DOMINION OF CANADA

DEPARTMENT OF AGRICULTURE

DOMINION EXPERIMENTAL FARMS

DIVISION OF HORTICULTURE

REPORT

OF THE DOMINION HORTICULTURIST

W. T. MACOUN

FOR THE YEAR 1924

Colorado Spruce, Austrian Pine, and Pyramidal Arbor-vitae at the Dominion Experimental Farm, Ottawa.

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REPORT OF THE DIVISION OF HORTICULTURE

W. T. MACOUN, DOMINION HORTICULTURIST

This is the thirty-eighth annual report of the Division of Horticulture, and, as it is not possible in any one report to treat of all the experiments which are in progress in the division or of the other work being carried on, those experiments are dealt with which, it is hoped, will prove of the greatest interest and value to the largest number. The experiments in canning and dehydration, which, during the past year, have been in charge of Miss Ethel Hamilton, are not dealt with in this report, but the results of the work will be published in bulletin form. Reference should be made here to a very useful collection of water-colour paintings of fruits and vegetables which is being gradually enlarged through the work of Miss Faith Fyles, B.A., artist, and this, with the herbarium of cultivated plants also under her charge, makes two very valuable reference collections.

Most of the pomological section of the report has been prepared by Mr. M. B. Davis, B.S.A., Chief Assistant; the section on vegetables by Mr. T. F. Ritchie, B.S.A., Assistant in Vegetable Gardening. The article on lilies was written by Miss Isabella Preston, Specialist in Ornamental Gardening. The remainder of the report was prepared by the Dominion Horticulturist. Dr. Frank T. Shutt, Dominion Chemist, supplied the photographs of evergreens.

THE SEASON

Each year some notes are made in the annual report on the character of the weather throughout the year, especially in regard to its bearing on the fruits, vegetables, and ornamental plants grown in the Horticultural Division.

By the middle of January, 1924, there were about fifteen inches of snow on the level, affording good protection for low-growing plants and the roots of trees. It was below zero on fourteen days during the month, the coldest day being on the 27th, when it was -29.8° F., and the coldest day of winter. There was no great thaw during the month, though the temperature rose above freezing on five days. The temperature did not get above freezing in February, but the lowest was only -12.4° F. below on the 24th, but it was below zero on nineteen days. March was a mild month, the temperature being above freezing on twenty-five days. The ground was showing in places by the 21st and was almost bare by the 27th. It was a very temperate winter, on the whole, and trees and shrubs came through in good condition.

The frost was out of the ground sufficiently to dig on April 7, 1924, which was four days earlier than the average for the past twenty-seven years for which a record has been kept, the average date being April 11. There was not much warm weather in April, the highest temperature being 74° F. on the 29th. The temperature was above freezing on twenty-five days. Work was well advanced by the end of the month.

There was much rain in the early part of May and the weather was cool. Vegetation was much behind the average during the month. The last spring frost was on May 21, when the temperature was 30.9° F. The highest temperature for the month was 69.8° F. on the 17th.

The weather became more seasonable in June, it being a warm month with a maximum temperature of 87.4° on the 22nd. July was also warm with a maximum of 95° F. on the 9th, which was also the hottest day of summer.

The temperature was over 80° F. on twelve days. August was almost as warm as July with a maximum temperature of 87·5 on the 31st, and over 80° on nine days. There were good rains during July and August, which, with the heat, induced a strong growth. September was also a warm month for that time of year. The maximum temperature was 87·2° F. on the 1st and the lowest 31·2° F. on September 25, this being the first autumn frost, which affected only the tenderest plants. The weather continued comparatively warm and dry throughout. There was a light frost on the 13th, when 30° F. was recorded, and another light one on the 14th, when it was 31·5°, but there was no killing autumn frost until October 18, when the temperature dropped to 27·5°. The highest temperature in October was on the 5th, when it was 73·1°. There was only one-quarter of an inch of rain during the month, but this and the warm weather made conditions very favourable for the ripening of wood which, after a warm wet summer, would otherwise have been in great danger of winter injury.

