species' full ornamental potential was not achieved at the sites tested.

**WRITTEN BY**

Claude Richer, Agr.

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Christine Galipeau, Biologist

**Table 1: Frequency of winter damage observed in *Rhododendron calendulaceum* (Michx.) Torr., 1995—99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 48 | 20 | 25 | | | | | 7 | | | | 52 |
| St. Clotilde | 28 | | | | | | | 72 | | | | 72 |
| St. Hyacinthe | 43 | 35 | | | | | | 22 | | | | 57 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 32 | 34 | 13 | | | | | 5 | | 10 | 6 | 68 |
| St. Foy | 86 | | 10 | | | | 2 | 2 | | | | 14 |
| La Pocatière | 36 | 3 | | 3 | | | | 58 | | | | 64 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 38 | | | | | | 3 | 24 | | 35 | | 62 |
| Kapuskasing* | - | | | | | | | | | | | - |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

* All specimens died at Kapuskasing.

No damage of types 5, 6, or 9 occurred in the plants tested.

Table 2: **Breakdown of *Rhododendron calendulaceum* (Michx.) Torr. specimens by saleable height category, 1994—98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 12 | 0 | 0 | 17 | 0 | 89 | 80 | - | - | - | - | 40 | 0 | 0 | 0 |
| 021-040 | 88 | 71 | 57 | 33 | 16 | 11 | 20 | - | - | - | - | 60 | 100 | 100 | 100 |
| 041-050 | 0 | 29 | 43 | 50 | 50 | - | - | - | - | - | - | - | - | - | - |
| 061-080 | 0 | 0 | 0 | 0 | 34 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 38 | 0 | 0 | 0 | 0 | 100 | 30 | 10 | 0 | 0 | 60 | 71 | 67 | - | - |
| 021-040 | 62 | 100 | 100 | 66 | 33 | 0 | 70 | 60 | 50 | 11 | 40 | 29 | 33 | - | - |
| 041-050 | 0 | 0 | 0 | 34 | 67 | 0 | 0 | 30 | 50 | 56 | - | - | - | - | - |
| 061-080 | - | - | - | - | - | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 60 | 12 | 0 | 0 | - | - | - | - | - | - |
| 021-040 | 40 | 88 | 67 | 100 | - | - | - | - | - | - |
| 041-050 | 0 | 0 | 33 | 0 | - | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected at St. Hyacinthe in 1994.

Table 3: **Breakdown of *Rhododendron calendulaceum* (Michx.) Torr. specimens by saleable width category, 1994—98**

| REGION 1 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 43 | 17 | 0 | 100 | 100 | - | - | - | - | 80 | 0 | 100 | 100 |
| 021-040 | 0 | 0 | 57 | 83 | 66 | - | - | - | - | - | - | 20 | 100 | 0 | 0 |
| 041-060 | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - | - | - | - | - | - |
| 061-080 | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - | - | - | - | - | - |

| REGION 2 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 88 | 75 | 33 | 0 | 0 | 100 | 80 | 30 | 10 | 0 | 100 | 100 | 100 | - | - |
| 021-040 | 12 | 25 | 34 | 67 | 33 | 0 | 20 | 60 | 70 | 22 | - | - | - | - | - |
| 041-060 | 0 | 0 | 33 | 33 | 67 | 0 | 0 | 10 | 20 | 33 | - | - | - | - | - |
| 061-080 | - | - | - | - | - | 0 | 0 | 0 | 0 | 45 | - | - | - | - | - |

| RÉGION 3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Width | Normandin | | | | | Kapuskasing | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 33 | 0 | - | - | - | - | - | - |
| 021-040 | 0 | 0 | 67 | 100 | - | - | - | - | - | - |
| 041-060 | - | - | - | - | - | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected at St. Hyacinthe in 1994.

# *RHODODENDRON MUCRONULATUM* 'ROSEUM'

| | |
|---|---|
| **Family:** | Ericaceae |
| **English common name:** | Korean Rhododendron |
| **French common name:** | Rhododendron de Corée |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This erect shrub, rounded to oval in shape, can reach 1.2–1.8 m high. It is slow growing.

The simple, alternate, deciduous leaves are oval to lanceolate in shape, 2–10 cm long and 3 cm wide. They are shiny light green at first, and then turn yellowish brown and finally bronze crimson in fall. They are finely textured and very aromatic when crushed.

The flower buds are ovoid, glabrous and pale brown in colour.

The flared funnel-shaped flowers are pale purplish pink and strongly scented. Roughly 4 cm in diameter, they appear very early, well before the leaves. The species flowers one or two days after *Rhododendron dauricum*, the earliest flowering rhododendron in the Quebec City region. Flowering is somewhat irregular and lasts around two weeks.

## ORIGIN AND DISTRIBUTION

The species, which originally comes from northern China, Manchuria, Korea and northern Japan, was introduced in 1882.

## USE

**Ornamental:** The cultivar can be used as a specimen plant or in mass plantings and requires an acid, humic soil.

## REQUIREMENTS

This cultivar does best in full sun but tolerates partial shade. It requires humic soil with a pH of 4.5–6.0. It prefers a moist but well-drained location.

Since transplanting is often problematic, balled and burlapped or container plants are essential. Flowers should be deadheaded after flowering. The cultivar is very sensitive to the cold and must be protected in winter with a good snow cover and supported with a solid structure to prevent mechanical breakage.

## DISEASES AND INSECTS

Plants in the genus are often affected by fungal diseases such as botrytis blight (*Botrytis*), root and crown rots (*Phytophtora*, *Sclerotinia* or *Pythium*) and powdery mildew.

Good horticultural practices will reduce the incidence of weevils, which often attack the plant.

## PROPAGATION

**Cutting:** Greenwood cuttings taken in late July seem to be effective; the rooting rate is around 50%. Young, semi-woody cuttings treated with an auxin compound, placed under a mist unit and provided with bottom heat, also give good results.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** 333 cuttings (8 cm) were taken on June 24, 1992 from roughly 20-year-old parent plants. They were dipped for five seconds in a 4000 ppm IBA/50% ethanol solution, rinsed under the tap and then immersed in a Benomyl-Captan® fungicide solution. They were planted in plug trays in a peat-perlite mixture (2:3; v:v) under an automatic mist unit (Mist-A-Matic®). The rooting rate was 89% after 120 days. Misting was discontinued in

early October and the plants were treated twice, at a one-week interval, with a soluble fertilizer (20-20-20, 200 ppm N). In November, they were removed from the plug trays and put in the cold store at -2°C in plastic bags perforated with a hatpin. In May 1993, they were potted up in Fertil Pot® containers in a peat-perlite mixture (3:2; v:v) and placed in the tunnel greenhouse, where they were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until late September. In November, they were returned to the cold store. In May 1994, they were wrapped and kept in the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 11 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

At St. Clotilde, all the plants died shortly after transplanting; all the plants also died at the region 3 sites after two winters and after three winters at L'Assomption and La Pocatière.

*Region 1*

At L'Assomption, although no damage occurred the first winter, half of the plants died the second winter and the other half, the third winter.

At St. Clotilde, all the plants died after transplanting.

At St. Hyacinthe, the single plant that survived transplanting suffered frost damage to the branch tips the first winter and had no growth.

*Region 2*

At Deschambault, 7%, 12% and 14% of specimens died the first three winters. Frost damage to the branch tips was observed the first four winters in 71%, 25%, 28% and 50% of plants. In addition, 21%, 29% and 50% had frost damage to the previous year's shoots the first, third and fourth winters. Mechanical breakage occurred in 62% and 28% the second and third winters. The last winter, 84% had frost damage to the flower buds.

At St. Foy, one plant died the second winter. The second and third winters, 88% and 57% had frost damage to the branch tips; the third winter, 14% had mechanical breakage.

At La Pocatière, 50%, 67% and 100% of specimens died the first three winters respectively. Of the surviving plants, 33% had frost damage to the previous year's shoots the second winter.

*Region 3*

Single plants died the first winter at Normandin and Kapuskasing and the remaining plants the following winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

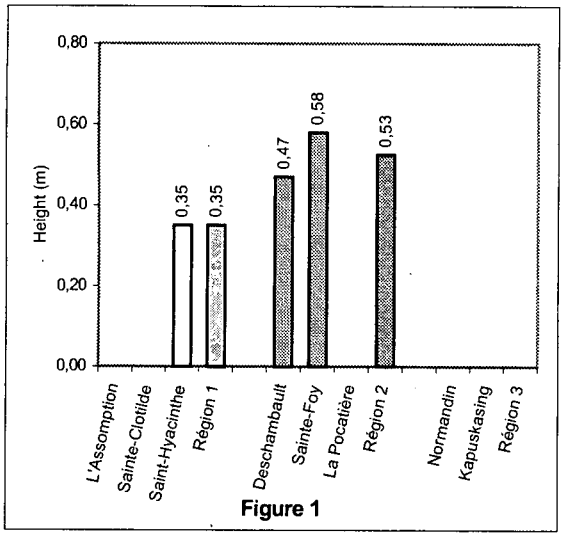


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

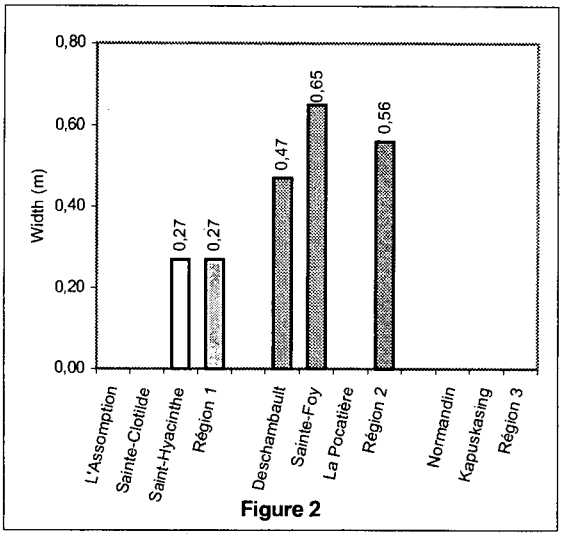


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Pruning to eliminate 10–30% of plants' total height was done at all sites.

### Flowering

The only site where flowering was observed was St. Foy (zone 4b), where the plants had been propagated and where they seemed the best adapted and had the least damage.

The fourth year of the trials, 50% of the plants at this site flowered, from May 23 to June 11. The following year, flowering was longer and earlier, from May 7 to the end of May, for an average duration of 20–23 days.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

The production of field-grown plants is limited to zone 4b; container-grown plants can be produced in zone 5 with winter protection. The tallest and widest plants were grown at St. Foy.

## HARDINESS EVALUATION

According to the literature, this rhododendron is hardy to zone 7. However, in these trials, the plants survived only at the St. Foy and Deschambault sites, both in zone 4b, with 100% mortality occurring at both the warmer (5a and 5b) and colder (2a, 2b and 4a) sites. A deep snow cover early in the season, associated with the winter temperatures in zone 4, appears to be critical to the cultivar's survival.

The cultivar can only be used in zone 4b or in areas with winter conditions similar to those in St. Foy. The parent plants have been at the Roger Van den Hende Garden for a number of years and generally do not suffer winter damage.

The cultivar's full ornamental potential was not achieved in the tests.

**WRITTEN BY**

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Christine Galipeau, Biologist

Table 1: **Frequency of winter damage observed in *Rhododendron mucronulatum* 'Roseum', 1995—99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 50 | | | | | | | 50 | | | | 50 |
| St. Clotilde* | - | | | | | | | | | | | - |
| St. Hyacinthe | 75 | 25 | | | | | | | | | | 25 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 3 | 35 | 17 | 20 | | | | 7 | | 18 | | 97 |
| St. Foy | 66 | 29 | | | | | | 2 | | 3 | | 34 |
| La Pocatière | 17 | 11 | | | | | | 72 | | | | 83 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 41 | | | | | | | 59 | | | | 59 |
| Kapuskasing | 0 | | | | | | 16 | 84 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

At St. Clotilde, all plants died shortly after transplanting.

No damage of types 5, 6, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of *Rhododendron mucronulatum* 'Roseum' specimens by saleable height category, 1994—98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 75 | 0 | 0 | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 |
| 21-40 | 25 | 100 | 100 | - | - | - | - | - | - | - | - | 100 | 100 | 100 | 100 |
| 41-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 61-80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 43 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 67 | 33 | 0 | - | - |
| 21-40 | 57 | 100 | 85 | 50 | 33 | 50 | 100 | 71 | 29 | 0 | 33 | 67 | 100 | - | - |
| 41-60 | 0 | 0 | 15 | 50 | 67 | 0 | 0 | 29 | 71 | 62 | - | - | - | - | - |
| 61-80 | - | - | - | - | - | 0 | 0 | 0 | 0 | 28 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 67 | 25 | - | - | - | 100 | 100 | - | - | - |
| 21-40 | 33 | 75 | - | - | - | - | - | - | - | - |
| 41-60 | - | - | - | - | - | - | - | - | - | - |
| 61-80 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in St. Hyacinthe in 1994.

Table 3: **Breakdown of *Rhododendron mucronulatum* 'Roseum' specimens by saleable width category, 1994—98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 100 | 75 | 0 | - | - | - | - | - | - | - | - | 100 | 0 | 0 | 0 |
| 21-40 | 0 | 25 | 100 | - | - | - | - | - | - | - | - | 0 | 100 | 100 | 100 |
| 41-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 61-80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 100 | 38 | 0 | 17 | 17 | 100 | 25 | 0 | 0 | 0 | 67 | 0 | 0 | - | - |
| 21-40 | 0 | 62 | 100 | 17 | 17 | 0 | 75 | 71 | 43 | 0 | 33 | 100 | 100 | - | - |
| 41-60 | 0 | 0 | 0 | 66 | 66 | 0 | 0 | 29 | 57 | 14 | - | - | - | - | - |
| 61-80 | - | - | - | - | - | 0 | 0 | 0 | 0 | 86 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 100 | 75 | - | - | - | 100 | 100 | - | - | - |
| 21-40 | 0 | 25 | - | - | - | - | - | - | - | - |
| 41-60 | - | - | - | - | - | - | - | - | - | - |
| 61-80 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in St. Hyacinthe in 1994.

# *RHODODENDRON* 'RAMAPO'

(1994 CONTROL)

The sections "Botanical Description", "Origin and Distribution", "Use", "Requirements" and "Bibliographic References" can be found in *Rusticité et Croissance de Plantes Ligneuses Ornementales au Québec*, Tome II. (VR 221).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** On June 23, 1992, 505 cuttings (around 8 cm) were taken from roughly 20-year-old parent plants. They were dipped for five seconds in a 4000 ppm IBA/50% ethanol solution, rinsed under the tap and then immersed in a Benomyl-Captan® fungicide solution. They were planted in plug trays in a peat-perlite mixture (2:3; v:v) under an automatic mist unit (Mist-A-Matic®). Because the heating cables malfunctioned, the rooting rate was only 26%. Misting was discontinued in early October and the plants were treated twice, at a one-week interval, with a soluble fertilizer (20-20-20, 200 ppm N). In November, they were removed from the plug trays and put in the cold store at -2°C in plastic bags perforated with a hatpin. In May 1993, they were potted up in Fertil Pot® containers in a peat-perlite mixture (3:2; v:v) and placed in the tunnel greenhouse, where they were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until late September. In November, they were returned to the cold store. In May 1994, they were wrapped and kept in the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 14 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Mortality was very high in this cultivar, with all specimens dying at St. Clotilde during the trial and 12 plants succumbing at Kapuskasing and La Pocatière.

*Region 1*

At L'Assomption, two plants died during each of the first two winters and three more the third winter. In addition, 83% had frost damage to the flower buds the second winter, while 8% and 20% had mechanical breakage the second and third winters.

At St. Clotilde, 79%, 67% and 100% of specimens died the first three winters.

At St. Hyacinthe, two plants died the third winter and 71% had foliage browning the second winter.

*Region 2*

At Deschambault, one plant died the second winter. The first two winters, frost damage to the flower buds occurred in 9% and 21% of specimens and mechanical breakage in 12% and 36%. The third winter, two plants had rodent damage, two died accidentally and 11% had frost damage to the branch tips.

In St. Foy, no damage occurred during the trial.

At La Pocatière, 15%, 27%, 25% and 83% of plants died the first four winters. The second winter, 18% had frost damage to the previous year's shoots, 36% had foliage browning and 9% had frost damage down to the ground. The last winter, the surviving plant had foliage browning.

*Region 3*

At Normandin, one shrub died the second winter and another the fourth winter; 36% had mechanical breakage the second winter and 11% had frost damage to the old wood the last winter.

At Kapuskasing, 6%, 6%, 56% and 57% of shrubs died the first four winters. The three surviving plants had frost damage to the old wood the last winter. Between 15 and 50% of plants had frost damage to the previous year's shoots each of the first four winters, 13% and 36% had frost damage to the branch tips the first two winters and 67% had frost damage to the flower buds the first winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

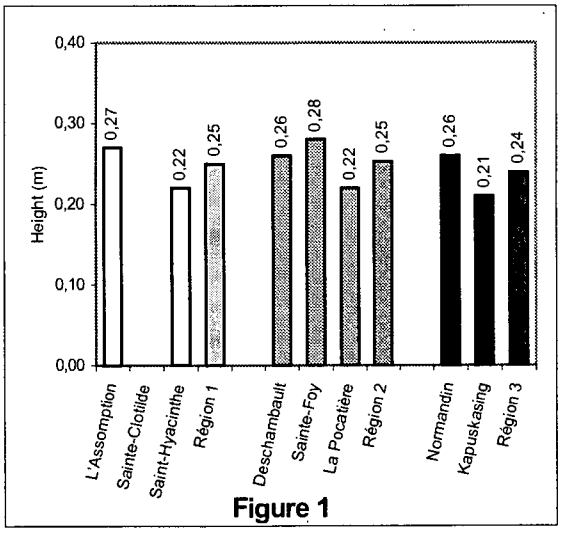


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

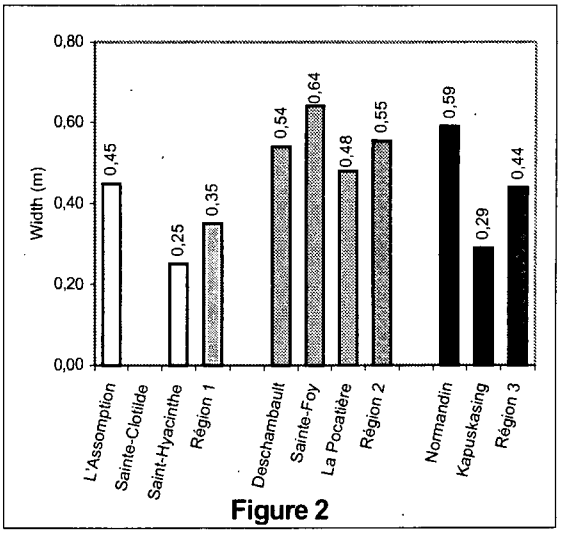


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Light pruning was done, but did not decrease height growth significantly.

### Flowering

Flowering was more abundant the first few years, occurring on all specimens. Duration was 15–20 days in zones 4b and 5a, 12–15 days in zones 4a and 2b, and roughly 10 days, when it occurred at all, in zone 2a.

Flowering began between May 15 and May 20 in the warmest zone, between May 21 and June 5 in zone 4, during the first few weeks of June in zone 2b and around June 10 in zone 2a.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Width growth in this rhododendron is greater than height growth. Plants died in all regions, particularly during the

third and fourth winters, except at Kapuskasing, where mortality occurred four out of the five winters.

Production of the cultivar therefore depends on a good snow cover, particularly in the Montreal region, where the snow may disappear during the winter. In zones 5 to 2b, an early accumulation of snow on the ground is beneficial to production.

## HARDINESS EVALUATION

As previous trials in 1987–92 and 1992–97 showed, this cultivar can be used in zones 2b, 3 and 4. According to the literature, it tolerates temperatures down to -32°C. These trials confirm that it can survive as far as zone 2b, with snow cover critical for fall and winter survival. A synthesis of the winter damage that occurred shows that all the plants died at the warmest site; plants must be protected during the coldest part of winter.

The cultivar can be used in zones 2b, 3 and 4 but frequently suffers damage in zone 5 when the snow cover disappears during the winter.

The cultivar achieved its full ornamental potential in zone 4b, at St. Foy. The parent plants, which have been at the Roger Van den Hende Garden for a number of years, usually do not have winter damage.

**WRITTEN BY**

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**Table 1: Frequency of winter damage observed in *Rhododendron* 'Ramapo', 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 68 | | 17 | | | | | 9 | | 6 | | | 32 |
| St. Clotilde | 18 | | | | | | | 82 | | | | | 82 |
| St. Hyacinthe | 82 | | | | | | | 4 | | | | 14 | 18 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 76 | 2 | 8 | | | | | 1 | | 10 | 3 | | 24 |
| St. Foy | 100 | | | | | | | | | | | | 0 |
| La Pocatière | 37 | | | 3 | | | 2 | 31 | | | | 27 | 63 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 87 | | | | 2 | | | 4 | | 7 | | | 13 |
| Kapuskasing | 8 | 10 | 13 | 25 | 20 | | | 24 | | | | | 92 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of types 6 or 9 occurred in the plants tested.

Table 2: Breakdown of *Rhododendron* 'Ramapo' specimens by saleable height category, 1994-98

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | - | - | - | - | 0 | 0 | 0 | 0 |
| 11-20 | 46 | 0 | 12 | 28 | 0 | 71 | 67 | - | - | - | - | 50 | 40 | 100 | 25 |
| 21-30 | 54 | 42 | 44 | 43 | 71 | 22 | 33 | - | - | - | - | 50 | 60 | 0 | 75 |
| 31-40 | 0 | 50 | 44 | 29 | 29 | - | - | - | - | - | - | - | - | - | - |
| 41-50 | 0 | 8 | 0 | 0 | 0 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 12 | 0 | 0 |
| 11-20 | 44 | 6 | 0 | 11 | 0 | 50 | 18 | 8 | 8 | 0 | 62 | 55 | 25 | 33 | 0 |
| 21-30 | 56 | 85 | 100 | 89 | 100 | 50 | 82 | 75 | 84 | 75 | 38 | 45 | 63 | 67 | 100 |
| 31-40 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 17 | 8 | 25 | - | - | - | - | - |
| 41-50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 0 | 0 | 0 |
| 11-20 | 78 | 78 | 82 | 60 | 22 | 53 | 50 | 55 | 16 | 33 |
| 21-30 | 22 | 22 | 18 | 40 | 78 | 47 | 43 | 45 | 67 | 67 |
| 31-40 | - | - | - | - | - | 0 | 0 | 0 | 17 | 0 |
| 41-50 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in St. Hyacinthe in 1994.

Table 3: **Breakdown of *Rhododendron* 'Ramapo' specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 58 | 11 | 0 | 0 | 100 | 100 | - | - | - | - | 29 | 0 | 25 | 13 |
| 021-040 | 0 | 42 | 77 | 71 | 43 | - | - | - | - | - | - | 71 | 100 | 75 | 87 |
| 041-060 | 0 | 0 | 12 | 29 | 57 | - | - | - | - | - | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 63 | 0 | 0 | 0 | 93 | 19 | 0 | 0 | 0 | 100 | 64 | 63 | 67 | 0 |
| 021-040 | 0 | 37 | 100 | 33 | 0 | 7 | 81 | 92 | 58 | 0 | 0 | 36 | 37 | 0 | 0 |
| 041-060 | 0 | 0 | 0 | 67 | 89 | 0 | 0 | 8 | 42 | 42 | 0 | 0 | 0 | 33 | 100 |
| 061-080 | 0 | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 50 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 93 | 57 | 9 | 0 | 0 | 74 | 86 | 27 | 0 | 0 |
| 021-040 | 7 | 43 | 73 | 10 | 11 | 26 | 14 | 73 | 100 | 100 |
| 041-060 | 0 | 0 | 18 | 60 | 44 | - | - | - | - | - |
| 061-080 | 0 | 0 | 0 | 30 | 45 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in St. Hyacinthe in 1994.

# *RHODODENDRON ROSEUM*

(LOISEL.) REHD.

| | |
|---|---|
| **Family:** | Ericaceae |
| **English common name:** | Roseshell Azalea, Early Azalea |
| **French common name:** | Rhododendron |
| **Synonym:** | *R. prinophyllum* (Small) Millais |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This branching deciduous shrub can grow to as much as three metres tall in its native habitat. The parent plant, which has been at the Roger Van den Hende Garden for 20 years, is a little over 1.5 m tall and around 1.0 m wide.

The young branches are slightly pubescent, with stiff hairs. The buds, 3–7 cm long, have obtuse, greyish pubescent scales.

The elliptic leaves are 7–10 cm long, briefly acuminate and slightly pubescent. They are light green to glaucous blue on the top and greyish underneath, and turn yellow in fall.

The light pink (on rare occasions, white) flowers are roughly 4 cm in diameter. This species blooms a few days after the leaves appear and a few days after *Rhododendron canadense*, *R.* 'Ramapo' and *R. vaseyi*. The flowers have a sweet clove-like fragrance. Each inflorescence has 5–9 visible flowers. The 1.5–4.0 cm long corolla is tubular and gradually tapered. The stamens are twice as long as the corolla tube. The styles are mauve at the base. The sepals are round to oval, pubescent and ciliate.

## ORIGIN AND DISTRIBUTION

The name rhododendron comes from the Greek words "rhodos" or "rhodon", meaning respectively red and pink, and "dendron" or tree. *Rhododendron roseum* (Loisel.) Rehd. is native to North America, occurring from southern Quebec and New Hampshire to Virginia, Illinois and Missouri. It was introduced to Europe around 1812 and possibly as early as 1790.

## USE

**Ornamental:** The species can be used as a specimen plant or in mass plantings; it needs an acid, humic soil.

## REQUIREMENTS

The species prefers full sun but will tolerate partial shade. It requires a humic soil with a pH of 4.5–6.0. It prefers a moist but well-drained site. Transplantation is often problematic and working with container-grown or balled and burlapped plants is preferable.

Deadheading the spent flowers is recommended.

## DISEASES AND INSECTS

Plants in the genus are often affected by fungal diseases such as botrytis blight (*Botrytis*), root and crown rots (*Phytophtora*, *Sclerotinia* or *Pythium*) and powdery mildew.

Good horticultural practices will reduce the incidence of weevils, which often attack the plant.

## PROPAGATION

**Cutting:** Greenwood cuttings taken in late July seem to be effective, with a rooting rate of around 50%. Semi-woody cuttings treated with an auxin compound, placed under a mist unit and given bottom heat, also give good results.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** 554 cuttings (8 cm) were taken on June 22, 1992 from around 20-year-old parent plants. They were dipped for five seconds in a 4000 ppm IBA/50% etha-

nol solution, rinsed under the tap and then immersed in a Benomyl-Captan® fungicide solution. They were planted in plug trays in a peat-perlite mixture (2:3; v:v) under an automatic mist unit (Mist-A-Matic®). The rooting rate was 47% after 120 days. Misting was discontinued in early October and the plants were treated twice, at a one-week interval, with a soluble fertilizer (20-20-20, 200 ppm N). In November, they were removed from the plug trays and put in the cold store at -2°C in plastic bags perforated with a hatpin. In May 1993, they were potted up in Fertil Pot® containers in a peat-perlite mixture (3:2; v:v) and placed in the tunnel greenhouse, where they were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until late September. In November, they were returned to the cold store. In May 1994, they were wrapped and kept in the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 9 cm high were planted at eight test sites throughout Quebec and in north-eastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

All the plants died shortly after transplanting or during the trials at the region 1 sites and at La Pocatière and Kapuskasing.

*Region 1*

At L'Assomption, no damage occurred the first winter, no data were collected the second winter, and the third winter, all the shrubs died.

All the plants at St. Clotilde died the first winter and all plants died shortly after transplanting at St. Hyacinthe.

*Region 2*

At Deschambault, one plant died the first winter and a second the third winter. The first winter, 20% had frost damage to the previous year's shoots while, the second winter, 25% had mechanical breakage and 25% had rodent damage. Damage to the branch tips was found in 50–65% of shrubs the second, third and fourth winters. The fifth winter, 67% had frost damage to the flower buds.

No damage was found at St. Foy.

At La Pocatière, all the shrubs died during the first two winters.

*Region 3*

At Normandin, a single plant died the second winter. No other damage was observed.

At Kapuskasing, 84% of specimens died the first winter and the rest succumbed the last winter. The fourth winter, all the plants had frost damage to the previous year's shoots.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

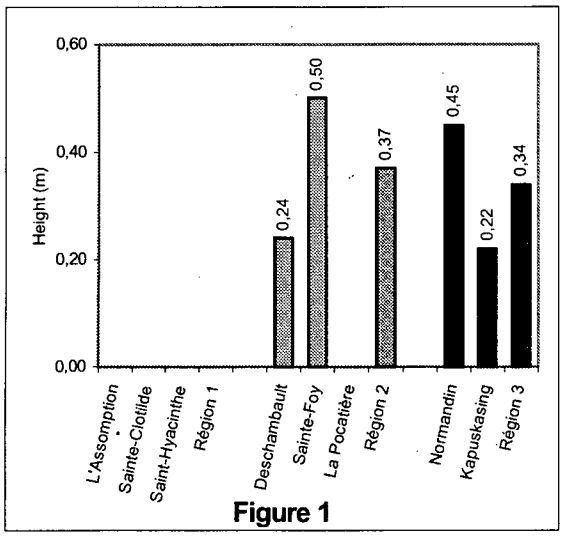


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

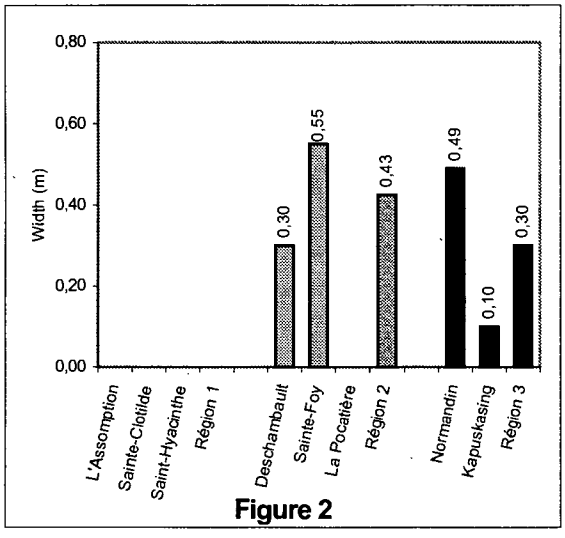


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Growth was regular and continual at St. Foy. Hard pruning, removing 10–60% of plants' height, was required at Deschambault, while only light pruning was required at Normandin.

### Flowering

At St. Foy (zone 4b), the shrubs only flowered the last season, from May 21 to June 21. At Normandin (zone 2b), plants also flowered the last season, from May 28 to June 8.

This magnificent shrub is something to see when in bloom.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

This rhododendron seems to need very specific soil and temperature conditions for successful production. Field production is only possible under the conditions found at St. Foy, Deschambault and Normandin. The abundance of the snow cover, which is laid down early in the season, and its persistence during the coldest part of the winter are two important factors in the survival of plants.

Container production could be possible in the Montreal region if adequate winter protection is ensured.

## HARDINESS EVALUATION

According to the references consulted, this rhododendron is hardy to USDA zone 3. The results of this trial show that the species can survive in zones 4b and 2b, where the snow cover protects the plants and the latter are never without a blanket of snow during the coldest part of the winter. The species cannot survive in zone 5, however. The parent plants, which have been at the Roger Van den Hende Garden for many years, usually do not have winter damage.

The species can be used in the same zones as above, with the proviso that young plants are particularly frost prone.

In zone 2b, however, the duration of flowering will be much shorter.

The species achieved its full ornamental potential only in zone 4b.

**WRITTEN BY**

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Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Rhododendron roseum* (Loisel.) Rehd., 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 50 | | | | | | | 50 | | | | 50 |
| St. Clotilde | 0 | | | | | | | 100 | | | | 100 |
| St. Hyacinthe* | - | | | | | | | | | | | - |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 30 | 33 | 14 | 4 | | | | 9 | | 5 | 5 | 70 |
| St. Foy | 100 | | | | | | | | | | | 0 |
| La Pocatière | 25 | | | | | | | 75 | | | | 75 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 95 | | | | | | | 5 | | | | 5 |
| Kapuskasing | 44 | | | 20 | | | | 36 | | | | 56 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

* All specimens died at St. Hyacinthe.

No damage of types 5, 6, 7 or 9 occurred in the plants tested.

**Table 2:** **Breakdown of *Rhododendron roseum* (Loisel.) Rehd. specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 0 | 0 | 0 | - | - | 50 | - | - | - | - | - | - | - | - | - |
| 11-20 | 67 | 0 | 0 | - | - | 50 | - | - | - | - | - | - | - | - | - |
| 21-30 | 33 | 100 | 100 | - | - | - | - | - | - | - | - | - | - | - | - |
| 31-40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 41-50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 20 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - |
| 11-20 | 60 | 75 | 50 | 67 | 33 | 83 | 67 | 0 | 0 | 0 | 100 | 100 | - | - | - |
| 21-30 | 20 | 25 | 50 | 33 | 67 | 0 | 33 | 100 | 20 | 0 | - | - | - | - | - |
| 31-40 | - | - | - | - | - | 0 | 0 | 0 | 60 | 0 | - | - | - | - | - |
| 41-50 | - | - | - | - | - | 0 | 0 | 0 | 20 | 60 | - | - | - | - | - |
| 51-60 | - | - | - | - | - | 0 | 0 | 0 | 0 | 40 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 100 | 25 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 0 |
| 11-20 | 0 | 50 | 34 | 33 | 0 | 50 | 100 | 0 | 0 | 0 |
| 21-30 | 0 | 0 | 33 | 67 | 33 | 17 | 0 | 100 | 100 | 100 |
| 31-40 | 0 | 25 | 33 | 0 | 67 | - | - | - | - | - |
| 41-50 | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - |

*All specimens died after transplanting.

Table 3: **Breakdown of *Rhododendron roseum* (Loisel.) Rehd. specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 67 | 0 | 0 | - | - | 100 | - | - | - | - | - | - | - | - | - |
| 11-20 | 33 | 100 | 50 | - | - | - | - | - | - | - | - | - | - | - | - |
| 21-30 | 0 | 0 | 50 | - | - | - | - | - | - | - | - | - | - | - | - |
| 31-40 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 41-50 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 51-60 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 60 | 0 | 25 | 0 | 0 | 100 | 17 | 0 | 0 | 0 | 50 | 0 | - | - | - |
| 11-20 | 40 | 100 | 75 | 33 | 0 | 0 | 83 | 20 | 0 | 0 | 50 | 100 | - | - | - |
| 21-30 | 0 | 0 | 0 | 67 | 67 | 0 | 0 | 80 | 0 | 0 | - | - | - | - | - |
| 31-40 | 0 | 0 | 0 | 0 | 33 | 0 | 0 | 0 | 100 | 0 | - | - | - | - | - |
| 41-50 | - | - | - | - | - | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - |
| 51-60 | - | - | - | - | - | 0 | 0 | 0 | 0 | 100 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-10 | 75 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 100 |
| 11-20 | 25 | 100 | 0 | 0 | 0 | 50 | 100 | 100 | 100 | 0 |
| 21-30 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - |
| 31-40 | 0 | 0 | 100 | 0 | 0 | - | - | - | - | - |
| 41-50 | 0 | 0 | 0 | 67 | 67 | - | - | - | - | - |
| 51-60 | 0 | 0 | 0 | 33 | 33 | - | - | - | - | - |

*All specimens died after transplanting.

# *RHODODENDRON VASEYI*

A. GRAY

The sections "Botanical Description", "Origin and Distribution", "Use", "Requirements", "Diseases and Insects" and "Propagation" can be found in *Hardiness and Growth of Woody Ornamental Plants in Quebec*, Volume IV (WV 017).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** 561 cuttings (10 cm) were taken on June 22, 1992 from roughly 20-year-old parent plants. They were dipped for five seconds in a 4000 ppm IBA/50% ethanol solution, rinsed under the tap and then immersed in a Benomyl-Captan® fungicide solution. They were planted in a peat-perlite mixture (2:3; v:v) and placed under an automatic mist unit (Mist-A-Matic®). The rooting rate was 36% after 120 days. Misting was discontinued in early October and the plants were treated twice, at a one-week interval, with a soluble fertilizer (20-20-20, 200 ppm N). In November, they were removed from the rooting containers and put in the cold store at -2°C in plastic bags perforated with a hatpin. In May 1993, they were potted up in Fertil Pot® containers in a peat-perlite mixture (3:2; v:v) and placed in the tunnel greenhouse, where they were treated weekly with a liquid fertilizer (20-20-20, 200 ppm N) until late September. In November, they were returned to the cold store at 0°C. In early May 1994, they were wrapped and kept in the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young plants 13 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Recovery after transplanting was very poor at St. Clotilde, particularly for a second trial. In the previous trial, mortality was due to dried-out root balls and unsuitable soil conditions for planting, but this time the losses were due to the species' poor ability to recover after transplanting.

*Region 1*

At L'Assomption, 75% of specimens died the second winter. The remaining plant succumbed the following year.

At St. Clotilde, all specimens died shortly after transplanting.

At St. Hyacinthe, 50% of plants died the first winter and the remainder were killed the following winter. The first winter, frost damage to the branch tips was found in half of the surviving plants.

*Region 2*

At Deschambault, two specimens died the first and fourth winters respectively. The first, third and fourth winters, 12%, 67% and 100% of specimens had frost damage to the branch tips. The second and fourth winters, damage to the one-year-old shoots occurred in 20% and 33% of plants. The last winter, 67% had frost damage to the flower buds. The second winter, 20% had mechanical breakage.

At St. Foy, single specimens died the first and fourth winters. The third winter, 33% had frost damage to the old wood.

At La Pocatière, 50% of specimens died the first winter and the rest succumbed the following winter.

*Region 3*

At Normandin, two specimens each died the second and fourth winters; the third winter, 25% had mechanical breakage.

At Kapuskasing, 25%, 15% and 100% of plants died the first, third and fourth winters. The first winter, 50% had frost damage to the branch tips and 25% had damage to the previous year's wood.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

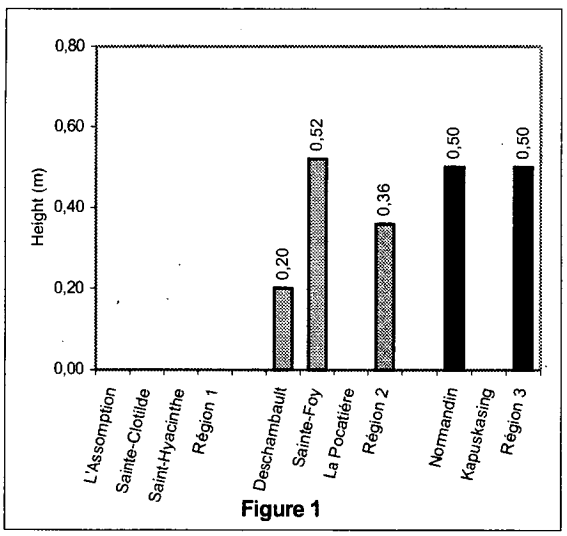


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

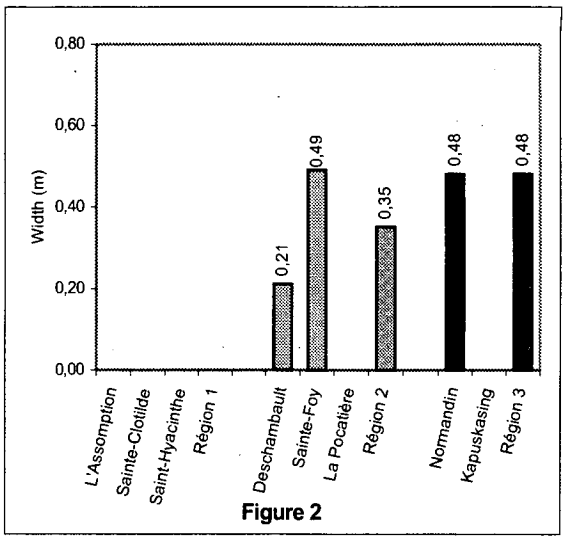


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

Height was very homogenous at all sites.

### Effect of pruning

The only pruning done was at Deschambault, where 30–40% of the previous year's growth had to be removed.

### Flowering

One shrub flowered at Deschambault the second year and two flowered at Normandin the last year, from May 13 to May 30.

Flowering was rare and very few plants expressed their floral characteristics during the trial.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

In the warmest region, production is too risky because the snow cover can disappear during the coldest part of the winter and is often late in getting established in fall. In hardiness zone 4, plants died during the first, second and

fourth winters. This rhododendron seems to need very specific soil and temperature conditions for successful production. Field production is only possible under the conditions found at St. Foy and Deschambault. The abundant snow cover, laid down early in the season, and lack of snow-free periods during the coldest part of the winter are two important factors in the survival of plants.

To sum up, container production is recommended and plants must be protected in winter. Using older plants provides a better chance of long-term survival.

## HARDINESS EVALUATION

This species does not take well to transplanting, which eliminated a number of plants in the first growing season. In addition, plants that did not fully recover from transplanting died the first winter. The remaining plants either had little winter damage to the aerial portions or succumbed, indicating that their root system did not tolerate cold well.

According to the literature, Rhododendron vaseyi is cold tolerant to USDA zone 4. These trials show that it can survive as far as zone 4, with a good snow cover required for its survival in fall and winter. They also show that the species' ability to withstand the climatic conditions in zone 5 is linked to the presence of a snow cover during cold periods and fulfillment of the species' special soil requirements.

The parent plant, well established at the Ericacetum (heath garden) at the Roger Van den Hende Garden, is nearly two metres tall, shows normal growth and has not had any winter damage for a number of years. However, it is located in a site protected from the wind, with optimum soil conditions and where the abundant snow cover is laid down early and persists all winter.

The species' full ornamental potential was not achieved at the trial sites.

**WRITTEN BY**

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Rhododendron vaseyi* A. Gray., 1995-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 7 | 8 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | |
| L'Assomption | 75 | | | | | | 25 | | | 25 |
| St. Clotilde | - | | | | | | | | | - |
| St. Hyacinthe | 13 | 12 | | | | | 75 | | | 87 |
| **REGION 2** | | | | | | | | | | |
| Deschambault | 23 | 36 | 13 | 11 | | | 13 | 4 | | 77 |
| St. Foy | 80 | | | | 6 | | 14 | | | 20 |
| La Pocatière | 25 | | | | | | 75 | | | 75 |
| **REGION 3** | | | | | | | | | | |
| Normandin | 83 | | | | | | 12 | 5 | | 17 |
| Kapuskasing | 33 | 12 | | 6 | | | 49 | | | 67 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 6, 7 or 9 occurred in the plants tested.

Table 2: **Breakdown of *Rhododendron vaseyi* A. Gray. specimens by saleable height category, 1994-98**

| REGION 1 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height | L'Assomption* | | | | | St. Clotilde* | | | | | St. Hyacinthe* | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 0 | - | - | - | - | - | - | - | - | 0 | - | - | - |
| 021-040 | 0 | 0 | 100 | - | - | - | - | - | - | - | - | 100 | - | - | - |
| 041-060 | 0 | 0 | 0 | - | - | - | - | - | - | - | - | - | - | - | - |

| REGION 2 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière* | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 38 | 34 | 67 | 67 | 33 | 50 | 0 | 0 | 0 | 0 | 0 | 50 | - | - | - |
| 021-040 | 62 | 66 | 33 | 33 | 67 | 50 | 100 | 100 | 100 | 50 | 100 | 50 | - | - | - |
| 041-060 | - | - | - | - | - | 0 | 0 | 0 | 0 | 50 | - | - | - | - | - |

| REGION 3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Height | Normandin | | | | | Kapuskasing* | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 80 | 25 | 0 | 0 | 0 | 50 | 67 | 100 | 0 | - |
| 021-040 | 20 | 75 | 50 | 33 | 0 | 50 | 33 | 0 | 100 | - |
| 041-060 | 0 | 0 | 50 | 67 | 100 | - | - | - | - | - |

*No plants survived beyond the third winter at L'Assomption, St. Hyacinthe, St. Clotilde and La Pocatière or beyond the fourth winter at Kapuskasing.

Table 3: **Breakdown of *Rhododendron vaseyi* A. Gray. specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption* | | | | | St. Clotilde* | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | - | 100 | - | - | - | - | - | - | - | - | 100 | - | - | - |
| 021-040 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 041-060 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 83 | - | 67 | 34 | 100 | 75 | 50 | 50 | 0 | - | 100 | - | - | - |
| 021-040 | 0 | 17 | - | 33 | 66 | 0 | 25 | 50 | 50 | 0 | - | - | - | - | - |
| 041-060 | - | - | - | - | - | 0 | 0 | 0 | 0 | 100 | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 100 | 25 | 0 | - | 100 | 100 | 100 | 100 | - |
| 021-040 | 0 | 0 | 25 | 67 | - | - | - | - | - | - |
| 041-060 | 0 | 0 | 50 | 0 | - | - | - | - | - | - |
| 061-080 | 0 | 0 | 0 | 33 | - | - | - | - | - | - |

*No plants survived beyond the third winter at L'Assomption, St. Hyacinthe, St. Clotilde and La Pocatière or beyond the fourth winter at Kapuskasing.

# *ROSA CANINA* L.

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Dog Rose |
| **French common name:** | Rosier |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub of erect habit and arching canes can grow to three metres tall. The canes have hook-shaped thorns.

The foliage consists of 5–7 oval to elliptic leaflets, each 2–4 cm long. They are glabrous on the upperside and slightly pubescent below.

The solitary flowers, sometimes occurring in clusters of three, are five petalled, purplish pink or white in colour and 4–5 cm in diameter. They bloom in early June.

The scarlet hips are 1.5–2.0 cm long, ellipsoid and edible.

## ORIGIN AND DISTRIBUTION

This shrub, native to Europe, occasionally escapes from cultivation in North America.

## USE

**Ornamental:** The species can be used as a flowering screen or hedge. It is prized for its foliage, flowers and fruits.

**Rootstock:** The species can also be used as a rootstock.

## REQUIREMENTS

In general, roses require a sunny spot; five to six hours of sunshine a day will allow the dew to evaporate from the foliage.

Most roses are adapted to a number of different soil types; they prefer soil rich in organic matter and will grow well in well-drained clay or sandy soil enriched with organic matter. For normal growth, a pH of 6.0–7.5 is required but the optimum pH is 6.5–6.8.

Training is required during the first few years after planting. After that, the only pruning needed is to remove dead or damaged wood or to renew old plants. With a good snow cover, no winter protection is required.

## DISEASES AND INSECTS

Information on the main pests and diseases affecting roses is provided in a special section of *Rusticité et Croissance de Plantes Ligneuses Ornementales au Québec*, Tome II. Annexe 1. Pathologie et ravageurs des rosiers (VR 221).

## PROPAGATION

**Cutting:** Softwood cuttings are commonly used and effective; a hormone rooting powder with 2500–6000 ppm IBA is recommended. Cuttings can also be dipped quickly (5 seconds) in a 4000 ppm IBA solution.

Rose cuttings are very susceptible to rot and special care must be taken to ensure the cleanliness of tools and worktables and to use sterile substrate and containers. A fungicide may be required when a mist unit is used.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** On July 14, 1992, 316 cuttings (15 cm) were taken from three-year-old parent plants roughly 1.5 m high. They were dipped in a 4000 ppm IBA/50% ethanol solution and planted in plug trays in a perlite-Promix® mixture (1:1; v:v) under a mist unit operating for 30 seconds every 6 minutes. The rooted cuttings were placed in shaded beds in late August. The rooting rate was over 50%. The plants were overwintered in cold frames and then potted up on June 28, 1993 in Fertil Pot® containers and grown in out-

side beds. They were treated weekly with a soluble fertilizer (20-20-20, 400 ppm N) until September 15. They were again overwintered in cold frames with an Astro-Foam® mulch; the survival rate was 85%. In May 1994, they were wrapped and shipped.

**Inclusion in testing network:** Young plants 18 cm high were planted at eight test sites throughout Québec and in north-eastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994–99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, frost damage to the branch tips occurred in 20%, 65% and 36% of plants the first three winters. Frost damage to the aerial portions above the snow cover was observed in 35% and 10% the second and third winter. The third winter, 18% had rodent damage and the fourth winter, 10% had mechanical breakage.

At St. Clotilde, 17% of specimens had frost damage to the old wood the fourth winter. The next winter, 33% had frost damage to the branch tips, 8% had damage to the previous year's shoots and one plant died.

No damage occurred at St. Hyacinthe.

*Region 2*

At Deschambault, 92%, 100% and 8% of plants had mechanical breakage the last three winters and 33% had frost damage to the previous year's shoots the last winter.

At St. Foy, 21% and 5% of specimens had frost damage to the branch tips the first two winters. The third winter, 58% had mechanical breakage.

At La Pocatière, 50% of the roses had frost damage to the branch tips the second winter.

*Region 3*

At Normandin, 35% of plants had frost damage to the branch tips the second winter. The last winter, 9% had frost damage to the previous year's shoots and 35%, to the old wood.

At Kapuskasing, one plant died the first winter. The following two winters, 5% and 8% had frost damage to the branch tips.

### Effect of pruning

Pruning to cut back 30–50% of plants' height was done several times at Normandin, Deschambault and St. Foy and once at L'Assomption.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

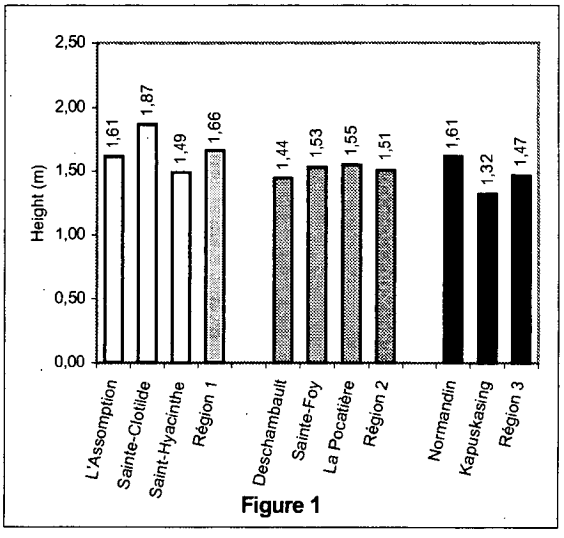


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

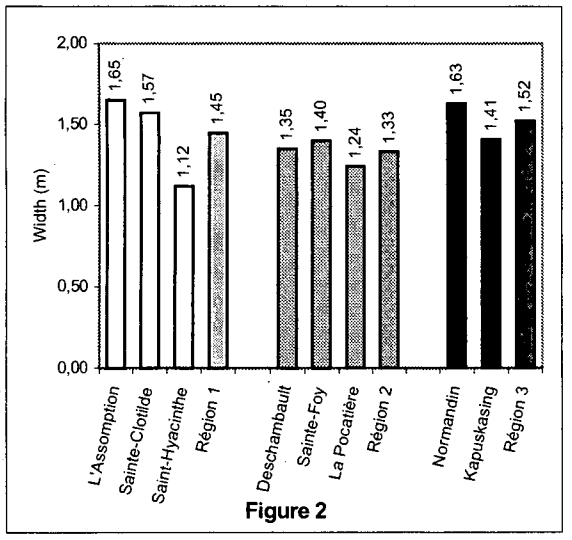


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Flowering

All the plants flowered at all the sites, almost every year. The duration of flowering was 10–25 days. The longest flowering occurred the last growing season, when flowers appeared two weeks earlier than usual at all the sites.

In zone 5b, flowering began twice between June 5 and 10 and twice on May 22. At the two zone 5a sites, the average onset of flowering was June 6–10 (on one occasion May 24). At the zone 4a and 4b sites, the onset was June 13–23, or 6–10 days later than in zone 5. At Normandin, in zone 2b, flowers generally appeared on June 23, except for the last year, when they came two weeks earlier. In zone 2a, onset was June 15–25.

The duration of flowering was around 11–16 days at all sites, although a few plants flowered for 21–24 days on a few occasions.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

The rose grew fastest at St. Clotilde and St. Hyacinthe, where all the plants were over one metre after three growing seasons, compared with 83% at St. Foy, La Pocatière and Kapuskasing. An additional growing season was needed at Deschamault and Normandin for plants to reach a similar height.

This species can be grown at all the sites tested, but growth will be greater in the warmest areas.

## HARDINESS EVALUATION

According to the references consulted, the species is hardy to USDA zone 3, which corresponds to the Canadian zone 4. However, the rose suffered no mortality at the coldest site in zone 2a. Therefore, it can survive risk-free in this zone.

A greater range of winter damage occurred at the warmest sites; significant temperature variations may affect canes left unprotected by the snow cover.

At the zone 2a and 2b sites, the plants grew higher than the snow cover but no damage occurred to the exposed canes. The species can therefore be used as far as zone 2a in terms of growth and flowering.

The young plants achieved their full ornamental potential at the zone 5a site.

## WRITTEN BY

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Christine Galipeau, Biologist

**Table 1: Frequency of winter damage observed in *Rosa canina* L., 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 61 | 24 | | | | 9 | | | | 2 | 4 | 39 |
| St. Clotilde | 87 | 6 | | 2 | 3 | | | 2 | | | | 13 |
| St. Hyacinthe | 100 | | | | | | | | | | | 0 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 53 | 7 | | | | | | | | 40 | | 47 |
| St. Foy | 83 | 3 | | | | | | | | 14 | | 17 |
| La Pocatière | 90 | 10 | | | | | | | | | | 10 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 84 | 6 | | 2 | 8 | | | | | | | 16 |
| Kapuskasing | 96 | 3 | | | | | | 1 | | | | 4 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 7 or 9 occurred in the plants tested.

**Table 2:** **Breakdown of *Rosa canina* L. specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 95 | 30 | 9 | 0 | 0 | 54 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 0 | 0 |
| 051-100 | 5 | 70 | 58 | 55 | 0 | 46 | 8 | 0 | 0 | 9 | 69 | 42 | 0 | 0 | 0 |
| 101-150 | 0 | 0 | 33 | 45 | 27 | 0 | 84 | 0 | 17 | 8 | 0 | 58 | 100 | 83 | 58 |
| 151-200 | 0 | 0 | 0 | 0 | 73 | 0 | 8 | 100 | 75 | 50 | 0 | 0 | 0 | 17 | 33 |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 8 | 33 | 0 | 0 | 0 | 0 | 9 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 76 | 0 | 0 | 0 | 0 | 37 | 0 | 0 | 0 | 0 | 60 | 0 | 0 | 0 | 0 |
| 051-100 | 24 | 95 | 41 | 17 | 8 | 63 | 42 | 17 | 18 | 9 | 40 | 50 | 17 | 0 | 0 |
| 101-150 | 0 | 5 | 59 | 83 | 75 | 0 | 53 | 8 | 82 | 16 | 0 | 50 | 75 | 50 | 33 |
| 151-200 | 0 | 0 | 0 | 0 | 17 | 0 | 5 | 75 | 0 | 75 | 0 | 0 | 8 | 50 | 67 |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 90 | 0 | 0 | 0 | 0 | 78 | 0 | 0 | 0 | 0 |
| 051-100 | 10 | 100 | 36 | 9 | 0 | 22 | 94 | 17 | 0 | 0 |
| 101-150 | 0 | 0 | 64 | 91 | 18 | 0 | 6 | 83 | 83 | 83 |
| 151-200 | 0 | 0 | 0 | 0 | 82 | 0 | 0 | 0 | 17 | 17 |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

Table 3: **Breakdown of *Rosa canina* L. specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 35 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 84 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 65 | 92 | 73 | 0 | 0 | 8 | 8 | 17 | 0 | 16 | 95 | 58 | 8 | 8 |
| 101-150 | 0 | 0 | 8 | 27 | 27 | 0 | 92 | 67 | 42 | 42 | 0 | 5 | 42 | 84 | 92 |
| 151-200 | 0 | 0 | 0 | 0 | 63 | 0 | 0 | 25 | 41 | 58 | 0 | 0 | 0 | 8 | 0 |
| 201-250 | 0 | 0 | 0 | 0 | 10 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 48 | 0 | 0 | 0 | 0 | 74 | 0 | 0 | 0 | 0 | 90 | 0 | 0 | 0 | 0 |
| 051-100 | 52 | 100 | 42 | 33 | 8 | 26 | 74 | 25 | 25 | 0 | 10 | 100 | 17 | 25 | 0 |
| 101-150 | 0 | 0 | 58 | 67 | 84 | 0 | 26 | 67 | 75 | 75 | 0 | 0 | 83 | 75 | 100 |
| 151-200 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 8 | 0 | 25 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 85 | 0 | 0 | 0 | 0 | 100 | 6 | 0 | 0 | 0 |
| 051-100 | 15 | 100 | 45 | 0 | 0 | 0 | 82 | 50 | 0 | 0 |
| 101-150 | 0 | 0 | 55 | 64 | 18 | 0 | 12 | 50 | 75 | 67 |
| 151-200 | 0 | 0 | 0 | 36 | 82 | 0 | 0 | 0 | 25 | 33 |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

# *Rosa*

# 'CAPTAIN SAMUEL HOLLAND'

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Captain Samuel Holland Rose |
| **French common name:** | Rosier 'Captain Samuel Holland' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This hardy Explorer™ rose, of erect habit and semi-arching canes at the tips, grows to 1.8 m tall at L'Assomption. The canes have roughly five thorns per 100 mm.

The lush foliage is light green and glossy. The ovate leaflets, with an acuminate apex and serrate margins, occur in groups of five to seven. On average, they are 50 mm long and 32 mm wide.

The rose flowers abundantly and continuously, beginning in late June. The bright red buds unfold into medium-red flowers, occurring in clusters of 1–10 flowers. The flowers have 23 petals and are close to 70 mm in diameter.

## ORIGIN AND DISTRIBUTION

This cultivar is a cross between two breeding lines derived from crosses between *R. kordesii*, 'Red Dawn' and 'Suzanne'. It was developed by hybridizer Dr. Felicitas Svejda of Agriculture and Agri-Food Canada, and introduced in 1990.

## USE

**Ornamental:** This rose can be used as a climber on a trellis or shrub rose with semi-arching canes.

## REQUIREMENTS

In general, roses require a sunny spot; five to six hours of sunshine a day will allow the dew to evaporate from the foliage. This cultivar, however, will also tolerate partial shade.

The cultivar is adapted to a number of different soil types but prefers a soil rich in organic matter and will grow well in well-drained clay or sandy soil enriched with organic matter. For normal growth, a pH of 6.0–7.5 is required but the optimum pH is 6.5–6.8.

Training is recommended during the first few years after planting. After that, pruning is only required to remove dead or damaged wood.

## DISEASES AND INSECTS

Information on the main pests and diseases affecting roses is provided in a special section of *Rusticité et Croissance de Plantes Ligneuses Ornementales au Québec*, Tome II. Annexe 1. Pathologie et ravageurs des rosiers (VR 221).

## PROPAGATION

Cultivars are propagated by grafts or cutting. Roses grown on their own roots are thought to be better adapted to winter conditions.

**Grafting:** Field-grown grafts are produced by t-budding. A *Rosa multiflora* seedling is usually used as the rootstock.

**Cutting:** Softwood cuttings treated with a hormone rooting powder with 2500–6000 ppm IBA provide good results. Dipping the cutting quickly (5 seconds) in a 4000 ppm IBA solution is also done.

Rose cuttings are very susceptible to rot and special care must be taken to ensure the cleanliness of tools and worktables and use clean substrate and containers. A fungicide may be required when a mist unit is used.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** On August 7, 1991, 300 cuttings (5–7 cm) were taken from two-year-old parent plants roughly 25 cm high and wide. They were dipped in a 20,000 ppm IBA/50% ethanol solution and planted in peat containers in a Promix®, sand and compost mixture (1:2:1; v:v:v) in the greenhouse under an automatic mist unit controlled with an electronic leaf. The heating cables were set at 25°C. Weekly Benomyl® fungicide treatments were provided throughout the propagation period. The rooting rate was 50% after 18 days. On August 30, the containers were moved to a lath house and treated with a soluble fertilizer (10-52-10) at the recommended rate. The plants were moved to the cold store in mid-October, where they were kept at 4°C. On May 19, 1992, they were transplanted in the nursery. On October 29, they were dug up, puddled and heeled in for the winter. In mid-April 1993, they were wrapped and put in the cold store at 4°C to await shipping in May.

**Inclusion in testing network:** Young plants 17 cm high were planted at eight test sites throughout Quebec and in north-eastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

The winter damage observed was quite varied and included, in particular, frost damage to the branch tips in regions 1 and 2 and frost damage to the aerial portions above the snow cover in all regions.

*Region 1*

At L'Assomption, 8% and 36% of plants died the third and fourth winters. Frost damage down to the snow cover occurred in 31% and 92% the first and third winters. Frost damage to the previous year's shoots occurred in 8%, 9% and 43% the first winter and last two winters. The branch tips were affected in 46%, 100% and 43% the first two winters and last winter. The fourth winter, 54% had rodent damage and the last winter, 14% had mechanical breakage.

At St. Clotilde, all the plants had frost damage to the branch tips the second winter. Data were not collected the last two winters.

At St. Hyacinthe, 17% and 10% of plants died the third and fourth winters. Frost damage down to the ground occurred in 10% the fourth winter; frost damage down to the snow cover occurred in 100% and 70% the first and fourth winters. During the last four winters, 38%, 17%, 10% and 44% had frost damage to the branch tips.

*Region 2*

At Deschambault, 17% and 10% of plants died the first two winters. Frost damage to the previous year's shoots occurred in 47%, 42% and 17% the first, third and fourth years. Frost damage to the branch tips was observed all five years in 53%, 80%, 50%, 67% and 80% of plants respectively.

At St. Foy, 10% and 11% of specimens died the third and fourth winters. The aerial portions above the snow cover suffered frost damage in 55% of plants the fourth winter. The first and fourth winters, frost damage to the old wood occurred in 10% and 11%; the third and fourth winters, 10% and 12% had frost damage to the previous year's shoots. Frost damage to the branch tips occurred in 90%, 100%, 20%, 11% and 50% over the five years respectively.

At La Pocatière, 10% and 44% of specimens died the second and third winters. During the first three winters, 90%, 70% and 33% suffered frost damage to the aerial portions above the snow cover. The third winter, 11% had frost damage to the previous year's shoots. In addition, 10%, 20%, 80% and 67% had frost damage to the branch tips the

first two and last two winters, and 20% and 33% had mechanical breakage.

*Region 3*

At Normandin, the last four winters, 7%, 8%, 27% and 12% of the roses died. Frost damage to the aerial portions above the snow cover was observed every winter in 73–100% of plants.

At Kapuskasing, 45%, 17% and 20% of specimens died the second, third and fourth winters. Frost damage to the aerial portions above the ground level occurred every winter (18%, 9%, 83%, 20% and 100% of plants respectively). The first two winters and fourth winter, 63%, 45% and 60% had frost damage to the previous year's shoots. The first winter, 10% had frost damage to the branch tips.

## Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

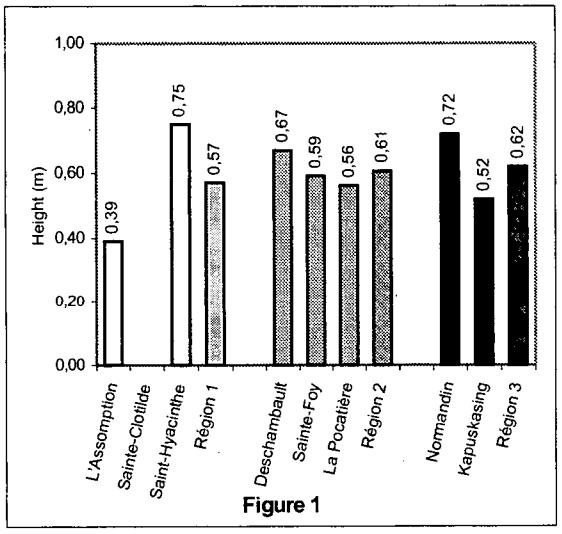


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

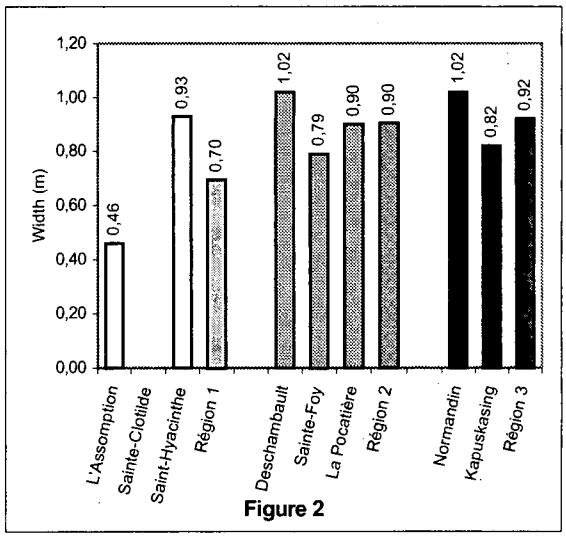


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

## Effect of pruning

Pruning to remove over 50% of the previous year's growth was done at all sites every year, except St. Clotilde, where no pruning was required. In region 3, more severe pruning had to be done, reducing height growth by 90%. However, in the latter region, plants recovered quickly from pruning.

## Flowering

In region 1, the onset of flowering was between June 15 and 23. In regions 2 and 3, flowering began in late June or early July. Abundant flowering throughout the summer, and often until mid-October, occurred at all sites except St. Clotilde, Deschambault and La Pocatière, where the flowering duration was shorter (26–53 days).

# PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

In general, the cultivar can be produced in regions 1 and 2, with plants growing to 41–80 cm during the second growing season. At St. Clotilde, 70% of the roses had reached this height by the end of the first growing season.

## HARDINESS EVALUATION

This cultivar was evaluated for five years in Ottawa, and an additional five years at L'Assomption and at some Canadian nurseries. At Ottawa and L'Assomption, only light frost damage occurred, requiring minimal pruning of the dead wood. The cultivar was rated hardy to zone 3.

In this trial, mortality occurred in roses that had been established for two to four years, which indicates that the cultivar had reached its limit of cold tolerance. In regions where the snow cover disappears in winter, occasional mortality was observed, while in the coldest areas, mortality occurred gradually as the years progressed. Therefore, the species can survive as far as zone 4, with the proviso that significant losses can occur if the snow cover is insufficient. The hardiness rating for survival given to the cultivar in the literature is slightly overestimated for nursery growing conditions, where more fertilizer is used.

The cultivar can be used as far as zone 4a for its habit and profuse flowering, with the proviso that some plants may die. The cultivar did not reach its maximum potential height during the trials at any site. A few plants reached 120–160 cm at the region 1 sites. In the region 2 sites, 120 cm was the greatest height attained, and 80 cm at Kapuskasing. Using the cultivar as a columnar plant is therefore not recommended at the sites tested.

The cultivar did not achieve its full ornamental potential at the trial sites. However, at St. Clotilde (zone 5b), the only frost damage observed was to the branch tips, and even when plants were cut back to the ground level, they grew vigorously and achieved significant growth every year.

**WRITTEN BY**

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**Table 1: Frequency of winter damage observed in *Rosa* 'Captain Samuel Holland', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 3 | 38 | | 12 | | 25 | | 9 | | 3 | 10 | 97 |
| St. Clotilde | 67 | 33 | | | | | | | | | | 33 |
| St. Hyacinthe | 38 | 22 | | | | 35 | 2 | 3 | | | | 62 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 8 | 66 | | 21 | | | | 5 | | | | 92 |
| St. Foy | 22 | 55 | | 5 | 5 | 11 | | 2 | | | | 78 |
| La Pocatière | 3 | 36 | | 2 | | 39 | | 10 | | 10 | | 97 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 0 | | | | | 89 | | 11 | | | | 100 |
| Kapuskasing | 2 | 2 | | 34 | | | 46 | 16 | | | | 98 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3 or 9 occurred in the plants tested.

**Table 2:** **Breakdown of *Rosa* 'Captain Samuel Holland' specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 38 | 0 | 0 | 0 | 57 | 30 | 0 | - | 0 | - | 54 | 8 | 0 | 0 | 13 |
| 041-080 | 62 | 85 | 17 | 36 | 43 | 70 | 0 | - | 0 | - | 46 | 38 | 51 | 20 | 37 |
| 081-120 | 0 | 15 | 50 | 64 | 0 | 0 | 100 | - | 90 | - | 0 | 54 | 33 | 70 | 50 |
| 121-160 | 0 | 0 | 33 | 0 | 0 | 0 | 0 | - | 10 | - | 0 | 0 | 16 | 10 | 0 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 27 | 7 | 0 | 0 | 10 | 50 | 0 | 20 | 0 | 12 | 30 | 0 | 0 | 0 | 40 |
| 041-080 | 73 | 80 | 83 | 67 | 60 | 50 | 90 | 80 | 44 | 76 | 60 | 80 | 67 | 40 | 40 |
| 081-120 | 0 | 13 | 17 | 33 | 30 | 0 | 10 | 0 | 56 | 12 | 0 | 20 | 33 | 60 | 20 |
| 121-160 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 47 | 40 | 33 | 8 | 0 | 91 | 27 | 17 | 60 | 25 |
| 041-080 | 47 | 60 | 67 | 36 | 57 | 9 | 73 | 83 | 40 | 75 |
| 081-120 | 6 | 0 | 0 | 55 | 43 | 0 | 0 | 0 | 0 | 0 |
| 121-160 | - | - | - | - | - | - | - | - | - | - |

* At St. Clotilde, data was not collected in 1995 and 1997.

Table 3: Breakdown of *Rosa* 'Captain Samuel Holland' specimens by saleable width category, 1993—97

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 8 | 7 | 0 | 0 | 43 | 10 | 0 | - | 0 | - | 23 | 0 | 0 | 0 | 0 |
| 051-100 | 84 | 61 | 8 | 27 | 57 | 90 | 33 | - | 0 | - | 70 | 77 | 75 | 80 | 87 |
| 101-150 | 8 | 31 | 84 | 73 | 0 | 0 | 67 | - | 0 | - | 7 | 23 | 25 | 20 | 13 |
| 151-200 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | - | 90 | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | 0 | 0 | - | 10 | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 34 | 7 | 0 | 0 | 10 | 40 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 20 |
| 051-100 | 66 | 60 | 33 | 25 | 30 | 50 | 40 | 80 | 45 | 75 | 80 | 30 | 55 | 80 | 60 |
| 101-150 | 0 | 33 | 67 | 75 | 60 | 10 | 40 | 20 | 55 | 25 | 0 | 70 | 45 | 20 | 0 |
| 151-200 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 20 |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 33 | 27 | 0 | 0 | 0 | 91 | 19 | 0 | 20 | 0 |
| 051-100 | 67 | 73 | 100 | 55 | 14 | 9 | 81 | 50 | 80 | 100 |
| 101-150 | 0 | 0 | 0 | 45 | 86 | 0 | 0 | 50 | 0 | 0 |
| 151-200 | - | - | - | - | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

* At St. Clotilde, data was not collected in 1995 and 1997.

# *ROSA* 'HENRY HUDSON'

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Henry Hudson Rose |
| **French common name:** | Rosier 'Henry Hudson' |
| **Category:** | Deciduous plant |
| **Subdivision :** | Shrub |

## BOTANICAL DESCRIPTION

This small, hardy Explorer™ rose, of rounded habit, is in the semi-dwarf category. It can grow to 0.5–0.7 m tall and 1.0 m wide according to the official description, but reached over 1.0 m high and 1.75 m wide in the trials.

Its light green foliage and thorny canes are very reminiscent of *rugosa* roses.

The pink buds open into double flowers, which are white with a tinge of pink, resembling apple blossoms. They are 6–7 cm in diameter, have around 20 petals and are fragrant. The plant flowers repeatedly from late June to late September.

## ORIGIN AND DISTRIBUTION

The cultivar was obtained from open pollination of the cultivar 'Schneezwerg'. It was created by hybridizer Dr. Felicitas Svejda of Agriculture and Agri-Food Canada, and was introduced in 1976.

## USE

**Ornamental:** The cultivar can be used as a specimen plant in landscaping or massed in a rose garden. It is prized for the colour of its flowers.

## REQUIREMENTS

In general, roses require a sunny spot; five to six hours of sunshine a day will allow the dew to evaporate from the foliage. However, this rose also tolerates partial shade.

The cultivar is adapted to different soils but prefers soil rich in organic matter and will grow well in well-drained clay soil or sandy soil enriched with organic matter. It tolerates a pH of 6.0–7.5 but does best with a pH of 6.5–6.8.

Training is recommended during the first few years after planting. After that, pruning is only required to remove winter-killed wood.

## DISEASES AND INSECTS

Information on the main pests and diseases affecting roses is provided in a special section of *Hardiness and Growth of Woody Ornamental Plants in Quebec*, Volume II, Appendix I, Pathology and Insects on Roses (VR 221).

## PROPAGATION

Cultivars are propagated by grafts or cuttings. Roses grown on their own roots are thought to be better adapted to winter conditions.

**Grafting:** Field-grown grafts are produced by t-budding. A *Rosa multiflora* seedling is usually used as the rootstock.

**Cutting:** Softwood cuttings treated with a hormone rooting powder with 2500–6000 ppm IBA provide good results. The cuttings may also be dipped quickly (5 seconds) in a 4000 ppm IBA solution.

Rose cuttings are very susceptible to rot and special care must be taken to ensure the cleanliness of tools and worktables and use clean substrate and containers. A fungicide may be required when a mist unit is used.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Central Experimental Farm, Ottawa; cultivated at L'Assomption Experimental Farm, L'Assomption, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** On July 11, 1990, 416 cuttings (10 cm) were taken from 12-year-old parent plants measuring roughly 80 cm high and 90 cm wide. They were dipped in a 5000 ppm IBA/50% ethanol solution and planted in peat pots in a sand-Promix® mixture (2:1; v:v), under an automatic mist unit controlled by an electronic leaf. The heating cables were set at 25°C. Weekly fungicide treatments with Benomyl® were provided throughout the propagation period. The rooting rate was 43% after 16 days. On August 2, the rooted cuttings were moved to the lath house and fertilized with a 10-52-10 solution at the recommended rate. In mid-October, the plants were put in the cold store at 2–5°C. On March 13, 1991, they were transferred to the greenhouse since budbreak had begun. On May 23, they were transplanted in the nursery; the survival rate was 100%. On October 29, 1992, they were dug up, puddled and heeled in for the winter. In mid-April, 1993, they were wrapped and put in the cold store to await shipping in May.

**Inclusion in testing network:** Young plants 17 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Little winter damage occurred in this cultivar.

*Region 1*

At L'Assomption, 33% and 100% of plants had frost damage to the branch tips the second and last winters.

At St. Clotilde, all plants had frost damage to the branch tips the second winter. Data were not collected in the spring of 1997 and 1998.

At St. Hyacinthe, single plants died the first two winters. The fourth winter, one quarter of the plants had frost damage to the branch tips and 8% had frost damage to the aerial portions above the snow cover.

*Region 2*

At Deschambault, one plant died the fourth winter. One quarter of the plants had frost damage to the old wood the first winter. The third and fourth winters, 58% and 27% of plants had mechanical breakage.

No damage occurred at St. Foy and La Pocatière.

*Region 3*

At Normandin, 8% of specimens had mechanical breakage the fourth winter but no other damage occurred.

At Kapuskasing, 6% of roses had frost damage to the previous year's shoots the first two winters. In addition, 78%, 11%, 100% and 8% had frost damage to the branch tips the first four winters.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

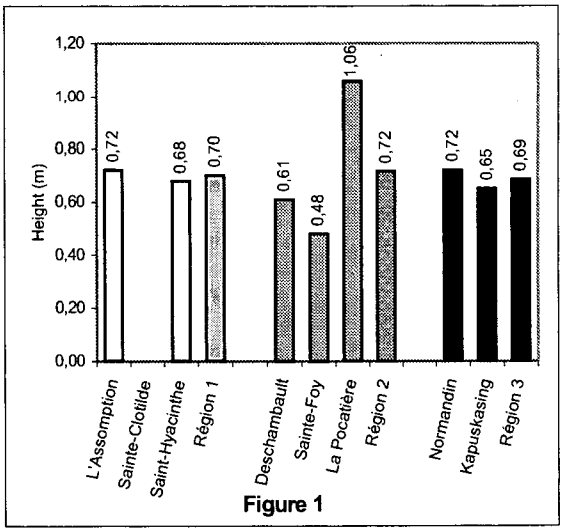


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

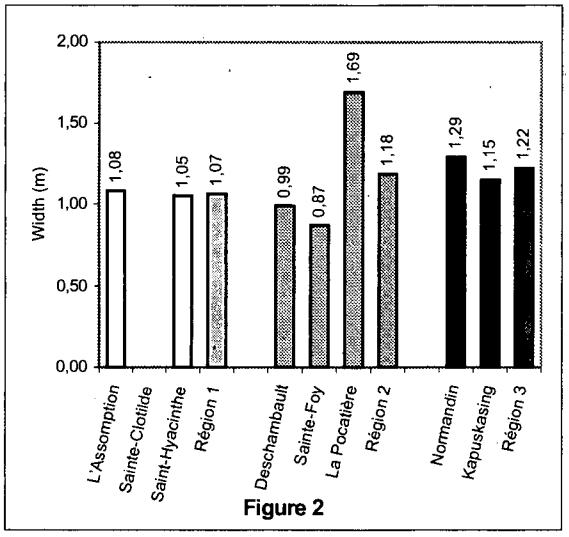


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Pruning to cut back 10% of height was required at St. Hyacinthe, Deschambault, St. Foy and L'Assomption every year. At Normandin, more severe pruning was done the fourth spring, reducing plants' height by 50%.

### Flowering

Flowering was continuous, extending over one to three months, depending on the site and year. In exceptional cases, it continued up to early October.

Flowering began over a two-week period, from mid to late-June in region 1 and from late June to early July in regions 2 and 3. Plants were in full bloom around a week after the onset of flowering.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

In general, the cultivar can be produced at all the sites. Roses reached a height of 41–60 cm by the third growing season at the region 1 sites and at Deschambault, La Pocatière and Normandin, while a fourth year was required at St. Foy and Kapuskasing. The soil at St. Foy seems to have affected the cultivar, reducing its growth; the foliage had chlorosis typical of a magnesium deficiency.

## HARDINESS EVALUATION

This cultivar was tested in Ottawa beginning in 1967 and at other sites in Canada beginning in 1973. In Ottawa, slight frost damage was observed during unusually harsh winters. It is considered hardy to zone 2.

In these trials, no mortality occurred in zone 2 and the cultivar only suffered slight damage at Kapuskasing. It can therefore survive as far as zone 2a, which modifies slightly the hardiness rating given by its breeders.

It can be used as far as zone 2a for its attractive habit and flowers.

The cultivar achieved its full ornamental potential at the St. Foy, La Pocatière and Normandin sites.

## WRITTEN BY

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**Table 1: Frequency of winter damage observed in *Rosa* 'Henry Hudson', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 73 | 27 | | | | | | | | | | 27 |
| St. Clotilde | 67 | 33 | | | | | | | | | | 33 |
| St. Hyacinthe | 91 | 5 | | | | 2 | | 2 | | | | 9 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 76 | | | | 5 | | | 2 | | 17 | | 24 |
| St. Foy | 100 | | | | | | | | | | | 0 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 98 | | | | | | | | | 2 | | 2 |
| Kapuskasing | 73 | 25 | | 2 | | | | | | | | 27 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 7, 9 or 11 occurred in the plants tested.

Table 2: Breakdown of *Rosa* 'Henry Hudson' specimens by saleable height category, 1993—97

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 6 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | 37 | 0 | 0 | 0 | 0 |
| 021-040 | 94 | 11 | 0 | 0 | 0 | 90 | 15 | 0 | 0 | - | 63 | 61 | 0 | 0 | 0 |
| 041-060 | 0 | 89 | 100 | 17 | 8 | 10 | 62 | 12 | 0 | - | 0 | 39 | 67 | 42 | 25 |
| 061-080 | 0 | 0 | 0 | 66 | 75 | | 15 | 63 | 25 | - | 0 | 0 | 33 | 58 | 75 |
| 081-100 | 0 | 0 | 0 | 17 | 17 | | 8 | 25 | 75 | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 5 | 0 | 0 | 0 | 0 | 20 | 10 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | 0 |
| 021-040 | 95 | 65 | 17 | 0 | 0 | 80 | 85 | 67 | 17 | 25 | 90 | 0 | 0 | 0 | 0 |
| 041-060 | 0 | 35 | 83 | 50 | 55 | 0 | 5 | 33 | 83 | 67 | 5 | 80 | 8 | 0 | 0 |
| 061-080 | 0 | 0 | 0 | 50 | 45 | 0 | 0 | 0 | 0 | 8 | 0 | 20 | 67 | 0 | 0 |
| 081-100 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 25 | 92 | 17 |
| 101-120 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 8 | 83 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 11 | 11 | 0 | 0 | 0 | 44 | 11 | 0 | 0 | 0 |
| 021-040 | 89 | 67 | 17 | 0 | 0 | 56 | 83 | 50 | 8 | 0 |
| 041-060 | 0 | 22 | 83 | 25 | 8 | 0 | 6 | 50 | 58 | 33 |
| 061-080 | 0 | 0 | 0 | 75 | 83 | 0 | 0 | 0 | 34 | 58 |
| 081-100 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 9 |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

*Data were not collected in 1997.

Table 3: Breakdown of *Rosa* 'Henry Hudson' specimens by saleable width category, 1993-97

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 95 | 0 | 8 | 0 | 0 | 45 | 8 | 0 | 0 | - | 84 | 11 | 0 | 0 | 0 |
| 051-100 | 5 | 100 | 92 | 42 | 25 | 55 | 92 | 25 | 0 | - | 16 | 89 | 91 | 100 | 42 |
| 101-150 | 0 | 0 | 0 | 58 | 75 | 0 | 0 | 75 | 33 | - | 0 | 0 | 9 | 0 | 58 |
| 151-200 | - | - | - | - | - | 0 | 0 | 0 | 67 | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 85 | 15 | 0 | 0 | 0 | 70 | 10 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 0 |
| 051-100 | 15 | 85 | 100 | 25 | 27 | 30 | 90 | 100 | 73 | 75 | 65 | 75 | 0 | 0 | 0 |
| 101-150 | 0 | 0 | 0 | 75 | 73 | 0 | 0 | 0 | 17 | 25 | 0 | 25 | 100 | 67 | 17 |
| 151-200 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 33 | 83 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 44 | 11 | 0 | 0 | 0 | 89 | 33 | 0 | 0 | 0 |
| 051-100 | 56 | 89 | 66 | 17 | 11 | 11 | 67 | 91 | 33 | 25 |
| 101-150 | 0 | 0 | 34 | 75 | 100 | 0 | 0 | 9 | 67 | 75 |
| 151-200 | 0 | 0 | 0 | 8 | 0 | - | - | - | - | - |

*Data were not collected in 1997.

# *ROSA* 'JENS MUNK'

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Henry Hudson Rose |
| **French common name:** | Rosier 'Henry Hudson' |
| **Category:** | Deciduous plant |
| **Subdivision :** | Shrub |

## BOTANICAL DESCRIPTION

This small, hardy Explorer™ rose, of rounded habit, is in the semi-dwarf category. It can grow to 0.5–0.7 m tall and 1.0 m wide according to the official description, but reached over 1.0 m high and 1.75 m wide in the trials.

Its light green foliage and thorny canes are very reminiscent of *rugosa* roses.

The pink buds open into double flowers, which are white with a tinge of pink, resembling apple blossoms. They are 6–7 cm in diameter, have around 20 petals and are fragrant. The plant flowers repeatedly from late June to late September.

## ORIGIN AND DISTRIBUTION

The cultivar was obtained from open pollination of the cultivar 'Schneezwerg'. It was created by hybridizer Dr. Felicitas Svejda of Agriculture and Agri-Food Canada, and was introduced in 1976.

## USE

**Ornamental:** The cultivar can be used as a specimen plant in landscaping or massed in a rose garden. It is prized for the colour of its flowers.

## REQUIREMENTS

In general, roses require a sunny spot; five to six hours of sunshine a day will allow the dew to evaporate from the foliage. However, this rose also tolerates partial shade.

The cultivar is adapted to different soils but prefers soil rich in organic matter and will grow well in well-drained clay soil or sandy soil enriched with organic matter. It tolerates a pH of 6.0–7.5 but does best with a pH of 6.5–6.8.

Training is recommended during the first few years after planting. After that, pruning is only required to remove winter-killed wood.

## DISEASES AND INSECTS

Information on the main pests and diseases affecting roses is provided in a special section of *Hardiness and Growth of Woody Ornamental Plants in Quebec*, Volume II, Appendix I, Pathology and Insects on Roses (VR 221).

## PROPAGATION

Cultivars are propagated by grafts or cuttings. Roses grown on their own roots are thought to be better adapted to winter conditions.

**Grafting:** Field-grown grafts are produced by t-budding. A *Rosa multiflora* seedling is usually used as the rootstock.

**Cutting:** Softwood cuttings treated with a hormone rooting powder with 2500–6000 ppm IBA provide good results. The cuttings may also be dipped quickly (5 seconds) in a 4000 ppm IBA solution.

Rose cuttings are very susceptible to rot and special care must be taken to ensure the cleanliness of tools and worktables and use clean substrate and containers. A fungicide may be required when a mist unit is used.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Central Experimental Farm, Ottawa; cultivated at L'Assomption Experimental Farm, L'Assomption, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** On July 11, 1990, 416 cuttings (10 cm) were taken from 12-year-old parent plants measuring roughly 80 cm high and 90 cm wide. They were dipped in a 5000 ppm IBA/50% ethanol solution and planted in peat pots in a sand-Promix® mixture (2:1; v:v), under an automatic mist unit controlled by an electronic leaf. The heating cables were set at 25°C. Weekly fungicide treatments with Benomyl® were provided throughout the propagation period. The rooting rate was 43% after 16 days. On August 2, the rooted cuttings were moved to the lath house and fertilized with a 10-52-10 solution at the recommended rate. In mid-October, the plants were put in the cold store at 2–5°C. On March 13, 1991, they were transferred to the greenhouse since budbreak had begun. On May 23, they were transplanted in the nursery; the survival rate was 100%. On October 29, 1992, they were dug up, puddled and heeled in for the winter. In mid-April, 1993, they were wrapped and put in the cold store to await shipping in May.

**Inclusion in testing network:** Young plants 17 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Little winter damage occurred in this cultivar.

*Region 1*

At L'Assomption, 33% and 100% of plants had frost damage to the branch tips the second and last winters.

At St. Clotilde, all plants had frost damage to the branch tips the second winter. Data were not collected in the spring of 1997 and 1998.

At St. Hyacinthe, single plants died the first two winters. The fourth winter, one quarter of the plants had frost damage to the branch tips and 8% had frost damage to the aerial portions above the snow cover.

*Region 2*

At Deschambault, one plant died the fourth winter. One quarter of the plants had frost damage to the old wood the first winter. The third and fourth winters, 58% and 27% of plants had mechanical breakage.

No damage occurred at St. Foy and La Pocatière.

*Region 3*

At Normandin, 8% of specimens had mechanical breakage the fourth winter but no other damage occurred.