November was a comparatively mild month. The lowest temperature was 7° F. on the 18th, but the ground thawed again, and it was not until November 29 that the winter may be said to have set in, when the ground froze again. This is four days later than the average for the past twenty-seven years, which is November 25. This closed a very fine autumn. December was a moderately cold month. It was ten times below zero during the month, the lowest being —21.5 on the 21st. The ground remained bare until December 13, when there was about three inches of snow.

Tables of meteorological records for the past thirty-five years will be found in the 1924 report of the Dominion Field Husbandman.

POMOLOGY

The past season could hardly be considered as a very satisfactory year for all fruits. It will be noticed by a reference to the meteorological report that the season was very late and cold weather prevailed throughout April and May, and, as is usually the case in such springs, the plum trees, coming into bloom very early as they do, experienced very cold and backward weather during their pollinating period. This resulted in a very poor set, although the bloom gave promise of a very large crop. Currants also suffered to some extent, but other fruits appeared to set a normal crop in comparison with their amount of bloom.

The winter of 1923-24 being comparatively mild, in so far as injury to fruit trees was concerned, the apple, pear and plum plantations came through in remarkably good condition, suffering only from minor winter injury to some unripened wood or in the pith of some of the less hardy varieties.

STRAWBERRY FERTILIZER EXPERIMENT

A rather intensive fertilizer experiment was commenced during the year and a complete report of the results cannot be given until next year, after the crop of 1925. The report contains, however, an outline of the experiment, together with the results from the work to date.

The object of the experiment is to determine, if possible, the effect of the application of nitrogenous fertilizers upon strawberries at different seasons of the year. The experiment was divided into two main divisions—first a study of the effect of spring applications of nitrogenous fertilizer to a strawberry plantation in its fruiting year, and second a study of the effect of nitrate of soda applied during different periods of the first year of the plantation.

A STUDY OF THE EFFECT OF SPRING APPLICATIONS OF NITROGENOUS FERTILIZER TO A STRAWBERRY PLANTATION IN ITS FRUITING YEAR

Nitrogenous fertilizers were applied on May 3 to some plots, which was just after the winter covering of straw had been removed. To other plots it was applied just as the plants were coming into full bloom and other plots did not receive any applications of nitrogenous fertilizer.

The plants used for this experiment were of the Parson Beauty variety and in each plot the age of the individual plant was known, the stolons having been staked and dated the previous year at the time of the formation of their root systems.

The soil was a light clay loam, well provided with fertilizing constituents, as it had in previous years been well manured. This was demonstrated by the excellent growth made by the plants in their first year. It was not expected, therefore, that such a soil would be very deficient in nitrogen.

There are at least three ways in which an application of nitrogenous fertilizer to a strawberry patch might be expected to yield results, namely (1) by causing an actual increase in the number of flowers or fruit buds formed, (2) by causing an increase in the size of the individual fruits, and (3) by increasing the set of the bloom. It was not anticipated that either of the spring applications of nitrogen would cause an increase in the number of fruits. This conclusion was previously arrived at, as our cytological work showed that strawberry plants might be expected to form their fruit buds for the next year's crop at an age of three weeks, so that to affect fruit-bud formation nutritional conditions within the plant would have to be altered at about that time, which would mean, for the majority of the plants, some time in September. Spring applications of nitrogenous fertilizers, however, should have effect on the increase of size and the set of fruit. It should also be added here that the claim has been advanced to the effect that nitrogenous fertilizers applied in the spring of the fruiting year actually cause a reduction, or rather a suppression of the number of fruit buds which develop. If such were the case these spring applications might work considerable mischief, which might more than offset any beneficial influences of spring applications upon size and set.