At Kapuskasing, 6% of roses had frost damage to the previous year's shoots the first two winters. In addition, 78%, 11%, 100% and 8% had frost damage to the branch tips the first four winters.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

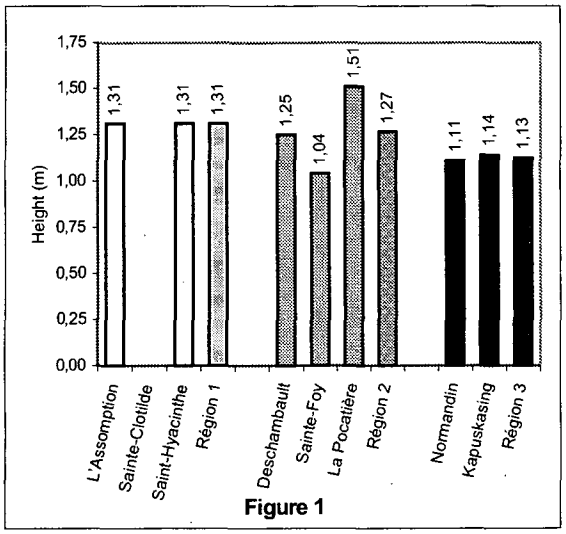


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

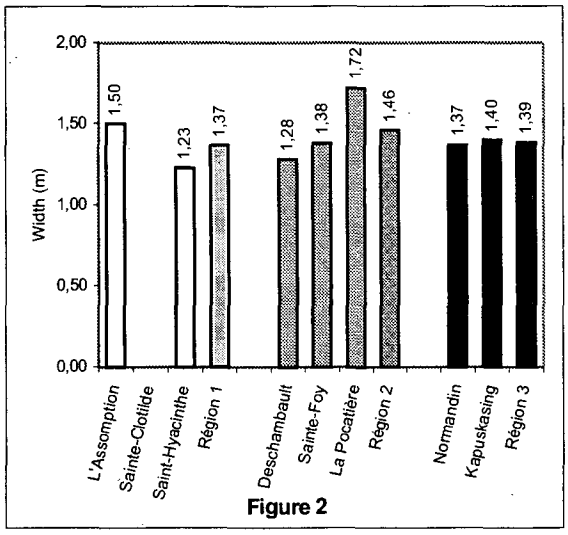


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Pruning to cut back 10% of height was required at St. Hyacinthe, Deschambault, St. Foy and L'Assomption every year. At Normandin, more severe pruning was done the fourth spring, reducing plants' height by 50%.

### Flowering

Flowering was continuous, extending over one to three months, depending on the site and year. In exceptional cases, it continued up to early October.

Flowering began over a two-week period, from mid to late-June in region 1 and from late June to early July in regions 2 and 3. Plants were in full bloom around a week after the onset of flowering.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

In general, the cultivar can be produced at all the sites. Roses reached a height of 41–60 cm by the third growing season at the region 1 sites and at Deschambault, La Pocatière and Normandin, while a fourth year was required at St. Foy and Kapuskasing. The soil at St. Foy seems to have affected the cultivar, reducing its growth; the foliage had chlorosis typical of a magnesium deficiency.

## HARDINESS EVALUATION

This cultivar was tested in Ottawa beginning in 1967 and at other sites in Canada beginning in 1973. In Ottawa, slight frost damage was observed during unusually harsh winters. It is considered hardy to zone 2.

In these trials, no mortality occurred in zone 2 and the cultivar only suffered slight damage at Kapuskasing. It can therefore survive as far as zone 2a, which modifies slightly the hardiness rating given by its breeders.

It can be used as far as zone 2a for its attractive habit and flowers.

The cultivar achieved its full ornamental potential at the St. Foy, La Pocatière and Normandin sites.

**WRITTEN BY**

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

Table 1: Frequency of winter damage observed in *Rosa* 'Jens Munk', 1994-98

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 67 | 31 | | 2 | | | | | | | | 33 |
| St. Clotilde | 78 | 22 | | | | | | | | | | 22 |
| St. Hyacinthe | 88 | 10 | | 2 | | | | | | | | 12 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 93 | | | | | | | | | 7 | | 7 |
| St. Foy | 95 | | | 2 | | | | | | 3 | | 5 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 87 | | | | | 13 | | | | | | 13 |
| Kapuskasing | 64 | 32 | | 4 | | | | | | | | 36 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 5, 7, 8, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of *Rosa* 'Jens Munk' specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 14 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | - | 43 | 7 | 0 | 0 | 0 |
| 041-080 | 86 | 7 | 0 | 0 | 0 | 87 | 30 | 0 | 0 | - | 57 | 36 | 0 | 0 | 0 |
| 081-120 | 0 | 93 | 100 | 27 | 16 | 0 | 70 | 38 | 0 | - | 0 | 57 | 50 | 33 | 17 |
| 121-160 | 0 | 0 | 0 | 73 | 84 | 0 | 0 | 63 | 41 | - | 0 | 0 | 50 | 67 | 83 |
| 161-200 | - | - | - | - | - | 0 | 0 | 0 | 59 | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 33 | 0 | 0 | 0 | 0 | 20 | 20 | 0 | 0 | 0 | 30 | 0 | 0 | 0 | 0 |
| 041-080 | 67 | 87 | 0 | 0 | 0 | 80 | 80 | 36 | 0 | 0 | 70 | 0 | 0 | 0 | 0 |
| 081-120 | 0 | 13 | 100 | 8 | 33 | 0 | 0 | 64 | 45 | 100 | 0 | 100 | 60 | 0 | 0 |
| 121-160 | 0 | 0 | 0 | 92 | 67 | 0 | 0 | 0 | 55 | 0 | 0 | 0 | 40 | 90 | 90 |
| 161-200 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 10 | 10 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 38 | 12 | 0 | 0 | 0 | 80 | 7 | 0 | 0 | 0 |
| 041-080 | 62 | 88 | 33 | 0 | 0 | 20 | 93 | 17 | 8 | 0 |
| 081-120 | 0 | 0 | 67 | 92 | 75 | 0 | 0 | 83 | 92 | 83 |
| 121-160 | 0 | 0 | 0 | 8 | 25 | 0 | 0 | 0 | 0 | 17 |
| 161-200 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: Breakdown of *Rosa* 'Jens Munk' specimens by saleable width category, 1993—97

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 21 | 0 | 0 | 0 | 0 | 13 | 0 | 0 | 0 | - | 71 | 0 | 0 | 0 | 0 |
| 051-100 | 79 | 86 | 9 | 0 | 0 | 87 | 90 | 0 | 0 | - | 29 | 100 | 25 | 75 | 0 |
| 101-150 | 0 | 14 | 91 | 37 | 50 | 0 | 10 | 63 | 0 | - | 0 | 0 | 75 | 25 | 100 |
| 151-200 | 0 | 0 | 0 | 63 | 50 | 0 | 0 | 37 | 92 | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 8 | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 20 | 0 | 0 | 0 | 0 | 13 | 13 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 |
| 051-100 | 80 | 93 | 8 | 0 | 0 | 87 | 87 | 37 | 0 | 0 | 80 | 10 | 0 | 0 | 0 |
| 101-150 | 0 | 7 | 92 | 92 | 100 | 0 | 0 | 63 | 91 | 73 | 0 | 90 | 100 | 40 | 20 |
| 151-200 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 9 | 27 | 0 | 0 | 0 | 60 | 80 |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 13 | 0 | 0 | 0 | 0 | 73 | 0 | 0 | 0 | 0 |
| 051-100 | 87 | 100 | 17 | 0 | 0 | 27 | 94 | 42 | 0 | 0 |
| 101-150 | 0 | 0 | 83 | 100 | 83 | 0 | 6 | 58 | 100 | 75 |
| 151-200 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 25 |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

# *Rosa* 'Marie-Victorin'

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Marie Victorin Rose |
| **French common name:** | Rosier 'Marie Victorin' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This Explorer™ rose, of spreading habit, can grow to 1.50 m tall and 1.25 m wide at maturity.

The glossy dark-green foliage turns yellow and red in fall.

This cultivar blooms repeatedly throughout the summer, from mid-June to late September. The flowers, which occur in clusters of 1–6, are around 9 cm in diameter and have 38 petals on average.

The pink, yellow and peach-coloured flower buds blossom into peach-coloured flowers, which fade to pale pink. The flowers have a slight fragrance.

The very fertile flowers produce many hips that turn bright orange in fall and remain on the plant over the winter.

## ORIGIN AND DISTRIBUTION

*Rosa* 'Marie-Victorin' is a cross between the floribunda rose 'Arthur Bell' and *Rosa* 'John Davis'. It was created by hybridizer Dr. Felicitas Svejda of Agriculture and Agri-Food Canada, and was introduced in 1998.

## USE

**Ornamental:** This rose can be used as a climber on a trellis or as a shrub with a semi-spreading habit. It is a good replacement for hybrid shrub roses.

## REQUIREMENTS

In general, roses require a sunny spot; five to six hours of sunshine a day will allow the dew to evaporate from the foliage. However, this rose does tolerate partial shade.

The cultivar is adapted to different soils but prefers soil rich in organic matter and will grow well in well-drained clay soil or sandy soil enriched with organic matter. It tolerates soils with a pH of 6.0–7.5 but does best in soil with a pH of 6.5–6.8.

Training is recommended during the first few years after planting. After that, pruning is only required to remove winter-killed wood.

## DISEASES AND INSECTS

Information on the main pests and diseases affecting roses is provided in a special section of *Rusticité et Croissance de Plantes Ligneuses Ornementales au Québec*, Tome II. Annexe 1. Pathologie et ravageurs des rosiers (VR 221).

## PROPAGATION

Cultivars are propagated by grafts or cutting. Roses grown on their own roots are thought to be better adapted to winter conditions.

**Grafting:** Field-grown grafts are produced by t-budding. The rootstock is usually a *Rosa multiflora* seedling.

**Cutting:** Softwood cuttings treated with a hormone rooting powder with 2500–6000 ppm IBA provide good results. Cuttings can also be dipped quickly (5 seconds) in a 4000 ppm IBA solution.

Rose cuttings are very susceptible to rot and special care must be taken to ensure the cleanliness of tools and work-tables and use clean substrate and containers. A fungicide may be required when a mist unit is used.

## PROPAGATION CARRIED OUT BY REPLOQ

Origin of parent plant: Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

Propagation site: Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

Propagation technique: On July 30, 1991, 180 cuttings (5–7 cm) were taken from 2-year-old parent plants measuring roughly 25 cm high and 15 cm wide. They were dipped in a 20,000 ppm IBA/50% ethanol solution and planted in the greenhouse in peat pots in a Promix®, sand and compost mixture (1:2:1; v:v:v), under an automatic mist unit controlled by an electronic leaf. The heating cables were set at 25°C. Weekly fungicide treatments with Benomyl® were provided throughout the propagation period. The rooting rate was 76% after 16 days. On August 16, the cuttings were moved to the lath house and fertilized with a 10-52-10 solution at the recommended rate. In mid-October, the plants were put in the cold store at 4°C. In late March, 1992, they were transferred to the greenhouse because budbreak had begun. On May 19, they were transplanted in the nursery. On October 29, they were dug up, puddled and heeled in for the winter. In mid-April, 1993, they were wrapped and put in the cold store at 4°C to await shipping in May.

**Inclusion in testing network:** Young plants 17 cm high were planted at eight test sites throughout Quebec and in north-eastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 36%, 100% and 17% of specimens had frost damage to the branch tips the first two winters and last winter. The last winter, 83% had frost damage to the previous year's shoots. The first, third and fourth winters, 64%, 100% and 17% had frost damage to the aerial portions above the snow cover. In addition, 84% had rodent damage the fourth winter.

At St. Clotilde, one rose died the first winter. The second and third winters, 100% and 33% had frost damage to the branch tips. The first and third winters, 60% and 67% had damage to the previous year's shoots. Data were not compiled the last two years.

At St. Hyacinthe, 40% and 13% of specimens died the third and fourth winters. The first four winters, 33%, 33%, 10% and 62% had frost damage to the branch tips. The last winter, half of the roses had frost damage to the old wood. The first winter, 67% had damage to the aerial portions above the snow cover and, the fourth winter, 25% had damage to the entire aerial portion above the ground.

*Region 2*

At Deschambault, 13%, 47% and 75% of plants had frost damage to the branch tips the first two winters and last winter and 87%, 53% and 8% had damage to the previous year's shoots during the same period. The third and fourth winters, all plants had frost damage to the aerial portions above the snow cover. In addition, the last winter, 17%. had mechanical breakage.

At St. Foy, 100%, 18%, 55% and 9% of plants had frost damage to the branch tips the last four winters. The third winter, 9% had damage to the previous year's shoots. The first and fourth winters, 100% and 36% had frost damage to the aerial portions above the snow cover. The fourth winter, 9% had mechanical breakage.

At La Pocatière, all roses had frost damage to the aerial portions above the snow cover the first two winters. The third and fourth winters, all plants had damage to the branch tips. No damage occurred the last winter.

*Region 3*

At Normandin, all plants had frost damage down to the snow cover all five winters.

At Kapuskasing, frost damage to the previous year's shoots occurred every year in 86%, 93%, 100%, 100% and 100% of specimens. The first two winters, 7% had damage

down to the ground level and the first winter, 7% had frost damage to the branch tips.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

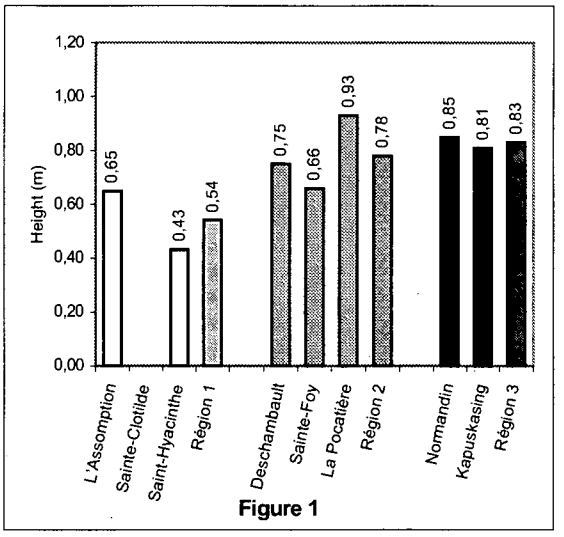


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

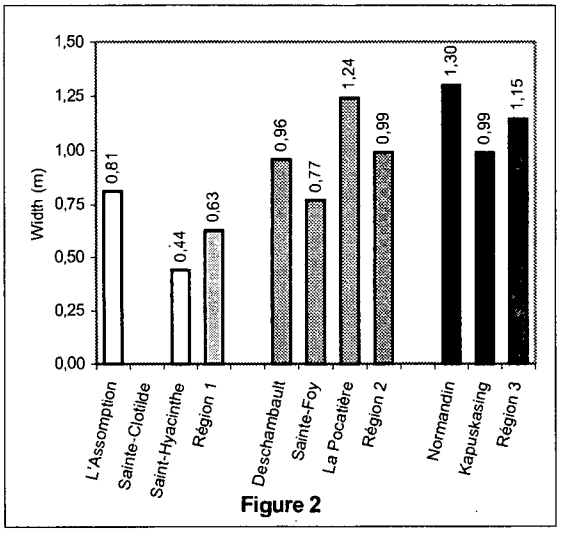


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Plants had to be severely cut back at all sites every year.

### Flowering

Plants flowered regularly and repeatedly. The onset of flowering was in mid-June in region 1, late June in region 2 and early July in region 3. The last year of the trials, the first flowers appeared a week later at all sites. In all regions, full bloom occurred one week after the anthesis of the first flowers.

The duration of flowering was almost three months at L'Assomption, Normandin and Kapuskasing. At the other sites, it ranged between one and two months.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

In general, the cultivar can be produced at all sites. Since plants will suffer frost damage to the aerial portions above the snow cover, extensive pruning in spring must be included in production planning.

Roses reached a height of over 81 cm after two growing seasons at L'Assomption and St. Clotilde.

## HARDINESS EVALUATION

The cultivar was evaluated for two years at Ottawa and three years at L'Assomption. It is considered hardy to zone 3 without special protection.

In these trials, the rose proved to be one of the most frost prone of the Explorer™ series, with the aerial portion strongly affected when not protected adequately by the snow. However, since no plants died in regions 2 and 3, it can survive as far as zone 2a.

The cultivar can be used as far as zone 2a throughout the trial area for its habit and attractive flowering, with the

proviso that it will take several years (at least three) to achieve its growth potential.

The cultivar did not achieve its full ornamental potential at the sites tested.

**WRITTEN BY**

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1: Frequency of winter damage observed in *Rosa* 'Marie Victorin', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 0 | 30 | | 17 | | 36 | | | | | 17 | 100 |
| St. Clotilde | 12 | 44 | | 42 | | | | 2 | | | | 88 |
| St. Hyacinthe | 33 | 30 | | | 10 | 12 | 5 | 10 | | | | 67 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 0 | 27 | | 29 | | 40 | | | | 4 | | 100 |
| St. Foy | 32 | 36 | | 2 | | 28 | | | | 2 | | 68 |
| La Pocatière | 20 | 40 | | | | 40 | | | | | | 80 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 0 | | | | | 100 | | | | | | 100 |
| Kapuskasing | 0 | 2 | | 96 | | | 2 | | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3 or 9 occurred in the plants tested.

Table 2: Breakdown of *Rosa* 'Marie Victorin' specimens by saleable height category, 1993-97

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 7 | 0 | 0 | 0 | 0 | 22 | 0 | 0 | 0 | - | 40 | 7 | 0 | 0 | 43 |
| 041-080 | 93 | 14 | 67 | 42 | 100 | 78 | 0 | 25 | 8 | - | 60 | 67 | 75 | 87 | 57 |
| 081-120 | 0 | 79 | 33 | 58 | 0 | 0 | 100 | 75 | 75 | - | 0 | 26 | 25 | 13 | 0 |
| 121-160 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 13 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 40 | 0 | 0 | 0 | 0 |
| 041-080 | 87 | 73 | 67 | 58 | 83 | 93 | 100 | 91 | 36 | 90 | 60 | 53 | 42 | 0 | 8 |
| 081-120 | 0 | 27 | 33 | 42 | 17 | 7 | 0 | 0 | 54 | 10 | 0 | 40 | 50 | 75 | 92 |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 10 | 0 | 0 | 7 | 8 | 25 | 0 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 12 | 12 | 17 | 0 | 0 | 57 | 7 | 0 | 0 | 0 |
| 041-080 | 88 | 82 | 83 | 72 | 34 | 43 | 85 | 100 | 92 | 67 |
| 081-120 | 00 | 6 | 0 | 28 | 66 | 0 | 8 | 0 | 8 | 33 |
| 121-160 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: Breakdown of *Rosa* 'Marie Victorin' specimens by saleable width category, 1993-97

| | REGION 1 | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 64 | 0 | 0 | 0 | 8 | 22 | 0 | 0 | 0 | - | 27 | 6 | 0 | 25 | 57 |
| 051-100 | 36 | 57 | 75 | 8 | 67 | 78 | 0 | 25 | 0 | - | 73 | 67 | 83 | 63 | 42 |
| 101-150 | 0 | 36 | 25 | 58 | 25 | 0 | 100 | 75 | 84 | - | 0 | 27 | 17 | 12 | 0 |
| 151-200 | 0 | 7 | 0 | 34 | 0 | 0 | 0 | 0 | 16 | - | - | - | - | - | - |
| | REGION 2 | | | | | | | | | | | | | | |
| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 9 | 0 | 9 | 33 | 0 | 0 | 0 | 0 |
| 051-100 | 73 | 33 | 33 | 25 | 67 | 87 | 74 | 27 | 37 | 82 | 67 | 27 | 8 | 0 | 9 |
| 101-150 | 20 | 60 | 67 | 75 | 33 | 13 | 26 | 66 | 63 | 9 | 0 | 73 | 92 | 67 | 91 |
| 151-200 | 0 | 7 | 0 | 0 | 0 | - | - | - | - | - | 0 | 0 | 0 | 33 | 0 |
| | REGION 3 | | | | | | | | | | | | | | |
| Width | Normandin | | | | | Kapuskasing | | | | | | | | | |
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | | | | | |
| 001-050 | 0 | 0 | 0 | 9 | 0 | 36 | 7 | 0 | 0 | 0 | | | | | |
| 051-100 | 100 | 81 | 100 | 0 | 8 | 64 | 57 | 50 | 25 | 50 | | | | | |
| 101-150 | 0 | 19 | 0 | 91 | 75 | 0 | 36 | 50 | 75 | 50 | | | | | |
| 151-200 | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - | | | | | |

* Data were not collected in 1997.

# *Rosa* 'Morden Centennial'

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Morden Centennial Rose |
| **French common name:** | Rosier 'Morden Centennial' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This Parkland™ rose, of almost erect habit, can grow to 1.0–1.5 m high. It has two or three large canes growing from the base, making it look somewhat like a climbing rose.

With its glossy dark green leaves, it has some of the most attractive foliage in the series.

The semi-double, medium-pink flowers are clustered in corymbs and exude a mild fragrance. They consist of 40 petals and measure 7–8 cm in diameter. The cultivar flowers repeatedly throughout the growing season, particularly abundantly in June, August and September.

## ORIGIN AND DISTRIBUTION

*Rosa* 'Morden Centennial' is from a cross between 'Prairie Princess' and a hardy rose derived from 'White Bouquet', *Rosa assiniboine* and *R. arkansana*. Introduced in 1980, it commemorates the one-hundredth anniversary of the city of Morden celebrated the same year. In 1996, the cultivar received an award from the Canadian Society for Horticultural Sciences for its excellence as a cultivar and for making a significant contribution to the industry.

## USE

**Ornamental:** The cultivar can be used as a specimen plant or in mass plantings for its flowers and hips.

## REQUIREMENTS

In general, roses require a sunny spot; five to six hours of sunshine a day will allow the dew to evaporate from the foliage.

Most roses are adapted to different types of soil; they prefer soil rich in organic matter and will grow well in well-drained clay soil or sandy soil enriched with organic matter. For normal growth, a pH of 6.0–7.5 is required but the optimum pH is 6.5–6.8.

Training is required during the first few years after planting. After that, pruning is only required to remove winter-killed wood and renew old plants. If the snow cover is adequate, this hardy rose needs no other winter protection.

## DISEASES AND INSECTS

Information on the main pests and diseases affecting roses is provided in a special section of *Rusticité et Croissance de Plantes Ligneuses Ornementales au Québec*, Tome II. Annexe 1. Pathologie et ravageurs des rosiers (VR 221).

## PROPAGATION

Cultivars are propagated by grafts or cutting. Roses grown on their own roots are thought to be better adapted to winter conditions.

**Grafting:** Field-grown grafts are produced by t-budding. The rootstock is usually a *Rosa multiflora* seedling.

**Cutting:** Softwood cuttings are usually used. Treatment with a hormone rooting powder with 2500–6000 ppm IBA is recommended. Cuttings can also be dipped quickly (5 seconds) in a 4000 ppm IBA solution.

Rose cuttings are very susceptible to rot and special care must be taken to ensure the cleanliness of tools and worktables and use clean substrate and containers. A fungicide may be required when a mist unit is used.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Rose garden, Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** On July 17 and 30, 1991, 280 cuttings (15 cm) were taken from 13-year-old parent plants measuring roughly 1 m high and 0.5 m wide. They were dipped in a 4000 ppm IBA/50% ethanol solution and planted in plug trays in a perlite-Promix® mixture (1:1; v:v), under an automatic mist unit operating for 30 seconds every five minutes. The rooted cuttings were transplanted to shaded beds on August 26; the rooting rate was 75%. They were overwintered in cold frames. On June 15, 1992, they were potted up in Fertil Pot® containers and grown in outdoor beds. They were treated weekly with a soluble fertilizer (20-20-20, 400 ppm N) until September 15. They were overwintered in cold frames for the second winter and then wrapped and shipped in May 1993.

**Inclusion in testing network:** Young plants 15 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993–98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 6%, 9% and 10% of specimens died during the second, fourth and fifth winters. All plants had frost damage to the aerial portions above the snow cover the first and third winters. The second and fifth winters, 95% and 50% had frost damage to the previous year's shoots. The fourth winter, 9% froze down to the ground level and 82% were damaged by the weight of the snow. The last winter, 40% had frost damage to the branch tips.

At St. Clotilde, 13% of the roses died the second winter. Frost damage to the branch tips occurred in 100% and 30% the first two winters; the second and third winters, 47% and 100% had frost damage to the previous year's shoots.

At St. Hyacinthe, 25% of the roses died the second winter. The first four winters, frost damage to the branch tips was found in 30%, 40%, 57% and 38% of plants. The first, second and fourth winters, 70%, 35% and 50% froze down to the level of the snow cover. The last two winters, 13% had frost damage to the previous year's shoots.

*Region 2*

At Deschambault, 42%, 50%, 20% and 50% of plants died the first four winters. Over the five winters, 41%, 10%, 40%, 50% and 50% had frost damage to the previous year's shoots; the first three winters, frost damage to the branch tips occurred in 12%, 29% and 40%. In addition, the first two winters and last winter, 6%, 20% and 50% had damage to the entire aerial portion above the ground level.

At St. Foy, a single plant died the first winter. The fourth winter, 11% had frost damage down to the snow cover. Over the five winters of the trial, 65%, 95%, 44%, 83% and 33% had frost damage to the branch tips. Damage to the previous year's shoots occurred the first three and last winters in 5%, 5%, 22% and 28% of plants.

At La Pocatière, one plant died the third winter. The first three and last winters, 100%, 13%, 50% and 14% of plants had frost damage down to the snow cover. In addition, 25% had frost damage down to the ground the third winter. Frost damage to the branch tips occurred in roughly 75% of specimens the second and last two winters.

*Region 3*

At Normandin, 20% of plants died the second winter and 44% had frost damage down to the soil level the following winter. Frost damage down to the snow cover occurred in

60%, 80%, 56%, 89% and 100% of plants in each of the five winters. The first winter, 27% had frost damage to the branch tips.

At Kapuskasing, 40%, 11%, 25% and 50% of plants died the first four winters, leaving only three plants to be evaluated. Frost damage to the previous year's shoots occurred all five winters (53%, 67%, 38%, 50% and 50%). In addition, 7%, 22% and 37% had frost damage down to the ground the first three winters.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

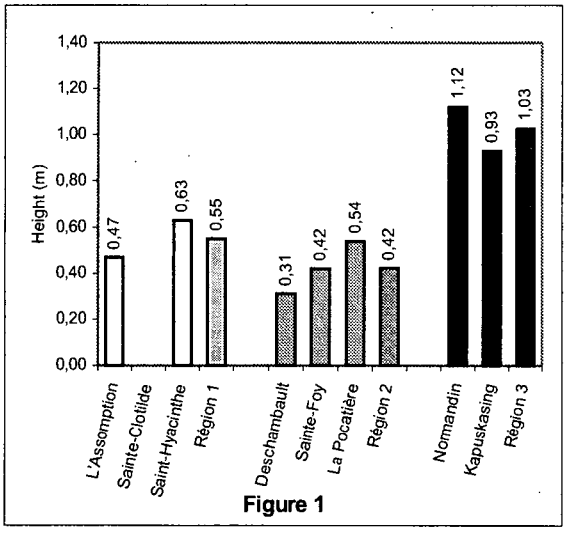


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

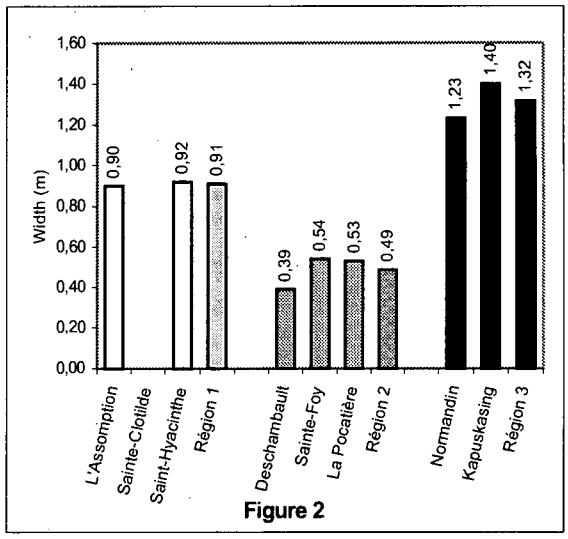


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

Pruning eliminating 30–80% of plants' height was done at all sites every spring.

### Flowering

The first flowers appeared in mid-June at region 1 sites, but not until late June or early July at the other sites.

The plants were in full bloom a week after the onset of flowering in all regions during all five years of the trials. Generally, the plants flowered repeatedly throughout the summer, with the last flowers appearing as late as mid-October.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Growth was quite variable from year to year, with winter damage reducing height every spring. After three growing seasons, 91% of the specimens at L'Assomption, 33% at St.

Clotilde and 45% at Normandin were over 81 cm. Plants that were not killed at Kapuskasing attained a similar height after five growing seasons. A significant decrease in height occurred the last year at the region 1 and 2 sites.

This cultivar requires particularly favourable soil conditions to get established and requires an abundant snow cover for protection, since mortality occurred throughout the five years of the trials, eliminating the weakest specimens over the years.

## HARDINESS EVALUATION

According to the hybridizer and the references consulted, the cultivar is hardy to zone 2. However, the rose was developed in western Canada and its cold, dry conditions. In eastern Canada, much mortality was observed, particularly in zone 4b near the St. Lawrence River (Deschambault) and in hardiness zone 2a. Therefore, the cultivar can survive as far as zone 2b, with the proviso that it must be protected by an adequate snow cover during the winter. Without adequate winter protection, it is likely to succumb anywhere in Quebec.

The intensity of winter damage means that roses must be cut back every spring to the level of the snow cover or close to the ground. Although the cultivar theoretically can grow to 1 m tall, only the roses at Normandin maintained this height until the end of the trial. The cultivar can therefore be used as far as zone 2b.

The young plants did not achieve their full ornamental potential at the sites tested.

**WRITTEN BY**

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Christine Galipeau, Biologist

**Table 1: Frequency of winter damage observed in *Rosa* 'Morden Centennial', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 0 | 8 | | 18 | | 40 | 2 | 5 | | | 27 | 100 |
| St. Clotilde | 0 | 47 | | 48 | | | | 5 | | | | 100 |
| St. Hyacinthe | 26 | 34 | | 3 | | 32 | | 5 | | | | 74 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 0 | 14 | | 38 | | | 16 | 32 | | | | 100 |
| St. Foy | 21 | 64 | | 12 | | 2 | | 1 | | | | 79 |
| La Pocatière | 6 | 43 | | | | 35 | 5 | 2 | | 9 | | 94 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 5 | 5 | | | | 77 | 8 | 5 | | | | 95 |
| Kapuskasing | 0 | | | 61 | | | 13 | 26 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3,5 or 9 occurred in the plants tested.

Table 2: Breakdown of *Rosa* 'Morden Centennial' specimens by saleable height category, 1993-97

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 44 | 7 | 0 | 0 | 40 | 73 | 25 | 0 | 30 | - | 90 | 50 | 11 | 0 | 0 |
| 041-080 | 56 | 88 | 9 | 37 | 60 | 27 | 50 | 67 | 20 | - | 10 | 50 | 45 | 75 | 88 |
| 081-120 | 0 | 5 | 18 | 44 | 0 | 0 | 25 | 33 | 40 | - | 0 | 0 | 33 | 25 | 12 |
| 121-160 | 0 | 0 | 73 | 19 | 0 | - | - | - | 10 | - | 0 | 0 | 11 | 0 | 0 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 90 | 80 | 50 | 100 | 80 | 31 | 33 | 22 | 44 | 44 | 12 | 0 | 0 | 0 |
| 041-080 | 0 | 10 | 20 | 25 | 0 | 20 | 69 | 67 | 50 | 56 | 56 | 63 | 88 | 72 | 100 |
| 081-120 | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 25 | 12 | 14 | 0 |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 11 | 0 | 0 | 0 | 0 | 14 | 0 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 67 | 33 | 0 | 0 | 0 | 87 | 45 | 38 | 0 | 0 |
| 041-080 | 33 | 67 | 55 | 0 | 0 | 13 | 55 | 62 | 83 | 0 |
| 081-120 | 0 | 0 | 45 | 100 | 100 | 0 | 0 | 0 | 17 | 100 |
| 121-160 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: Breakdown of *Rosa* 'Morden Centennial' specimens by saleable width category, 1993-97

| REGION 1 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 33 | 17 | 0 | 10 | 30 | 53 | 75 | 33 | 20 | - | 75 | 30 | 11 | 0 | 12 |
| 051-100 | 67 | 50 | 10 | 0 | 20 | 47 | 25 | 33 | 10 | - | 25 | 35 | 44 | 75 | 50 |
| 101-150 | 0 | 27 | 36 | 9 | 40 | 0 | 0 | 34 | 20 | - | 0 | 35 | 45 | 12 | 38 |
| 151-200 | 0 | 6 | 54 | 53 | 10 | 0 | 0 | 0 | 50 | - | 0 | 0 | 0 | 13 | 0 |
| 201-250 | 0 | 0 | 0 | 28 | 0 | - | - | - | - | - | - | - | - | - | - |
| **REGION 2** | | | | | | | | | | | | | | | |
| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 88 | 100 | 100 | 75 | 100 | 80 | 47 | 55 | 50 | 55 | 89 | 25 | 37 | 15 | 43 |
| 051-100 | 12 | 0 | 0 | 25 | 0 | 10 | 33 | 28 | 40 | 33 | 11 | 75 | 63 | 85 | 57 |
| 101-150 | - | - | - | - | - | 10 | 15 | 11 | 5 | 12 | - | - | - | - | - |
| 151-200 | - | - | - | - | - | 0 | 5 | 6 | 5 | 0 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| **REGION 3** | | | | | | | | | | | | | | | |
| Width | Normandin | | | | | Kapuskasing | | | | | | | | | |
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | | | | | |
| 001-050 | 67 | 14 | 0 | 0 | 0 | 87 | 55 | 25 | 0 | 0 | | | | | |
| 051-100 | 33 | 73 | 100 | 0 | 0 | 13 | 11 | 25 | 33 | 0 | | | | | |
| 101-150 | 0 | 13 | 0 | 66 | 100 | 0 | 33 | 50 | 33 | 67 | | | | | |
| 151-200 | 0 | 0 | 0 | 34 | 0 | 0 | 0 | 0 | 34 | 33 | | | | | |
| 201-250 | - | - | - | - | - | - | - | - | - | - | | | | | |

* No data were collected in 1997.

# *SALIX FRAGILIS* 'BULLATA

| | |
|---|---|
| **Family:** | Salicaceae |
| **English common name:** | Bullata Crack Willow |
| **French common name:** | Saule fragile 'Bullata' |
| **Synonym:** | *Salix fragilis sphaerica* Hryniewecki & Kodendza |
| **Category:** | Deciduous plant |
| **Subdivision:** | Medium-sized tree |

## BOTANICAL DESCRIPTION

This multi-stemmed shrub has a compact, globose habit. It reached 5.0 m in height and 4.0 m in width at the Roger Van den Hende Garden after 25 years' growth.

The thick, rough, light green bark furrows and turns blackish as it ages. The young shoots — smooth, shiny, olive green or brown — are easily broken off at the knots. The buds are gummy.

The leaves are lanceolate, with a long acumen, dentate, glandulous, slightly downy at the base then becoming glabrous; they are between 6 and 15 cm long and a quarter the width. The glandulous petiole is from 1.0 to 2.5 cm long with semi-cordiform dentate stipules that quickly fall. The light green, shiny leaves turn brownish yellow in the fall.

The slim, greenish catkins appear early, before leafing, in great quantities; the thicker male catkins measure 2 to 4 cm in length whereas the female catkins, thin and loose, are a little longer.

## ORIGIN AND DISTRIBUTION

The species *S. fragilis* L. comes from Europe and Western Asia. It is found near watercourses and has been grown since antiquity. It gets its name from its brittle shoots, which break off and litter the ground in anything of a wind. The 'Bullata' cultivar was created in Sweden around 1785.

## USE

**Ornamental:** This cultivar, more attractive than the rest of the species, may be used by itself or as part of a grouping in a large space for its distinctive look.

## REQUIREMENTS

Very hardy in Europe, this willow prefers deep clayey soil and thrives in full sun, in damp or even soggy places, close to the water.

## DISEASES AND INSECTS

Willows are affected by a number of fungal diseases, the most often met with being powdery mildew or oidium (*Uncinula* sp.), crown gall and rust (*Melamspora* sp.).

Willows are also attacked by a number of insect species. Those most often mentioned are the poplar borer (*Saperda calcarata*, *S. moesta* and *S. inornata*), spittlebugs, the willow flea weevil (*Rhynchaenus rufipes*), the imported willow leaf beetle (*Plagiodera versicolora*), the poplar-and-willow borer (*Cryptorhynchus lapathi*), the willow leaf beetle (*Calligrapha multipunctata bigsbyana*) and the Japanese beetle (*Popillia japonica*).

## PROPAGATION

**Cutting:** Hardwood cuttings, taken in spring or fall, offer so easy a propagation method that there is hardly any point in using other methods.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** Three hundred and ninety-eight cuttings about 15 cm long were taken on June 22, 1992 from parent plants about 25 years old. They were soaked for 5 seconds in a 4000-ppm IBA / 50% ethanol solution, then washed in tapwater. They were then dipped in a

fungicidal solution based on Benomyl-Captan®, misted under a Mist-A-Matic® and replanted in compartments filled with peat and perlite (2:3; v:v). Rooting was 96% after 50 days. The misting was stopped at the beginning of August and the plants fertilized with a soluble fertilizer (20-20-20, 200 ppm nitrogen) every week until mid-September. In November, they were taken out of compartments and placed in cold storage at -2°C in plastic bags perforated with a straight pin. In May 1993, they were potted up in Fertil Pots® on a substrate of peat and perlite (3:2; v:v) and placed in a tunnel greenhouse for about a month, then taken outside and planted in slightly shaded coldframes. They were fertilized every week with a soluble fertilizer (20-20-20, 200 ppm nitrogen) until the end of September. They spent the winter outside under a thick layer of snow. At the beginning of May 1994, they were packed and placed in cold storage at 4°C, then shipped a few days later.

**Inclusion in testing network:** Young plants 20 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-1999)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of the main damage that occurred each winter at each of the sites are shown below.

There was little winter damage to this cultivar and no mortality was observed during the trial.

*Region 1*

In L'Assomption, there was frost damage to the stem tips of 19 and 92% of the seedlings the first and fourth winters.

No damage occurred at the St. Clotilde and St. Hyacinthe sites.

*Region 2*

Mechanical breakage was observed on 50 and 18% of the seedlings the third and fourth winters in Deschambault.

In St. Foy, 43% of the seedlings suffered frost damage to stem tips the first winter and 50% of the shrubs suffered mechanical breakage the third winter.

No damage occurred in La Pocatière.

*Region 3*

In Normandin, 25% of the seedlings sustained mechanical breakage the third winter. The last winter, 17% of the seedlings showed frost damage to the previous year's shoots and 25% of the seedlings had frost damage to old wood.

No damage occurred in Kapuskasing.

### Height and width growth

Figures 1 and 2 show the average height and width of specimens after five years of trials at each site in each of the regions.

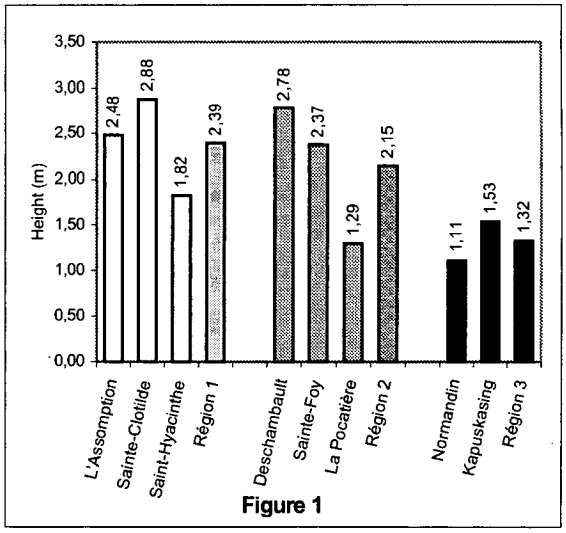


**Figure 1.** Average height of shrubs at trial's end for each of the eight sites and each of the three regions

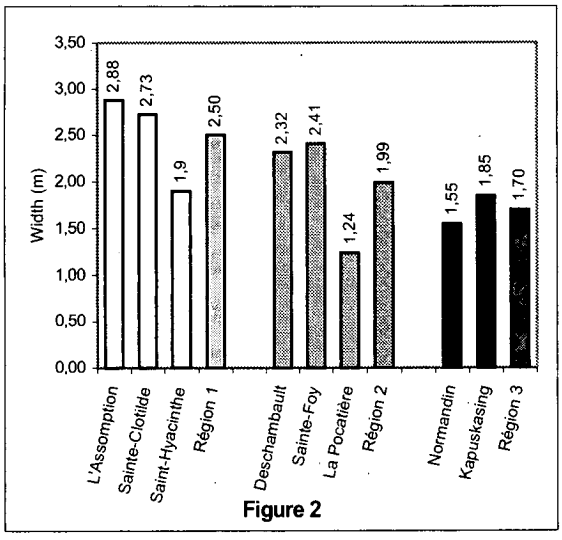


**Figure 2.** Average width of shrubs at trial's end for each of the eight sites and each of the three regions

### Effect of pruning

Light pruning was done at the L'Assomption and St. Foy sites. Somewhat more drastic pruning, removing between 20 and 50% of the total height of the seedlings, was done at the Deschambault and Normandin sites.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height or width.

The results showed that the growth of this cultivar is directly related to the length of the growing season, the biggest seedlings being in zone 5b, in St. Clotilde. Again, shrub growth was almost zero at the St. Hyacinthe site the last three years, so severe was the insect infestation on the foliage.

Production of this cultivar is very quick at sites in region 1, where all seedlings reached a height between 1.01 and 2.00 m after two years' growth. At sites in climatic zone 4b, it took another year for seedlings of comparable height to be obtained, and still another year of growth after that in zone 2, where growth was clearly less.

## HARDINESS EVALUATION

This species' hardiness rating varies from zone 3b to zone 5b depending on the authors of the references consulted, but no rating is given for the particular cultivar in Quebec.

The evaluation results at the various sites and in the various climatic zones clearly show that survival of this cultivar is assured in zone 2a as well as at all trial sites.

Its use potential extends to the same zones, with the proviso that in zones 2a, 2b and 4a, growth slows as of the third year.

The cultivar's full ornamental character is shown in zone 5 if quick growth is considered to be one of the desired characteristics for this cultivar.

## WRITTEN BY

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**Table 1.** **Frequency of winter damage observed on *Salix fragilis* 'Bullata', 1995-1999**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 78 | 22 | | | | | | | | | | 22 |
| St. Clotilde | 100 | | | | | | | | | | | 0 |
| St. Hyacinthe | 100 | | | | | | | | | | | 0 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 86 | | | | | | | | | 14 | | 14 |
| St. Foy | 81 | 9 | | | | | | | | 10 | | 19 |
| La Pocatière | 100 | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 87 | | | 3 | 5 | | | | | 5 | | 13 |
| Kapuskasing | 100 | | | | | | | | | | | 0 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3, 6, 7, 8, 9 or 11 was sustained by the specimens in the trial.

**Table 2.** **Breakdown of specimens of *Salix fragilis* 'Bullata' by saleable height category, 1994-1998**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 100 | 0 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 29 | 0 | 0 | 0 |
| 101-200 | 0 | 90 | 58 | 58 | 0 | 0 | 62 | 34 | 0 | 0 | 0 | 71 | 100 | 100 | 100 |
| 201-300 | 0 | 10 | 42 | 42 | 100 | 0 | 38 | 66 | 100 | 66 | - | - | - | - | - |
| 301-400 | - | - | - | - | - | 0 | 0 | 0 | 0 | 34 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 100 | 24 | 0 | 0 | 0 | 100 | 43 | 0 | 0 | 0 | 100 | 100 | 92 | 25 | 0 |
| 101-200 | 0 | 76 | 83 | 17 | 0 | 0 | 57 | 100 | 75 | 8 | 0 | 0 | 8 | 75 | 100 |
| 201-300 | 0 | 0 | 17 | 83 | 92 | 0 | 0 | 0 | 25 | 92 | - | - | - | - | - |
| 301-400 | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 100 | 85 | 50 | 75 | 8 | 100 | 95 | 42 | 0 | 0 |
| 101-200 | 0 | 15 | 50 | 25 | 92 | 0 | 5 | 58 | 100 | 100 |
| 201-300 | - | - | - | - | - | - | - | - | - | - |
| 301-400 | - | - | - | - | - | - | - | - | - | - |

Table 3. **Breakdown of specimens of *Salix fragilis* 'Bullata' by saleable width category, 1994-1998**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 100 | 5 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 76 | 0 | 0 | 0 |
| 101-200 | 0 | 95 | 100 | 17 | 0 | 0 | 95 | 42 | 0 | 0 | 0 | 24 | 100 | 100 | 75 |
| 201-300 | 0 | 0 | 0 | 83 | 83 | 0 | 5 | 58 | 67 | 67 | 0 | 0 | 0 | 0 | 25 |
| 301-400 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 33 | 33 | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 100 | 62 | 0 | 0 | 0 | 100 | 14 | 0 | 0 | 0 | 100 | 100 | 83 | 8 | 0 |
| 101-200 | 0 | 38 | 100 | 42 | 17 | 0 | 86 | 92 | 100 | 66 | 0 | 0 | 17 | 92 | 100 |
| 201-300 | 0 | 0 | 0 | 58 | 83 | 0 | 0 | 8 | 0 | 34 | - | - | - | - | - |
| 301-400 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-100 | 100 | 48 | 0 | 17 | 0 | 100 | 76 | 8 | 0 | 0 |
| 101-200 | 0 | 52 | 100 | 83 | 100 | 0 | 24 | 92 | 92 | 92 |
| 201-300 | - | - | - | - | - | 0 | 0 | 0 | 8 | 8 |
| 301-400 | - | - | - | - | - | - | - | - | - | - |

# *SPIREA HYPERICIFOLIA* 'OBOVATA'

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Spiraea |
| **French common name:** | Spirée à feuilles de millepertuis |
| **Synonym:** | *Spiraea hypericifolia* var. *obovata* (Waldst. & Kit.) Maxim., *S. acutifolia* Willd. |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub, with a bushy growth habit and upright, gracefully arching branches, may reach 1.0 m in height and width.