To test the foregoing hypothesis actual counts were made of the number of flower stalks and individual blossoms on each plant in the different plots. As the age of each plant was known it was possible then to segregate comparable plants from each plot and compare the number of flowers or bloom which each bore.

RESULTS.—In all, 864 individual plants were examined and 13,210 fruits were borne by these 864 plants. The plants and fruits were divided among the three different plots as follows:—

Series A—Nitrated May 3 at the rate of 325 pounds of nitrate of soda per acre. Number of plants examined, 226. Number of fruits, 3,532.

Series B—Nitrated just before bloom (June 4) at the rate of 325 pounds nitrate of soda per acre. Number of plants examined, 293. Number of fruits, 4,130.

Series C—Not nitrated; check plots. Number of plants examined, 345. Number of fruits, 5,548.

Average number of blossoms per plants from each series was as follows:—

Series A, nitrated May 3	15·62
Series B, nitrated June 4	14·10
Series C, not nitrated	16·08

The foregoing figures are from all plants, regardless of age, and indicate quite clearly that there was not any reduction in numbers or suppression due to spring applications of nitrate of soda. Although there is a slight difference in favour of the non-nitrated plots this is so small as compared with the plots nitrated May 3, namely about 3 per cent, that it cannot be regarded as at all significant. The important point from this part of the experiment is that *spring applications of nitrate of soda at a high rate per acre failed to cause any suppression or reduction of the developing floral primordia.*

TABLE 1.—DETAILS OF RESULTS FROM A SERIES AND C SERIES. APPLICATION OF NITRATE OF SODA TO STRAWBERRIES.

Date plant rooted	A Series: Average number blossoms	C Series: Average number blossoms
20-7-23	35·0	34·0
27-7-23	40·1	32·3
3-8-23	19·8	18·6
10-8-23	22·7	28·0
17-8-23	19·0	20·0
24-8-23	18·4	25·7
31-8-23	17·4	19·4
7-9-23	17·2	14·5
14-9-23	17·1	18·0
21-9-23	14·0	15·5
28-9-23	10·74	11·1
5-10-23	20·0	10·6
12-10-23	11·4	9·0
19-10-23	10·0	.....
26-10-23	.....	8·0

An examination of the details of the results from the A Series plots and the C Series reveals the fact that the older plants, i.e., those formed previous to September 7, were considerably affected by the nitrate applications and showed a considerable reduction of blossoms per plant. On the other hand, the later-formed stolons, or younger plants, showed an increase in the number of blossoms produced on the nitrated series.

In addition to again calling attention to the necessity of knowing the age of the plants being dealt with in making deductions, this indicates that there might be a difference in the effect of spring applications of nitrate of soda upon plants of different ages. This point will receive further attention in future work along this line.

EFFECT OF NITRATE OF SODA UPON THE SET.—In addition to checking up on the effect of spring applications of nitrate of soda upon the number of blossoms formed, information was also gathered as to the effect of spring applications of nitrate upon the actual set obtained.

The following table gives the set in per cent of the primary, secondary, tertiary and quaternary blooms. A word of explanation with regard to these terms might not be amiss here. Each fruiting plant of the strawberry produces one or more flower stalks. Each flower stalk produces one central blossom, which is termed the primary. This blossom is generally the largest and first to appear. There are also produced for each primary two, or sometimes three, secondaries; these are produced on long branch stalks which are attached directly to the main flower stalk bearing the primary. These secondary stalks each produce two (sometimes more) lateral blossoms called tertiary, and each tertiary produces two lateral blooms called quaternary. Occasionally the quaternary stalk will produce a quinary, but we have never observed a full com-

plement of the latter. There are variations from the above, but this is the general plan. Normally, therefore, each flower-stalk produces as follows:—

1 primary blossom
2 secondary blossoms
4 tertiary blossoms
8 quaternary blossoms

15 blossoms in all.

If there are three secondaries then the total number must increase to twenty-two.