Its obovate leaves, rounded and slightly crenate at the apex, light green, almost sessile, with sharp (rarely blunt) tips, are from 2.0 to 3.5 cm long and have 3 to 5 downy, greyish pinnate veins.

Its white axillary flowers appear each spring to the previous year's shoots. They grow in clusters of 4 to 8, in dense umbels all along the shoot, and are 5 mm in diameter. The umbels, almost always sessile, are carried on downy pedicels. The rounded petals, barely longer than the stamens, produce flowers toward mid-May.

## ORIGIN AND DISTRIBUTION

The word "spirea" is said to come from the Latinized Greek word speira meaning garland. The species *Spiraea hypericifolia* L. is native to Eastern and Central Europe and southwestern Siberia. It was discovered in the 18th century and introduced in 1800. This is one of the first spireas to bloom in the spring. No information was found on the origin of the cultivar.

## USE

**Ornamental:** This spirea may be grown by itself or in massed plantings for its shape and its early, abundant flowering.

## REQUIREMENTS

This cultivar prefers sunny spots and cool, fertile, well-drained soils, but it is tolerant of poor soil and drought. It is easily transplanted. Pruning is done after flowering is finished, as the flowers appear on the previous year's wood.

## DISEASES AND INSECTS

The main disease met with in growing spireas is powdery mildew, which appears as light brown spots on the leaf tops. Spireas may be affected by the fire blight and by *Septoria* leaf spot.

The spirea aphid (*Aphis spiraecola*) appears in late June or early July. These green aphids infest the young shoots as well as the inflorescences. Nematodes too attack spireas, but spittlebugs are the only insects that cause severe damage.

## PROPAGATION

**Cutting:** Cuttings with leaves root quickly; the softer they are, the more easily they root. A medium of perlite and peat is recommended.

The semi-hardwood cuttings taken just before flowering are processed with a 4000-ppm IBA hormone solution and misted. At the end of 2 to 4 weeks, the roots are about 2 cm long.

Hardwood cuttings are taken after the leaves fall. Clustered in packages of 25, they are soaked in IBA (8000 ppm) and kept in sand at a temperature of about 3°C. In the spring they are replanted one by one before the buds swell, half of the cutting being buried in the soil.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Fruticetum, Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Four hundred 25-cm cuttings were taken on July 23, 1993 from parent plants 3 years old measuring 65 cm in height. They were soaked in a 4000-ppm IBA / 50% ethanol solution, placed in multipots filled with perlite and Promix® (1:1; v:v), then misted for 30 seconds every 5 minutes. The rooted cuttings were placed in shaded beds at the beginning of September; the rooting rate was 80%. The seedlings were overwintered in beds protected by a winter cover of Astro-Foam® and panels. The rate of winter survival was 100%. They were packed and shipped in May 1993.

**Inclusion in testing network:** Young plants 5 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-1999)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of the main damage that occurred each winter at each of the sites are shown below.

A lot of damage and mortality was seen with this spirea. All seedlings died on planting in St. Clotilde, while they all died during the first winter in Kapuskasing. One seedling died in St. Foy, 2 in St. Hyacinthe, 5 in L'Assomption, 8 in Normandin, 14 in Deschambault and 15 in La Pocatière.

*Region 1*

In L'Assomption, 10% of the seedlings died each of the first three winters. Frost damage to stem tips was observed the first three winters and the last on 63, 88, 30 and 22% of the seedlings. In addition, 50% of the seedlings showed frost damage to the stems above the snow cover and 10% sustained mechanical breakage the third winter. The following winter, all the seedlings froze on old wood. Rodent damage was observed on 67% of the seedlings the last winter.

All the seedlings died on planting in St. Clotilde.

In St. Hyacinthe, 6% of the seedlings died each of the first two winters, while 94, 18 and 64% suffered frost damage to their stem tips the first three winters.

*Region 2*

In Deschambault, 59, 28 and 40% of the seedlings died the first two winters and the fourth. Frost damage to the previous year's shoots occurred the first four winters on 41, 28, 40 and 60% of the seedlings. In addition, 20% sustained mechanical breakage the third winter.

In St. Foy, one seedling died the third winter and 75% of the seedlings sustained mechanical breakage. The first and fourth winters, 80 and 64% had damage to their stem tips. Twenty percent had freezing of the previous year's shoots the first winter.

In La Pocatière, 55, 37 and 50% of the seedlings died the first two winters and the fourth. There was frost damage to the previous year's shoots on 17 and 50% of the seedlings the first two winters, while 27 and 12% froze down to the ground. The third and fourth winters, 100 and 50% of the seedlings suffered frost damage to stem tips. The following winter, the previous year's shoots froze on half of the seedlings; the other half froze down to the snow cover.

*Region 3*

In Normandin, 21, 37 and 20% of the seedlings died the second and the last two winters. In addition, 12% of the seedlings sustained mechanical breakage the third winter and the previous year's shoots froze the last winter on 20% of them.

All the seedlings died the first winter in Kapuskasing.

### Height and width growth

Figures 1 and 2 show the average height and width of specimens after five years of trials at each site in each of the regions.

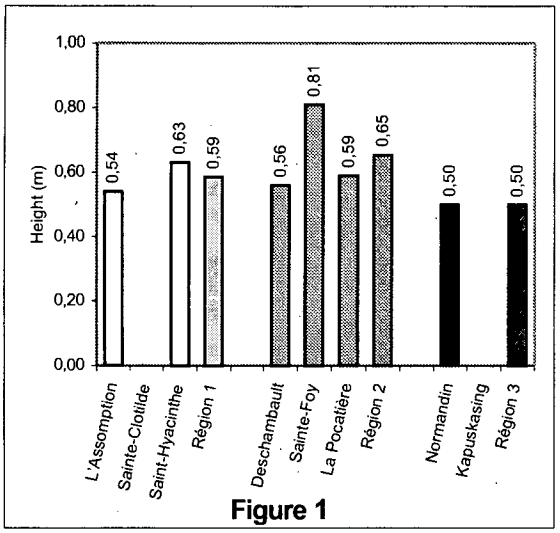


**Figure 1.** Average height of shrubs at trial's end for each of the sites and each of the three regions

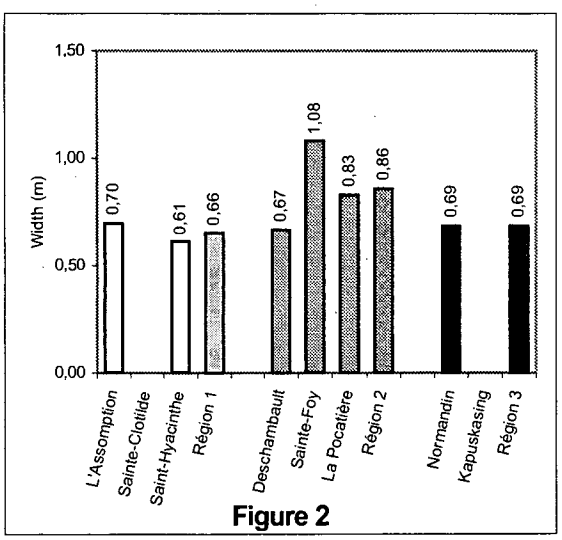


**Figure 2.** Average width of shrubs at trial's end for each of the sites and each of the three regions

### Effect of pruning

Pruning was carried out at all sites, removing between 30 and 70% of the seedlings' height.

### Flowering

The flowering of plants of this species is very different from one climatic zone to another. First, at the warmest site (zone 5b) and the coldest one (zone 2a) no flowering occurred. In zone 2b, a few seedlings flowered twice, for about 20 days only. The longest period of bloom was observed at the site in zone 5a (L'Assomption), where all seedlings flowered each summer for 36 to 10 days, the period of bloom being shorter the older the plant. In climatic zone 4, the average duration of the period of bloom was 28 days in St. Foy (zone 4b) and 20 days in Deschambault (zone 4b) and La Pocatière (zone 4a); all seedlings flowered at the first site, whereas only a few seedlings produced flowers at the two other sites.

The flowers appeared at all sites between May 15 and 23, with a few exceptions.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

Recovery after transplantation was difficult at the L'Assomption site, where the soil was more clayey. The root system of young seedlings may have required more care than is recommended for all plants in the trial plot.

The tallest specimens were those at the St. Foy site, in zone 4b, where the snow protects the seedlings each winter, without melting. Serious pruning reduced the final height of the seedlings the last year at the Deschambault

(zone 4a) and Normandin (zone 2b) sites, showing that the damage can be very significant on well-established plants.

This spirea can be grown in Quebec, but the winter damage will require drastic pruning that will significantly reduce spring flowering.

## HARDINESS EVALUATION

The hardiness rating assigned by Rehder corresponds to US zone 4 (Canadian zone 5). Except at the St. Foy site, many seedlings died at sites in zones 2a, 2b, 4a and 4b. The survival rating of this spirea is therefore zone 5, the mortality rate being too high in the other zones. The fact that many seedlings succumbed during the last winters shows that the plant is not well adapted to conditions and that its resistance weakens over time.

It is possible to grow this plant at sites in zone 5, with the proviso that, even though seedlings survived at sites in zones 4a and 4b, there may be high mortality in a hard winter. The plant may have done well for some years but, when too hard a winter comes along, or snow that is too little, too late or melts during the coldest months, they are sure to die.

This plant's ornamental character was not fully expressed at the trial sites.

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Table 1. **Frequency of winter damage observed on *Spiraea hypericifolia* 'Obovata', 1995-1999**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 7 | 41 | | | 20 | 10 | | 7 | | | 15 | 93 |
| St. Clotilde | - | | | | | | | | | | | - |
| St. Hyacinthe | 63 | 35 | | | | | | 2 | | | | 37 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 0 | 37 | | 34 | | | | 25 | | 4 | | 100 |
| St. Foy | 51 | 28 | | 4 | | | | 3 | | 14 | | 49 |
| La Pocatière | 0 | 30 | | 23 | | 10 | 8 | 29 | | | | 100 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 78 | | | 4 | | | | 14 | | 4 | | 22 |
| Kapuskasing | - | | | | | | | | | | | - |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3 or 9 was sustained by the plants in the trial.

Table 2. **Breakdown of specimens of *Spiraea hypericifolia* 'Obovata' by saleable height category, 1994-1998**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 74 | 0 | 0 | 0 | 0 | - | - | - | - | - | 100 | 6 | 0 | 0 | 0 |
| 021-040 | 26 | 29 | 20 | 11 | 0 | - | - | - | - | - | 0 | 53 | 9 | 0 | 0 |
| 041-060 | 0 | 65 | 40 | 11 | 22 | - | - | - | - | - | 0 | 41 | 91 | 27 | 18 |
| 061-080 | 0 | 6 | 40 | 78 | 44 | - | - | - | - | - | 0 | 0 | 0 | 64 | 73 |
| 081-100 | 0 | 0 | 0 | 0 | 34 | - | - | - | - | - | 0 | 0 | 0 | 9 | 9 |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 47 | 0 | 0 | 20 | 0 | 47 | 0 | 0 | 0 | 0 | 61 | 12 | 0 | 0 | 0 |
| 021-040 | 53 | 57 | 20 | 0 | 33 | 53 | 20 | 0 | 0 | 0 | 39 | 50 | 25 | 50 | 0 |
| 041-060 | 0 | 43 | 80 | 60 | 33 | 0 | 73 | 25 | 27 | 10 | 0 | 38 | 50 | 25 | 50 |
| 061-080 | 0 | 0 | 0 | 20 | 34 | 0 | 7 | 50 | 46 | 35 | 0 | 0 | 25 | 25 | 50 |
| 081-100 | - | - | - | - | - | 0 | 0 | 25 | 27 | 18 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | 0 | 0 | 0 | 0 | 37 | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 79 | 0 | 0 | 0 | 20 | 100 | - | - | - | - |
| 021-040 | 21 | 74 | 50 | 50 | 40 | - | - | - | - | - |
| 041-060 | 0 | 26 | 50 | 38 | 40 | - | - | - | - | - |
| 061-080 | 0 | 0 | 0 | 12 | 0 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

Table 3. **Breakdown of specimens of *Spiraea hypericifolia* 'Obovata' by saleable width category, 1994-1998**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 29 | 29 | 22 | 23 | - | - | - | - | - | 100 | 83 | 18 | 10 | 0 |
| 041-080 | 0 | 71 | 71 | 68 | 22 | - | - | - | - | - | 0 | 17 | 82 | 81 | 81 |
| 081-120 | 0 | 0 | 0 | 10 | 55 | - | - | - | - | - | 0 | 0 | 0 | 9 | 19 |
| 121-160 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 14 | 0 | 20 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 50 | 0 | 0 | 0 |
| 041-080 | 0 | 86 | 100 | 60 | 100 | 0 | 53 | 8 | 9 | 10 | 0 | 50 | 100 | 75 | 50 |
| 081-120 | 0 | 0 | 0 | 20 | 0 | 0 | 47 | 92 | 91 | 36 | 0 | 0 | 0 | 25 | 50 |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 0 | 54 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 21 | 37 | 0 | 20 | 100 | 0 | 0 | 0 | 0 |
| 041-080 | 0 | 79 | 63 | 87 | 80 | - | - | - | - | - |
| 081-120 | 0 | 0 | 0 | 13 | 0 | - | - | - | - | - |
| 121-160 | - | - | - | - | - | - | - | - | - | - |

# *SPIREA JAPONICA* 'CRISPA'

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Bumalda Spirea, Twist Spirea |
| **French common name:** | Spirée crispée du Japon |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This small, bushy, compact and rounded shrub may reach 0.6 m in height and width. It is slow-growing.

The oval leaves, which have this cultivar's characteristic twisted appearance, have a laciniate border and are from 5 to 10 cm long. At first they are red, some variegated with pinkish white, but then turn dark green and remain green in the fall.

The bright carmine rose flowers, which are gathered in flattened corymbs 15 cm in diameter, appear in summer at the tips of the shoots or sometimes along their length. The very showy bloom extends over several weeks from June to September.

The roots are fine and numerous.

## ORIGIN AND DISTRIBUTION

The word "spirea" is said to come from the Latinized Greek word speira meaning garland. This cultivar is of horticultural origin, as it was developed by Hesse in 1923.

## USE

**Ornamental:** The attractions of this cultivar are its shape, texture, foliage and bloom. It is used as part of a grouping, in massed plantings or in large rock gardens.

## REQUIREMENTS

This cultivar prefers a sunny spot, with cool, fertile, well-drained soil, but is tolerant of poor soil and drought. It recovers easily upon transplantation. Pruning is done in the spring, when the first buds appear, and the plant must be cut short.

## DISEASES AND INSECTS

The main illness met with in growing this spirea is powdery mildew, which takes the form of light brown spots on the leaf tops. Spireas may be affected by fire blight and *Septoria* leaf spot.

The spirea aphid (*Aphis spiraecola*) appears in later June or early July. These green aphids infest the young shoots and inflorescences. Nematodes too attack spireas, but spittlebugs are the only insects to cause severe damage.

## PROPAGATION

**Cutting:** Leafed cuttings root quickly; the softer they are, the easier the rooting. A medium of perlite and peat is recommended.

Semi-hardwood cuttings taken just before flowering are processed with a 4000-ppm IBA hormone solution and misted. At the end of 2 to 4 weeks, the roots measure some 2 cm in length.

Hardwood cuttings are taken after the leaves fall. In bunches of 25, they are soaked in IBA (8000 ppm) and kept in sand at a temperature of about 3°C. In the spring they are replanted one by one before the buds swell, half the cutting being buried in the soil.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** A gift from the Dominique Savio nursery in St. Jean Baptiste de Rouville, Quebec.

**Propagation site:** Agriculture and Agri-Food Canada research farm in L'Assomption, Quebec

**Propagation technique:** Four hundred and eighty 5- to 7-cm cuttings were taken on July 7, 1993 from parent plants about 3 years old measuring 50 cm tall and 30 cm wide. They were soaked for 5 seconds in a 5000-ppm IBA / 50%

ethanol solution, misted (Mist-A-Matic®) and planted in flats filled with of Promix® and Turface® (1:2; v:v). The rooting rate was 100% after 21 days. Some of the seedlings were potted up in 10-cm plastic containers while others were kept in the rooting containers. They were placed in outdoor beds and fertilized with a soluble fertilizer (20-20-20, 200 ppm nitrogen) until mid-August. In November they were placed in cold storage at 5°C. The plants budded in the cold room in late April 1994 and were transferred to the greenhouse. In May they were packed and shipped a few days later.

**Inclusion in testing network:** Young plants 8 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-1999)

### Winter damage

Table 1 shows the observed frequency, over five years, of winter damage to this cultivar. The details of the main damage that occurred each winter at each of the sites are shown below.

All the seedlings died during the trial at the L'Assomption and Kapuskasing sites.

*Region 1*

In L'Assomption, 24, 20, 86 and 100% of the seedlings died during the first four winters. In addition, 80% of the surviving seedlings froze down to the snow cover the second winter and 14% froze down to the ground the third winter.

In St. Clotilde, the first three winters, between 30 and 35% of the seedlings had frost damage to their stem tips and the rest had freezing of the previous year's shoots. In addition, 40% of the seedlings suffered damage to old wood and 60% to the previous year's shoots during the last winter.

In St. Hyacinthe, 10% of the seedlings died each of the second, third and fourth winters, while 100, 29 and 90% of the seedlings showed frost damage to stem tips the first three winters.

*Region 2*

In Deschambault, 17 and 10% of the seedlings died the second and third winters. Frost damage to stem tips was observed each winter on 41, 70, 64, 60 and 90% of the seedlings. In addition, frost damage to the previous year's shoots occurred on 58, 12, 40 and 10% of the seedlings the first two and last two winters. During the third winter, 10% of the seedlings sustained mechanical breakage.

In St. Foy, 6 and 7% of the seedlings died the first two winters and 21 and 7% of the seedlings showed freezing of the previous year's shoots. The first three winters, 73, 14 and 30% of the seedlings had frost damage to their stem tips.

In La Pocatière, two seedlings died the second winter and another the fourth winter, while 47, 80, 100, 89 and 38% of the seedlings showed frost damage to stem tips each winter. In addition, 53% of the seedlings had frost damage to the previous year's shoots the first winter. The following winter, one seedling froze right to the ground.

*Region 3*

In Normandin, 31, 27 and 10% of the seedlings died during the first three winters. In addition, 36% froze down to the ground the second winter.

All the seedlings died the first winter in Kapuskasing.

### Height and width growth

Figures 1 and 2 show the average height and width of specimens after five years of trials at each site in each of the regions.

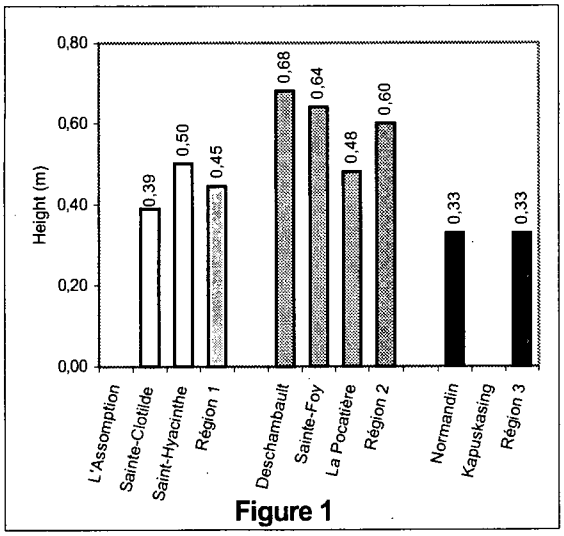


**Figure 1.** Average height of shrubs at trial's end for each of the sites and each of the three regions

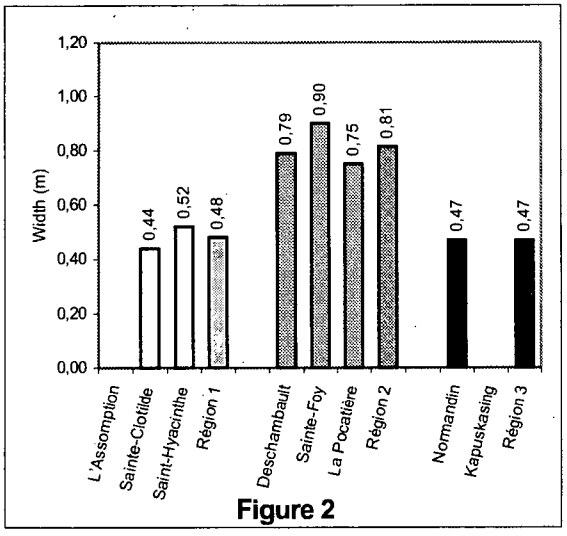


**Figure 2.** Average width of shrubs at trial's end for each of the sites and each of the three regions

### Effect of pruning

Extensive pruning was done at the Normandin, La Pocatière, Deschambault, St. Foy and St. Hyacinthe sites because of the frost damage to above-ground stems or those emerging from the snow cover, a total of 2 to 4 times during the trial. Removal of 50 to 90% of the total height of the seedlings considerably slowed their growth.

### Flowering

Flowers appear on the current year's shoots, so that there is annual flowering in spite of the severe pruning done each spring. They do however appear somewhat late, and the flowering period is considerably shorter.

The average flowering period is 80 to 95 days, but can be as little as 50 or as much as 120 days.

At sites in zones 5a and 5b, the flowers open between June 26 and 29 and flowering ends, depending on the year, between September 15 and October 1. At sites in zone 4, the flowers open between July 7 and 15, or to 15 days later, and the flowering period ends about September 20. In zone 2b, the first flowers were observed between July 18 and 25 and the flowering lasted from 40 to 50 days depending on the year.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

The seedlings' recovery on transplantation was excellent, possibly because they had been mounded.

Growth in height was impressive at the Deschambault site, as seedlings gained in height each year, reaching 1.0 m by trial's end. It is possible to grown this cultivar where snow protects the plants all winter, with the proviso that extensive damage will require substantial annual pruning.

## HARDINESS EVALUATION

The hardiness rating in the literature for this cultivar is zone 3. Winter survival is closely related to the presence of snow as well as to the harshness of the climate. Many seedlings died the first two winters at all sites in region 1 (especially at 5a sites), as well as at sites in zones 4a, 4b

and 2b. This cultivar's survival potential is uncertain in all climatic zones when the seedlings are young and fragile. However, adult plants do survive at sites in zones 2b, 4a, 4b and 5a despite often very extensive winter damage, especially when the plants are uncovered.

This spirea's usefulness is limited to zones 4 and 5, as the extensive damage in the absence of snow necessitates severe pruning in the spring. In contrast, flowering did occur even in zone 2b.

The shrub's ornamental character was not fully expressed at the trial sites.

**WRITTEN BY**

Claude Richer, Agr.

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Christine Galipeau, Biol.

**Table 1. Frequency of winter damage observed on *Spiraea japonica* 'Crispa', 1995-1999**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 0 | 19 | | | | 20 | 3 | 58 | | | | 100 |
| St. Clotilde | 19 | 20 | | 54 | 7 | | | | | | | 81 |
| St. Hyacinthe | 50 | 44 | | | | | | 6 | | | | 50 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 3 | 65 | | 25 | | | | 5 | | 2 | | 97 |
| St. Foy | 68 | 23 | | 5 | | | | 4 | | | | 32 |
| La Pocatière | 12 | 71 | | 10 | | | 1 | 6 | | | | 88 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 77 | | | | | | 7 | 16 | | | | 33 |
| Kapuskasing | 0 | | | | | | | 100 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3, 9 and 11 was sustained by the plants in the trial.

Table 2. Breakdown of specimens of *Spiraea japonica* 'Crispa' by saleable height category, 1994-1998

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 76 | 0 | 33 | 0 | - | 80 | 0 | 0 | 14 | 0 | 95 | 0 | 0 | 11 | 0 |
| 021-040 | 24 | 75 | 50 | 100 | - | 20 | 5 | 84 | 42 | 80 | 5 | 86 | 60 | 34 | 25 |
| 041-060 | 0 | 25 | 17 | 0 | - | 0 | 95 | 0 | 44 | 20 | 0 | 14 | 40 | 44 | 62 |
| 061-080 | - | - | - | - | - | 0 | 0 | 16 | 0 | 0 | 0 | 0 | 0 | 11 | 13 |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 83 | 12 | 0 | 0 | 0 | 60 | 28 | 0 | 0 | 0 | 74 | 0 | 0 | 0 | 0 |
| 021-040 | 17 | 88 | 18 | 10 | 0 | 40 | 28 | 10 | 60 | 10 | 26 | 100 | 44 | 34 | 25 |
| 041-060 | 0 | 0 | 64 | 50 | 10 | 0 | 44 | 20 | 20 | 70 | 0 | 0 | 56 | 66 | 75 |
| 061-080 | 0 | 0 | 18 | 40 | 60 | 0 | 0 | 70 | 20 | 20 | - | - | - | - | - |
| 081-100 | 0 | 0 | 0 | 0 | 30 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 100 | 10 | 20 | 0 | 25 | 100 | - | - | - | - |
| 021-040 | 0 | 72 | 80 | 75 | 50 | - | - | - | - | - |
| 041-060 | 0 | 18 | 0 | 25 | 25 | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |

Table 3. **Breakdown of specimens of *Spiraea japonica* 'Crispa' by saleable width category, 1994-1998**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ( cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 94 | 66 | 100 | - | 100 | 5 | 58 | 72 | 80 | 100 | 100 | 40 | 33 | 12 |
| 041-080 | 0 | 6 | 34 | 0 | - | 0 | 95 | 25 | 28 | 20 | 0 | 0 | 60 | 67 | 88 |
| 081-120 | - | - | - | - | - | 0 | 0 | 17 | 0 | 0 | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ( cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 77 | 18 | 10 | 0 | 100 | 35 | 10 | 0 | 0 | 100 | 27 | 11 | 0 | 13 |
| 041-080 | 0 | 23 | 82 | 80 | 60 | 0 | 65 | 40 | 70 | 0 | 0 | 73 | 78 | 77 | 50 |
| 081-120 | 0 | 0 | 0 | 10 | 40 | 0 | 0 | 50 | 30 | 100 | 0 | 0 | 11 | 23 | 37 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ( cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 73 | 100 | 50 | 25 | 100 | - | - | - | - |
| 041-080 | 0 | 27 | 0 | 50 | 75 | - | - | - | - | - |
| 081-120 | - | - | - | - | - | - | - | - | - | - |

# *SPIREA NIPPONICA* VAR. *TOSAENSISS* (YATABE) MAK.

| | |
|---|---|
| **Family:** | Rosaceae |
| **English common name:** | Nippon Spiraea, Japanese Spiraea |
| **French common name:** | Spirée du Japon |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This compact shrub, with an upright growth habit, upright branches and arching, reddish brown shoots, may reach 1.5 m in height and width. Its rate of growth is average.

The foliage is dark green above with a bluish green colour below. The entire leaves, oblong-lanceolate to oblong-obovate and sometimes crenate at the apex, are from 1 to 3 cm long.

When in bloom, this small shrub looks like a mound of snow. The abundant white flowers, clustered in dense umbels, appear in May or June on the previous year's shoots and invade the upper part of the shoots, concealing practically all the foliage.

## ORIGIN AND DISTRIBUTION

The word "spirea" is said to come from the Latinized Greek *speira* meaning garland. This variety was introduced in Japan, where it has been grown since 1935. Some of the references consulted include this variety with the cultivar *S. japonica* 'Snowmound' but do indicate that it is more resistant to cold.

## USE

**Ornamental:** This variety is grown for its spectacular blossom. It is used in massed plantings or hedges.

## REQUIREMENTS

This full-sun variety is tolerant of poor soil but prefers cool, fertile, well drained soil. It is drought-tolerant and transplants well if grown in pots. Pruning is often necessary after flowering.

## DISEASES AND INSECTS

The main illness met with in growing this spirea is powdery mildew, which appears as light brown spots on the leaf tops. Spireas may also be affected by fire blight and *Septoria* leaf spot.

The spirea aphid (*Aphis spiraecola*) appears in late June or early July. These green aphids infest the young shoots and inflorescences. Nematodes too attack spireas, but of all the insects it harbours spittlebugs are the only ones to cause severe damage.

## PROPAGATION

**Cutting**: Leafy cuttings will root quickly; the softer they are, the easier the rooting. A medium of perlite and peat is recommended.

Semi-hardwood cuttings taken just before flowering are treated with a 4000-ppm IBA hormone solution and misted. After 2 to 4 weeks, the roots are about 2 cm in length.

Hardwood cuttings are taken after leaf-fall. Clustered in packages of 25, they are soaked in IBA (8000 ppm) and kept in sand at a temperature of about 3°C. In the spring they are replanted one by one before budburst, half of the cutting being buried in the soil.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Fruticetum, Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Four hundred 15-cm cuttings were taken on July 17, 1992 from parent plants 3 years old and 50 cm tall. They were soaked in a 4000-ppm IBA / 50% ethanol solution, placed in multipots filled with perlite and Promix® (1:1; v:v), then misted for 30 seconds every 6 minutes. The rooted cuttings were placed in shaded beds at the beginning of September; the rooting rate was 100%. The seedlings were potted up on June 20, 1993 in Fertil Pots® and cultivated in outdoor beds. During the summer they were fertilized every week with a soluble fertilizer (20-20-20, 400 ppm nitrogen). They were overwintered in beds protected by an Astro-Foam® winter cover and panels; the rate of winter survival was 80%. They were packed and shipped in May 1994.

**Inclusion in testing network:** Young plants 14 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-1999)

### Winter damage

The frequency of winter damage observed over five years on this variety is shown in Table 1. Details of the main damage that occurred each winter at each of the sites are shown below.

There was mortality at almost all sites.

*Region 1*

In L'Assomption, 17% of the seedlings died the fourth winter; the following winter, 30% of the seedlings froze down to the ground. The last three winters, 83, 25 and 70% of the seedlings froze down to the snow cover. Less severe damage occurred the second winter, affecting 67% of the seedlings' stem tips. The third winter, 17% of the seedlings were damaged by rodents and 58% had damage to old wood.

Frost damage to stem tips occurred each winter in St. Clotilde, on 41, 63, 67, 8 and 67% of the seedlings. In addition, 58 and 8% of the seedlings froze to the level of the previous year's shoots.

In St. Hyacinthe, 25% of the seedlings died during the third winter and 67% froze down to the snow cover, while 100, 33 and 8% of the seedlings had damage to their stem tips the first three winters.

*Region 2*

In Deschambault, one seedling died the first winter. Frost damage to stem tips occurred on 67 to 100% of the seedlings each winter. In addition, 15 and 8% of the seedlings froze down to the previous year's shoots the second and fourth winters.

All of the seedlings had frozen stem tips the first winter in St. Foy and 92% sustained mechanical breakage the third winter.

In La Pocatière, 19 and 6% of the seedlings died the first two winters and, the second winter, 41% had damage to the previous year's shoots; 6% froze down to the ground. Frost damage to stem tips occurred on 12, 64 and 82% of the seedlings the second and the last two winters, while 18% froze down to the snow cover the second and fifth winters.

*Region 3*

In Normandin, 17% of the seedlings died the third winter. The second and fourth winters, 67 and 100% froze down to the snow cover. The third winter, one plant had broken stems.

In Kapuskasing, 42, 28 and 20% of the seedlings died the last three winters. One seedling froze down to the ground the second winter and, the last winter, 20% suffered damage to old wood.

### Height and width growth

Figures 1 and 2 show the average height and width of specimens after five years of trials at each site in each of the regions.

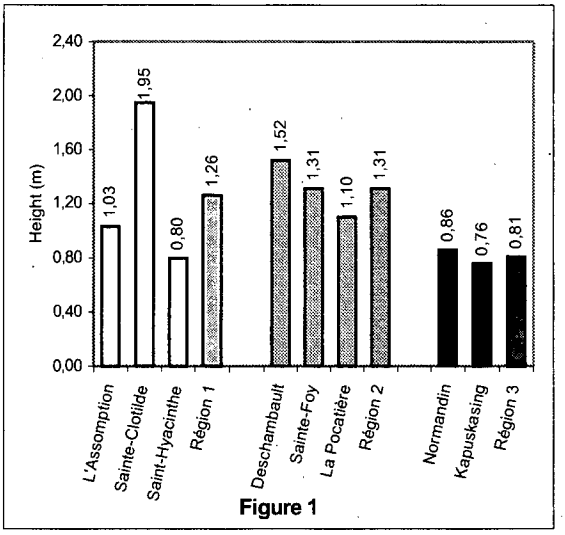


**Figure 1.** Average height of shrubs at trial's end for each of the eight sites and each of the three regions

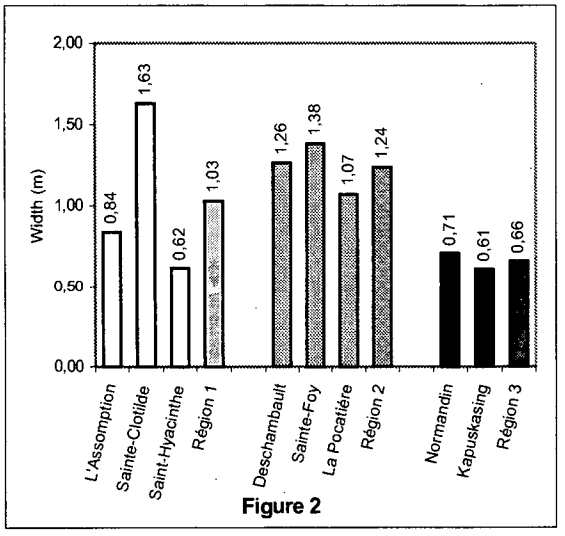


**Figure 2.** Average width of shrubs at trial's end for each of the eight sites and each of the three regions

### Effect of pruning

Pruning was carried out at all sites, removing between 30 and 70% of the seedlings' height, except in La Pocatière and St. Clotilde.

### Flowering

Flowering occurred each year at all sites. Its duration, which varied between 21 and 29 days, was very constant from one year to the next in all climatic zones; if it started earlier, it also ended earlier in the season.

At sites in climatic zone 5, the first flowers appeared between May 23 and June 16 depending on the year. They bloomed between 5 and 7 days later at sites in climatic zone 4b and about 10 days later at all other sites (zones 4a, 2b and 2a).

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

Recovery on transplantation was excellent because the seedlings were grown as a root ball.

Growth in height was faster at the St. Clotilde, Deschambault and St. Foy sites and greater in the last years at the L'Assomption and St. Hyacinthe sites. It was possible to grow shrubs more than 1.00 m tall after 3 years. At the other sites, pruning was so severe that after five years only half of the shrubs had reached this height.

This variety may be grown where snow builds up early in the season and persists throughout the coldest periods.

## HARDINESS EVALUATION

The hardiness rating for the species is zone 4, but for the variety, either none is given or it varies between zones 3

and 5b depending on the reference consulted. The facts are hard to pin down for this variety, as many sources confuse it with the 'Snowmound' cultivar.

Winter survival is closely related to the presence of snow as well as extreme winter temperatures. Many seedlings died in region 1 after the third or fourth winters (zone 5a in L'Assomption and St. Hyacinthe) for lack of sufficient snow protection and, in region 3 (zone 2), because of low temperatures. This variety's survival potential is limited to zone 4b, but it should be noted that very severe damage may occur when plants are uncovered during the winter in zone 5.

Its use potential is limited to zones 4 and 5, as extensive damage in the absence of snow necessitates drastic pruning in the spring.

This spirea's ornamental character was not fully expressed in the trials.

**WRITTEN BY**

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Christine Galipeau, Biol.

**Table 1.** **Frequency of winter damage observed on *Spiraea nipponica* var. *tosaensis* (Yatabe) Mak., 1995-1999**

| Trial site | No Damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 0 | 27 | | 13 | 10 | 36 | 6 | 4 | | | 4 | 100 |
| St. Clotilde | 37 | 50 | | 13 | | | | | | | | 63 |
| St. Hyacinthe | 54 | 28 | | | | 13 | | 5 | | | | 46 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 1 | 87 | | 2 | | | | 1 | | 9 | | 99 |
| St. Foy | 62 | 20 | | | | | | | | 18 | | 38 |
| La Pocatière | 47 | 32 | | 8 | | 7 | 1 | 5 | | | | 53 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 60 | | | 2 | | 33 | | 3 | | 2 | | 40 |
| Kapuskasing | 0 | | | 77 | 5 | | 1 | 17 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3 and 9 was sustained by the plants in the trial.

Table 2. **Breakdown of specimens of *Spiraea nipponica* var. *tosaensis* (Yatabe) Mak. by saleable height category, 1994-1998**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 5 | 0 | 17 | 10 | 100 | 0 | 0 | 0 | 0 | 95 | 62 | 25 | 0 | 0 |
| 051-100 | 0 | 95 | 83 | 83 | 10 | 0 | 79 | 8 | 0 | 0 | 5 | 38 | 58 | 100 | 44 |
| 101-150 | 0 | 0 | 17 | 0 | 70 | 0 | 21 | 83 | 75 | 0 | 0 | 0 | 17 | 0 | 56 |
| 151-200 | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 9 | 25 | 66 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | 0 | 0 | 0 | 0 | 34 | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 95 | 0 | 0 | 0 | 0 | 95 | 0 | 0 | 0 | 0 | 81 | 0 | 0 | 0 | 0 |
| 051-100 | 5 | 75 | 0 | 0 | 0 | 5 | 95 | 0 | 83 | 0 | 19 | 100 | 91 | 64 | 0 |
| 101-150 | 0 | 25 | 100 | 92 | 50 | 0 | 5 | 100 | 17 | 100 | 0 | 0 | 9 | 36 | 100 |
| 151-200 | 0 | 0 | 0 | 8 | 50 | - | - | - | - | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 95 | 0 | 0 | 10 | 0 | 100 | 90 | 0 | 0 | 0 |
| 051-100 | 5 | 100 | 66 | 40 | 50 | 0 | 10 | 100 | 85 | 60 |
| 101-150 | 0 | 0 | 34 | 50 | 50 | 0 | 0 | 0 | 15 | 40 |
| 151-200 | - | - | - | - | - | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

Table 3. **Breakdown of specimens of *Spiraea nipponica* var. *tosaensis* (Yatabe) Mak. by saleable width category, 1994-1998**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 0 | 0 | 17 | 0 | 68 | 0 | 0 | 0 | 0 | 100 | 62 | 25 | 0 | 0 |
| 041-080 | 0 | 100 | 91 | 83 | 20 | 32 | 26 | 17 | 67 | 0 | 0 | 38 | 75 | 44 | 56 |
| 081-120 | 0 | 0 | 9 | 0 | 60 | 0 | 74 | 83 | 25 | 17 | 0 | 0 | 0 | 56 | 44 |
| 121-160 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 8 | 83 | - | - | - | - | - |
| 161-200 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ( cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 67 | 0 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 | 91 | 6 | 0 | 0 | 0 |
| 041-080 | 33 | 100 | 0 | 0 | 0 | 14 | 33 | 0 | 8 | 0 | 9 | 88 | 55 | 0 | 0 |
| 081-120 | 0 | 0 | 100 | 66 | 50 | 0 | 67 | 92 | 25 | 0 | 0 | 6 | 45 | 82 | 73 |
| 121-160 | 0 | 0 | 0 | 34 | 42 | 0 | 0 | 8 | 67 | 100 | 0 | 0 | 0 | 18 | 27 |
| 161-200 | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ( cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 0 | 8 | 0 | 0 | 91 | 19 | 8 | 0 | 40 |
| 041-080 | 0 | 100 | 50 | 20 | 40 | 9 | 81 | 92 | 57 | 20 |
| 081-120 | 0 | 0 | 42 | 80 | 60 | 0 | 0 | 0 | 43 | 40 |
| 121-160 | - | - | - | - | - | - | - | - | - | - |
| 161-200 | - | - | - | - | - | - | - | - | - | - |

# *SYMPHORICARPOS ALBUS*

(L.) S. F. BLAKE

| | |
|---|---|
| **Family:** | Caprifoliaceae |
| **English common name:** | Common Snowberry, Waxberry |
| **French common name:** | Symphorine blanche |
| **Synonym:** | *Symphoricarpos racemosus* Michx. |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub, with a globose, bushy growth habit, may grow as tall as 1.0 m high and as wide as 1.5 m. The round, downy stems are thin, upright then arched at the tips.

The leaves are opposite, simple, oval and blunt, dark green above and glaucous below, measuring from 3 to 5 cm in length. In the summer they turn dark bluish green.

The small, pink, bell-shaped flowers grow in terminal clusters on the current year's wood. They bloom between late May and early June. The corolla is regular and measures 6 mm in length.

The large white berries are produced from September to November and remain on the plant for part of the winter. They are abundant and measure from 8 to 12 mm in diameter. The fruits are inedible; they contain harmful substances or poison.

*S. albus* has creeping and suckering roots.

## ORIGIN AND DISTRIBUTION

This native species is found on hillsides and rocky shorelines in the Ottawa River Valley, the Monteregian hills and the calcareous regions of eastern Quebec. It is also found in the northeastern United States.

The scientific name *Symphoricarpos* comes from the Greek "symphorein", meaning "to gather", and "karpos" meaning fruit, because of the waxberry's fruit.

## USE

**Ornamental:** This species is grown chiefly for its berries, as the flowers are insignificant. It is highly adaptable and well suited to places with poor soil. It can be used for renaturalization and is attractive to birds. It may be used by itself, in groupings or massed plantings, or in informal hedges.

**Cookery:** The waxberry is not widespread enough to be used as a honey plant.

## REQUIREMENTS

The waxberry grows in full sun and is tolerant of shade, but will not grow as thickly there. As far as soil type is concerned, it is not very demanding, but prefers a rocky, calcareous soil. It is tolerant of very damp or compacted soil as well as de-icing salt.

It is easily transplanted.

## DISEASES AND INSECTS

As far as we know there are no particular disease or insect problems affecting this species.

## PROPAGATION

**Seeds:** After the fruits are harvested, the pulp is removed from the seeds, which are stratified during the winter. Seeding may be done the following spring. Germination is good, and the young plants may reach 50 cm in height the first year. It is less expensive to grow the plants from seed than from cuttings.

**Cutting:** Woody cuttings need to be taken in early winter and stored in a cold, humid place. The cuttings are planted directly in the soil in the spring and the young plants may reach a height of 40 to 50 cm the first year.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Île Notre-Dame, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** 4 Four hundred 20-cm cuttings were taken on July 10, 1991 from parent plants 12 years old, measuring 1.25 m in height and 1.00 m in width. They were soaked in a 4000-ppm IBA / 50% ethanol solution, then placed in multipots filled with perlite and Promix® (1:1; v:v), and misted for 30 seconds every 5 minutes. The rooted cuttings were placed in shaded beds on August 15; the rooting rate was 75%. The plants were potted up on August 29 in Fertil Pots®. They were overwintered in beds protected by coldframes and panels; the winter survival rate was 100%. During the 1992 season they were cultivated in outdoor beds and were fertilized every week until September 15 with a soluble fertilizer (20-20-20, 400 ppm nitrogen). They were again overwintered in beds protected by coldframes and panels. They were packed and shipped in May 1993.

**Inclusion in testing network:** Young plants 34 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-1998)

### Winter damage

The frequency of winter damage observed over five years on this species is shown in Table 1. Details of the main damage that occurred each winter at each of the sites are shown below.

Mortality was very low for this species, as only one plant died, in Normandin.

*Region 1*

In L'Assomption, 100, 33 and 58% of the seedlings froze down to the snow cover the first, third and fourth winters. Frost damage to the previous year's shoots was observed on 67 and 100% of the seedlings, the third and fifth winters. All seedlings suffered frost damage to their stem tips the second winter. In addition, 42% were damaged by rodents the fourth winter.