The primary and secondary blooms produce the earliest and largest berries; the tertiary bloom produce much smaller fruit, and the quaternary produce largely inferior-sized fruits and nubbins at the end of the season.

TABLE 2.—SHOWING TOTAL SET OF BLOOM ON DIFFERENT PLOTS, ALL PLANTS, REGARDLESS OF AGE

—	Primary	Secondary	Tertiary	Quaternary	Total
Series A, itrated May 3	96·7	98·5	91·9	82·9	91·9
Series B, nitrated at bloom	100·0	98·5	89·6	70·8	88·9
Series C, not nitrated	100·0	99·9	88·4	56·0	86·2

It will be noticed from the table that there was somewhat of an increase in total set on the two nitrated series when compared with the non-nitrated. On examining the details it will be further observed that there was considerable variation, but little real difference in the set of the primary, secondary and tertiary blooms in all plots, but that there was a marked difference in the set on the quaternary bloom of the nitrated series. In short, nitrate applications in spring failed to influence to any appreciable extent the set of primary, secondary and even tertiary blossoms, but did influence to a very marked degree the set of the quaternary blossoms. Following is a more detailed analysis of this:—

TABLE 3.—APPLICATION OF NITRATE OF SODA TO STRAWBERRIES—SHOWING PERCENTAGE OF SET ON DIFFERENT AGE PLANTS OF THE PRIMARY, SECONDARY, TERTIARY AND QUATERNARY BLOOM

—	Plants rooted Aug. 10				
	Pr.	Sec.	Ter.	Quar.	Total
Series A, nitrated May 3	84·6	91·4	81·3	84·6	89·8
Series B, nitrated at bloom	100	100	100	77·7	96·9
Series C, no nitrate	100	95·4	90	73·1	87·8

—	Plants rooted Aug. 31				
	Pr.	Sec.	Ter.	Quar.	Total
Series A, nitrated May 3	100	98·2	83·8	84·4	93·9
Series B, nitrated at bloom	100	99·2	93·6	68·3	89·4
Series C, no nitrate	100	100	92·9	54·2	86·2

—	Plants rooted Sept. 28				
	Pr.	Sec.	Ter.	Quar.	Total
Series A, nitrated May 3	100	100	90	77·2	90·6
Series B, nitrated at bloom	100	97·8	84·8	74·2	88·2
Series C, no nitrate	100	100	86·4	51	85·4

In table 3 three ages of plants are treated separately. Attention is called to the comparative consistency and uniformity of these results with that of the total count regardless of age, that is that in all cases the non-nitrated plots showed a lower set. It is also suggestive to note that in the younger plants the differences in the set of the quarternary blossoms are more marked, for instance, in plants rooted on the 10th of August the set of the nitrated plots was 84·6 and 77·7 as compared with 73·1 for the non-nitrated, while in the plants which were not rooted until the 28th of September the differences were 77·2 and 74·2 as compared with 51. This is further evidence that the age of the plant is a necessary factor in determining the result of fertilizer applications.

INFLUENCE OF SPRING APPLICATIONS OF NITROGEN ON THE SIZE OF FRUIT.—The next point of investigation was the influence of the spring application of nitrate of soda on the size of the fruit. The primary, secondary and tertiary fruits from the comparable plants in each plot were measured and weighed and the mean size and weights are recorded below. The measurements were taken of the length and the diameter of the greatest girth of each fruit in millimeters and the square millimeters calculated from this.