In St. Clotilde, there was frost damage to stem tips on 50, 65 and 17% of the seedlings the first three winters, while 50 and 75% of the seedlings suffered frost damage to the previous year's shoots the first and third winters. The data were not collated at the end of the last two winters.

In St. Hyacinthe, the [*omission*] second winter, 67 and 33% of the seedlings had damage to their stem tips, while all the rest of the seedlings froze down to the snow cover the first and fourth winters.

*Region 2*

In Deschambault, frost damage to stem tips was observed each winter, on 45, 100, 92, 100 and 100% of the seedlings. In addition, all the rest of the seedlings suffered damage to the previous year's shoots the first winter.

In St. Foy, there was frost damage to stem tips the first four winters, on 57, 100, 50 and 17% of the seedlings. In addition, all the rest of the seedlings suffered frost damage to the previous year's shoots the first and third winters. The fourth winter, 75% were damaged by mechanical breakage.

In La Pocatière, 95% of the seedlings froze down to the snow cover the first winter and the rest of the seedlings had frost damage to their stem ends.

*Region 3*

In Normandin, one seedling died the first winter and all the rest suffered frost damage to their stem ends, while 33% sustained mechanical breakage the fourth winter.

In Kapuskasing, all seedlings had freezing of the previous year's shoots the first four winters and 92% of them the last winter. In addition, the remaining shrubs had freezing of stem tips the last winter.

### Height and width growth

Figures 1 and 2 show the average height and width of specimens after five years of trials at each site in each of the regions.

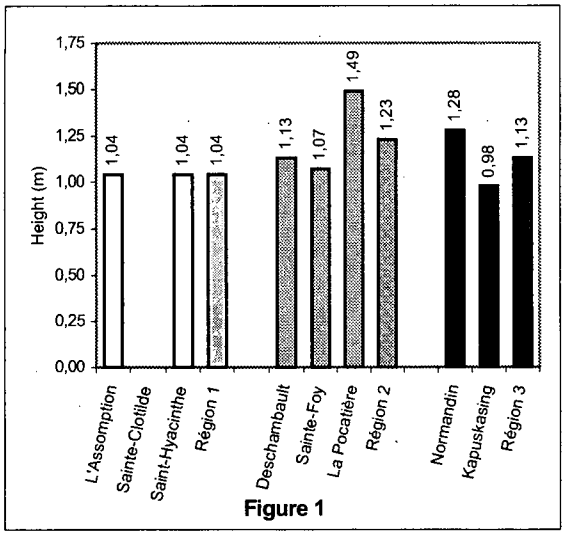


**Figure 1.** Average height of shrubs at trial's end for each of the sites and each of the three regions

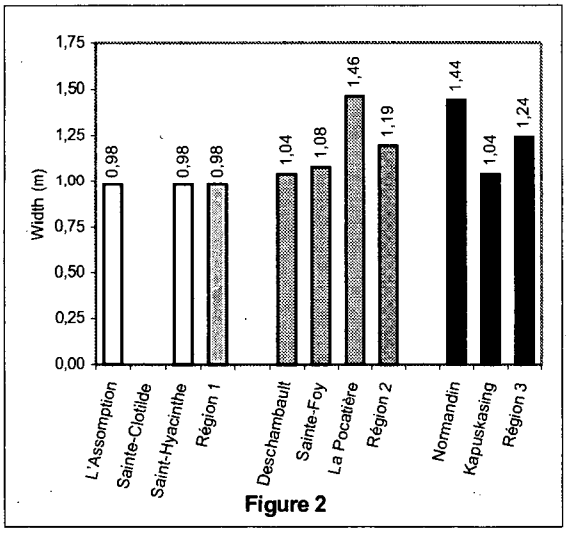


**Figure 2.** Average width of shrubs at trial's end for each of the sites and each of the three regions

### Effect of pruning

Severe pruning, removing from 50 to 60% of the above-ground portion of the plant, was carried out at almost all sites the first year. More pruning, removing from 30 to 50% of the above-ground portion, was done at almost all sites in subsequent years.

### Flowering

The first flowers bloomed between late June and late July at the sites in regions 1 and 2, and one to two weeks later at the sites in region 3. Full flowering was achieved within periods varying from 4 to 26 days depending on the site and the year.

On the average, flowering extended over two to three months at all sites.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

This species grows better at sites with sandy or rocky soil than at sites with heavier soil. In addition, the fertilization done during the trials on this indigenous species, which is quite undemanding as regards mineral soil conditions, may affect the acquisition of cold tolerance in the fall, causing more frequent frost damage.

In general, this species can be grown at all sites, but it should be planted in poor, well-drained soil.

## HARDINESS EVALUATION

The hardiness rating assigned to this species in the literature is zone 2. Under trial conditions, many seedlings had light damage (stem tips) or more severe damage (freezing of the previous year's shoots or of the whole above-snow portion of the plant). The species can nevertheless survive into zone 2a and is useful in zone 2b.

The species' full ornamental character was not expressed during the trial, possibly because of excessive fertilization of a species that is relatively undemanding.

**WRITTEN BY**

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**Table 1.** **Frequency of winter damage observed on *Symphoricarpos albus* (L.) S. F. Blake, 1994-1998**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 0 | 20 | | 33 | | 38 | | | | | 9 | 100 |
| St. Clotilde | 14 | 44 | | 42 | | | | | | | | 86 |
| St. Hyacinthe | 60 | 20 | | | | 20 | | | | | | 40 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 2 | 87 | | 11 | | | | | | | | 98 |
| St. Foy | 22 | 45 | | 19 | | | | | | 14 | | 78 |
| La Pocatière | 80 | 1 | | | | 19 | | | | | | 20 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 74 | 19 | | | | | | 1 | | 6 | | 26 |
| Kapuskasing | 0 | 2 | | 98 | | | | | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3, 5, 7 and 9 was sustained by the plants in the trial.

**Table 2.** **Breakdown of specimens of *Symphoricarpos albus* L.) S. F. Blake (by saleable height category, 1993-1997**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 100 | 95 | 67 | 17 | 25 | 100 | 100 | 38 | 83 | - | 100 | 100 | 25 | 17 | 25 |
| 101-200 | 0 | 5 | 33 | 83 | 75 | 0 | 0 | 62 | 17 | - | 0 | 0 | 75 | 83 | 75 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 100 | 100 | 50 | 41 | 25 | 100 | 100 | 17 | 0 | 50 | 100 | 67 | 0 | 0 | 0 |
| 101-200 | 0 | 0 | 50 | 59 | 75 | 0 | 0 | 83 | 100 | 50 | 0 | 33 | 100 | 100 | 100 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 100 | 95 | 33 | 8 | 0 | 100 | 76 | 83 | 67 | 58 |
| 101-200 | 0 | 5 | 67 | 92 | 100 | 0 | 24 | 17 | 33 | 42 |

* Data for St. Clotilde not collected in 1997.

Table 3. **Breakdown of specimens of *Symphoricarpos albus* (L.) S. F. Blake by saleable width category, 1993-1997**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-025 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | 33 | 0 | 0 | 0 | 0 |
| 026-050 | 100 | 38 | 0 | 0 | 0 | 43 | 36 | 12 | 25 | - | 67 | 24 | 0 | 0 | 0 |
| 051-075 | 0 | 33 | 17 | | 8 | 57 | 64 | 13 | 58 | - | 0 | 71 | 42 | 33 | 8 |
| 076-100 | 0 | 24 | 42 | 75 | 42 | 0 | 0 | 25 | 17 | - | 0 | 5 | 58 | 67 | 42 |
| 101-125 | 0 | 5 | 33 | 25 | 50 | 0 | 0 | 38 | 0 | - | 0 | 0 | 0 | 0 | 42 |
| 126-150 | 0 | 0 | 8 | 0 | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 | 8 |
| 151-175 | - | - | - | - | - | 0 | 0 | 12 | 0 | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-025 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 026-050 | 100 | 25 | 8 | 8 | 0 | 57 | 0 | 0 | 0 | 0 | 90 | 0 | 0 | 0 | 0 |
| 051-075 | 0 | 65 | 58 | 25 | 8 | 43 | 24 | 8 | 0 | 25 | 10 | 0 | 0 | 0 | 0 |
| 076-100 | 0 | 10 | 34 | 67 | 50 | 0 | 71 | 34 | 8 | 16 | 0 | 67 | 25 | 0 | 0 |
| 101-125 | 0 | 0 | 0 | 0 | 25 | 0 | 5 | 50 | 33 | 17 | 0 | 33 | 67 | 50 | 0 |
| 126-150 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 8 | 50 | 42 | 0 | 0 | 8 | 42 | 58 |
| 151-175 | - | - | - | - | - | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 8 | 42 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-025 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 026-050 | 24 | 5 | 0 | 0 | 0 | 86 | 0 | 0 | 0 | 0 |
| 051-075 | 76 | 25 | 8 | 0 | 0 | 14 | 29 | 0 | 8 | 8 |
| 076-100 | 0 | 55 | 25 | 8 | 0 | 0 | 71 | 67 | 25 | 17 |
| 101-125 | 0 | 15 | 25 | 34 | 9 | 0 | 0 | 33 | 67 | 75 |
| 126-150 | 0 | 0 | 42 | 33 | 33 | - | - | - | - | - |
| 151-175 | 0 | 0 | 0 | 25 | 58 | - | - | - | - | - |

* Data for St. Clotilde not collected in 1997.

# *SYMPHORICARPOS ORBICULACUS*

MOENCH.

| | |
|---|---|
| **Family:** | Caprifoliaceae |
| **English common name:** | Indian currant, coralberry |
| **French common name:** | Symphorine à feuilles rondes, Symphorine rouge |
| **Synonym** | *Symphoricarpos vulgaris* Michx |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This bushy, dense shrub, with its slim, slanting, very downy and twiggy branches, has a rounded habit. At maturity it measures 1.0 m in height and width. This is a fast-growing shrub.

The deciduous leaves are simple, opposite, oval, blunt and rounded, between 1.5 and 3.0 cm long. They are dark matte green above, greyish and downy underneath. They turn red in the fall.

The yellowish-white flowers, with overtones of pink, are borne in clusters or small dense bouquets in July and August. The perfect flowers produce nectar; they are found all along the shoot. The persistent calyx has 4 to 5 teeth and the bell-shaped corolla is from 3 to 4 mm long.

The abundant fruits are small purplish-red berries from 4 to 6 mm in diameter, which persist from late fall until November. The fruits are inedible; they contain harmful substances or poison.

*S. orbiculatus* has creeping and suckering roots.

## ORIGIN AND DISTRIBUTION

The natural range of *S. orbiculatus* extends from New Jersey to Georgia, Kansas, Texas and the western Dakotas.

The scientific name *Symphoricarpos* comes from the Greek "symphorein", meaning "to gather", and "karpos" meaning fruit, because of the coralberry's fruit.

## USE

**Ornamental:** This species is grown chiefly for its berries, as the flowers are insignificant. It may be used by itself, in groupings or massed plantings, or in informal hedges. It is highly adaptable and well suited to places with poor soil.

**Naturalization:** This species may be used in renaturalization.

**Birds:** Because of its abundant fruit, this shrub attracts birds.

## REQUIREMENTS

The coralberry grows in full sun and is tolerant of shade, but will not grow as thickly there. As far as soil type is concerned, it is not very demanding, but prefers a rocky, calcareous soil. It is tolerant of very damp or compacted soil as well as de-icing salt.

It is easily transplanted.

## DISEASES AND INSECTS

As far as we know there are no particular disease or insect problems affecting this species.

## PROPAGATION

**Seeding:** After the fruits are harvested, the pulp is removed from the seeds, which are stratified over the winter. According to Flemion and Parker, germination will occur if the seeds are stratified at 10°C and kept in wet sand at 5°C for 6 months. Seeding may be done the following spring. Germination is good, and the young plants may reach 50 cm in height the first year. It is less expensive to grow the plants from seed than from cuttings.

**Cutting:** Woody cuttings may be taken in early winter and stored in a cold, humid place. They are planted directly in the soil early in the spring.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Île Notre-Dame, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Four hundred 20-cm cuttings were taken on July 10, 1991 from parent plants 12 years old, measuring 100 cm in height and width. They were soaked in a 4000-ppm IBA / 50% ethanol solution, then placed in multipots filled with perlite and Promix® (1:1; v:v), then misted for 30 seconds every 5 minutes. The rooted cuttings were placed in shaded beds on August 15; the rooting rate was 100%. The seedlings were potted up on August 29 in Fertil Pots®. They were overwintered in beds protected by coldframes and panels; the winter survival rate was 100%. During the 1992 season they were cultivated in outdoor beds, fertilized every week until September 15 with a soluble fertilizer (20-20-20, 400 ppm nitrogen). They were again overwintered in beds protected by coldframes and panels. They were packed and shipped in May 1993.

**Inclusion in testing network:** Young plants 30 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-1998)

### Winter damage

The frequency of winter damage observed over five years on this species is shown in Table 1. Details of the main damage that occurred each winter at each of the sites are shown below.

A number of seedlings died at the L'Assomption, St. Hyacinthe, La Pocatière, Normandin and Kapuskasing sites.

*Region 1*

In L'Assomption, the mortality rate was very high, with 42, 29 and 80% of the seedlings succumbing during the last three winters. Serious damage occurred each winter: 100, 33, 42 and 14% of the seedlings froze down to the snow cover the first four winters, 17% froze down to the ground the third winter, there was frost damage to the previous year's shoots on 57 and 20% of the seedlings the last two winters, and 67% suffered frost damage to their stem ends the second winter.

In St. Clotilde, 14% of the seedlings died the second winter. All of them froze down to the snow cover the first winter and showed frost damage to old wood the third winter. The second winter, 53% of the seedlings suffered frost damage to their stem ends.

In St. Hyacinthe, 43, 50 and 50% of the seedlings died during the first three winters, so that only one seedling remained in the trial. In addition, the surviving specimens showed frost damage down to the snow cover or the ground the first winter, or frost damage above the snow cover or on stem tips the second winter.

*Region 2*

In Deschambault, one seedling died the last winter. Frost damage to the previous year's shoots was observed on 100, 90, 100, 58 and 25% of the seedlings each winter. The rest had damage to their stem tips.

In St. Foy, 10% of the seedlings died each of the first two winters. The damage occurred especially during the first three winters, when old wood froze on all specimens the first winter and, the following winter, the previous year's shoots. In addition, the third winter, 9% of the seedlings had damage to their stem tips, 9% froze down to the snow cover, 9% down to the ground, 36% had frost damage to old wood and 36% to the previous year's shoots. The fourth winter, 82% of the seedlings suffered mechanical breakage and all of them showed frost damage to their stem tips the last winter.

In La Pocatière, 72, 33, 50 and 50% of the seedlings died during the first four winters, so that only one seedling remained in the trial. The surviving specimens had frost damage down to the snow cover or down to the ground each winter. However, 2 and 1 specimens showed frost damage to old wood the second winter and mechanical breakage the last winter.

*Region 3*

In Normandin, 32, 30, 43 and 75% of the seedlings died during the first four winters, so that only one seedling remained in the trial. The surviving specimens showed frost damage to their stem ends the first two winters, 28% froze down to the ground the third winter, and 25% had frost damage to old wood the fourth winter.

In Kapuskasing, all specimens died during the first four winters; those temporarily surviving had frozen down to the ground.

**Height and width growth**

Figures 1 and 2 show the average height and width of specimens after five years of trials at each site in each of the regions.

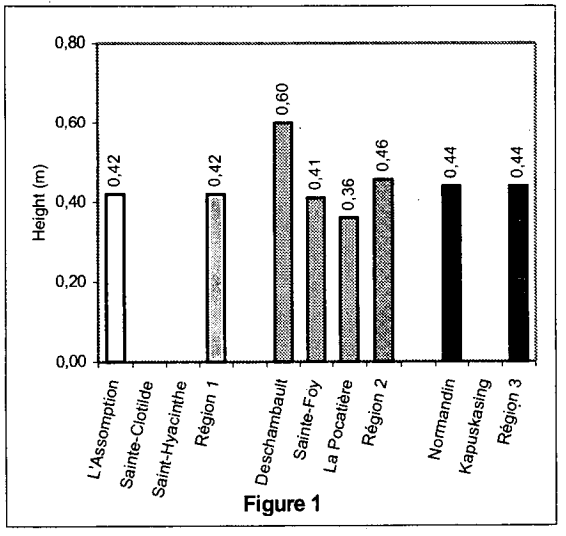


**Figure 1.** Average height of shrubs at trial's end for each of the sites and each of the three regions

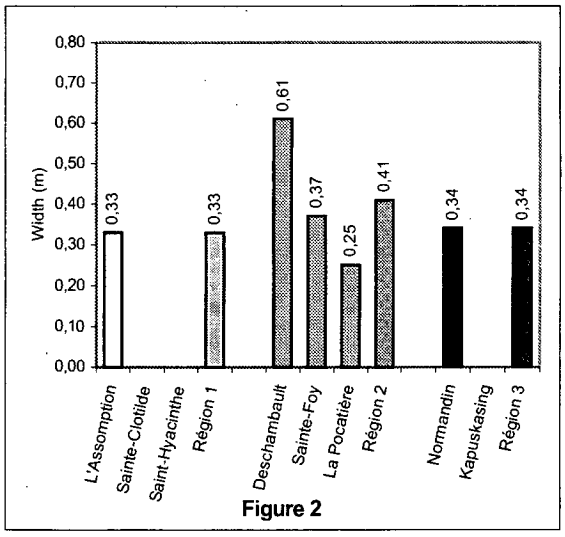


**Figure 2.** Average width of shrubs at trial's end for each of the sites and each of the three regions

The final height and width of the seedlings varied widely each year.

**Effect of pruning**

Severe pruning was done each year, cutting the seedlings' height by 50 to 90% of the previous year's growth, at all sites except St. Clotilde, where only light pruning was necessary the fourth year. In Kapuskasing, surviving specimens were cut back to ground level the three first years, then died.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height and width.

This species is less well suited for growing in Quebec than *S. albus*, as the mortality rate is higher and seedling growth was much affected by winter damage.

The fertilization that was done during trials of this indigenous species, which is quite undemanding as

regards mineral soil conditions, may affect the acquisition of cold tolerance in the fall, thus causing more frequent frost damage.

This species can be grown only at sites whose characteristics are similar to its natural, poor environments and in zones where winter protection is adequate (snow or coverings).

## HARDINESS EVALUATION

The hardiness rating given for this species in the literature is zone 2b, but under trial conditions, a high mortality rate was observed in climatic zones 5a (L'Assomption and St. Hyacinthe) as well as in climatic zones 4a, 2a and 2b. The survival rating of this species is overestimated in the literature. It depends for its survival on two factors: the climatic conditions under which the plants are grown, but also the mineralogical conditions. At all sites, the cumulative die-off of seedlings over the first three or four winters shows that the species is ill suited both to winter conditions and to recommended nursery practice. Its survival is therefore very limited in Quebec under intensive cultivation.

The use rating is set at zone 5b, where there was little mortality and damage occurred at an early stage in the trial, and zone 4b, provided snow protects the shrubs from overly cold winter conditions.

The species' full ornamental character was not expressed during the trial, possibly because of excessive fertilization of a species that is relatively undemanding. However, the parent plants, on Île Notre-Dame in Montreal, show little damage from one year to the next.

## WRITTEN BY

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**Table 1.** **Frequency of winter damage observed on *Symphoricarpos orbiculatus* Moench., 1994-1998**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 0 | 13 | | 15 | | 37 | 3 | 32 | | | | 100 |
| St. Clotilde | 10 | 17 | | | 33 | 33 | | 7 | | | | 90 |
| St. Hyacinthe | 2 | 22 | | | | 15 | 13 | 48 | | | | 98 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 0 | 23 | | 75 | | | | 2 | | | | 100 |
| St. Foy | 4 | 22 | | 25 | 25 | 2 | 2 | 4 | | 16 | | 96 |
| La Pocatière | 0 | | | 7 | | 12 | 30 | 41 | | 10 | | 100 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 46 | 7 | | | 5 | | 6 | 36 | | | | 54 |
| Kapuskasing | 0 | | | 1 | | | 44 | 55 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3, 9 and 11 was sustained by the plants in the trial.

Table 2. **Breakdown of specimens of *Symphoricarpos orbiculatus* Moench. by saleable height category, 1993-1997**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | 5 | 0 | 0 | 0 | - |
| 021-040 | 5 | 0 | 25 | 29 | 40 | 10 | 0 | 0 | 50 | - | 19 | 16 | 0 | 0 | - |
| 041-060 | 62 | 47 | 8 | 14 | 60 | 56 | 50 | 14 | 25 | - | 62 | 42 | 50 | 100 | - |
| 061-080 | 33 | 53 | 67 | 29 | 0 | 34 | 50 | 56 | 25 | - | 14 | 34 | 50 | 0 | - |
| 081-100 | 0 | 0 | 0 | 28 | 0 | 0 | 0 | 30 | 0 | - | 0 | 8 | 0 | 0 | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 24 | 0 | 0 | 0 | 25 | 33 | 43 | 46 | 10 | 55 | 10 | 0 | 0 | 0 | 100 |
| 041-060 | 71 | 62 | 16 | 0 | 25 | 67 | 42 | 18 | 36 | 45 | 80 | 33 | 0 | 0 | 0 |
| 061-080 | 5 | 38 | 67 | 59 | 41 | 0 | 5 | 27 | 45 | 0 | 10 | 50 | 100 | 100 | 0 |
| 081-100 | 0 | 0 | 17 | 41 | 9 | 0 | 0 | 0 | 9 | 0 | 0 | 17 | 0 | 0 | 0 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 8 | 0 | 25 | 0 | 0 | 37 | 40 | 0 | - |
| 021-040 | 11 | 77 | 15 | 25 | 0 | 40 | 45 | 20 | 50 | - |
| 041-060 | 37 | 15 | 57 | 25 | 100 | 50 | 18 | 40 | 50 | - |
| 061-080 | 41 | 0 | 28 | 25 | 0 | 10 | 0 | 0 | 0 | - |
| 081-100 | 11 | 0 | 0 | 0 | 0 | - | - | - | - | - |

* Data not collected in 1997 in St. Clotilde and St. Hyacinthe.

Table 3. **Breakdown of specimens of *Symphoricarpos orbiculatus* Moench. By saleable width category, 1993-1997**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 14 | 0 | 0 | 0 | 40 | 14 | 0 | 0 | 50 | - | 43 | 17 | 0 | 0 | - |
| 021-040 | 81 | 33 | 8 | 43 | 20 | 86 | 43 | 14 | 25 | - | 57 | 58 | 25 | 0 | - |
| 041-060 | 5 | 48 | 50 | 14 | 40 | 0 | 57 | 43 | 25 | - | 0 | 25 | 25 | 100 | - |
| 061-080 | 0 | 19 | 33 | 29 | 0 | 0 | 0 | 29 | 0 | - | 0 | 0 | 50 | 0 | - |
| 081-100 | 0 | 0 | 9 | 14 | 0 | 0 | 0 | 0 | 0 | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | 0 | 0 | 14 | 0 | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 38 | 0 | 0 | 0 | 0 | 14 | 10 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 62 | 28 | 0 | 0 | 42 | 86 | 58 | 45 | 19 | 82 | 67 | 50 | 25 | 0 | 100 |
| 041-060 | 0 | 48 | 42 | 0 | 8 | 0 | 32 | 36 | 45 | 18 | 28 | 33 | 75 | 100 | 0 |
| 061-080 | 0 | 24 | 42 | 33 | 25 | 0 | 0 | 19 | 18 | 0 | 5 | 17 | 0 | 0 | 0 |
| 081-100 | 0 | 0 | 16 | 50 | 25 | 0 | 0 | 0 | 18 | 0 | - | - | - | - | - |
| 101-120 | 0 | 0 | 0 | 17 | 0 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 23 | 0 | 25 | 0 | 25 | 64 | 40 | 0 | - |
| 021-040 | 58 | 77 | 28 | 50 | 100 | 75 | 36 | 60 | 75 | - |
| 041-060 | 42 | 0 | 57 | 25 | 0 | 0 | 0 | 0 | 25 | - |
| 061-080 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

* Data not collected in 1997 in St. Clotilde and St. Hyacinthe.

# *SYRINGA KOMAROWII*

SCHNEID

| | |
|---|---|
| **Family:** | Oleaceae |
| **English common name:** | Chinese Lilac |
| **French common name:** | Lilas de Chine |
| **Synonym:** | *Syringa sargentiana* Schneid. |
| **Category:** | Deciduous plant |
| **Subdivision:** | Medium-sized tree |

## BOTANICAL DESCRIPTION

This shrub with a spreading growth habit may reach between 3.0 and 4.0 m in height. The downy young stems become glabrous and greyish brown with age.

The dark green leaves are acuminate, oval-oblong, glabrous on the upper surface and downy beneath, and about 10 to 16 cm long. The petiole is from 1 to 2 cm long.

The scented flowers, with petals that are purplish-pink on the inside and paler toward the outside, are carried on a short, dense panicle that is cylindrical to ovoid in shape. Flowering begins around mid-June; there may, on occasion, be a second flowering in August.

## ORIGIN AND DISTRIBUTION

This lilac is native to western China. It was introduced into the United States in about 1911.

## USE

**Ornamental:** This species may be used by itself or in groupings for its blossom and scent.

## REQUIREMENTS

To ensure that more flower buds form, faded flowers must be cut. This species, like all lilacs, requires full sun and prefers slightly acid soil.

## DISEASES AND INSECTS

The main fungal diseases affecting lilacs are powdery mildew or oidium (*Microsphaera penicillata*), grey mould (*Botrytis*), crown gall (*Agrobacterium tumefaciens*), fire blight (*Pseudomonas syringae*) and twig blight (*Phytophthora syringae*).

Insects such as the lilac borer (*Podosesia syringae*), the lilac leafminer (*Gracillaria syringella*), the oystershell scale (*Lepidosaphes ulmi*), the black vine weevil (*Otiorhynchus sulcatus*) and the strawberry root weevil (*Otiorhynchus ovatus*) may appear periodically and cause serious damage to lilacs.

## PROPAGATION

**Seeding:** This species is not usually grown from seed. However, a 40- to 60-day stratification period at 4°C will promote germination.

**Cutting:** Certain sources of information call for tip cuttings taken immediately after growth begins. As soon as the new stems are 10 to 15 cm long they are cut, processed with a hormone powder containing 8000 ppm of IBA, then misted for a 6-week period on a well-drained substrate kept at a temperature of about 20°C (ambient heat).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Arboretum of the Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** Four hundred 20 cm cuttings were taken on June 15, 1992 from parent plants 4 years old and 2.0 m tall. They were soaked in a 4000-ppm IBA 4000 / 50% ethanol solution, then placed in multipots filled with perlite and Promix® (1:1; v:v) and misted for 30 seconds every 6 minutes. The rooted cuttings were placed in shaded beds on August 3; the rooting rate was 62%. The seedlings were potted up on June 29, 1993 in Fertil Pots®

and cultivated in outdoor beds. They were fertilized every week with a soluble fertilizer (20-20-20, 400 ppm nitrogen). They were then overwintered once again in beds protected by an Astro-Foam® winter cover and panels; the rate of winter survival was 100%. They were packed and shipped in May 1994.

**Inclusion in testing network:** Young plants 18 cm tall were planted at eight trial sites throughout Quebec and northeastern Ontario. Their winter survival and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-1999)

### Winter damage

The frequency of winter damage observed over five years on this species is shown in Table 1. The details of the main damage that occurred each winter at each of the sites are shown below.

All seedlings succumbed at the Kapuskasing site, and seedlings also died at all the other sites except Deschambault.

*Region 1*

In L'Assomption, 5 and 75% of the seedlings died during the first two winters. The second winter, one tree had frost damage to its stem tips, while 5 and 100% of the seedlings froze down to the snow cover the second and fourth winters. Then, all lilacs had damage to old wood.

In St. Clotilde, 33 and 37% of the seedlings died the third and fourth winters. In addition, 12% had damage to old wood the fourth winter.

In St. Hyacinthe, seedlings died each of the first four winters, eliminating 10, 35, 60 and 50% of them. In addition, the first winter, 26% had damage to their stem tips.

*Region 2*

In Deschambault, there was frost damage to stem tips each winter, affecting 5, 65, 42, 17 and 42% of the seedlings. In addition, 15 and 33% of them froze to the previous year's shoots the second and third winters. The third and fourth winters, 25 and 83% of the seedlings sustained mechanical breakage

In St. Foy, two seedlings died during the first winter.

In La Pocatière, one plant died during each of the first two winters, and the second winter there was freezing of the previous year's shoots on 10% of the seedlings.

*Region 3*

In Normandin, seedlings died the first four winters, eliminating 5, 20, 12 and 43% of them. In addition, 25% of the seedlings had frozen stem tips the last winter, 12% sustained mechanical breakage the third winter, and 25% froze down to the snow cover the second winter.

In Kapuskasing, 6, 35, 75 and 100% of the seedlings died during the first four winters. Frost damage occurred on the stem tips of 13% of the seedlings the first winter and to the previous year's shoots of 40, 36 and 25% of the seedlings the first three winters. In addition, 33 and 28% of the seedlings froze down to the ground the first two winters.

### Height and width growth

Figures 1 and 2 show the average height and width of specimens after five years of trials at each site in each of the regions.

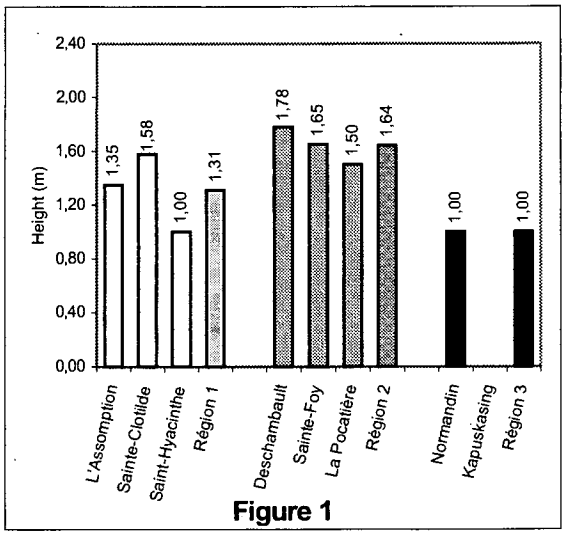


**Figure 1.** Average height of shrubs at trial's end for each of the sites and each of the three regions

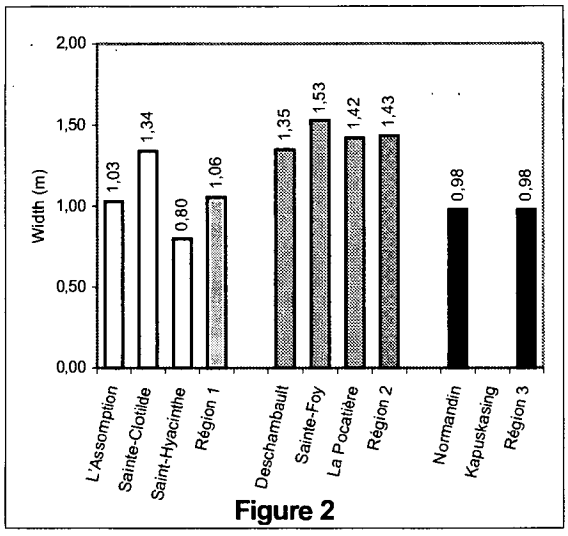


**Figure 2.** Average width of shrubs at trial's end for each of the sites and each of the three regions

### Effect of pruning

Pruning that removed 20% of the total height of the seedlings was done in St. Foy and Deschambault, whereas at the Normandin and L'Assomption sites as much as 50% was removed more than once of reprises.

### Flowering

One seedling only survived at the L'Assomption site, while another did set flowers during the last year of evaluation. The duration of the flowering period was about 7 days, from June 5 to 12. In St. Hyacinthe, the seedlings flowered each of last 3 years and the duration of flowering increased with the age of the seedlings, varying from 8 to 17 days.

In the three sites in climatic zone 4, the first flowers appeared between June 15 and 20 during the second, third and fourth years of evaluation; the last year they appeared on about June 4. The duration of the period of flowering was from 7 to 12 days the first three years and from 17 to 25 days the last year.

At sites in zone 2b, one seedling flowered the second year only and no flowering occurred at the site in zone 2a.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens by category at each test site for the final height and width obtained at the end of each year. Nursery growers will find these tables useful for estimating annual production as well as the number of years necessary to obtain a given height or width.

There was considerable annual seedling growth, increasing over the five years of evaluation, both as regards height and width. However, the Normandin specimens were cut back a lot the last year and few shrubs survived the trial.

It is possible to grow plants of this species at the sites in zone 4, where they indeed grow quickly. In climatic zones 5 and 2, production is also possible, but the rate of mortality is very high there; the snow cover at the Normandin site allows many young plants to survive. In zone 5, the mortality observed in the third and fourth years was very probably caused by freezing of roots ithe absence of snow. The lilacs could be grown in pots in this zone, to take advantage of the warm climatic conditions in

the summer and still have a protective cover during the winter.

These seedlings' quick growth means that shrubs in excess of 1.01 m tall can be obtained in three years at sites in climatic zone 4 as well as at the St. Clotilde and Normandin sites, where they survived. At many of the other sites it takes another year to obtain shrubs of that height.

## HARDINESS EVALUATION

This species' hardiness rating is zone 5 (US).

Seedlings died at all sites, and particularly at the warmest sites, where the snow did not permanently cover them during the coldest period, and at the coldest ones, where winter temperatures are too cold for the plant to tolerate. The trial results show that this species is hardy into zone 4, so long as snow cover appears early in the season and is constant throughout the winter.

Use potential is also restricted to zone 4. However, the parent plant, in the Montreal Botanical Garden, has been growing there for a number of years.

The potential for full expression of ornamental character cannot be defined for this species, as the height reached by the seedlings at trial's end was too far from the species' real potential.

## WRITTEN BY

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**Table 1. Frequency of winter damage observed on Syringa Komarowii Schneid., 1995-1999**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 42 | 1 | | | 20 | 21 | | 16 | | | | 58 |
| St. Clotilde | 83 | | | | 2 | | | 15 | | | | 17 |
| St. Hyacinthe | 64 | 5 | | | | | | 31 | | | | 36 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 39 | 31 | | 10 | | | | | | 20 | | 61 |
| St. Foy | 98 | | | | | | | 2 | | | | 2 |
| La Pocatière | 96 | | | 2 | | | | 2 | | | | 4 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 71 | 5 | | | | 5 | | 17 | | 2 | | 29 |
| Kapuskasing | 2 | 4 | | 25 | | | 15 | 54 | | | | 98 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage because of weather conditions
11 = rodent damage

No damage of type 3, 9 and 11 was sustained by the plants in the trial.

Table 2. **Breakdown of specimens of *Syringa Komarowii* Schneid. by saleable height category, 1994-1998**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 60 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 12 | 0 | 0 | 0 |
| 051-100 | 0 | 40 | 100 | 100 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 88 | 75 | 50 | 100 |
| 101-150 | 0 | 0 | 0 | 0 | 100 | 0 | 85 | 100 | 100 | 20 | 0 | 0 | 25 | 50 | 0 |
| 151-200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 80 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ( cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 30 | 0 | 0 | 0 | 100 | 12 | 0 | 0 | 0 | 91 | 0 | 0 | 0 | 0 |
| 051-100 | 0 | 65 | 42 | 0 | 0 | 0 | 82 | 17 | 8 | 0 | 9 | 90 | 10 | 0 | 0 |
| 101-150 | 0 | 5 | 58 | 50 | 33 | 0 | 6 | 83 | 75 | 33 | 0 | 10 | 90 | 91 | 73 |
| 151-200 | 0 | 0 | 0 | 50 | 50 | 0 | 0 | 0 | 17 | 67 | 0 | 0 | 0 | 9 | 27 |
| 201-250 | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 0 | 0 | 0 | 0 | 100 | 36 | 25 | 50 | - |
| 051-100 | 0 | 30 | 0 | 14 | 0 | 0 | 64 | 75 | 50 | - |
| 101-150 | 0 | 70 | 75 | 14 | 75 | - | - | - | - | - |
| 151-200 | 0 | 0 | 25 | 72 | 25 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

Table 3. **Breakdown of specimens of *Syringa Komarowii* Schneid. by saleable width category, 1994-1998**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ( cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 95 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 100 | 50 | 0 | 0 |
| 051-100 | 0 | 5 | 100 | 100 | 50 | 0 | 100 | 58 | 50 | 40 | 0 | 0 | 50 | 100 | 0 |
| 101-150 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 42 | 50 | 20 | 0 | 0 | 0 | 0 | 100 |
| 151-200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 40 | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ( cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 70 | 0 | 0 | 0 | 100 | 25 | 0 | 0 | 0 | 100 | 15 | 0 | 0 | 0 |
| 051-100 | 0 | 30 | 75 | 0 | 0 | 0 | 75 | 42 | 0 | 0 | 0 | 85 | 46 | 27 | 0 |
| 101-150 | 0 | 0 | 25 | 100 | 83 | 0 | 0 | 58 | 75 | 92 | 0 | 0 | 54 | 73 | 100 |
| 151-200 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 25 | 8 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| ( cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 100 | 5 | 0 | 0 | 0 | 100 | 79 | 37 | 0 | - |
| 051-100 | 0 | 90 | 37 | 14 | 50 | 0 | 21 | 63 | 100 | - |
| 101-150 | 0 | 5 | 63 | 72 | 50 | - | - | - | - | - |
| 151-200 | 0 | 0 | 0 | 14 | 0 | - | - | - | - | - |

# *THUJA OCCIDENTALIS*

L. (1993 CONTROL)

The sections "Botanical Description", "Origin and Distribution", "Use", "Requirements" and "Diseases and Insects" can be found in *Hardiness and Growth of Woody Ornamental Plants in Quebec*, Volume I (95-0070) and Volume III (VT 008).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique**: Cuttings (5 cm) were taken on December 13, 1991 from eight-year-old parent plants measuring roughly 120 cm high and 60 cm wide. After a shallow wound was made at the base, the cuttings were dipped for five seconds in a 4000-ppm IBA/50% ethanol solution. The cuttings were planted in plug trays (45 cells) in a Promix®-sand mixture (1:2; v:v), and placed under an automatic mist unit operating for five seconds every hour. The heating cables were set at 25°C. A weekly fungicide treatment of Benomyl® was given throughout the propagation period. The rooting rate was 75% after three months. Misting was gradually discontinued and the seedlings were put in the lathhouse and fertilized with a 10-52-10 solution at the recommended rate. On May 19, 1992, they were transplanted into the nursery and treated with a soluble fertilizer (20-20-20) at the recommended rate. On October 25, the seedlings were dug up, puddled and heeled in for the winter. In mid-April 1993, they were wrapped and stored in the cellar to await shipping in May.

**Inclusion in testing network:** Young trees 22 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Three plants died at L'Assomption, one at Normandin and five at Kapuskasing.

#### *Region 1*

At L'Assomption, two plants died the first winter and another the fourth winter. The first winter, 5% had partial foliage browning.

No frost damage was observed at St. Clotilde during the trials.

At St. Hyacinthe, 65% of trees had foliage browning the second winter and 20% were damaged by the weight of the snow the last winter.

#### *Region 2*

At Deschambault, foliage browning occurred in one plant the first winter. The last two winters, 33% and 17% of specimens had frost damage to the branch tips. The fourth winter, 8% had mechanical breakage.

At St. Foy, 15%, 54%, 100% and 100% of trees had frost damage to the branch tips the first three winters and the last winter.

No damage was observed at La Pocatière during the trials.

#### *Region 3*

At Normandin, one specimen died the first winter and another had foliage browning the last winter. The second and fourth winters, 5% and 17% of specimens were damaged by the weight of the snow.

At Kapuskasing, 31% of specimens died the first winter. In addition, 6% and 9% had frost damage to the previous year's shoot the first two winters.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

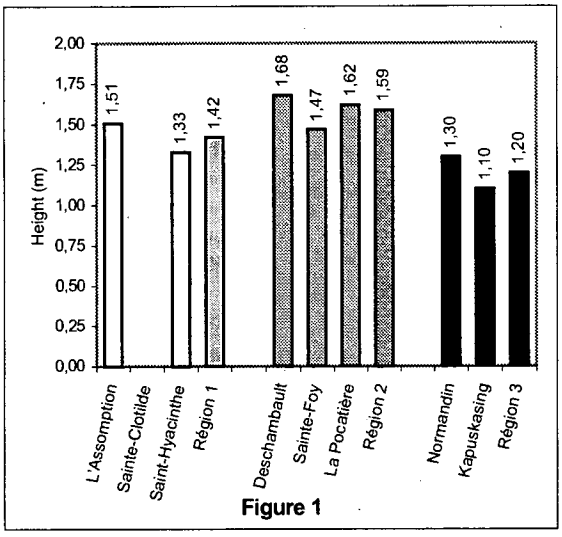


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

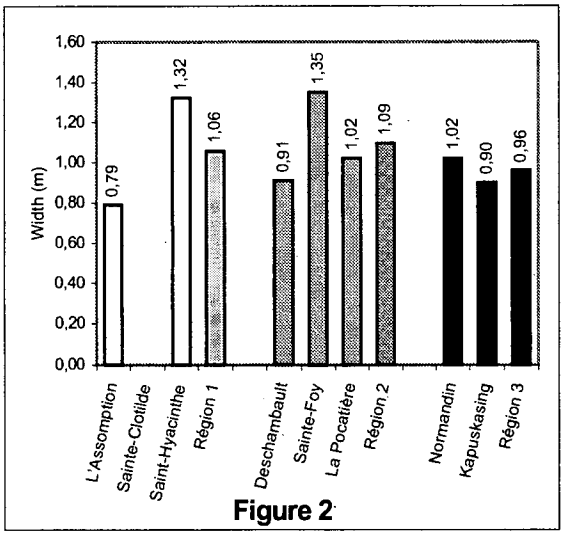


**Figure 2.** Mean width of trees at trial's end for each of the sites and three regions

Growth doubled during the second growing season at L'Assomption and La Pocatière, but increased gradually each year at the other sites.

### Effect of pruning

The only pruning done was to remove damaged portions of the stems.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

At all the sites except Kapuskasing and St. Hyacinthe, 75-95% of specimens were over 51 cm tall after two growing seasons. The first few years, plants at the region 2 sites were wider than those in the other regions, but this difference disappeared with time. After four growing seasons, 90% or more of the specimens were over 1.21 m tall at all the sites.

Unusually, growth was similar at all sites, with the specimens at Kapuskasing similar to those at the other sites.

## HARDINESS EVALUATION

A comparison of the results with the results of previous trials shows that the species can survive beyond zone 2, and can be used as far as zone 2b in the case of specimen plants and zone 3 in the case of hedges. The species' full ornamental potential can be achieved as far as zone 3.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

Table 1: **Frequency of winter damage observed in *Thuja occidentalis* L. (1993 control), 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 95 | | | | | | | 4 | | | | 1 | 5 |
| St. Clotilde | 100 | | | | | | | | | | | | 0 |
| St. Hyacinthe | 72 | | | | | | | | | 6 | | 22 | 28 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 87 | 10 | | | | | | | | 2 | | 1 | 13 |
| St. Foy | 46 | 54 | | | | | | | | | | | 54 |
| La Pocatière | 100 | | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 93 | | | | | | | 1 | | 4 | | 2 | 7 |
| Kapuskasing | 81 | | | 3 | | | | 6 | | | | | 9 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of types 5, 6, 7, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of *Thuja occidentalis* L. (1993 control) specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | - | 25 | 0 | 0 | 0 | 0 |
| 041-080 | 71 | 16 | 0 | 0 | 0 | 62 | 8 | 0 | 0 | - | 65 | 55 | 5 | 0 | 0 |
| 081-120 | 29 | 73 | 24 | 9 | 0 | 33 | 25 | 12 | 0 | - | 10 | 40 | 20 | 10 | 0 |
| 121-160 | 0 | 10 | 34 | 8 | 0 | 0 | 60 | 12 | 0 | - | 0 | 0 | 40 | 0 | 5 |
| 160-200 | 0 | 0 | 42 | 83 | 100 | 0 | 7 | 66 | 100 | - | 0 | 0 | 35 | 90 | 95 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 0 | 0 | 0 | 0 | 0 | 23 | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 |
| 041-080 | 58 | 0 | 0 | 0 | 0 | 54 | 15 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 |
| 081-120 | 42 | 26 | 0 | 0 | 0 | 23 | 39 | 0 | 0 | 0 | 33 | 25 | 0 | 0 | 0 |
| 121-160 | 0 | 42 | 8 | 0 | 0 | 0 | 38 | 33 | 0 | 0 | 0 | 67 | 10 | 0 | 0 |
| 160-200 | 0 | 32 | 92 | 100 | 100 | 0 | 8 | 67 | 100 | 100 | 0 | 8 | 90 | 100 | 100 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 5 | 0 | 0 | 8 | 0 | 6 | 0 | 0 | 0 | 0 |
| 041-080 | 60 | 0 | 0 | 0 | 0 | 69 | 55 | 10 | 0 | 0 |
| 081-120 | 35 | 58 | 0 | 0 | 0 | 25 | 45 | 60 | 10 | 0 |
| 121-160 | 0 | 42 | 42 | 0 | 0 | 0 | 0 | 20 | 20 | 0 |
| 160-200 | 0 | 0 | 58 | 92 | 100 | 0 | 0 | 10 | 70 | 100 |

* Data were not collected in 1997.