Table 4 gives the results of these measurements and weights:—

TABLE 4.—APPLICATION OF NITRATE OF SODA TO STRAWBERRIES—SHOWING MEAN MEASUREMENTS AND WEIGHTS OF INDIVIDUAL FRUITS FROM THE DIFFERENT PLOTS

	Measurements in sq. millimeters			Weight in ounces		
	Prim.	Second.	Ter.	Prim.	Second.	Ter.
Series A, nitrated May 3..	12·11	8·57	7·0	0·52	0·42	0·16
Series B, nitrated at bloom.	11·54	8·37	4·20	0·48	0·30	0·14
Series C, no nitrate.....	11·38	8·87	5·52	0·48	0·29	0·19

It will be observed that there was somewhat of an increase in the size of the primary bloom on the early nitrated plots and a considerable increase of the secondary. In the case of the tertiary the differences, while slight, are in favour of the non-nitrated series. In per cent there was an increase in size of 8 per cent of the early-nitrated primaries over the non-nitrated, and in the case of the secondaries an increase of 40 per cent, while the decrease in size of the tertiary fruit was about 15 per cent. It is quite probable that this was not an actual difference, but simply due to random sampling and likewise the increase of 8 per cent in the primaries is not considered as significant.

A STUDY OF THE EFFECT OF NITRATE OF SODA APPLIED DURING DIFFERENT PERIODS OF THE FIRST YEAR OF THE PLANTATION

This phase of the strawberry fertilizer work was started in the spring of 1924, the variety Parson Beauty being used throughout. The soil was a medium sandy loam and had been manured the previous year and had grown a crop of roots.

The following treatments were given:—

Series A—Nitrate of soda applied at planting and on July 14.
Series B—Nitrate of soda applied one month after planting.
Series C—Nitrate of soda applied August 15.
Series D—Nitrate of soda applied September 15.
Series E—Nitrate of soda applied September 15 and before bloom.
Series F—Nitrate of soda applied September 15 and in full bloom.
Series G—Did not receive any nitrate applications.

All plots were replicated three times, making four plots of each treatment systematically distributed over the area.

The runners in each plot were counted on the following dates: July 15, August 1, August 15 and September 1. The object of these counts was to determine, if possible, the effect of nitrate applications upon early runner formation. In the report of this division for the year 1921 data were presented to show a close correlation between the age of the stolon or plant and its subsequent yield and recommendations were made that it seemed advisable to get a full stand of plants at as early a date as possible. Before comparing the dates when a full stand of plants can be considered as having been attained on the various plots we must decide what constitutes a full stand. Unfortunately there is little experimental data available with regard to yields from spaced plantations. Darrow states that the distance apart should be 6 inches by 6 inches. This gives about four plants to the square foot.

In the experiment here being considered the rows were fifteen feet long with three rows to the plot, making forty-five feet of row in all. Accepting two feet as the widest row to be permitted one would have for each of these plots an area of ninety square feet to be covered with plants, which at four to the square foot would require three hundred and sixty plants per plot. This number was obtained in all the plots by, or previous to, September 1 and nitrate applications had no appreciable effect in altering the date when a full stand was obtainable.

In addition to the four plots of each series referred to above there was one plot of each series from which material was gathered for the purpose of determining the date at which fruit buds were laid down or differentiated in the plants of various ages.

Throughout the season careful notes were taken on the condition and appearance of the plants before and after the nitrate applications.

Results.—It was observed that the plots to which nitrate was applied at planting time had a larger number of deaths among the original plants than those where the nitrate applications were deferred until the plants had become established. Apparently there exists a grave danger of applying nitrate too close to the plant before full establishment of the root system.

From Table No. 5 it will be further noted that the plots receiving the nitrate at planting and one month after planting had not as many runners on August 1 as the plots to which nitrate had not been applied until after that date. The conclusion is, therefore, forced upon us that on this particular soil nitrogen was not a limiting factor and that hence applications of nitrate of soda early in the planting year did not induce early runner formation in this instance. On soils deficient in this element it is highly probable that a different result entirely might have been obtained. When it is remembered that this land had not been manured for two years and had previously grown a crop of roots the results demonstrate the imperativeness of growers attempting a little fertilizer work on their own land rather than accept the verdict from a distant experiment to the effect that applications of manure or fertilizer during the planting year is always an essential from the standpoint of runner production.