Table 3: **Breakdown of *Thuja occidentalis* L. (1993 control) specimens by saleable width category, 1993-97**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 100 | 67 | 8 | 0 | 100 | 92 | 12 | 0 | - | 100 | 100 | 95 | 0 | 0 |
| 051-100 | 0 | 0 | 33 | 83 | 73 | 0 | 8 | 76 | 37 | - | 0 | 0 | 5 | 100 | 40 |
| 101-150 | 0 | 0 | 0 | 9 | 27 | 0 | 0 | 12 | 54 | - | 0 | 0 | 0 | 0 | 55 |
| 151-200 | - | - | - | - | - | - | - | - | 9 | - | 0 | 0 | 0 | 0 | 5 |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 79 | 25 | 0 | 0 | 100 | 38 | 0 | 0 | 0 | 100 | 25 | 0 | 0 | 0 |
| 051-100 | 0 | 21 | 75 | 100 | 75 | 0 | 62 | 83 | 58 | 8 | 0 | 75 | 90 | 80 | 0 |
| 101-150 | 0 | 0 | 0 | 0 | 25 | 0 | 0 | 17 | 42 | 75 | 0 | 0 | 10 | 20 | 90 |
| 151-200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 0 | 10 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 68 | 42 | 0 | 0 | 100 | 82 | 0 | 10 | 10 |
| 051-100 | 0 | 32 | 58 | 100 | 42 | 0 | 18 | 90 | 70 | 20 |
| 101-150 | 0 | 0 | 0 | 0 | 58 | 0 | 0 | 10 | 20 | 70 |
| 151-200 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

# *THUJA OCCIDENTALIS*

L. (1994 CONTROL)

The sections "Botanical Description", "Origin and Distribution", "Use", "Requirements" and "Diseases and Insects" can be found in *Hardiness and Growth of Woody Ornamental Plants in Quebec*, Volume I (95-0070) and Volume III (VT 008).

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique**: 400 cuttings (15 cm) were taken on December 13, 1991 from nine-year-old parent plants measuring roughly 1.7 m high and .7 m wide. After a shallow wound was made at the base, the cuttings were dipped for five seconds in a 4000-ppm IBA/50% ethanol solution. The cuttings were planted in plug trays (45 cells) in a Promix®-perlite mixture (1:2; v:v), and placed under an automatic mist unit operating for five seconds every hour. The heating cables were set at 25°C. A weekly fungicide treatment of Benomyl® was given throughout the propagation period. The rooting rate was 80% after six weeks. Misting was discontinued and the seedlings were put in the lathhouse and treated with a soluble fertilizer (10-52-10). On May 20, 1993, they were transplanted to the nursery. On October 15, the seedlings were dug up, puddled and heeled in for the winter. In mid-April 1994, they were wrapped and stored in the cellar to await shipping in May.

**Inclusion in testing network:** Young trees 20 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 15% of specimens suffered frost damage to the branch tips the fourth winter.

No damage occurred at St. Clotilde.

At St. Hyacinthe, 37% of plants had foliage browning the second winter and all plants suffered damage from field mice the following winter.

*Region 2*

At Deschambault, 26% of trees suffered mechanical breakage the first two winters. The following two winters, frost damage to the branch tips was observed in 25% and 42% of plants. One tree had mechanical breakage the third winter.

At St. Foy, the branch tips were affected in 50%, 85%, 100% and 17% of trees the first two and last two winters. One tree had mechanical breakage after the fourth winter.

No damage occurred at La Pocatière.

*Region 3*

At Normandin, one plant had frost damage to the branch tips the last winter and 42% had mechanical breakage the third winter.

No damage was observed at Kapuskasing.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

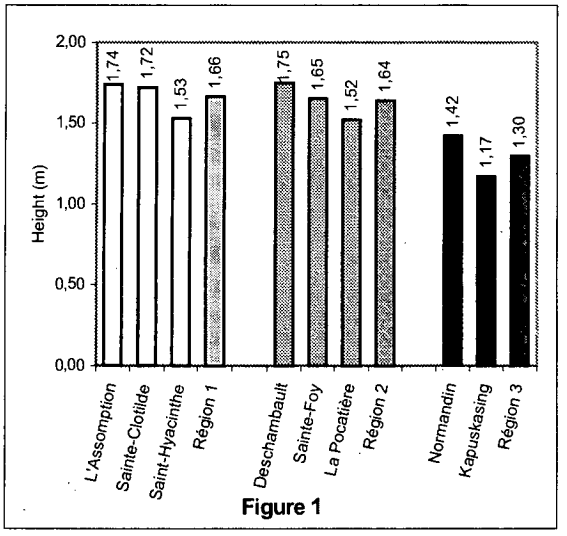


**Figure 1.** Mean height of trees at trial's end for each of the eight sites and three regions

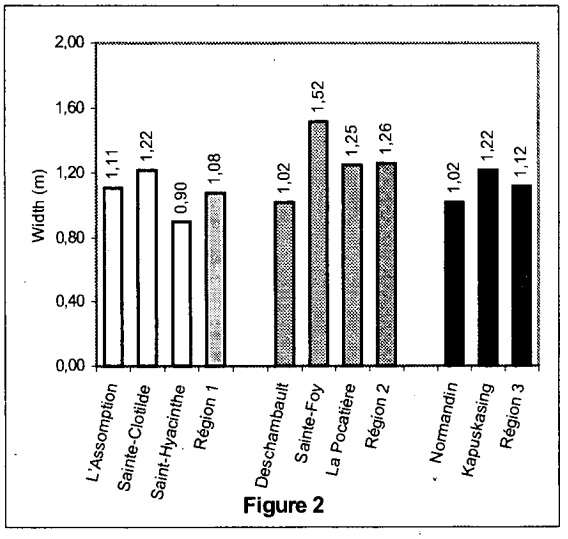


**Figure 2.** Mean width of trees at trial's end for each of the eight sites and three regions

Growth doubled during the second growing season at L'Assomption and La Pocatière, but increased gradually each year at the other sites. Growth was slower at Kapuskasing, however.

### Effect of pruning

The only pruning done was to remove damaged portions of the stems.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

After two growing seasons, 80-100% of specimens had attained a height of over 51 cm at all the sites. By trial's end, plants at the region 2 sites were wider than those in the other regions, with the difference intensifying with time. All the specimens at St. Foy attained a width greater than 0.81 cm after three growing seasons. A fourth year was required to obtain a comparable width at St. Clotilde, La Pocatière, Normandin and Kapuskasing and a fifth year at Deschambault.

This plant can be produced at all sites. In this trial, width growth at Kapuskasing was comparable to that at other sites, but has been much slower in other years.

## HARDINESS EVALUATION

A comparison of the results with those of previous trials shows that the species can survive beyond zone 2 and can be used as far as zone 2b in the case of specimen plants and zone 3 in the case of hedges. The species' full ornamental potential was achieved as far as zone 3.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Thuya occidentalis* L. (1994 control), 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 97 | 3 | | | | | | | | | | | 3 |
| St. Clotilde | 100 | | | | | | | | | | | | 0 |
| St. Hyacinthe | 73 | | | | | | | | | | 20 | 7 | 27 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 74 | 13 | | | | | | | | 2 | | 11 | 26 |
| St. Foy | 48 | 50 | | | | | | | | 2 | | | 52 |
| La Pocatière | 100 | | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 90 | 2 | | | | | | | | 8 | | | 10 |
| Kapuskasing | 100 | | | | | | | | | | | | 0 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of types 3, 4, 5, 6, 7, 8 or 9 occurred in the plants tested.

Table 2: **Breakdown of *Thuja occidentalis* L. (1994 control) specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 78 | 5 | 0 | 0 | 0 | 100 | 5 | 0 | 0 | 0 | - | 0 | 0 | 0 | 0 |
| 051-100 | 22 | 95 | 23 | 0 | 0 | 0 | 95 | 17 | 0 | 0 | - | 79 | 27 | 0 | 0 |
| 101-150 | 0 | 0 | 77 | 61 | 16 | 0 | 0 | 83 | 83 | 17 | - | 21 | 73 | 100 | 45 |
| 151-200 | 0 | 0 | 0 | 39 | 69 | 0 | 0 | 0 | 17 | 83 | - | 0 | 0 | 0 | 55 |
| 201-250 | 0 | 0 | 0 | 0 | 15 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 74 | 10 | 0 | 0 | 0 | 80 | 10 | 0 | 0 | 0 | 90 | 15 | 0 | 0 | 0 |
| 051-100 | 26 | 80 | 16 | 0 | 0 | 20 | 90 | 25 | 0 | 0 | 10 | 85 | 42 | 0 | 0 |
| 101-150 | 0 | 10 | 84 | 67 | 8 | 0 | 0 | 75 | 83 | 17 | 0 | 0 | 58 | 83 | 50 |
| 151-200 | 0 | 0 | 0 | 33 | 92 | 0 | 0 | 0 | 17 | 83 | 0 | 0 | 0 | 17 | 50 |
| 201-250 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-050 | 89 | 0 | 0 | 0 | 0 | 89 | 11 | 0 | 0 | 0 |
| 051-100 | 11 | 100 | 91 | 25 | 0 | 11 | 89 | 84 | 25 | 25 |
| 101-150 | 0 | 0 | 9 | 75 | 84 | 0 | 0 | 16 | 75 | 75 |
| 151-200 | 0 | 0 | 0 | 0 | 16 | - | - | - | - | - |
| 201-250 | - | - | - | - | - | - | - | - | - | - |

*Data on St. Hyacinthe were not collected in 1994.

**Table 3:** **Breakdown of *Thuja occidentalis* L. (1994 control) specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 100 | 17 | 0 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | - | 73 | 0 | 0 | 0 |
| 041-080 | 0 | 83 | 69 | 23 | 0 | 0 | 94 | 100 | 0 | 0 | - | 27 | 73 | 73 | 36 |
| 081-120 | 0 | 0 | 31 | 77 | 69 | 0 | 6 | 0 | 100 | 50 | - | 0 | 27 | 27 | 64 |
| 121-160 | 0 | 0 | 0 | 0 | 31 | 0 | 0 | 0 | 0 | 50 | - | - | - | - | - |
| 161-200 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 84 | 26 | 0 | 0 | 0 | 80 | 0 | 0 | 0 | 0 | 100 | 20 | 0 | 0 | 0 |
| 041-080 | 16 | 74 | 75 | 33 | 0 | 20 | 85 | 0 | 0 | 0 | 0 | 80 | 25 | 0 | 0 |
| 081-120 | 0 | 0 | 25 | 67 | 91 | 0 | 15 | 100 | 25 | 8 | 0 | 0 | 75 | 66 | 25 |
| 121-160 | 0 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 75 | 67 | 0 | 0 | 0 | 34 | 75 |
| 161-200 | - | - | - | - | - | 0 | 0 | 0 | 0 | 25 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-040 | 73 | 50 | 0 | 0 | 0 | 73 | 11 | 0 | 0 | 0 |
| 041-080 | 27 | 50 | 100 | 8 | 8 | 17 | 89 | 42 | 0 | 0 |
| 081-120 | 0 | 0 | 0 | 92 | 84 | 0 | 0 | 58 | 50 | 33 |
| 121-160 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 50 | 67 |
| 161-200 | - | - | - | - | - | - | - | - | - | - |

*Data on St. Hyacinthe were not collected in 1994

# *THUJA OCCIDENTALIS* 'BUCHANANI'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Buchanani Arborvitae |
| **French common name:** | Thuya occidental 'Buchanani' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub, of wide, rounded habit, can grow to 3 m tall and over 2 m wide after 30 years.

The branches, a slightly greyish dull green, are very fine, giving the cultivar a light, airy look.

## ORIGIN AND DISTRIBUTION

The cultivar has been in Laval University's Roger Van den Hende Garden for over 30 years, having been planted by Van den Hende himself. Mention of the cultivar is made by Rehder.

## USE

**Ornamental:** This cultivar is prized as both a specimen plant and for its use in mass plantings due to its unique airy look.

## REQUIREMENTS

This shrub grows equally well in full sun and partial shade. It prefers deep, moist soil. Light annual pruning allows a more compact form to be maintained.

## DISEASES AND INSECTS

There is no disease or insect pest specific to the cultivar and recommendations for the species form are generally applicable to cultivars.

Thuja species are potential primary hosts for various types of cedar rusts (*Gymnosporangium juniperi-virginianae, Gymnosporangium globosum*), with *Thuja occidentalis* being the most susceptible species. Cultivars are probably more resistant to the rust. *Alternaria, Epicoccum* and crown rot (*Phytophthora* spp., *Sclerotinia* spp., *Pythium* spp.) are other fungal diseases that may occur under favourable conditions.

The main insect pests affecting *Thuja* comprise scale insects (*lecanium*), spider mites, northern cedar bark beetle (*Phloeosinus canadensis*), black vine weevil (*Otiorhynchus sulcatus*) and strawberry root weevil (*Otiorhyncus ovatus*).

## PROPAGATION

**Cutting:** Cuttings taken in August or September and planted in a cold frame or greenhouse flats root readily. The use of auxin compounds increases the success rate.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Roger Van den Hende Garden, Laval University, St. Foy, Quebec

**Propagation site:** Laval University, St. Foy, Quebec

**Propagation technique:** On June 11, 1991, 401 cuttings (12 cm) were taken from roughly twenty-year-old parent plants. They were dipped for five seconds in a 8000-ppm IBA/50% ethanol solution, washed under the tap and then immersed in a Benomyl-Captan® fungicide solution. They were planted in a peat-perlite mixture (2:3; v:v) and placed under an automatic mist unit (Mist-A-Matic®). The rooting rate was 97% after 130 days. Misting was halted in early October and the seedlings were treated twice at a one-week interval with soluble fertilizer (20-20-20, 200 ppm N). In November, the plants were removed from their containers and kept in the cold store at 0°C in plastic bags perforated with a hairpin. In May 1992, they were potted up in Fertil Pot® containers in a peat-perlite mixture (3:2; v:v) and kept in a tunnel greenhouse for roughly a month,

and then moved to lightly shaded cold frames. They were treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until mid-September. In November, the seedlings were again moved to the cold store and kept at -1°C, to await shipping a few days later.

**Inclusion in testing network:** Young shrubs 18 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Mortality was observed in the shrubs over the first two winters.

*Region 1*

At L'Assomption, 26% and 14% of the specimens died during the first two winters.

No damage was found at St. Clotilde.

At St. Hyacinthe, 9% and 5% of the shrubs died the first two winters. All shrubs suffered foliage browning the second winter.

*Region 2*

At Deschambault, 8% of the plants died the fourth winter.

At St. Foy, 52%, 75% and 66% of plants suffered frost damage to the branch tips the second, third and fifth winters. In addition, 17% had foliage browning the third winter.

No damage was found at La Pocatière.

*Region 3*

At Normandin, 15% and 6% of shrubs died the first two winters. The fourth winter, 83% had mechanical breakage.

At Kapuskasing, the first winter, 10% of shrubs died, 15% had frost damage to the branch tips and 10% had damage to the previous year's shoots.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

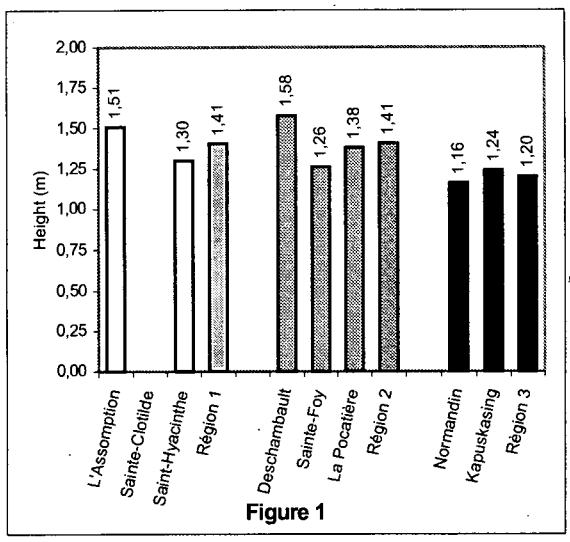


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

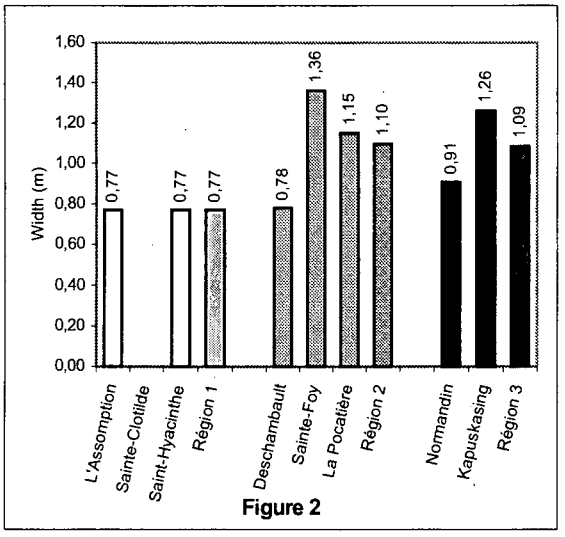


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

Growth was regular at all sites. Widths were particularly homogenous at the region 1 and 2 sites.

### Effect of pruning

The only pruning required was light pruning at St. Foy and La Pocatière.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Height growth in the cultivar was very similar at all sites regardless of the climatic region, with all plants measuring 0.51-1.0 m after three years.

The cultivar can be produced throughout Quebec. Recovery after transplanting appears to be more problematic than in other cultivars: careful handling or container production can be used to mitigate this problem during production.

## HARDINESS EVALUATION

The species and its cultivars are generally rated hardy to zone 3, depending on the references consulted. The trial results show that the cultivar can survive and be used at least as far as zone 2a.

When well established, the cultivar can achieve its full ornamental potential as far as zone 2b. The parent plant at Roger Van den Hende Garden is over 30 years old, never suffers damage and has good annual growth, unlike the young shrubs at the St. Foy site.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Thuja occidentalis* 'Buchanani', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 92 | | | | | | | 8 | | | | | 8 |
| St. Clotilde | 100 | | | | | | | | | | | | 0 |
| St. Hyacinthe | 63 | | | | | | | 5 | | | | 32 | 37 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 98 | | | | | | | 2 | | | | | 2 |
| St. Foy | 58 | 39 | | | | | | | | | | 3 | 42 |
| La Pocatière | 100 | | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 79 | | | | | | | 4 | | 17 | | | 21 |
| Kapuskasing | 93 | 2 | | 3 | | | | 2 | | | | | 7 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of types 3, 5, 6, 7, 9 or 11 occurred in the plants tested.

Table 2: Breakdown of *Thuja occidentalis* 'Buchanani' specimens by saleable height category, 1993-97

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 68 | 14 | 0 | 0 | 0 | 100 | 52 | 0 | 0 | - | 100 | 56 | 6 | 0 | 6 |
| 051-100 | 32 | 86 | 62 | 12 | 0 | 0 | 48 | 83 | 27 | - | 0 | 47 | 61 | 12 | 11 |
| 101-150 | 0 | 0 | 38 | 63 | 50 | 0 | 0 | 17 | 73 | - | 0 | 0 | 33 | 27 | 61 |
| 151-200 | 0 | 0 | 0 | 25 | 50 | - | - | - | - | - | 0 | 0 | 0 | 61 | 22 |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 95 | 5 | 0 | 0 | 0 | 95 | 5 | 0 | 0 | 0 | 95 | 9 | 0 | 0 | 0 |
| 051-100 | 5 | 95 | 56 | 0 | 0 | 5 | 62 | 58 | 8 | 0 | 5 | 91 | 83 | 25 | 0 |
| 101-150 | 0 | 0 | 44 | 91 | 33 | 0 | 33 | 42 | 92 | 50 | 0 | 0 | 17 | 75 | 92 |
| 151-200 | 0 | 0 | 0 | 9 | 67 | 0 | 0 | 0 | 0 | 50 | 0 | 0 | 0 | 0 | 8 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 75 | 75 | 8 | 8 | 0 | 95 | 73 | 8 | 0 | 0 |
| 051-100 | 25 | 25 | 58 | 0 | 25 | 5 | 27 | 83 | 34 | 8 |
| 101-150 | 0 | 0 | 34 | 92 | 75 | 0 | 0 | 9 | 66 | 92 |
| 151-200 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Clotilde were not collected in 1997.

Table 3: **Breakdown of *Thuja occidentalis* 'Buchanani' specimens by saleable width category, 1993-97**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 100 | 25 | 0 | 0 | 100 | 84 | 0 | 0 | - | 100 | 95 | 72 | 0 | 5 |
| 041-080 | 0 | 0 | 75 | 75 | 58 | 0 | 16 | 67 | 0 | - | 0 | 5 | 28 | 58 | 44 |
| 081-120 | 0 | 0 | 0 | 25 | 42 | 0 | 0 | 33 | 100 | - | 0 | 0 | 0 | 42 | 51 |
| 121-160 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 95 | 81 | 8 | 0 | 0 | 100 | 0 | 0 | 0 | 0 | 100 | 14 | 0 | 0 | 0 |
| 041-080 | 5 | 19 | 92 | 100 | 58 | 0 | 100 | 17 | 0 | 0 | 0 | 86 | 92 | 8 | 0 |
| 081-120 | 0 | 0 | 0 | 0 | 42 | 0 | 0 | 83 | 100 | 17 | 0 | 0 | 8 | 92 | 84 |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 0 | 83 | 0 | 0 | 0 | 0 | 16 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 62 | 42 | 0 | 0 | 100 | 16 | 0 | 0 | 0 |
| 041-080 | 0 | 38 | 58 | 25 | 58 | 0 | 84 | 83 | 0 | 0 |
| 081-120 | 0 | 0 | 0 | 75 | 42 | 0 | 0 | 17 | 100 | 50 |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 0 | 50 |

* Data for St. Clotilde were not collected in 1997.

# *THUJA OCCIDENTALIS* 'SHERWOOD FROST'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Sherwood Frost American Arborvitae |
| **French common name:** | Thuya occidental 'Sherwood Frost' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This dwarf conifer shrub, of erect habit, can grow to 0.8 m tall in ten years. It is a very vigorous, fast-growing cultivar.

It is characterized particularly by its unusual variegated foliage, a mixture of green and creamy white, which occurs mainly on the current year's shoots.

## ORIGIN AND DISTRIBUTION

No mention of this cultivar was found in the literature.

## USE

**Ornamental:** This small shrub can be used in rock gardens and small gardens.

## REQUIREMENTS

This conifer is adapted to all types of soil (clay, loam, sandy or organic) but prefers moist, deep, rich and even calcareous soils. It does not tolerate road salt well.

The shallow rooting facilitates the transplanting of balled and burlapped specimens. The cultivar requires little or no pruning.

The foliage, like that of most conifers, is susceptible to browning. Direct sun exposure in the spring is to be avoided and plants should be protected from the sun (jute, white geotextile, etc.).

## DISEASES AND INSECTS

There is no disease or insect pest specific to the cultivar and recommendations for the species form are generally applicable to cultivars.

*Thuja* species are potential primary hosts for various types of cedar rusts (*Gymnosporangium juniperi-virginianae, Gymnosporangium globosum*), with *Thuja occidentalis* being the most susceptible species. Cultivars are probably more resistant to the rust. *Alternaria, Epicoccum* and crown rot (*Phytophthora* spp., *Sclerotinia* spp., *Pythium* spp.) are other fungal diseases that may occur under favourable conditions.

The main insect pests affecting *Thuja* comprise scale insects (lecanium), spider mites, northern cedar bark beetle (*Phloeosinus canadensis*), black vine weevil (*Otiorhynchus sulcatus*) and strawberry root weevil (*Otiorhyncus ovatus*).

## PROPAGATION

**Cutting:** Cuttings taken in August or September and planted in a cold frame or greenhouse flats will root readily.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Purchased from Jardin de Jean-Pierre, St. Christine, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** On December 21, 1992, 245 cuttings (5-7 cm) were taken from 43-cm high, 32-cm wide parent plants. After a shallow wound was made at the base, the cuttings were dipped for five seconds in a 5000-ppm IBA/50% ethanol solution. The cuttings were planted in plug trays in a Promix®-perlite mixture (1:2; v:v), and placed under an automatic mist unit operating for ten seconds every hour. The temperature of the heating cables was set at 20°C and the greenhouse at 15°C. The rooting rate was 49% after four months, with the excessively

humid conditions in the greenhouse contributing to the loss of cuttings. In mid-April 1993, the cuttings were potted up in 10-cm containers in a Promix®-Turface® mixture (1:2; v:v) and treated with a soluble fertilizer (10-52-10). On May 25, they were moved to outdoor beds and treated weekly with a soluble fertilizer (20-20-20, 200 ppm N) until the end of August. The plants were overwintered in beds protected with cold frames. The survival rate was 100%. In May 1994, they were wrapped and put in the cold store at 4°C to await shipping a few days later.

**Inclusion in testing network:** Young shrubs 13 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Several plants died during the trials at certain sites.

*Region 1*

At L'Assomption, one shrub died the first winter and another had foliage browning the third winter.

At St. Clotilde, foliage browning occurred in 67%, 20% and 25% of plants the first three winters. One shrub had frost damage to the previous year's shoots the fourth winter.

At St. Hyacinthe, frost damage to the branch tips occurred in 93% of shrubs the first winter and foliage browning in 29% the second winter. Data were not collected in 1997.

*Region 2*

At Deschambault, 100% and 92% of shrubs had foliage browning the first and last winters.

At St. Foy, the first winter, one shrub died and 57% of plants had foliage browning. In addition, 28% and 77% had frost damage to the branch tips the first two winters.

At La Pocatière, one seedling died the third winter and another had frost damage to the previous year's shoots the fourth winter.

*Region 3*

At Normandin, single plants died during the second and fifth winters. Foliage browning occurred in 7% and 67% of specimens the first and third winters. The last winter, 92% had frost damage to the previous year's shoots.

At Kapuskasing, one shrub died the first winter; 67% had frost damage to the branch tips the third and fourth winters and a single plant had foliage browning the last winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

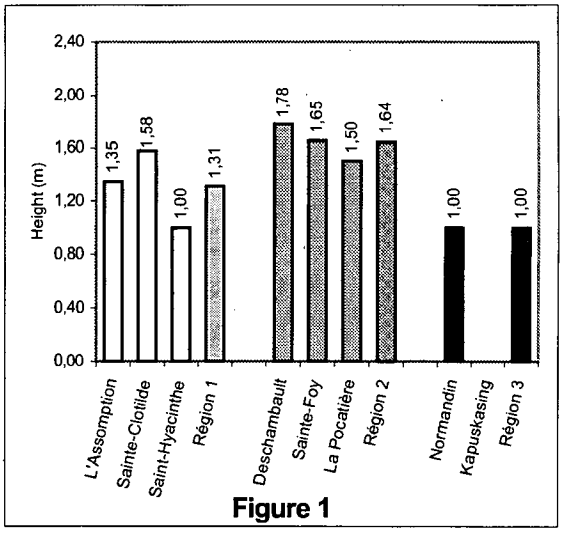


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

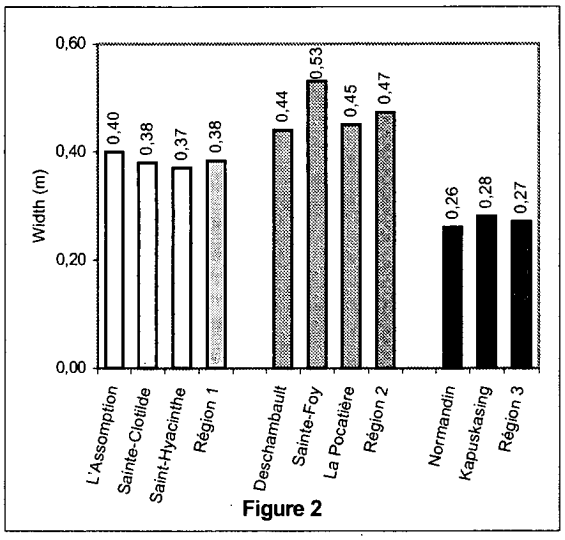


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

### Effect of pruning

Light pruning for training purposes was done at L'Assomption, Deschambault and Normandin.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

After two growing seasons, all the plants at L'Assomption, St. Foy and Deschambault had reached 21-40 cm tall, while a third season was required at St. Clotilde, St. Hyacinthe and La Pocatière and a fourth at Kapuskasing. Some of the specimens at Normandin reached this height after three growing seasons, but growth varied widely from plant to plant.

Although this cultivar can be produced at all the trial sites, growth is much slower at sites in the coldest region.

## HARDINESS EVALUATION

The same hardiness rating is given to this cultivar in the literature as the species form (zone 3). A comparison of the results obtained with the cultivar and the species form shows that survival rates in the cultivar after the first winter are slightly lower, since several of the latter died during the trials, while no mortality was observed in the species during the same period. The poor rooting rate obtained during propagation may be associated with weaker root development, which would explain the mortality that occurred the first winter at L'Assomption, St. Foy and Kapuskasing. Specimens died the third and fourth winters at La Pocatière and Normandin, showing that winter conditions were a bit too harsh there for this cultivar.

The cultivar can survive as far as zone 2, with the proviso that mortality may occur in the weakest specimens.

The cultivar can be used as far as zone 2; this rating is linked to slower growth, partial foliage browning and less dense plants.

The cultivar did not achieve its full ornamental potential at the sites tested.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Thuja occidentalis* 'Sherwood Frost', 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 97 | | | | | | | 1 | | | | 2 | 3 |
| St. Clotilde | 76 | 2 | | | | | | | | | | 22 | 24 |
| St. Hyacinthe | 70 | 23 | | | | | | | | | | 7 | 30 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 62 | | | | | | | | | | | 38 | 38 |
| St. Foy | 66 | 21 | | | | | | 1 | | | | 12 | 34 |
| La Pocatière | 96 | | | 2 | | | | 2 | | | | | 4 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 64 | | | 18 | | | | 3 | | | | 15 | 36 |
| Kapuskasing | 70 | 26 | | | | | | 2 | | | | 2 | 30 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of types 3, 5, 6, 7, 9, 10 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of *Thuja occidentalis* 'Sherwood Frost' specimens by saleable height category, 1994-98**

| REGION 1 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 31 | 0 | 0 | 0 | 0 | 50 | 20 | 8 | 0 | 0 | - | 43 | 8 | 8 | 0 |
| 21-40 | 69 | 100 | 36 | 18 | 9 | 40 | 80 | 75 | 67 | 50 | - | 57 | 84 | 75 | 50 |
| 41-60 | 0 | 0 | 64 | 73 | 82 | 10 | 0 | 17 | 33 | 50 | - | 0 | 8 | 17 | 50 |
| 61-80 | 0 | 0 | 0 | 9 | 9 | - | - | - | - | - | - | - | - | - | - |

| REGION 2 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 13 | 0 | 0 | 0 | 0 | 43 | 0 | 0 | 0 | 0 | 28 | 15 | 0 | 0 | 0 |
| 21-40 | 87 | 93 | 17 | 8 | 0 | 57 | 100 | 73 | 28 | 8 | 72 | 85 | 82 | 37 | 18 |
| 41-60 | 0 | 7 | 83 | 84 | 17 | 0 | 0 | 27 | 72 | 73 | 0 | 0 | 18 | 63 | 54 |
| 61-80 | 0 | 0 | 0 | 8 | 83 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 0 | 0 | 28 |

| REGION 3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Height | Normandin | | | | | Kapuskasing | | | | |
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 57 | 64 | 67 | 25 | 17 | 60 | 36 | 25 | 0 | 0 |
| 21-40 | 43 | 36 | 33 | 75 | 75 | 40 | 64 | 75 | 92 | 92 |
| 41-60 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 8 | 8 |
| 61-80 | - | - | - | - | - | - | - | - | - | - |

Data for St. Hyacinthe were not collected in 1994.

Table 3. **Breakdown of *Thuja occidentalis* 'Sherwood Frost' specimens by saleable width category, 1994-98**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 100 | 67 | 0 | 0 | 0 | 100 | 87 | 17 | 8 | 0 | - | 93 | 17 | 8 | 8 |
| 21-40 | 0 | 33 | 100 | 100 | 45 | 0 | 13 | 83 | 92 | 92 | - | 7 | 83 | 92 | 75 |
| 41-60 | 0 | 0 | 0 | 0 | 55 | 0 | 0 | 0 | 0 | 8 | - | 0 | 0 | 0 | 17 |
| 51-80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 100 | 60 | 0 | 0 | 0 | 93 | 25 | 0 | 0 | 0 | 100 | 50 | 0 | 0 | 0 |
| 21-40 | 0 | 40 | 100 | 100 | 25 | 7 | 75 | 82 | 18 | 9 | 0 | 50 | 100 | 90 | 9 |
| 41-60 | 0 | 0 | 0 | 0 | 75 | 0 | 0 | 18 | 82 | 72 | 0 | 0 | 0 | 10 | 91 |
| 51-80 | - | - | - | - | - | 0 | 0 | 0 | 0 | 19 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 01-20 | 100 | 100 | 66 | 33 | 17 | 87 | 57 | 42 | 25 | 25 |
| 21-40 | 0 | 0 | 34 | 67 | 83 | 13 | 43 | 58 | 75 | 75 |
| 41-60 | - | - | - | - | - | - | - | - | - | - |
| 51-80 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Hyacinthe were not collected in 1994.

# *THUJA OCCIDENTALIS* 'SHERWOOD MOSS'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Sherwood Moss American Arborvitae |
| **French common name:** | Thuya occidental 'Sherwood Moss' |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This dwarf conifer shrub of conical habitat can grow to 0.8 m tall at maturity according to the literature, although it reached 1.2 m tall and wide at the zone 4 sites tested.

The cultivar's habit is very similar to that of 'Sherwood Frost' during the first two or three growing seasons, but it then becomes taller and wider. The young leaves are dark green and turn a bronze colour in winter.

## ORIGIN AND DISTRIBUTION

No references were found on the cultivar's origin.

## USE

**Ornamental:** The cultivar can be used in small gardens or as a low hedge.

## REQUIREMENTS

The conifer does well in a wide range of soils (clay, loam, sandy or organic) but prefers moist, deep, rich and even calcareous soils. It does not tolerate road salt very well.

It is shallow rooted, facilitating the transplanting of balled and burlapped specimens. The cultivar requires little or no pruning.

Like most conifers, it is susceptible to foliage browning. Direct sun exposure in the spring is to be avoided and it should be protected with a screen (jute, white geotextile, etc.).

## DISEASES AND INSECTS

There is no disease or insect pest specific to the cultivar and recommendations for the species form are generally applicable to cultivars.

*Thuja* species are potential primary hosts for various types of cedar rusts (*Gymnosporangium juniperi-virginianae, Gymnosporangium globosum*), with *Thuja occidentalis* being the most susceptible species. Cultivars are probably more resistant to the rust. *Alternaria, Epicoccum* and crown rot (*Phytophthora* spp., *Sclerotinia* spp., *Pythium* spp.) are other fungal diseases that may occur under favourable conditions.

The main insect pests affecting *Thuja* comprise scale insects (lecanium), spider mites, northern cedar bark beetle (*Phloeosinus canadensis*), black vine weevil (*Otiorhynchus sulcatus*) and strawberry root weevil (*Otiorhyncus ovatus*).

## PROPAGATION

**Cutting:** Cuttings taken in August or September and planted in a cold frame or flats in the greenhouse will root readily.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Purchased from Jardin de Jean-Pierre, St. Christine, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** On December 21, 1992, 430 cuttings (7-10 cm) were taken from 50-cm tall and wide parent plants. After a shallow wound was made at the base, the cuttings were dipped for five seconds in a 5000-ppm IBA/50% ethanol solution. The cuttings were planted in plug trays in a Promix®-perlite mixture (1:2; v:v), and placed under an automatic mist unit operating for ten

seconds every hour. The temperature of the heating cables was set at 20°C and the greenhouse at 15°C. In mid-April 1993, the cuttings were removed from the mist propagation system and treated with a soluble fertilizer (10-52-10). The rooting rate was 63% after four months, with the excessively humid conditions in the greenhouse contributing to the loss of the cuttings. On May 19, 273 seedlings (20 cm) were transplanted into the nursery, where they received a second application of soluble fertilizer (10-52-10). In November, they were dug up and heeled in for the winter. In May 1994, they were puddled, wrapped and put in the cold store at 5°C to await shipping a few days later.

**Inclusion in testing network:** Young shrubs 17 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1994 to 1999.

## RESULTS (1994-99)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Foliage damage was found on a number of occasions. Three shrubs died in St. Clotilde and four at St. Hyacinthe during the trials.

*Region 1*

The only damage that occurred at L'Assomption was foliage browning, found in 42% of specimens the fourth winter.

At St. Clotilde, 11% and 9% of plants died the first and third winters. In addition, the first two winters, foliage browning occurred in 89% and 12%.

At St. Hyacinthe, 33% of specimens died the third winter; the first winter, 14% had frost damage to the branch tips and the second winter, all had foliage browning. Data were not collected in 1997.

*Region 2*

At Deschambault, 100% and 50% of specimens had foliage browning the first two winters. The second winter, one plant had rodent damage.

At St. Foy, the second winter, one specimen had frost damage to the branch tips.

No damage occurred at La Pocatière.

*Region 3*

At Normandin, the third winter, 8% of shrubs died and 67% had mechanical breakage. The last winter, 67% had frost damage to the previous year's shoots.

At Kapuskasing, foliage browning occurred in 8% of specimens the last winter.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

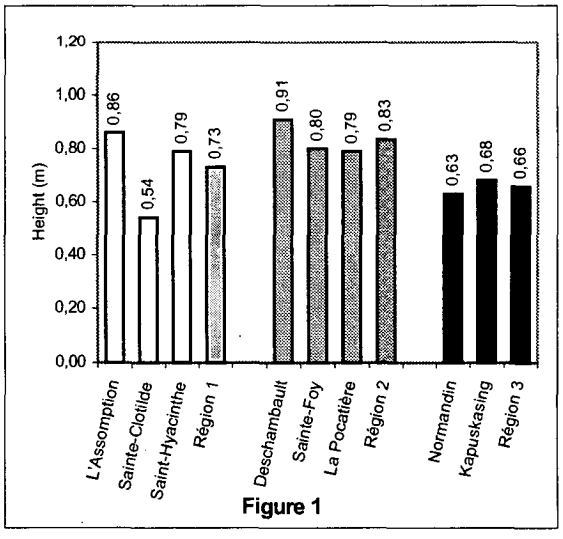


**Figure 1.** Mean height of shrubs at trial's end for each of the eight sites and three regions

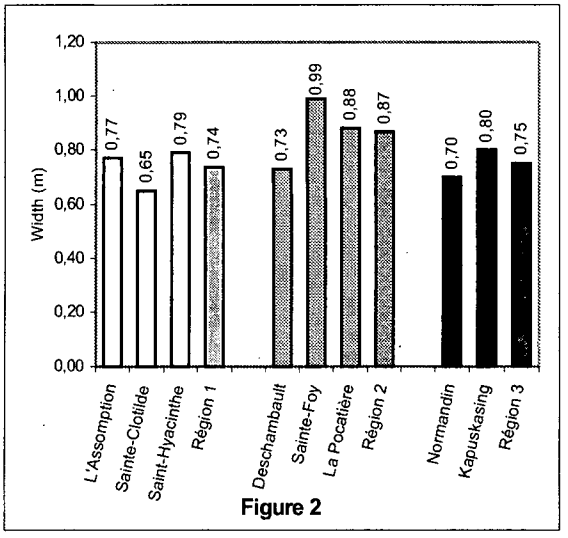


**Figure 2.** Mean width of shrubs at trial's end for each of the eight sites and three regions

### Effect of pruning

Light pruning was done at L'Assomption and Normandin.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

After two growing seasons, 95% and 96% of specimens at L'Assomption and St. Foy had reached a height of 31-60 cm, compared with 81% at St. Hyacinthe, 76% at Kapuskasing and 66% at Deschambault and La Pocatière. A third growing season was required at Normandin to produce plants of comparable height.

The cultivar can be produced at all the sites; growth was slightly faster under the conditions found at L'Assomption (zone 5a and good snow cover) and St. Foy (zone 4b and good snow cover).

## HARDINESS EVALUATION

Although, in the literature, this cultivar is given the same hardiness rating as the species form (zone 3), our results show that it can survive as far as zone 2. Survival rates in zones 2a and 2b were excellent, since specimens at Normandin (2b) and Kapuskasing (2a) were protected by an extensive snow cover every winter during the trials.

The cultivar can also be used as far as zone 2; growth was regular and plants grew wider than tall at the region 2 and 3 sites.

During the trials, the cultivar achieved its full ornamental potential in the zone 2a, 4a and 4b sites, with the snow cover playing an important role.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Thuja occidentalis* 'Sherwood Moss', 1995-99**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 92 | | | | | | | | | | | 8 | 8 |
| St. Clotilde | 76 | | | | | | | 4 | | | | 20 | 24 |
| St. Hyacinthe | 63 | 3 | | | | | | 8 | | | | 26 | 37 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 69 | | | | | | | | | | 1 | 30 | 31 |
| St. Foy | 99 | 1 | | | | | | | | | | | 1 |
| La Pocatière | 100 | | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 72 | | | 13 | | | | | | 13 | | 2 | 28 |
| Kapuskasing | 98 | | | | | | | | | | | 2 | 2 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of types 3, 5, 6, or 9 occurred in the plants tested.

**Table 2:** **Breakdown of *Thuja occidentalis* 'Sherwood Moss' specimens by saleable height category, 1994-98**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-030 | 80 | 5 | 0 | 0 | 0 | 94 | 81 | 17 | 8 | 8 | - | 19 | 8 | 0 | 0 |
| 031-060 | 20 | 95 | 58 | 0 | 0 | 6 | 19 | 75 | 92 | 84 | - | 81 | 67 | 33 | 8 |
| 061-090 | 0 | 0 | 42 | 83 | 59 | 0 | 0 | 8 | 0 | 8 | - | 0 | 25 | 67 | 92 |
| 091-120 | 0 | 0 | 0 | 17 | 41 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-030 | 100 | 35 | 0 | 0 | 0 | 71 | 4 | 0 | 0 | 0 | 86 | 33 | 0 | 0 | 0 |
| 031-060 | 0 | 65 | 67 | 36 | 0 | 29 | 96 | 100 | 58 | 0 | 14 | 67 | 100 | 0 | 0 |
| 061-090 | 0 | 0 | 33 | 64 | 54 | 0 | 0 | 0 | 42 | 100 | 0 | 0 | 0 | 100 | 100 |
| 091-120 | 0 | 0 | 0 | 0 | 46 | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-030 | 90 | 67 | 17 | 0 | 0 | 100 | 24 | 0 | 0 | 0 |
| 031-060 | 10 | 33 | 83 | 67 | 42 | 0 | 76 | 100 | 25 | 25 |
| 061-090 | 0 | 0 | 0 | 33 | 58 | 0 | 0 | 0 | 75 | 75 |
| 091-120 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1994.

Table 3: Breakdown of *Thuja occidentalis* 'Sherwood Moss' specimens by saleable width category, 1994-98

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 45 | 0 | 0 | 0 | 0 | 89 | 19 | 0 | 0 | 0 | - | 9 | 0 | 0 | 0 |
| 021-040 | 55 | 90 | 17 | 0 | 0 | 11 | 81 | 83 | 17 | 9 | - | 76 | 8 | 0 | 0 |
| 041-060 | 0 | 10 | 58 | 50 | 8 | 0 | 0 | 17 | 75 | 8 | - | 15 | 58 | 25 | 0 |
| 061-080 | 0 | 0 | 25 | 50 | 58 | 0 | 0 | 0 | 8 | 83 | - | 0 | 34 | 75 | 75 |
| 081-100 | 0 | 0 | 0 | 0 | 34 | - | - | - | - | - | - | 0 | 0 | 0 | 25 |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 60 | 15 | 0 | 0 | 0 | 9 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 40 | 85 | 17 | 0 | 0 | 91 | 19 | 0 | 0 | 0 | 100 | 95 | 0 | 0 | 0 |
| 041-060 | 0 | 0 | 83 | 36 | 18 | 0 | 81 | 0 | 0 | 0 | 0 | 5 | 67 | 0 | 0 |
| 061-080 | 0 | 0 | 0 | 64 | 64 | 0 | 0 | 100 | 17 | 0 | 0 | 0 | 33 | 100 | 0 |
| 081-100 | 0 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 75 | 75 | 0 | 0 | 0 | 0 | 100 |
| 101-120 | - | - | - | - | - | 0 | 0 | 0 | 8 | 25 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 94 | 95 | 96 | 97 | 98 | 94 | 95 | 96 | 97 | 98 |
| 001-020 | 38 | 19 | 0 | 0 | 0 | 14 | 5 | 0 | 0 | 0 |
| 021-040 | 62 | 81 | 58 | 8 | 0 | 86 | 71 | 8 | 0 | 0 |
| 041-060 | 0 | 0 | 42 | 58 | 25 | 0 | 24 | 58 | 17 | 0 |
| 061-080 | 0 | 0 | 0 | 25 | 42 | 0 | 0 | 34 | 75 | 42 |
| 081-100 | 0 | 0 | 0 | 9 | 33 | 0 | 0 | 0 | 8 | 58 |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1994.

# *THUJA OCCIDENTALIS* 'SPIRALIS'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Spiralis Eastern Arborvitae |
| **French common name:** | Thuya occidental 'Spiralis' |
| **Category:** | Evergreen plant |
| **Subdivision :** | Medium-sized tree |

## BOTANICAL DESCRIPTION

This small, conical-shaped tree, which grows to 6-7 m tall and 1.0-1.5 m wide, has the narrowest habit of all the arborvitae. Slow growing, it only reaches 3 m tall and 0.6 m wide after ten years, with height growth of around 25 cm per year after that.

The branches are oblong near the trunk, but become vertical at the tips. The young shoots are arranged spirally on the branches (helicoid). The shoot complex consists of small flattened fern-like sprays. The leaves, consisting of imbricate scales, are dull green in summer after they emerge and turn dark green in fall.

The small, ochre-brown cones are numerous in fall (October).

## ORIGIN AND DISTRIBUTION

The first mention of the cultivar was in 1923.

## USE

**Ornamental:** The tree is used mainly in mass plantings with other plants to create a contrasting effect. It can also be used as a specimen plant or as a screen.

## REQUIREMENTS

The conifer does well in a wide range of soils (clay, loam, sandy or organic) but prefers moist, deep, rich and even calcareous soils. It does not tolerate road salt very well.

It is shallow rooted, facilitating the transplanting of balled and burlapped specimens. The cultivar requires little or no pruning.

## DISEASES AND INSECTS

There is no disease or insect pest specific to the cultivar and recommendations for the species form are generally applicable to cultivars.

*Thuja* species are potential primary hosts for various types of cedar rusts (*Gymnosporangium juniperi-virginianae*, *Gymnosporangium globosum*), with *Thuja occidentalis* being the most susceptible species. Cultivars are probably more resistant to the rust. *Alternaria*, *Epicoccum* and crown rot (*Phytophthora* spp., *Sclerotinia* spp., *Pythium* spp.) are other fungal diseases that may occur under favourable conditions.

The main insect pests affecting *Thuja* comprise scale insects (lecanium), spider mites, northern cedar bark beetle (*Phloeosinus canadensis*), black vine weevil (*Otiorhynchus sulcatus*) and strawberry root weevil (*Otiorhyncus ovatus*).

## PROPAGATION

**Cutting:** Cuttings taken in August or September and planted in a cold frame or flats in the greenhouse will root readily.

**Grafting:** Grafting should be done in late winter in the greenhouse, from well-rooted container rootstocks. Doing this operation in summer is less successful.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** On December 11, 1991, 400 cuttings (15 cm) were taken from eight-year-old, roughly

1.15-m tall and 0.6-m wide parent plants. After a shallow wound was made at the base, the cuttings were dipped for five seconds in a 4000-ppm IBA/50% ethanol solution. The cuttings were planted in plug trays (45 cells) in a Promix®-sand mixture (1:2; v:v), and placed under an automatic mist unit operating for five seconds every hour. The temperature of the heating cables was set at 25°C. Benomyl® fungicide treatments were provided throughout the propagation period. The rooting rate was 60% after three months. Misting was gradually discontinued and the plants were put in the greenhouse until spring, after being treated with a soluble fertilizer (10-52-10) at the recommended rate. On May 20, 1992, the seedlings were transplanted into the nursery, where they received a second application of soluble fertilizer (20-20-20) at the recommended rate. On October 25, they were dug up, puddled and heeled in for the winter. In mid-April, 1993, they were wrapped and put in the cellar to await shipping in May.

**Inclusion in testing network:** Young trees 20 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, the first winter, 12% of specimens died and 6% suffered foliage browning.

At St. Clotilde, 5% of trees died the first winter.

At St. Hyacinthe, 23% and 9% of specimens died the first and fourth winters. The second winter, all plants had foliage browning.

*Region 2*

At Deschambault, 23% of specimens had foliage browning the first winter. The second and third winters, 6% and 8% had mechanical breakage. The last two winters, 33% and 8% suffered frost damage to the branch tips.

At St. Foy, damage to the branch tips occurred in 24%, 24%, 75% and 92% of plants the first three winters and the last winter respectively.

At La Pocatière, frost damage to the previous year's shoots was observed in 9% of specimens the fourth winter.

*Region 3*

One seedling died the first winter at Normandin; the fourth winter, 33% had mechanical breakage and 8% had foliage browning.

At Kapuskasing, the first three winters, 30%, 8% and 8% of specimens died. The first winter, 23% had foliage browning and the following winter, 8% suffered damage to the previous year's shoots.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

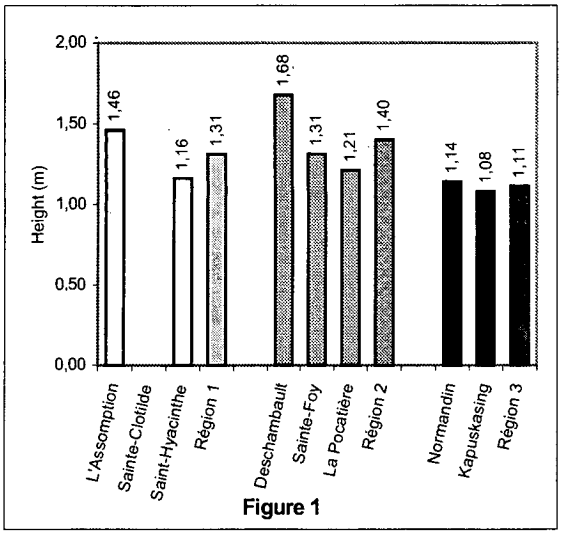


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

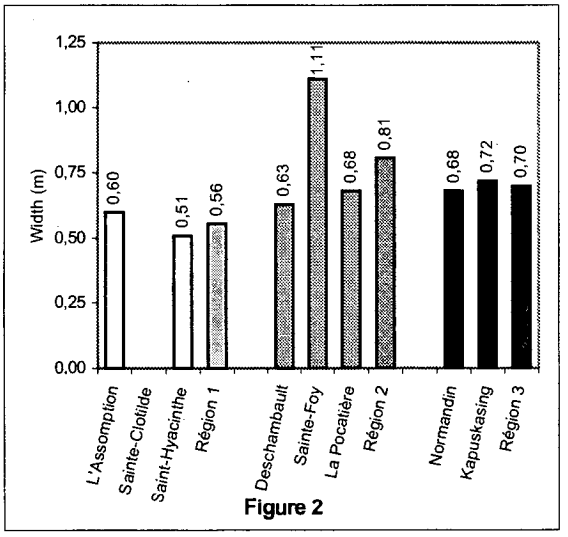


**Figure 2.** Mean width of trees at trial's end for each of the sites and three regions

### Effect of pruning

The only pruning done was to cut back the damaged portions of stems.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

This cultivar can be produced at all the sites except Kapuskasing, where growth was much slower, height did not increase after the second growing season and mortality was high the first winter in the field.

## HARDINESS EVALUATION

In zone 2a, this cultivar suffered mortality during the first three winters, which suggests that the plants had become weakened or had problems adapting to the winter conditions there. This indicates that the species can survive as far as zone 2b.

The species can also be used as far as zone 2b, since regular growth occurred at the zone 2b site.

The cultivar did not achieve its full ornamental potential at the sites tested, although frost damage was very sporadic in zones 5a, 5b and 4a.

## WRITTEN BY

Claude Richer, Agr.

Jacques-André Rioux, Agr.

Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Thuja occidentalis* 'Spiralis', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 74 | | | | | | | 6 | | | | 20 | 26 |
| St. Clotilde | 96 | | | | | | | 2 | | | | 2 | 4 |
| St. Hyacinthe | 98 | | | | | | | 2 | | | | | 2 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 84 | 8 | | | | | | | | 3 | | 5 | 16 |
| St. Foy | 57 | 43 | | | | | | | | | | | 43 |
| La Pocatière | 97 | | | 3 | | | | | | | | | 3 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 90 | | | | | | | 1 | | 7 | | 2 | 10 |
| Kapuskasing | 85 | | | 2 | | | | 10 | | | | 3 | 15 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of types 3, 5, 6, 7, 9 or 11 occurred in the plants tested.

Table 2. **Breakdown of *Thuja occidentalis* 'Spiralis' specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 40 | 0 | 0 | 0 | 100 | 56 | 8 | 0 | - | 100 | 90 | 27 | 0 | 0 |
| 051-100 | 0 | 60 | 100 | 0 | 0 | 0 | 44 | 92 | 18 | - | 0 | 10 | 73 | 85 | 25 |
| 101-150 | 0 | 0 | 0 | 72 | 28 | 0 | 0 | 0 | 82 | - | 0 | 0 | 0 | 15 | 75 |
| 151-200 | 0 | 0 | 0 | 28 | 72 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 100 | 24 | 0 | 0 | 0 | 100 | 35 | 0 | 0 | 0 | 100 | 53 | 10 | 0 | 0 |
| 051-100 | 0 | 76 | 66 | 0 | 0 | 0 | 65 | 100 | 50 | 0 | 0 | 47 | 90 | 18 | 0 |
| 101-150 | 0 | 0 | 34 | 75 | 8 | 0 | 0 | 0 | 50 | 100 | 0 | 0 | 0 | 82 | 55 |
| 151-200 | 0 | 0 | 0 | 25 | 92 | - | - | - | - | - | 0 | 0 | 0 | 0 | 45 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 89 | 47 | 8 | 0 | 0 | 100 | 92 | 11 | 0 | 0 |
| 051-100 | 11 | 53 | 92 | 58 | 25 | 0 | 8 | 89 | 87 | 87 |
| 101-150 | 0 | 0 | 0 | 42 | 75 | 0 | 0 | 0 | 13 | 13 |
| 151-200 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: Breakdown of *Thuja occidentalis* 'Spiralis' specimens by saleable width category, 1993-97

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 100 | 82 | 9 | 0 | 100 | 100 | 33 | 18 | - | 0 | 100 | 100 | 77 | 17 |
| 041-080 | 0 | 0 | 18 | 91 | 100 | 0 | 0 | 67 | 72 | - | 0 | 0 | 0 | 23 | 83 |
| 081-120 | - | - | - | - | - | 0 | 0 | 0 | 10 | - | - | - | - | - | - |
| 121-160 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 47 | 12 | 0 | 0 | 0 | 100 | 59 | 0 | 0 | 0 | 100 | 100 | 45 | 9 | 0 |
| 041-080 | 53 | 88 | 58 | 83 | 33 | 0 | 41 | 100 | 100 | 0 | 0 | 0 | 55 | 91 | 100 |
| 081-120 | 0 | 0 | 42 | 17 | 67 | 0 | 0 | 0 | 0 | 67 | - | - | - | - | - |
| 121-160 | - | - | - | - | - | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-040 | 100 | 88 | 92 | 25 | 0 | 100 | 100 | 44 | 0 | 0 |
| 041-080 | 0 | 12 | 8 | 75 | 100 | 0 | 0 | 56 | 100 | 87 |
| 081-120 | - | - | - | - | - | 0 | 0 | 0 | 0 | 13 |
| 121-160 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

# *THUJA OCCIDENTALIS* 'UMBRACULIFERA'

| | |
|---|---|
| **Family:** | Cupressaceae |
| **English common name:** | Eastern arborvitae, Arborvitae, Cedar |
| **French common name:** | Thuya occidental 'Umbraculifera' |
| **Synonym:** | *Thuya occidentalis* var. *umbraculifera* Beiss. |
| **Category:** | Evergreen plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This dwarf shrub, with a perfectly uniform globular shape, can grow to 1.0 m wide and 0.7 m tall in ten years, according to the literature. However, the specimens at L'Assomption exceeded this height after five growing seasons.

Features distinguishing it from other *Thuja* include its rich bluish-green foliage and hemispheric shape extending to the ground, which is reminiscent of an umbrella, hence its name.

It has several main branches, which are initially erect and then spreading, forming a compact, rounded crown.

The pinkish-brown twigs turn dark bronze in winter.

## ORIGIN AND DISTRIBUTION

The first mention of this cultivar is 1892 in Germany.

## USE

**Ornamental:** The cultivar is mainly used as a specimen plant and in association, or to contrast, with other conifers.

## REQUIREMENTS

This cultivar does not transplant well and transplanting must be done when it is as small as possible. Most *Thuja* cultivars do best in a light, moist soil and tolerate semishady sites and low temperatures but not drought.

## DISEASES AND INSECTS

There is no disease or insect pest specific to the cultivar and recommendations for the species form are generally applicable to cultivars.

*Thuja* species are potential primary hosts for various types of cedar rusts (*Gymnosporangium juniperi-virginianae*, *Gymnosporangium globosum*), with *Thuja occidentalis* being the most susceptible species. Cultivars are probably more resistant to the rust. *Alternaria*, *Epicoccum* and crown rot (*Phytophthora* spp., *Sclerotinia* spp., *Pythium* spp.) are other fungal diseases that may occur under favourable conditions.

The main insect pests affecting *Thuja* comprise scale insects (lecanium), spider mites, northern cedar bark beetle (*Phloeosinus canadensis*), black vine weevil (*Otiorhynchus sulcatus*) and strawberry root weevil (*Otiorhyncus ovatus*).

## PROPAGATION

**Cutting:** Cuttings taken in August or September and planted in a cold frame or flats in the greenhouse will root readily. The use of auxin compounds will increase the success rate.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Expermental Farm, L'Assomption, Quebec

**Propagation technique:** On December 11, 1991, 400 cuttings (15 cm) were taken from eight-year-old, roughly 1.0-m tall and 0.7-m wide parent plants. After a shallow wound was made at the base, the cuttings were dipped for five seconds in a 4000-ppm IBA/50% ethanol solution. The cuttings were planted in fibre pots in a Promix®-sand

mixture (1:2; v:v), and placed under an automatic mist unit operating for five seconds every hour. The temperature of the heating cables was set at 25°C. Benomyl® fungicide treatments were provided throughout the propagation period. The rooting rate was 70% after 15 weeks. Misting was halted on April 5 and the plants were kept in the greenhouse until spring, after being treated with a soluble fertilizer (10-52-10) at the recommended rate. On May 20, 1992, the seedlings were transplanted into the nursery, where they received a second application of soluble fertilizer (20-20-20) at the recommended rate. On October 25, they were dug up, puddled and heeled in for the winter. In mid-April, 1993, they were wrapped and put in the cellar to await shipping in May.

**Inclusion in testing network:** Young plants 15 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

No frost damage was observed at L'Assomption. At St. Clotilde, one shrub died the second winter.

At St. Hyacinthe, one specimen died the first winter and 26% and 67% of the shrubs had foliage browning the first two winters.

*Region 2*

At Deschambault, 17% of specimens died the fourth winter. Foliage browning occurred in 9%, 17% and 20% of plants the first winter and last two winters.

At St. Foy, 33% of plants had frost damage to the branch tips the third winter. Foliage browning occurred in 25% the fifth winter.

No damage was observed at La Pocatière.

*Region 3*

At Normandin, 25% of specimens had foliage browning the last winter of the trials.

At Kapuskasing, one shrub died the second winter. Frost damage to the branch tips occurred in 9% and 18% of plants the last two winters. The fourth winter, 9% had frost damage to the previous year's shoots.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

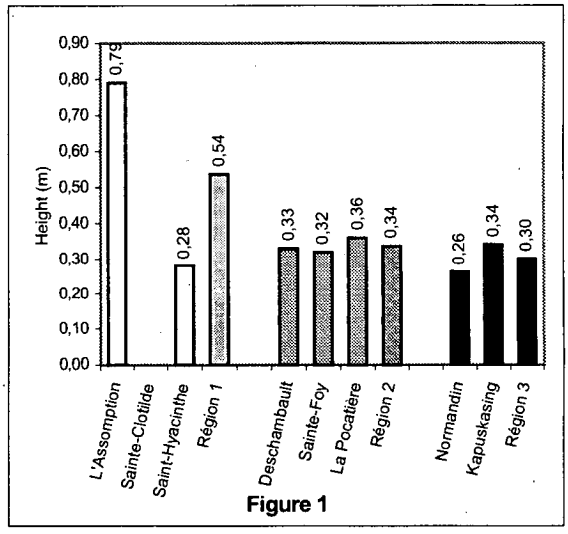


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

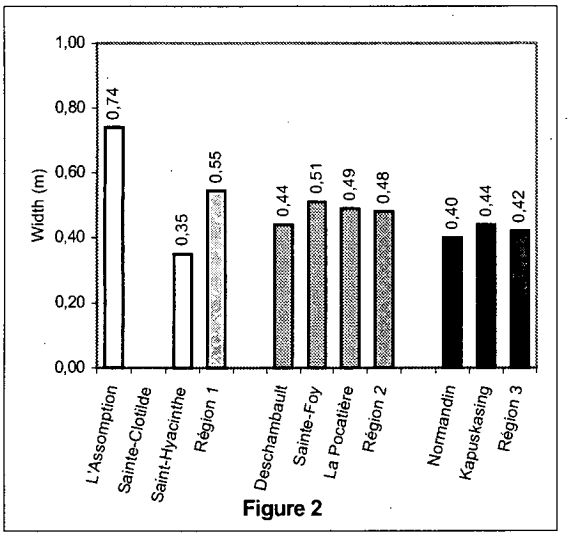


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

Regular growth was observed at all sites. Width growth was particularly homogenous in regions 1 and 2.

### Effect of pruning

Light pruning was done at St. Foy and La Pocatière.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Height and width growth was greatest at L'Assomption, with the size of specimens greatly exceeding that at other sites. Maximum height was attained after three or four growing seasons at all sites, with the shrubs in region 3 growing more slowly.

The cultivar can be produced at all the sites tested.

## HARDINESS EVALUATION

The species and its cultivars are generally considered hardy to zone 3, according to the references consulted. The cultivar can survive and be used at least as far as zone 2a; since the plants are small, the snow covers them completely every year.

The cultivar can achieve its full ornamental potential as far as zone 4a. The parent plant at the Montreal Botanical Garden, which is over 15 years old, has not suffered any significant damage in years and has good annual growth.

## WRITTEN BY

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**Table 1: Frequency of winter damage observed in *Thuja occidentalis* 'Umbraculifera', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 14 | |
| **REGION 1** | | | | | | | | | | | | | |
| L'Assomption | 100 | | | | | | | | | | | | 0 |
| St. Clotilde | 98 | | | | | | | 2 | | | | | 2 |
| St. Hyacinthe | 67 | | | | | | | 2 | | | | 31 | 33 |
| **REGION 2** | | | | | | | | | | | | | |
| Deschambault | 87 | | | | | | | 3 | | | | 10 | 13 |
| St. Foy | 88 | 7 | | | | | | | | | | 5 | 12 |
| La Pocatière | 100 | | | | | | | | | | | | 0 |
| **REGION 3** | | | | | | | | | | | | | |
| Normandin | 95 | | | | | | | | | | | 5 | 5 |
| Kapuskasing | 92 | 5 | | 2 | | | | 1 | | | | | 8 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage
14 = partial foliage browning in evergreens

No damage of types 3, 5, 6, 7, 9, 10 or 11 occurred in the plants tested.

Table 2: **Breakdown of *Thuja occidentalis* 'Umbraculifera' specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 33 | 0 | 0 | 0 | 0 | 86 | 71 | 29 | 0 | - | 84 | 83 | 33 | 6 | 6 |
| 021-040 | 67 | 71 | 33 | 0 | 0 | 14 | 29 | 71 | 100 | - | 16 | 17 | 67 | 95 | 94 |
| 041-060 | 0 | 29 | 42 | 59 | 8 | - | - | - | - | - | - | - | - | - | - |
| 061-080 | 0 | 0 | 25 | 33 | 58 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | 0 | 0 | 0 | 8 | 25 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 62 | 24 | 0 | 0 | 0 | 86 | 48 | 25 | 0 | 0 | 81 | 57 | 33 | 0 | 0 |
| 021-040 | 38 | 76 | 0 | 0 | 0 | 14 | 52 | 75 | 0 | 0 | 19 | 43 | 67 | 100 | 100 |
| 041-060 | 0 | 0 | 100 | 100 | 100 | 0 | 0 | 0 | 100 | 100 | - | - | - | - | - |
| 061-080 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 81 | 90 | 75 | 50 | 16 | 86 | 62 | 9 | 0 | 0 |
| 021-040 | 19 | 9 | 25 | 50 | 84 | 14 | 38 | 91 | 100 | 91 |
| 041-060 | - | - | - | - | - | 0 | 0 | 0 | 0 | 9 |
| 061-080 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: Breakdown of *Thuja occidentalis* 'Umbraculifera' specimens by saleable width category, 1993-97

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 67 | 19 | 0 | 0 | 0 | 48 | 57 | 14 | 0 | - | 100 | 72 | 22 | 11 | 0 |
| 021-040 | 33 | 81 | 58 | 0 | 0 | 52 | 43 | 86 | 100 | - | 0 | 28 | 78 | 83 | 89 |
| 041-060 | 0 | 0 | 42 | 41 | 17 | - | - | - | - | - | 0 | 0 | 0 | 6 | 11 |
| 061-080 | 0 | 0 | 0 | 59 | 50 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | 0 | 0 | 0 | 0 | 33 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 43 | 14 | 0 | 0 | 0 | 62 | 0 | 0 | 0 | 0 | 81 | 19 | 0 | 0 | 0 |
| 021-040 | 57 | 86 | 100 | 100 | 20 | 38 | 100 | 92 | 67 | 0 | 19 | 81 | 100 | 30 | 0 |
| 041-060 | 0 | 0 | 0 | 0 | 80 | 0 | 0 | 8 | 33 | 92 | 0 | 0 | 0 | 70 | 100 |
| 061-080 | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 57 | 33 | 25 | 0 | 0 | 71 | 10 | 0 | 0 | 0 |
| 021-040 | 43 | 67 | 75 | 100 | 33 | 29 | 90 | 100 | 82 | 27 |
| 041-060 | 0 | 0 | 0 | 0 | 67 | 0 | 0 | 0 | 18 | 73 |
| 061-080 | - | - | - | - | - | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

# *TILIA PLATYPHYLLOS* SCOP.

| | |
|---|---|
| **Family:** | Tiliaceae |
| **English common name:** | Bigleaf Linden |
| **French common name:** | Tilleul à grandes feuilles, Tilleul de Hollande |
| **Synonym:** | *Tilia grandifolia* Ehrh., *Tilia europea* L. |
| **Category:** | Deciduous plant |
| **Subdivision :** | Large tree |

## BOTANICAL DESCRIPTION

This vigorous species, with a rounded crown, can grow to 10 m tall and 9 m wide in 20 years under our conditions, compared with a height of 30-35 m in its native land.

The trunk is straight, with smooth bark. The young twigs are green tinged with reddish brown, slightly pubescent and scattered with lenticels. The lateral buds are 6-7 mm long and the same colour as the twigs; there are no terminal buds.

The cordate leaves are soft and pubescent, with dentate margins, measuring 6-12 cm long and almost as wide. They are similar to basswood (*Tilia americana*) leaves. The blade is briefly acuminate at the apex, light green and pubescent on the underside and dark green and slightly pubescent on the top. The petiole is also pubescent.

The large (8-15 mm in diameter), strongly fragrant flowers are yellowish white. They occur in groups of three or six in short, pendulous axillary cymes roughly 10 cm long. The peduncle is joined to a large, lanceolate bract (5-10 cm long) characteristic of the linden family, along about half of its length. The regular flowers have five sepals, five petals and many stamens. Flowering occurs between early and middle June.

The woody indehiscent capsules often have very hard walls.

## ORIGIN AND DISTRIBUTION

The species originates from Europe and is found in temperate regions as far east as Asia Minor. Native to high-elevation forests in France, it has been cultivated for centuries.

## USE

**Ornamental:** *Tilia platyphyllos* is one of the most commonly grown lindens, and is often used in large gardens and parks. It is also used as a shade tree.

## REQUIREMENTS

The species prefers moist, loose, fertile soil. It sometimes forms suckers, which must be cut back in midsummer.

## DISEASES AND INSECTS

The species and all its cultivars are highly susceptible to linden borer (*Saperda vestita*). Although Japanese beetles (*Popillia japonica*) also attack the genus, there is no specific information on the cultivars. Powdery mildew (*Microsphaera penicillata*) may also be a problem in the genus.

## PROPAGATION

**Seeds:** *T. platyphyllos* seeds require a long time to germinate, because the pericarp is impermeable and the embryo insufficiently developed. A 20-minute treatment in a sulphuric acid bath will result in effective scarification. Once the fruits have been thoroughly washed, they should be stratified for 3-5 months in damp peat moss at a temperature of 1-5°C.

Stratification must be done immediately after harvest and the seeds should be sown the second spring after maturity. The tigellum, which is very soft, has difficulty piercing even a thin soil layer hardened by rain. It is a good idea to cover the seedbed lightly with small evergreen boughs. In addition, young seedlings are very susceptible to frost and

must be mulched as a precautionary measure if there is a risk of late frost.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden, Montreal, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** The fruits were harvested in the fall of 1989 from a 45-year-old, 8-m tall and 40-cm-diameter parent plant. The seeds were sown in a cold frame on June 15, 1990, after undergoing scarification with concentrated sulphuric acid, followed by a rinse under the tap. They were planted 10 mm deep in a Promix®-sand mixture (1:2; v:v). Shade was provided with a cloth (63 %). Emergence occurred in spring 1991. Mean height growth the first year was 10 cm. In mid-October, 547 seedlings were dug up and heeled in for the winter. On May 14, 1992, they were transplanted into the nursery. On October 29, they were dug up and heeled in a second time. In mid-April 1993, they were wrapped and put in the cold store at 4°C to await shipping in May.

**Inclusion in testing network:** Young plants 27 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

Mortality occurred mainly during the first two winters. Transplanting mortality was observed at all sites, killing 5-50% of the specimens.

*Region 1*

At L'Assomption, 10% of specimens died the first winter; 64% and 25% had frost damage to the branch tips the first and fourth winters and 13% had frost damage to the previous year's shoots the second and fourth winters. In addition, 9% had damage to the old wood the last winter.

At St. Clotilde, 23% and 20% of specimens died the first two winters. The second winter, 10% had frost damage to the branch tips and 10% had damage to the previous year's shoots. Data were not collected in the last two winters.

At St. Hyacinthe, 21% and 9% of specimens died the first two winters. In addition, the first winter, 7% had frost damage to the branch tips and 29% froze down to the level of the snow cover.

*Region 2*

At Deschambault, 10% of specimens died the first winter. Frost damage to the branch tips occurred in 5%, 6%, 8% and 8% of trees the first four winters. In addition, 8% had mechanical breakage the third and fifth winters.

At St. Foy, 8% of specimens died the first winter. Frost damage to the branch tips occurred in 85%, 8%, 40% and 10% of plants the first four winters; 10% had frost damage to the previous year's shoots the third winter and 20% had mechanical breakage the fourth winter.

At La Pocatière, the first winter, 7% of plants died and 26% had frost damage to the previous year's shoots. The first two winters, 7% and 21% had frost damage to the branch tips.

*Region 3*

At Normandin, 8% of specimens died the first winter. In addition, 77% and 90% of plants had frost damage to the branch tips the first and third winters and 9% had mechanical breakage the fourth winter.

At Kapuskasing, 27% of specimens died in each of the first two winters. The first and third winters, 33% and 13%

suffered frost damage to the branch tips. The first, third and fourth winters, 33%, 38% and 63% had damage to the previous year's shoots and, the first winter, 7% froze down to the ground level. The third winter, 13% had mechanical breakage.

### Height and trunk diameter growth

Figures 1 and 2 show the mean height and trunk diameter of specimens after five years of testing for each site in the three regions.

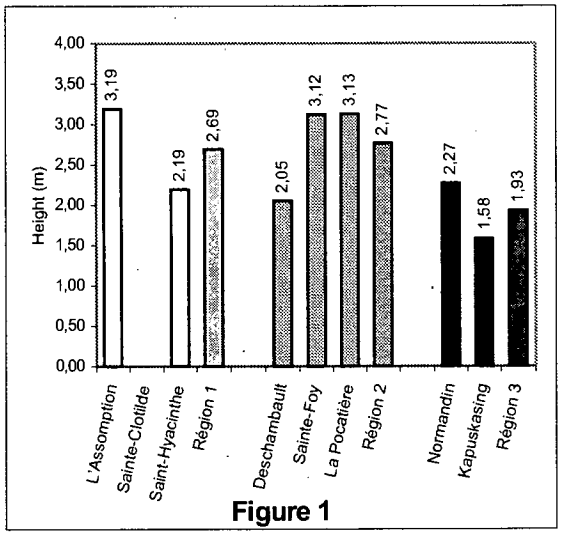


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

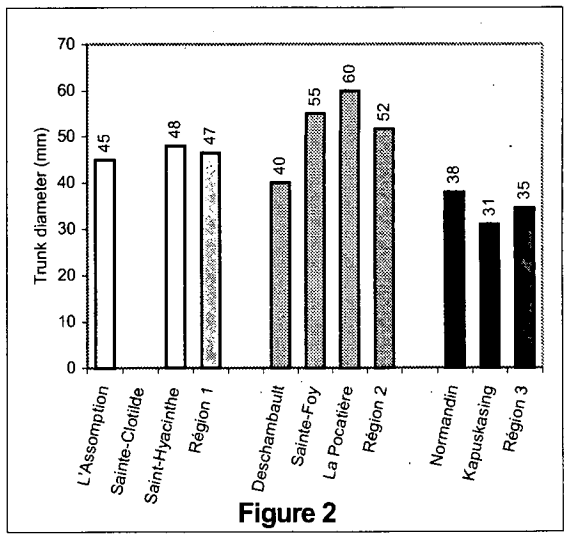


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the sites and three regions

### Effect of pruning

Stable, continuous growth was observed at most sites. At Normandin and Kapuskasing, 20-50% of the previous year's shoot had to be cut back, helping to reduce the height of plants.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and trunk diameter categories (heights and trunk diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

Production is faster at the region 2 sites, with the trees at St. Foy and La Pocatière taller and bigger than those at the other sites at trial's end. After three growing seasons, 80% of specimens at St. Foy and La Pocatière were over two metres tall, while four growing seasons were required at L'Assomption and a fifth at St. Hyacinthe and Normandin to obtain plants of comparable size.

The species can be produced at all region 1 and 2 sites.

## HARDINESS EVALUATION

The trial results modify somewhat the information found in the literature that the species can survive as far as zone 2. Given the fact that over 50% of the specimens died at Kapuskasing, it can survive as far as zone 2b. The damage at St. Clotilde (zone 5) was attributable to causes other than frost injury.

The species can be used as far as zone 2b, with the proviso that slight damage may occur the first few winters.

The species did not achieve its full ornamental potential in the trial although the parent plant is perfectly adapted to the conditions at the Montreal Botanical Garden in zone 5b.


## WRITTEN BY

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**Table 1:** **Frequency of winter damage observed in *Tilia platyphyllos* Scop., 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 74 | 18 | | 5 | 1 | | | 2 | | | | 26 |
| St. Clotilde | 79 | 3 | | 3 | | | | 15 | | | | 21 |
| St. Hyacinthe | 87 | 1 | | | | 6 | | 6 | | | | 13 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 89 | 5 | | | | | | 2 | | 4 | | 11 |
| St. Foy | 64 | 28 | | 2 | | | | 1 | | 5 | | 36 |
| La Pocatière | 88 | 6 | | 5 | | | | 1 | | | | 12 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 63 | 33 | | | | | | 2 | | 2 | | 37 |
| Kapuskasing | 50 | 9 | | 27 | | | 3 | 11 | | | | 50 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 9 or 11 occurred in the plants tested.

**Table 2:** **Breakdown of *Tilia platyphyllos* Scop. specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption* | | | | | St. Clotilde* | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 90 | 10 | - | 0 | 0 | 85 | 50 | 0 | 0 | - | 100 | - | - | 0 | 0 |
| 051-100 | 10 | 30 | - | 0 | 0 | 15 | 50 | 33 | 20 | - | 0 | - | - | 0 | 0 |
| 101-150 | 0 | 60 | - | 0 | 0 | 0 | 0 | 33 | 0 | - | 0 | - | - | 20 | 10 |
| 151-200 | 0 | 0 | - | 0 | 0 | 0 | 0 | 17 | 40 | - | 0 | - | - | 40 | 20 |
| 201-250 | 0- | 0 | - | 0 | 0 | 0 | 0 | 17 | 0 | - | 0 | - | - | 40 | 50 |
| 251-300 | 0 | 0 | - | 50 | 25 | 0 | 0 | 0 | 40 | - | 0 | - | - | 0 | 20 |
| 301-350 | 0 | 0 | - | 50 | 50 | - | - | - | - | - | - | - | - | - | - |
| 351-400 | 0 | 0 | - | 0 | 25 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 95 | 39 | 0 | 0 | 0 | 54 | 8 | 0 | 0 | 0 | 60 | 0 | 0 | 0 | 0 |
| 051-100 | 5 | 44 | 42 | 25 | 17 | 46 | 17 | 0 | 0 | 0 | 34 | 14 | 0 | 0 | 0 |
| 101-150 | 0 | 17 | 42 | 8 | 17 | 0 | 42 | 10 | 0 | 0 | 6 | 57 | 0 | 0 | 0 |
| 151-200 | 0 | 0 | 8 | 34 | 17 | 0 | 33 | 10 | 0 | 0 | 0 | 29 | 17 | 9 | 0 |
| 201-250 | 0 | 0 | 8 | 25 | 25 | 0 | 0 | 60 | 20 | 0 | 0 | 0 | 67 | 25 | 8 |
| 251-300 | 0 | 0 | 0 | 8 | 8 | 0 | 0 | 20 | 70 | 20 | 0 | 0 | 16 | 33 | 25 |
| 301-350 | 0 | 0 | 0 | 0 | 16 | 0 | 0 | 0 | 10 | 70 | 0 | 0 | 0 | 33 | 50 |
| 351-400 | - | - | - | - | - | 0 | 0 | 0 | 0 | 10 | 0 | 0 | 0 | 0 | 17 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-050 | 69 | 17 | 0 | 0 | 0 | 87 | 54 | 37 | 0 | 0 |
| 051-100 | 31 | 58 | 0 | 0 | 0 | 13 | 36 | 13 | 37 | 0 |
| 101-150 | 0 | 25 | 9 | 0 | 0 | 0 | 10 | 50 | 63 | 50 |
| 151-200 | 0 | 0 | 27 | 60 | 27 | 0 | 0 | 0 | 0 | 38 |
| 201-250 | 0 | 0 | 55 | 30 | 45 | 0 | 0 | 0 | 0 | 12 |
| 251-300 | 0 | 0 | 9 | 10 | 19 | - | - | - | - | - |
| 301-350 | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - |
| 351-400 | - | - | - | - | - | - | - | - | - | - |

Data were not collected.

Table 3. **Breakdown of *Tilia platyphyllos* Scop. specimens by saleable trunk diameter category, 1993-97**

**REGION 1**

| Diameter | L'Assomption* | | | | | St. Clotilde* | | | | | St. Hyacinthe* | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 50 | 0 | - | 0 | 0 | 8 | 10 | 0 | 0 | - | 100 | - | - | 0 | 0 |
| 11-20 | 50 | 89 | - | 0 | 0 | 92 | 40 | 33 | 0 | - | 0 | - | - | 0 | 0 |
| 21-30 | 0 | 11 | - | 0 | 0 | 0 | 50 | 0 | 20 | - | 0 | - | - | 10 | 0 |
| 31-40 | 0 | 0 | - | 43 | 13 | 0 | 0 | 33 | 20 | - | 0 | - | - | 50 | 30 |
| 41-50 | 0 | 0 | - | 43 | 75 | 0 | 0 | 34 | 40 | - | 0 | - | - | 40 | 30 |
| 51-60 | 0 | 0 | - | 14 | 12 | 0 | 0 | 0 | 20 | - | 0 | - | - | 0 | 20 |
| 61-70 | - | - | - | - | - | - | - | - | - | - | 0 | - | - | 0 | 20 |

**REGION 2**

| Diameter | Deschambault | | | | | Sainte-Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 100 | 56 | 25 | 0 | 0 | 85 | 8 | 0 | 0 | 0 | 73 | 0 | 0 | 0 | 0 |
| 11-20 | 0 | 44 | 17 | 25 | 8 | 15 | 25 | 0 | 0 | 0 | 27 | 21 | 0 | 0 | 0 |
| 21-30 | 0 | 0 | 42 | 8 | 17 | 0 | 67 | 0 | 0 | 0 | 0 | 79 | 17 | 0 | 0 |
| 31-40 | 0 | 0 | 16 | 50 | 25 | 0 | 0 | 80 | 0 | 0 | 0 | 0 | 83 | 0 | 0 |
| 41-50 | 0 | 0 | 0 | 17 | 32 | 0 | 0 | 20 | 80 | 10 | 0 | 0 | 0 | 67 | 8 |
| 51-60 | 0 | 0 | 0 | 0 | 8 | 0 | 0 | 0 | 20 | 70 | 0 | 0 | 0 | 33 | 42 |
| 61-70 | 0 | 0 | 0 | | 9 | 0 | 0 | 0 | 0 | 20 | 0 | 0 | 0 | 0 | 50 |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 100 | 0 | 0 | 0 | 0 | 80 | 45 | 0 | 0 | 0 |
| 11-20 | 0 | 100 | 30 | 0 | 0 | 20 | 55 | 63 | 13 | 0 |
| 21-30 | 0 | 0 | 70 | 60 | 18 | 0 | 0 | 37 | 62 | 37 |
| 31-40 | 0 | 0 | 0 | 40 | 64 | 0 | 0 | 0 | 25 | 63 |
| 41-50 | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - |
| 51-60 | 0 | 0 | 0 | 0 | 9 | - | - | - | - | - |
| 61-70 | - | - | - | - | - | - | - | - | - | - |

Data were not collected.

# *TILIA X* 'FLAVESCENS' SHERIDAN HYBRIDS'

| | |
|---|---|
| **Family:** | Tiliaceae |
| **English common name:** | Sheridan Hybrids Linden |
| **French common name:** | Tilleul à petites feuilles 'Sheridan Hybrids' |
| **Synonym:** | *Tilia cordata* 'Sheridan Hybrids' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Large tree |

## BOTANICAL DESCRIPTION

This cultivar can be differentiated from the species form *T. cordata* by its smaller size; erect, conical habit; darker coloured foliage and larger leaves. It can grow to 15 m tall and 8 m wide. It has a moderate growth rate.

The straight trunk is covered with reddish bark that turns brownish grey with age. The branches are erect in the upper part of the crown but more horizontal in the basal part. The shiny glabrous twigs are reddish- or greenish-brown and zigzagged. The buds, also green or reddish, are globose and held at a wide angle from the branch. They are covered with two scales.

The alternate, cordate leaves are thick, dark green and finely toothed, measuring approximately 3-7 cm long. The upperside is shiny and the underside glaucous, and the vein axils are slightly pubescent. The leaves turn light yellow in fall.

The hermaphroditic flowers are whitish yellow and fragrant, with a diameter of 8-15 mm. They bloom in late June and occur in small, long-stalked cymes. Each cluster is attached to a greenish bract, which remains until the fruit ripens.

The indehiscent, ovoid capsules are covered with a fine brown pubescence, and contain one or two seeds. They ripen in fall and fall to the ground at the same time as the leaves.

The cultivar has creeping roots.

## ORIGIN AND DISTRIBUTION

*T.* x 'Flavescens' was produced from a cross between *T. cordata* and *T. americana*, and was developed by Sheridan Nurseries in the U.S.

## USE

**Ornamental:** This linden can be used as a specimen plant, in mass plantings alone or with other plants or as a roadside tree. It is prized for its summer flowering and showy bracts. Very hardy and undemanding, it tolerates pollution well and requires little pruning when used as a roadside tree.

**Culinary:** The bracts and flowers are used to make herbal teas.

**Bees:** The nectar-laden flowers attract bees and wasps.

## REQUIREMENTS

The cultivar prefers full sun, but tolerates light shade. It grows in any type of soil except for excessively dry soils. It prefers a fertile, moist, deep, well-drained, slightly calcareous loam.

This is a shallow-rooted tree.

## DISEASES AND INSECTS

Powdery mildew (*Microsphaera penicillata*) can be a problem in the genus.

The species and its cultivars are susceptible to linden borer (*Saperda vestita*). Although Japanese beetles (*Popillia japonica*) also attack the genus, there is no specific information on the cultivar.

## PROPAGATION

**Grafting:** T-budding is usually used to propagate cultivars; the best results are obtained using *Tilia cordata* seedlings as rootstocks.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Scion: City of Montreal nursery, Terrebonne, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique:** *T. cordata* seedlings, 2.5 years old and the thickness of a pencil, were used as rootstocks. They were grown from seed provided by Lawyer's Nursery (U.S.A.). On August 13, 1991, scions were taken from five-year old parent plants measuring roughly 4 m high and 80-100 mm in diameter. T-budding was carried out on August 14 on 475 specimens; the following spring, the survival rate was 75%. The rootstocks were cut back the first week of May 1992 to 1.0 cm above the union. The scions were staked and tied during the growing season and suckers from the rootstock were removed every two weeks. On October 29, the plants were dug up and heeled in for the winter. In mid-April 1993, they were wrapped and stored in the cellar to await shipping in May.

**Inclusion in testing network:** Young plants 100 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

Transplanting mortality was over 50% at almost all the sites. In addition, a number of plants died the first winter.

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 28% of specimens died the first winter. The first and fourth winters, 14% and 25% had frost damage to the branch tips and 15% had damage to the old wood the first winter.

At St. Clotilde and St. Hyacinthe, the first winter, 71% of plants died and 14% froze down to the snow cover. Data were not gathered at St. Clotilde the last three years.

*Region 2*

At Deschambault, the first winter, 56% of plants died and 19% froze down to the ground level. Frost damage to the branch tips was observed in 6%, 28% and 14% of specimens the first, third and fourth winters. The last two winters, mechanical damage occurred in 14% and 28% of plants.

At St. Foy, 18% of specimens died the first winter. Frost damage to the branch tips was observed in 54%, 89% and 12% of plants the first three winters. The fourth winter, 37% of trees had mechanical breakage.

At La Pocatière, only three plants survived transplanting; two of these died the first winter and the third succumbed the third winter.

*Region 3*

At Normandin, the first winter, 64% of plants died and 7% had frost damage to the previous year's shoots. The first three winters, 7%, 40% and 40% of trees had frost damage to the branch tips and the fourth winter, 20% had mechanical breakage.