TABLE 5.—APPLICATION OF NITRATE OF SODA TO STRAWBERRIES. SHOWING NUMBER OF PLANTS FORMED IN EACH PLOT AT DIFFERENT DATES

Plot	July 15	August 1	August 15	September 1
A-3	16	114	222	426
A-4	14	109	233	419
A-5	28	116	276	482
A-6	20	105	272	511
	78	444	1,003	1,838
B-1	32	124	277	438
B-2	8	95	210	405
B-4	16	103	324	579
B-5	17	121	241	493
	73	453	1,052	1,915
C-1	41	175	323	539
C-2	33	153	305	561
C-3	18	144	319	586
C-5	37	162	340	634
	129	634	1,287	2,320
D-1	21	135	269	528
D-3	43	206	390	741
D-5	29	139	355	621
D-6	35	173	370	669
	128	653	1,384	2,559
E-1	20	106	214	414
E-2	37	149	331	640
E-3	16	138	308	599
E-5	33	140	344	666
	106	533	1,197	2,319
F-1	23	111	236	417
F-2	19	149	317	604
F-3	27	130	257	520
F-5	28	149	315	568
	98	539	1,125	2,109
G-1	25	132	293	501
G-2	28	128	297	540
G-3	14	137	298	580
G-5	26	117	253	490
	93	514	1,141	2,111

POLLINATION STUDIES WITH APPLES IN 1924

In the pollination work carried on in 1924 all crosses were made and all work done under the Sax method whereby blooms are emasculated but not bagged. Care is taken to remove the nectar-cup and thus with petals removed there is but very slight danger of insect visitors being attracted. A large number of blooms were unemasculated and left unpollinated as checks and since, out of 2,838 blooms only four of these unemasculated checks were set, it may be safely assumed that the negligible set of 0·14 per cent is well within the range of experimental error and that the method is safe and satisfactory.

RATE OF POLLEN-TUBE GROWTH

A study of the rate of pollen-tube growth, that is the time required for the pollen-tube to grow down the style, was undertaken in the field, since positive results were achieved in 1923, showing that thirty-eight to forty-four hours sufficed for the tube to reach the base of the style. Notwithstanding the fact that a range of thirty-eight to forty-four hours was allowed for the tube to grow down the style in 1924 not one fruit set of some sixteen hundred blossoms pollinated, thus demonstrating the result of cold weather in retarding tube growth. The weather prevailing during blossoming season was windy and unusually cold and this alone is the only factor to which a negative set could be attributed. Temperature records for 1924 show an average daily temperature of 47·5° minimum temperature and 72·1° average of the daily maximum during bloom, which is 4·1° to 4·3° lower than the average daily maximum and minimum for the previous year. The highest temperature recorded was 78·4° (1924) as compared with 89·5° in 1923.

EFFECT OF APPLYING POLLEN AT DIFFERENT STAGES OF RECEPTIVITY

An experiment was carried on of applying pollen the same day that the female parent was emasculated and each day afterwards for five days. Eighty-seven blooms were emasculated and pollinated. The results obtained showed an excellent set the first and second days pollinated, a slight decrease with the pollinations of the third day after emasculation and a decided falling off for the fourth, fifth and sixth day after emasculation. These results fairly conclusively demonstrate that unless a bloom is pollinated the same day it is first receptive, or not later than the first or second day after becoming receptive, possibility of securing fertilization is slight. Tabulated these results appear as follows:—

TABLE 6—APPLYING POLLEN AT VARIOUS STAGES OF RECEPTIVITY

—	Date emasculated	Number of clusters	Number of bloom	Date pollinated	Weather when pollinated	Blossoms	
						Set	Percentage
McIntosh x Duchess.....	June 2	90	178	June 2	Cloudy and warm.	74	41·6
" "	" 2	75	145	" 3	"	66	45·5
" "	" 2	71	140	" 4	"	25	17·9
" "	" 2	73	122	" 5	"	9	7·4
" "	" 2	61	112	" 6	Cloudy and windy.	3	2·7
" "	" 2	23	45	" 7	After rain cold wind.	2	4·4

A COMPARISON OF THE VALUE OF BLOOM IN DIFFERENT STAGES OF MATURITY AS FEMALE PARENT

Another phase of pollination attacked was that of selecting three types of buds of Duchess. Type I comprised buds just ready to open, type II were about two to three days from opening and type III buds that were quite tight and four to five days from opening. These emasculated buds were pollinated with Crimson Beauty pollen the same day as emasculated, one day after, two and three days after emasculation, and in each case, except one, of the three types emasculated the larger buds (Type I) proved to give the greatest set and the small buds the lowest set.

TABLE 7—VALUE OF BLOOM IN VARIOUS STAGES OF MATURITY

—	Type	Number of clusters	Number of bloom	Emasculated	Pollinated	Set	Percentage
Duchess x Crimson Beauty.....	I	25	50	May 28	May 29	8	16·0
" "	II	24	47	" 28	" 29	6	14·9
" "	III	24	47	" 28	" 29	0	0·0
" "	I	23	45	" 28	" 31	7	15·5
" "	II	25	49	" 28	" 31	1	2·0
" "	III	23	45	" 28	" 31	0	0·0
" "	I	23	46	" 29	" 29	3	6·5
" "	II	22	44	" 29	" 29	3	7·0
" "	III	26	52	" 29	" 29	9	17·3
" "	I	24	48	" 29	" 31	15	31·2
" "	II	24	48	" 29	" 31	14	29·2
" "	III	25	50	" 29	" 31	9	18·0

Emasculations on the four days averaged as follows: Type I, 17·5 per cent set, Type II, 12·8 per cent set, and Type III, 9·3 per cent, hence we may assume that large buds just ready to open should be used in order to obtain the greatest set in apple breeding work.

Pollen from these buds was ripened in the laboratory and that from Type I buds gave the highest germination and longest pollen tubes, while Type II ranked next best and Type III buds did not germinate well for twenty-four to forty-eight hours and then were not as high in germination as pollen from the larger buds.

OBSERVATIONS AND NOTES ON BLOOMING DATES OF THE MEMBERS OF INDIVIDUAL CLUSTERS

Extended observations were carried on with twenty-five clusters of bloom from some seven varieties of apples to determine the spread in the number of days on which bloom opened, the number of days over which the pistil is receptive and the number of days until the style withered. These data are tabulated.

TABLE 8—APPLES—OBSERVATIONS AND NOTES ON BLOOMING DATES OF THE INDIVIDUAL CLUSTERS

Variety	Spread of days bloom opened	Central bloom		Lateral bloom		Notes
		Days receptive until browning of stigma	Days until withering of style	Days receptive until browning of stigma	Days until withering of style	
Dudley.....	4	2–3	7–9	2–3	7–9	Spreading and glistening coincide, 10 of 25 central bloom abortive, lateral one only.
Fameuse.....	3	2–3	7–8	2–3	5–8	Pistils spreading one day before glistening.
Crimson Beauty...	4	2–3	7–8	2–3	6–7	10 central pistils abortive, no lateral.
Wealthy.....	4	2–3	6–8	2–3	5–6	Glistening and spreading coincide.
Duchess.....	5	2–3	6–8	2–3	5–8	Abortive pistils, central 2. " " lateral 0.
McIntosh.....	4	2–3	6–8	2–3	5–8	Stamens subtend pistils.
Bethel.....	3	2–3	6–7	2–3	6–7	" "

NOTE.—In all varieties the stigmas were whitish but one day before becoming receptive.