At Kapuskasing, only seven plants survived transplanting; six of them died the first winter and the seventh the following winter.

### Height and trunk diameter growth

Figures 1 and 2 show the mean height and trunk diameter of specimens after five years of testing for each site in the three regions.

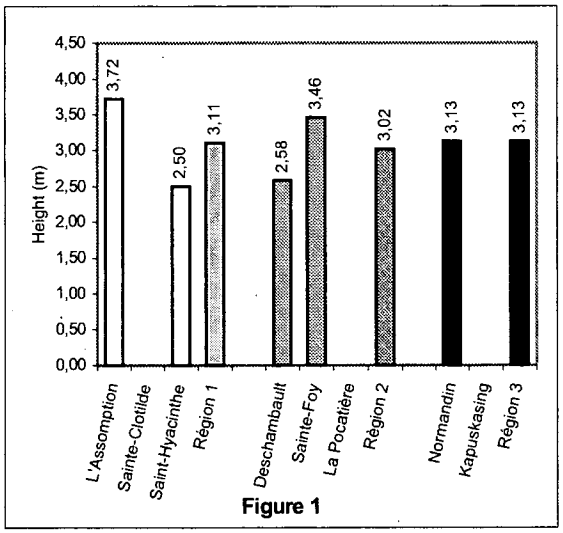


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

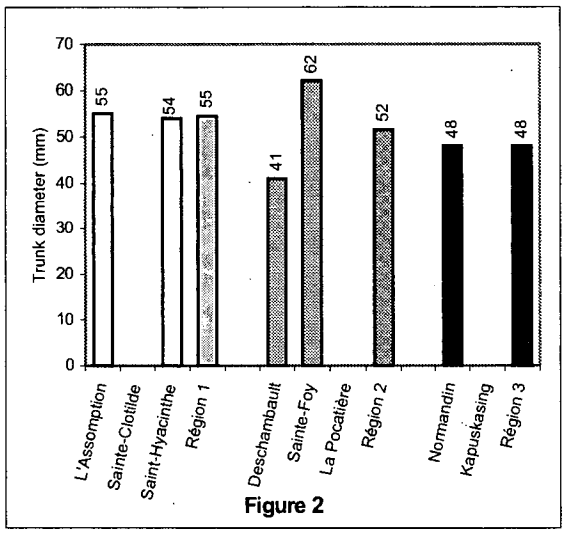


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the sites and three regions

### Effect of pruning

In general, pruning was done annually to remove frost-injured branches or those damaged by mechanical breakage.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and trunk diameter categories (heights and trunk diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

The young plants, which were propagated by grafts, had very high mortality during transplanting and most of the plants that survived transplanting died the first winter. Among the four sites where a sufficient number of plants survived so that a conclusive evaluation could be carried out (L'Assomption, Deschambault, St. Foy and Normandin), growth was slowest at Deschambault.

All plants reached a height of 2-4 m after four growing seasons at St. Foy, Normandin and L'Assomption.

It is difficult to state with certainty whether the cultivar can be produced in the regions tested. The high mortality suffered at the beginning of the trials leads one to wonder about root quality in the rootstocks used as well as the damage that may have occurred when the plants were heeled in for the winter before transplanting.

## HARDINESS EVALUATION

Among the species forms, *T. cordata* is hardy to U.S. zone 3 and *T. americana* to U.S. zone 2 (which corresponds to Canada's zone 3). No hardiness zone has been assigned to the hybrid of these two species but the test results show clearly that the cultivar suffered high mortality during the first winter regardless of the hardiness zone. The young graft was probably frost-prone or the root system may

have been damaged before transplanting. This cultivar should be re-evaluated before assigning it to a hardiness zone.

Setting aside the mortality that occurred, the surviving trees had relatively slight winter damage as far as zone 2b, indicating that it is quite likely that the cultivar can be used in zones 4 and 5, and maybe even zone 2b.

**WRITTEN BY**

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**Table 1: Frequency of winter damage observed in *Tilia* x 'Flavescens Sheridan Hybrids', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 83 | 8 | | | 3 | | | 6 | | | | 17 |
| St. Clotilde | 57 | | | | | 7 | | 36 | | | | 43 |
| St. Hyacinthe | 83 | | | | | 3 | | 14 | | | | 17 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 57 | 10 | | | | | 3 | 11 | | 19 | | 43 |
| St. Foy | 58 | 31 | | | | | | 4 | | 7 | | 42 |
| La Pocatière | 34 | | | | 11 | | | 55 | | | | 66 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 64 | 17 | | 1 | | | | 13 | | 5 | | 36 |
| Kapuskasing | 0 | | | 7 | | | | 93 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 9 or 11 occurred in the plants tested.

**Table 2: Breakdown of *Tilia* x 'Flavescens Sheridan Hybrids' specimens by saleable height category, 1993-97**

| REGION 1 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 36 | 30 | 0 | 0 | 0 | 84 | 0 | 0 | 0 | - | 72 | 50 | 0 | 0 | 0 |
| 101-200 | 64 | 50 | 50 | 12 | 0 | 14 | 100 | 0 | 0 | - | 28 | 50 | 100 | 50 | 50 |
| 201-300 | 0 | 20 | 38 | 38 | 25 | 0 | 0 | 100 | 50 | - | 0 | 0 | 0 | 50 | 0 |
| 301-400 | 0 | 0 | 12 | 50 | 25 | 0 | 0 | 0 | 50 | - | 0 | 0 | 0 | 0 | 50 |
| 401-500 | 0 | 0 | 0 | 0 | 50 | - | - | - | - | - | - | - | - | - | - |

| REGION 2 | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 68 | 44 | 28 | 0 | 0 | 45 | 22 | 0 | 0 | 0 | 33 | 100 | 0 | - | - |
| 101-200 | 32 | 56 | 58 | 27 | 14 | 55 | 55 | 25 | 0 | 0 | 67 | 0 | 100 | - | - |
| 201-300 | 0 | 0 | 14 | 57 | 71 | 0 | 23 | 75 | 62 | 13 | - | - | - | - | - |
| 301-400 | 0 | 0 | 0 | 16 | 15 | 0 | 0 | 0 | 38 | 87 | - | - | - | - | - |
| 401-500 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

| REGION 3 | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Height | Normandin | | | | | Kapuskasing | | | | |
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 57 | 60 | 0 | 0 | 0 | 85 | 100 | - | - | - |
| 101-200 | 43 | 0 | 40 | 0 | 0 | 15 | 0 | - | - | - |
| 201-300 | 0 | 40 | 60 | 80 | 40 | - | - | - | - | - |
| 301-400 | 0 | 0 | 0 | 20 | 60 | - | - | - | - | - |
| 401-500 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: Breakdown of *Tilia* x 'Flavescens Sheridan Hybrids' specimens by saleable trunk diameter category, 1993-97

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 7 | 0 | 0 | 0 | 0 | 0 | - | 0 | 0 | - | 0 | 0 | 0 | 0 | 0 |
| 11-20 | 36 | 10 | 12 | 0 | 0 | 17 | - | 0 | 0 | - | 71 | 0 | 50 | 0 | 0 |
| 21-30 | 57 | 70 | 25 | 13 | 0 | 83 | - | 0 | 0 | - | 29 | 0 | 0 | 0 | 0 |
| 31-40 | 0 | 20 | 38 | 12 | 12 | 0 | - | 100 | 0 | - | 0 | 50 | 0 | 50 | 50 |
| 41-50 | 0 | 0 | 25 | 38 | 38 | 0 | - | 0 | 0 | - | 0 | 50 | 50 | 0 | 0 |
| 51-60 | 0 | 0 | 0 | 12 | 13 | 0 | - | 0 | 50 | - | 0 | 0 | 0 | 50 | 0 |
| 61-70 | 0 | 0 | 0 | 25 | 12 | 0 | - | 0 | 50 | - | 0 | 0 | 0 | 0 | 50 |
| 71-80 | 0 | 0 | 0 | 0 | 25 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 6 | 28 | 0 | 0 | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 11-20 | 56 | 29 | 29 | 14 | 0 | 18 | 23 | 0 | 0 | 0 | 0 | 0 | 0 | - | - |
| 21-30 | 38 | 43 | 43 | 14 | 29 | 54 | 22 | 50 | 0 | 0 | 33 | 0 | 0 | - | - |
| 31-40 | 0 | 0 | 28 | 43 | 14 | 10 | 55 | 50 | 25 | 12 | 67 | 100 | 0 | - | - |
| 41-50 | 0 | 0 | 0 | 29 | 29 | 0 | 0 | 0 | 75 | 25 | 0 | 0 | 100 | - | - |
| 51-60 | 0 | 0 | 0 | 0 | 28 | 0 | 0 | 0 | 0 | 50 | - | - | - | - | - |
| 61-70 | - | - | - | - | - | 0 | 0 | 0 | 0 | 13 | - | - | - | - | - |
| 71-80 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 01-10 | 50 | 0 | 0 | 0 | 0 | 42 | 0 | - | - | - |
| 11-20 | 14 | 0 | 0 | 0 | 0 | 29 | 0 | - | - | - |
| 21-30 | 36 | 20 | 20 | 0 | 0 | 29 | 100 | - | - | - |
| 31-40 | 0 | 80 | 40 | 20 | 0 | - | - | - | - | - |
| 41-50 | 0 | 0 | 40 | 40 | 20 | - | - | - | - | - |
| 51-60 | 0 | 0 | 0 | 40 | 40 | - | - | - | - | - |
| 61-70 | 0 | 0 | 0 | 0 | 40 | - | - | - | - | - |
| 71-80 | - | - | - | - | - | - | - | - | - | - |

* Data were not collected in 1994 and 1997.

# *ULMUS AMERICANA* L.

| | |
|---|---|
| **Family:** | Ulmaceae |
| **English common name:** | White Elm, American Elm |
| **French common name:** | Orme d'Amérique, Orme blanc |
| **Category:** | Deciduous plant |
| **Subdivision:** | Large tree |

## BOTANICAL DESCRIPTION

This majestic species, which has an umbrella- or fan-shaped crown at maturity, is one of the largest trees in eastern Canada, growing up to 35 m high and 175 cm in diameter and living to 200 years or older.

The straight trunk is buttressed at the base, branching into a few large, upright limbs and many outwardly fanning branches to form a wide, spreading, globular crown. The species is fast growing.

The bark is dark greyish brown, deeply furrowed with oblique intersecting ridges. With age, it becomes mottled ash grey and scaly. The outer bark shows alternating layers of light orange brown and dark brown.

The twigs are greyish brown and often decidedly zigzag, and are finely pubescent when young. The lenticels are inconspicuous.

The 5-mm-long reddish buds are conical and pointed. The apical bud is bent and the others are pressed against the twig. There are 6 to 9 reddish-brown bud scales with darker, pubescent margins.

The dense, dark green foliage consists of simple alternate ovate leaves, 7-15 cm long, short petioled with double serrate margins and an asymmetrical base. The upperside of the leaf is usually moderately rough (occasionally smooth) and the underside, paler and slightly pubescent. The veins are protruding, consisting of 15-20 parallel veins on either side of the midrib, two or three of them forked. The leaves turn a golden yellow in fall.

The perfect flowers are tiny (5 mm), apetalous and brownish red in colour. They bloom in late April. They occur in loose pauciflorous fascicles, each flower on an individual pedicel.

Fruiting occurs early, just after leaf-out. The circular, flat, brown samaras (15 mm) are ciliate on the margins but otherwise glabrous, with one seed in the centre. They fall when ripe, between late May and early June.

The white elm has spreading creeping roots and deep lateral roots.

## ORIGIN AND DISTRIBUTION

The white elm, which is native to Quebec, occurs throughout eastern North America as far north as the Lower Laurentians. It is found most commonly on alluvial flats, wet bottomlands and areas with springs or standing water.

## USE

**Ornamental:** This majestic tree is of great ornamental value in large spaces where all its characteristics can be appreciated. As a roadside tree, it creates an arching vault of foliage over the road.

**Cabinetmaking:** The wood is used in cabinetmaking for panels, coffins and barrels for dry stores and also in shipbuilding and the manufacture of sports equipment.

## REQUIREMENTS

This species tolerates shade, but grows best in full sun. It is adapted to all types of soils except dry soils. It grows to a greater size in rich, moist and well-drained sandy or gravelly loams. It has a great tolerance for compacted soils and urban conditions such as air pollution, road salt and disturbed habitats.

## DISEASES AND INSECTS

The species is attacked by a number of insects that sometimes cause defoliation. Scale insects, leafhoppers, fall webworms (*Hyphantria cunea*) and Japanese beetles (*Popillia japonica*) are particularly attracted to it. One of the worse scourges of the species is Dutch elm disease (*Ceratocystis ulmi* Buism.), the vectors for which are two bark beetles (*Hylurgopinus rufipes* Eichh. and *Scolytus multistriatus* Marsh.).

Diseases such as anthracnose (*Gnomonia* spp.) and powdery mildew (*Microspharera* penicillata) are also observed.

## PROPAGATION

**Seeds:** Propagation by seeds is the most common. Elm seeds loose their viability quickly when stored at room temperature. They can be kept for several months in sealed containers at a temperature of 0-4°C. The seeds mature in spring, and must be sown immediately. Germination occurs quickly.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Agriculture and Agri-Food Canada's Experimental Farm, La Pocatière, Quebec

**Propagation site:** Agriculture and Agri-Food Canada's Experimental Farm, L'Assomption, Quebec

**Propagation technique**: On June 21, 1990, the seeds were harvested from a 70-year-old parent plant, 25 m tall and with a trunk diameter of 60 cm. On July 30, the seeds were sown in a cold frame filled with a Promix®-sand mixture (1:2; v:v), covered with a 10-cm layer of peatmoss, with 63% shade. Germination occurred 20 days later. In mid-October, 161 seedlings were dug up, puddled and heeled in for the winter. On May 22, 1991, they were transplanted into the nursery; losses of 28% occurred. In spring, the seedlings were fertilized once with 15-15-15. In mid-October, they were again dug up and heeled in for the winter. Because the beginning of the trials was postponed for a year, they were again moved into the nursery on May 15, 1992. On October 29, they were dug up, puddled and heeled in for the winter. In mid-April 1993, the seedlings were wrapped and kept in the cold store at 4°C to await shipping in May.

**Inclusion in testing network:** Young plants 110 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the species over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 33% and 42% of specimens suffered frost damage to the branch tips the first and fourth winters. In addition, the fourth winter, 8% had mechanical breakage.

No damage was observed at St. Clotilde. Data were not collected the last two winters.

At St. Hyacinthe, 8% of trees had mechanical breakage last winter.

*Region 2*

At Deschambault, 26% and 11% of seedlings had frost damage to the branch tips the first two winters and 5% had damage to the previous year's shoots the first winter.

At St. Foy, 43% and 19% of plants had frost damage to the branch tips the first two winters; in addition, the first winter, 33% had damage to the previous year's shoots. The fourth winter, 33% had mechanical breakage.

At La Pocatière, frost damage to the branch tips occurred in 43% and 8% of plants the first and fourth winters. In

addition, the first winter, 10% had frost damage to the previous year's shoots.

*Region 3*

At Normandin, the first winter, 35% of specimens had mechanical breakage and an equal percentage had frost damage to the branch tips.

**Height and trunk diameter growth**

Figures 1 and 2 show the mean height and trunk diameter of specimens after five years of testing for each site in the three regions.

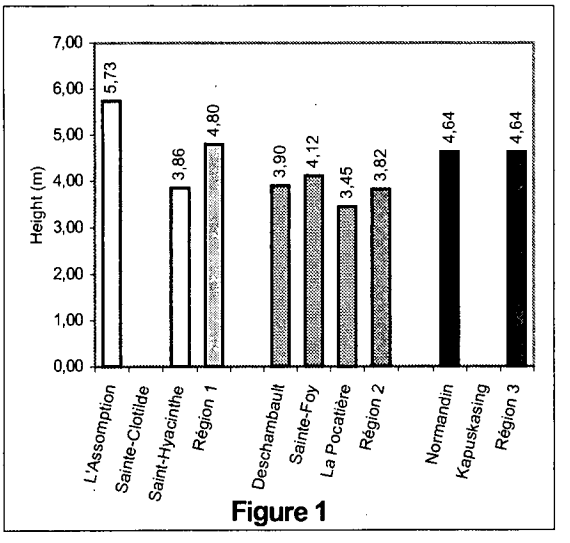


**Figure 1.** Mean height of trees at trial's end for each of the sites and three regions

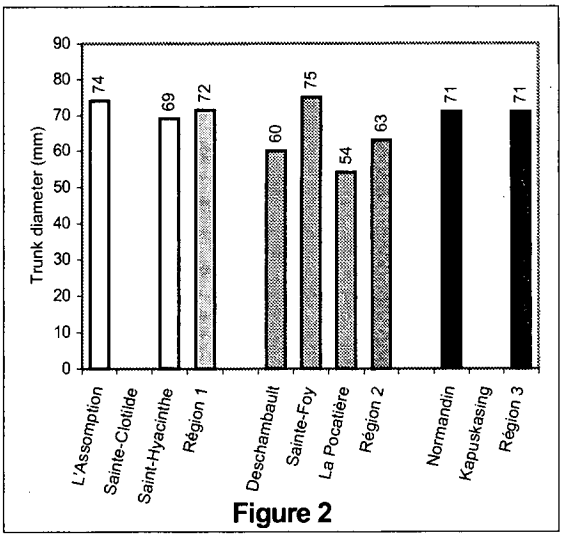


**Figure 2.** Mean trunk diameter of trees at trial's end for each of the sites and three regions

**Effect of pruning**

Annual growth was constant and regular at all sites and pruning did not affect height growth.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and trunk diameter categories (heights and trunk diameters are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and trunk diameter.

Production of the species was faster at the region 1 sites: after four growing seasons, plants at L'Assomption and St. Clotilde had an average height of 4 m, while a fifth year was required at Normandin for 90% or more to reach a comparable height. At the other sites, most trees were over 3 m tall after five years.

The species can be produced in all the regions as far as zone 2b, with the proviso that growth will be faster in the warmer regions.

## HARDINESS EVALUATION

No mortality occurred in zone 2b and damage was very slight at all the other sites. The results confirm the information in the literature that the species can survive as far as zone 2.

According to the trials, the species can be used as far as zone 2b. The species' full ornamental potential was achieved in zone 5 (as has occurred for the parent plant in zone 4a over the years).


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**Table 1:** **Frequency of winter damage observed in *Ulmus americana* L., 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 83 | 15 | | | | | | | | 2 | | 17 |
| St. Clotilde | 100 | | | | | | | | | | | 0 |
| St. Hyacinthe | 98 | | | | | | | | | 2 | | 2 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 92 | 7 | | 1 | | | | | | | | 8 |
| St. Foy | 74 | 12 | | 7 | | | | | | 7 | | 26 |
| La Pocatière | 88 | 10 | | 2 | | | | | | | | 12 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 86 | 7 | | | | | | | | 7 | | 14 |
| Kapuskasing* | - | | | | | | | | | | | - |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 5, 6, 7, 8, 9 or 11 occurred in the plants tested.

Table 2: **Breakdown of *Ulmus americana* L. specimens by saleable height category, 1993-97**

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 0 | 0 | 0 | 0 | 0 | 5 | 0 | 0 | 0 | - | 14 | 0 | 0 | 8 | 0 |
| 101-200 | 28 | 5 | 0 | 0 | 0 | 76 | 10 | 0 | 0 | - | 86 | 43 | 0 | 0 | 0 |
| 201-300 | 72 | 72 | 8 | 0 | 0 | 19 | 76 | 25 | 0 | - | 0 | 57 | 84 | 25 | 17 |
| 301-400 | 0 | 23 | 75 | 8 | 0 | 0 | 14 | 50 | 8 | - | 0 | 0 | 16 | 50 | 41 |
| 401-500 | 0 | 0 | 17 | 42 | 17 | 0 | 0 | 25 | 58 | - | 0 | 0 | 0 | 17 | 42 |
| 501-600 | 0 | 0 | 0 | 50 | 25 | 0 | 0 | 0 | 25 | - | - | - | - | - | - |
| 601-700 | 0 | 0 | 0 | 0 | 58 | 0 | 0 | 0 | 9 | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 5 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 101-200 | 63 | 21 | 9 | 8 | 0 | 67 | 33 | 0 | 0 | 0 | 90 | 33 | 8 | 0 | 0 |
| 201-300 | 32 | 79 | 83 | 8 | 9 | 33 | 67 | 17 | 8 | 0 | 10 | 62 | 67 | 25 | 17 |
| 301-400 | 0 | 0 | 8 | 75 | 33 | 0 | 0 | 83 | 50 | 58 | 0 | 5 | 25 | 75 | 75 |
| 401-500 | 0 | 0 | 0 | 9 | 58 | 0 | 0 | 0 | 42 | 25 | 0 | 0 | 0 | 0 | 8 |
| 501-600 | - | - | - | - | - | 0 | 0 | 0 | 0 | 17 | - | - | - | - | - |
| 601-700 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Height | Normandin | | | | |
|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 |
| 001-100 | 10 | 0 | 0 | 0 | 0 |
| 101-200 | 70 | 20 | 0 | 0 | 0 |
| 201-300 | 20 | 65 | 25 | 8 | 8 |
| 301-400 | 0 | 15 | 75 | 33 | 0 |
| 401-500 | 0 | 0 | 0 | 59 | 58 |
| 501-600 | 0 | 0 | 0 | 0 | 34 |
| 601-700 | - | - | - | - | - |

* Data were not collected in 1997.

Table 3: **Breakdown of *Ulmus americana* L. specimens by saleable trunk diameter category, 1993-97**

**REGION 1**

| Diameter | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 19 | 0 | 0 | 0 | - | 43 | 0 | 0 | 0 | 0 |
| 021-040 | 100 | 76 | 0 | 0 | 0 | 81 | 67 | 25 | 17 | - | 57 | 95 | 42 | 0 | 0 |
| 041-060 | 0 | 24 | 92 | 8 | 0 | 0 | 33 | 33 | 17 | - | 0 | 5 | 58 | 67 | 18 |
| 061-080 | 0 | 0 | 8 | 67 | 40 | 0 | 0 | 42 | 50 | - | 0 | 0 | 0 | 25 | 55 |
| 081-100 | 0 | 0 | 0 | 25 | 60 | 0 | 0 | 0 | 16 | - | 0 | 0 | 0 | 8 | 27 |
| 101-120 | 0 | 0 | 0 | 0 | 20 | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Diameter | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 37 | 11 | 8 | 0 | 0 | 29 | 0 | 0 | 0 | 0 | 28 | 5 | 0 | 0 | 0 |
| 021-040 | 63 | 89 | 75 | 17 | 8 | 71 | 95 | 50 | 0 | 0 | 72 | 95 | 83 | 25 | 8 |
| 041-060 | 0 | 0 | 17 | 83 | 33 | 0 | 5 | 42 | 67 | 9 | 0 | 0 | 17 | 75 | 75 |
| 061-080 | 0 | 0 | 0 | 0 | 59 | 0 | 0 | 8 | 25 | 58 | 0 | 0 | 0 | 0 | 17 |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 8 | 33 | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 3**

| Diameter | Normandin | | | | |
|---|---|---|---|---|---|
| (mm) | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 20 | 10 | 0 | 0 | 0 |
| 021-040 | 80 | 90 | 45 | 8 | 0 |
| 041-060 | 0 | 0 | 55 | 59 | 25 |
| 061-080 | 0 | 0 | 0 | 25 | 50 |
| 081-100 | 0 | 0 | 0 | 8 | 25 |
| 101-120 | - | - | - | - | |

* Data were not collected in 1997.

# *WEIGELA FLORIDA* 'FOLIIS PURPUREUS'

| | |
|---|---|
| **Family:** | Caprifoliaceae |
| **English common name:** | Old fashioned Weigela, Purple-Leaf Weigela |
| **French common name:** | Weigela au feuillage pourpre |
| **Synonym:** | *Weigela florida* 'Purpurea' |
| **Category:** | Deciduous plant |
| **Subdivision:** | Shrub |

## BOTANICAL DESCRIPTION

This shrub, of narrow, compact habit, can grow to 2 m tall. The branches are erect at first but become drooping with age. Growth is slow.

The grey-brown stems are covered with small spots or protuberances with large circular lenticels. They have two rows of small hairs running from node to note. The pith is pale brown.

The dark purple leaves are opposite, oval to oblong in shape and pointed at the apex. The leaves are short petioled and without stipules. They are 4-10 cm long.

The dark pink flowers bloom abundantly from late May to June. They occur in axillary cymes of three or four flowers borne on short, leafy twigs from last year's branches. The corolla, 3 cm long and wide, is initially tubular and then grows funnelform, with rounded spreading lobes. The inside of the flower is pale pink.

The fruit is a two-valved woody capsule of no ornamental value.

The roots are fine and very numerous.

## ORIGIN AND DISTRIBUTION

The genus was named in honour of C.E. von Weigela (1748-1831), a German scholar and author of various botanical treatises. *Weigela florida*'s natural range includes Japan, northern China, Korea and Manchuria. It was introduced by Fortune in 1845 and the genus was formerly known as *Diervilla*.

The cultivar 'Foliis Purpureus' comes from Holland, where it was selected from a species mutation and has been grown since 1930.

## USE

**Ornamental:** The cultivar can be used alone or in mass plantings. It is prized for its flowers and foliage.

## REQUIREMENTS

This cultivar prefers full sun but will tolerate light shade. In the shade, however, its floral characteristics and habit will be less attractive. It is not demanding about soil, but does best in a well-drained site.

The cultivar transplants easily. Pruning, when required, should be done after the first flowering. Pruning involves removing the branches that have already flowered to make way for the new shoots that will bear the next crop of flowers.

## DISEASES AND INSECTS

No serious diseases seem to affect this cultivar but two flea beetles often cause significant damage in the genus: the western black flea beetle (*Phyllotreta pusilla*) and the redheaded flea beetle (*Systena frontalis*).

## PROPAGATION

**Cutting:** Greenwood cuttings taken in early summer are the most effective for propagating the cultivar. Once rooted, they should be kept in the propagation area until ready to plant. Using semi-drought conditions to force lignification is advisable to reduce winter losses.

Cuttings taken just after flowering will root readily.

## PROPAGATION CARRIED OUT BY REPLOQ

**Origin of parent plant:** Montreal Botanical Garden Arboretum, Montreal, Quebec

**Propagation site:** Montreal Botanical Garden, Montreal, Quebec

**Propagation technique:** On July 24, 1991, 400 cuttings (20 cm) were taken from ten-year-old and 1-m tall and wide parent plants. The cuttings were dipped in a 4000-ppm IBA/50% ethanol solution, planted in plug trays filled with a perlite-Promix® mixture (1:1; v:v), and placed under a mist unit operating for 30 seconds every five minutes. The rooted cuttings were transferred to shaded beds on August 17; the rooting rate was 99%. They were then overwintered under a cold frame; the survival rate was 95%. The plants were potted up on June 6, 1992 in Fertil Pot® containers and put in outdoor beds, where they were treated weekly until September 15 with a soluble fertilizer (20-20-20, 400 ppm N). The plants were overwintered again in cold frames. They were wrapped and shipped in May 1993.

**Inclusion in testing network:** Young plants 15 cm high were planted at eight test sites throughout Quebec and in northeastern Ontario. Winter hardiness and growth potential were evaluated from 1993 to 1998.

## RESULTS (1993-98)

### Winter damage

Table 1 shows the frequency of winter damage observed in the cultivar over a five-year period. Details are provided below of the main types of damage that occurred each winter at each of the sites.

*Region 1*

At L'Assomption, 9%, 8% and 64% of specimens died the first, third and fourth winters. Frost damage to the branch tips was observed in 90%, 37% and 36% the first two and fourth winters.

At St. Clotilde, 28% and 67% of plants had frost damage to the branch tips the second and third winters.

At St. Hyacinthe, the first winter, 38% of shrubs died and 6% had damage to the branch tips. The last winter, 12% had frost damage to the old wood and 38% froze down to the level of the snow cover.

*Region 2*

At Deschambault, frost damage to the branch tips was observed in 5% and 10% of plants the first two winters; the fourth winter, 17% had mechanical damage.

At St. Foy, frost damage to the branch tips occurred in 95%, 70%, 67% and 83% of plants the first four winters. The fourth winter, 17% suffered mechanical breakage.

At La Pocatière, the first winter, 5% of specimens died, 40% had damage to the branch tips and 15% had frost damage to the previous year's shoots.

*Region 3*

At Normandin, 50% of shrubs died the first winter and the other half suffered frost damage to the branch tips. The fourth winter, 10% had frost damage to the previous year's shoots and the others suffered mechanical breakage.

At Kapuskasing, 63%, 29% and 20% of specimens died the first three winters. Frost damage down to the ground level occurred in 37%, 43%, 80%, 100% and 100% of plants over the five winters respectively. The second winter, 28% had damage to the previous year's shoots.

### Height and width growth

Figures 1 and 2 show the mean height and width of specimens after five years of testing for each site in the three regions.

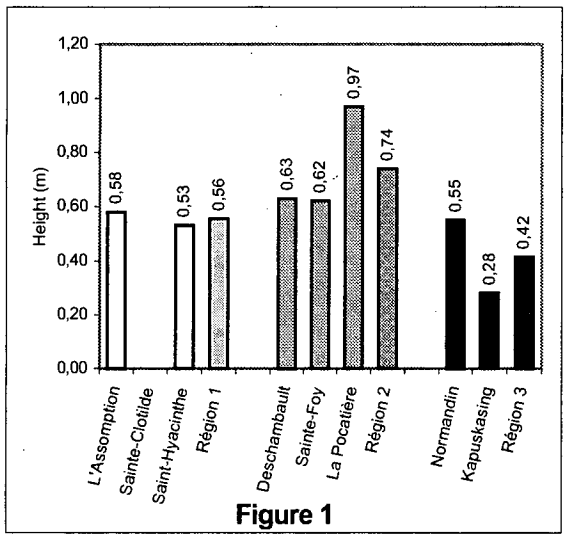


**Figure 1.** Mean height of shrubs at trial's end for each of the sites and three regions

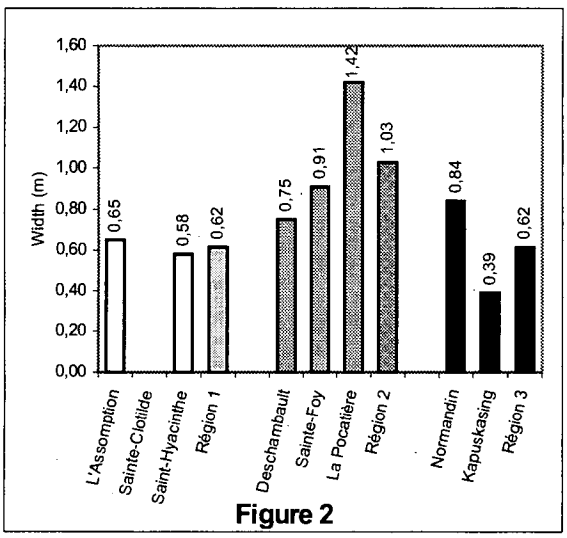


**Figure 2.** Mean width of shrubs at trial's end for each of the sites and three regions

### Effect of pruning

No pruning was required at St. Clotilde, St. Hyacinthe and La Pocatière. Plants had to be cut back by 10-40% of their height three times at Deschambault, St. Foy and L'Assomption. Very extensive pruning (plants were cut back to 1 cm from the ground) was done every year at the zone 2a site in region 3. At Normandin, pruning was required once or twice, reducing the height of plants by 70-80%.

### Flowering

At the region 1 sites, the first flowers appeared in the first week of June. All shrubs in region 2 and at Normandin flowered very regularly from mid- to late June. Flowering duration increased over the years. Late flowering was seen in four plants at Kapuskasing.

The plants were in full flower after nine days at all the sites. Flowering duration was highly variable, lasting from 10 to 46 days depending on the year and site.

## PRODUCTION RECOMMENDATIONS

Tables 2 and 3 indicate the percentage of saleable specimens obtained at each test site after each year by height and width categories (heights and widths are those obtained at the end of each year). Nursery operators will find these tables useful for estimating annual production and the number of years needed to obtain a given height and width.

Two growing seasons were required to obtain plants over 41 cm tall at La Pocatière, while three years were needed at St. Foy and four years at L'Assomption, St. Hyacinthe, Deschambault and Normandin.

Plants can be produced fastest in region 2, with high mortality observed in zone 2b the first year despite the extensive snow cover.

## HARDINESS EVALUATION

According to the literature, the cultivar is hardy to zone 5. The results of the trial show that it can survive as far as zone 2b. Significant mortality and very severe winter damage occurred in all plants at Kapuskasing (2a) every winter. Compared to the cultivar 'Nana Purpurea', this cultivar is slightly less prone to damage in cold areas.

The cultivar can be used as far as zone 2b, as long as the snow protects the plants adequately.

The cultivar did not achieve its full ornamental potential at the sites tested and only does so south of the zones tested.

**WRITTEN BY**

Claude Richer, Agr.

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Christine Galipeau, Biologist

**Table 1:** **Frequency of winter damage observed in *Weigela florida* 'Foliis Purpureus', 1994-98**

| Trial site | No damage | Percentage breakdown of damage | | | | | | | | | | Cumulative damage |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | WINTER DAMAGE[a] | | | | | | | | | | |
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | |
| **REGION 1** | | | | | | | | | | | | |
| L'Assomption | 51 | 33 | | | | | | 16 | | | | 49 |
| St. Clotilde | 68 | 32 | | | | | | | | | | 32 |
| St. Hyacinthe | 81 | 2 | | | 3 | | 7 | 7 | | | | 19 |
| **REGION 2** | | | | | | | | | | | | |
| Deschambault | 94 | 3 | | | | | | | | 3 | | 6 |
| St. Foy | 34 | 63 | | | | | | | | 3 | | 66 |
| La Pocatière | 88 | 8 | | 3 | | | | 1 | | | | 12 |
| **REGION 3** | | | | | | | | | | | | |
| Normandin | 60 | 10 | | 2 | | | | 10 | | 18 | | 40 |
| Kapuskasing | 0 | | | 6 | | | 72 | 22 | | | | 100 |

[a]Key:

1 = no damage
2 = damage to branch tips
3 = frost damage to flower buds
4 = previous year's shoots affected
5 = old wood affected
6 = died back to snow cover
7 = died back to soil surface
8 = dead
9 = sunscald, trunk splitting
10 = mechanical breakage related to weather conditions
11 = rodent damage

No damage of types 3, 6, 9 or 11 occurred in the plants tested.

Table 2: Breakdown of *Weigela florida* 'Foliis Purpureus' specimens by saleable height category, 1993-97

**REGION 1**

| Height | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 0 | 0 | 0 | 0 | 0 | 30 | 0 | - | - | - | 31 | 0 | 0 | 0 | 0 |
| 021-040 | 95 | 32 | 25 | 0 | 0 | 65 | 0 | - | - | - | 69 | 100 | 38 | 0 | 25 |
| 041-060 | 5 | 68 | 42 | 30 | 75 | 5 | 100 | - | - | - | 0 | 0 | 62 | 100 | 62 |
| 061-080 | 0 | 0 | 33 | 20 | 25 | - | - | - | - | - | 0 | 0 | 0 | 0 | 13 |
| 081-100 | 0 | 0 | 0 | 50 | 0 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Height | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 19 | 5 | 0 | 0 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 021-040 | 81 | 95 | 33 | 0 | 9 | 80 | 5 | 0 | 0 | 0 | 85 | 0 | 0 | 0 | 0 |
| 041-060 | 0 | 0 | 58 | 75 | 33 | 5 | 90 | 58 | 0 | 67 | 15 | 58 | 0 | 0 | 0 |
| 061-080 | 0 | 0 | 9 | 25 | 58 | 0 | 5 | 42 | 58 | 33 | 0 | 42 | 33 | 8 | 0 |
| 081-100 | - | - | - | - | - | 0 | 0 | 0 | 25 | 0 | 0 | 0 | 50 | 75 | 58 |
| 101-120 | - | - | - | - | - | 0 | 0 | 0 | 17 | 0 | 0 | 0 | 17 | 17 | 42 |

**REGION 3**

| Height | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 5 | 0 | 0 | 0 | 0 | 26 | 100 | 40 | 25 | 0 |
| 021-040 | 75 | 90 | 10 | 0 | 20 | 74 | 0 | 60 | 75 | 100 |
| 041-060 | 20 | 10 | 70 | 70 | 40 | - | - | - | - | - |
| 061-080 | 0 | 0 | 20 | 30 | 40 | - | - | - | - | - |
| 081-100 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Clotilde were not collected from 1995 to 1997.

Table 3: **Breakdown of *Weigela florida* 'Foliis Purpureus' specimens by saleable width category, 1993-97**

**REGION 1**

| Width | L'Assomption | | | | | St. Clotilde* | | | | | St. Hyacinthe | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 48 | 0 | 0 | 0 | 0 | 75 | 0 | - | - | - | 50 | 0 | 0 | 0 | 0 |
| 021-040 | 52 | 53 | 25 | 0 | 0 | 25 | 0 | - | - | - | 50 | 44 | 13 | 0 | 0 |
| 041-060 | 0 | 42 | 58 | 20 | 25 | 0 | 100 | - | - | - | 0 | 56 | 75 | 25 | 75 |
| 061-080 | 0 | 5 | 17 | 30 | 75 | - | - | - | - | - | 0 | 0 | 12 | 75 | 25 |
| 081-100 | 0 | 0 | 0 | 50 | 0 | - | - | - | - | - | - | - | - | - | - |
| 101-120 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 121-140 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 141-160 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 161-180 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

**REGION 2**

| Width | Deschambault | | | | | St. Foy | | | | | La Pocatière | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 81 | 19 | 0 | 0 | 0 | 45 | 0 | 0 | 0 | 0 | 35 | 0 | 0 | 0 | 0 |
| 021-040 | 19 | 81 | 33 | 8 | 0 | 55 | 5 | 0 | 0 | 0 | 65 | 0 | 0 | 0 | 0 |
| 041-060 | 0 | 0 | 67 | 50 | 25 | 0 | 45 | 42 | 0 | 0 | 0 | 21 | 0 | 0 | 0 |
| 061-080 | 0 | 0 | 0 | 42 | 42 | 0 | 45 | 58 | 0 | 33 | 0 | 69 | 8 | 0 | 0 |
| 081-100 | 0 | 0 | 0 | 0 | 33 | 0 | 5 | 0 | 75 | 25 | 0 | 10 | 75 | 0 | 0 |
| 101-120 | - | - | - | - | - | 0 | 0 | 0 | 25 | 42 | 0 | 0 | 17 | 50 | 0 |
| 121-140 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 50 | 50 |
| 141-160 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 42 |
| 161-180 | - | - | - | - | - | - | - | - | - | - | 0 | 0 | 0 | 0 | 8 |

**REGION 3**

| Width | Normandin | | | | | Kapuskasing | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| (cm) | 93 | 94 | 95 | 96 | 97 | 93 | 94 | 95 | 96 | 97 |
| 001-020 | 20 | 0 | 0 | 0 | 0 | 63 | 71 | 20 | 0 | 0 |
| 021-040 | 70 | 60 | 10 | 0 | 0 | 37 | 29 | 60 | 100 | 50 |
| 041-060 | 10 | 40 | 10 | 0 | 0 | 0 | 0 | 20 | 0 | 50 |
| 061-080 | 0 | 0 | 50 | 0 | 0 | - | - | - | - | - |
| 081-100 | 0 | 0 | 30 | 70 | 40 | - | - | - | - | - |
| 101-120 | 0 | 0 | 0 | 30 | 50 | - | - | - | - | - |
| 121-140 | - | - | - | - | - | - | - | - | - | - |
| 141-160 | - | - | - | - | - | - | - | - | - | - |
| 161-180 | - | - | - | - | - | - | - | - | - | - |

* Data for St. Clotilde were not collected from 1995 to 1997.

# ANNEX 1. PATHOLOGY AND INSECTS ON ROSES

## ROSE DISEASES

### Mosaic on rose

Several different viruses infect roses and mosaic is a symptom. Rose mosaic is the most commun. This is an old disease which occurs in nurseries, gardens and commercial field plantings. Serious damage is not usually observed, however stunting and poor growth can occur. Most rose viruses are spread from plant to plant by graft transmission rather than by insects which is common for most viruses.

### Powdery mildew (*Sphaerotheca apnnosa* var. *rosae*)

The infection results in a white powdery substance on the leaves, buds and twigs causing distorted and dwarfed leaves. Petals, sepals and receptacles of the flower buds are also subject to attack. Frequently, the unopened buds are affected to any great extent. The disease is more likely to occur during cool, dry conditions and can spread rapidly. Powder mildew is usually not a season-long problem.

### Botrytis blight (*Botrytis cinerea*)

This disease prevents the blooms from opening. The buds turn brown and decay. Sometimes, partially opened flowers are attacked, the individual petals turning brown and shriveling. The fungus is always present in rainy seasons when the old blooms are not gathered. Winter-killed canes also harbor the fungus.

### Rust (*Phragmidium disciflorum*)

Infection sites results in small, orange or yellow pustules on green portions of the plant. In early spring, theses masses may be inconspicuous as to be unnoticed. In the late summer or early fall, the spots change and black pustules appear, frequently in the same affected areas. These pustules overwinter within the leaf and the stem tissus after leaves have fallen and later produce the spores that cause the spring infection.

### Black spot

The spores of the fungus are dispersed by splashing raindrops and not by wind. The presence of free moisture is necessary for black spot infection to occur. The primary symptoms are irregularly-shaped black spots with feathery edges often surrounded by a yellow halo on the foliage. Infected leaves eventually drop off and this will be more severe under warm temperatures rather than cool temperatures. Heavy infection causes excessive and premature defoliation, reducing the carbohydrate contents of canes and roots which in turn reduces the amount of subsequent foliage and flowering parts. Infection can also occurs on petioles, twigs and canes.

## INSECTS ON ROSES

**Thrips (*Tetranychus urticae*)**

The two-spotted mite (0,3 to 0,5 mm long) is green yellowish. It is a greenhouse pest but can also do much damage in garden roses. Feeding damage of this green spider mite results in stippled spotting causing yellowing or bronzing of completely fed-over leaves that drop prematurely.

**Megachile of rose (*Megachile centuncularis)***

External sides of the leaves appear to be cut in small semi-cercles and these damages are caused by grey or reddish bees.

**Aphids**

Insects rapidly infest flower buds, stalks and on the under sides of the leaves. Two species of aphids (green or greenish colors) are mostly infest the roses. The small rose aphid (*Macrosiphum rosae*) injured the plants, caused a poor growth and a decreasing flowering period. The small green aphid of apple (*Aphis pomi*) caused a leaf curl and a poor growth.

**Foliage sawfly** *(Arge rosae, Arge pagana)*

These are small yellow and black wasps. Larvae ate the limb of foliage without attack to the internal epidermis and nervations. Older, they cut leaves irregularly.

**Stem sawfly** *(Blennocampa elongatula, Ardis bruniventris, Ardis sulcata)*

Stems and new shoots are affected by false caterpillars. They burrow increasing galleries (*Blennocampa elongatule;* larva is yellow-brown with a brown head) or decreasing galleries (*Ardis brunniventris* or *Ardis sulcata;* larva is yellowish with a dark yellow head). Shoots faded.

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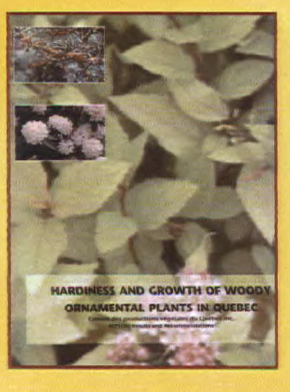




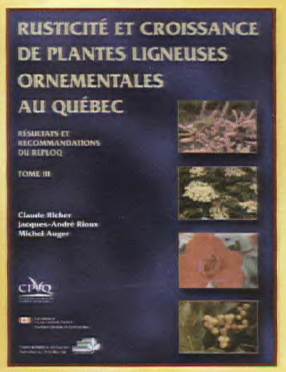



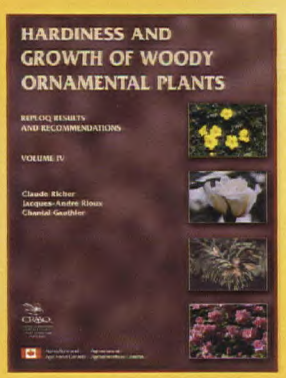


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