It will be seen by the data tabulated that the period over which bloom opened of each variety shows a range of three to five days. Also it is apparent that for both the central and the lateral bloom of a cluster two to three days

is the maximum period of receptivity and actual pollination must take place during this period and before browning of the stigma indicates that receptivity has ended. This observation is collaborated by the result of pollen application over six days, in which pollination during the first three days only gave tangible results. It will be noted that the range of days until withering of the style is calculated after the time of becoming receptive. Hence the range of days during which the pollen tube could still grow down the style was 5-6, 5-8, 6-7, 6-8, 7-8 and 7-9 days, as will be seen by the tabulated data, depending on the variety and whether central or lateral bloom. Allowing for the fact that pollination may have been delayed until the second or third day of receptivity a minimum marginal time of forty-eight to seventy-two hours and more would still remain before the withering of the style prevented passage of the pollen tube. In other words, even should the pollination of the bloom not take place until the second or third and last day the pistil was receptive, the time remaining would be ample for fertilization to take place before withering of the style prevented.

Another fact apparent from the table is that when pistils are abortive it is generally the central and not the lateral that are thus deformed. Whether this might be due to actual frost damage just prior to bloom and to the fact that the central bloom, being much farther advanced, would stand much greater chance of injury is problematical. Two varieties show a definite tendency for stamens to subtend the pistil, thus enhancing the opportunity for self-pollination to occur. In two varieties the spreading apart of the five pistils and the glistening appearance of the stigmas coincided exactly, but did not for the other five varieties. It would appear, therefore, that for certain varieties, at least, as an appearance of receptivity, either spreading pistils or glistening, sticky stigmas are equally reliable.

12720—3½

A STUDY OF INTERCOMPATIBILITY IN APPLES

Intercompatibility work was continued during the blooming season of 1924 and the tabulated results of the set of fruit with various crosses follow:—

TABLE 9—INTERCOMPATIBILITY IN APPLES

Female Parent	Percentage set	Number of seeds per fruit	Percentage abortive
Bethel x Crimson Beauty	6·1	9·5	10·5
" x Fameuse	15·5	12·7	51·0
" x Duchess	18·0	11·5	7·2
" x Yellow Transparent	21·0	11·2	15·8
" x Dudley	15·5	11·3	26·5
Crimson Beauty x Wealthy	21·9	6·8	0·7
" x Bethel	20·8	6·3	0·8
" x Fameuse	24·4	7·4	29·3
" x Duchess	12·9	4·1	23·9
" x Yellow Transparent	22·9	7·1	32·6
" x Dudley	31·9	7·4	0·5
Duchess x Crimson Beauty	53·1	4·8	23·3
" x Wealthy	27·9	6·1	12·8
" x Bethel	53·2	5·4	5·9
" x Fameuse	26·5	6·6	28·8
" x Yellow Transparent	40·7	7·2	20·2
" x Dudley	29·9	7·4	2·9
Dudley x Crimson Beauty	24·3	8·7	2·7
" x McIntosh	22·1	8·0	12·4
" x Wealthy	19·5	7·7	5·3
" x Bethel	19·6	7·3	4·0
" x Fameuse	22·8	7·5	30·6
" x Duchess	17·4	7·1	0·7
" x Yellow Transparent	22·8	8·0	4·8
Fameuse x Wealthy	1·4	10·0	20·0
McIntosh x Crimson Beauty	5·2	6·5	23·0
" x Wealthy	5·7	9·1	14·5
" x Fameuse	7·8	7·1	10·5
" x Duchess	2·0	7·2	20·3
" x Yellow Transparent	11·2	7·1	15·4
" x Dudley	2·0	11·0	0·0
Wealthy x Yellow Transparent	12·0	9·9	25·2
" x Wealthy	20·0	11·6	1·9
" x Bethel	1·0	10·0	10·0
" x Fameuse	31·8	9·0	21·7
" x Duchess	16·7	8·7	2·1
" x Yellow Transparent	21·6	9·1	3·0
" x Dudley	27·7	9·4	2·2
Yellow Transparent x Crimson Beauty	12·0	9·9	25·2
" x Wealthy	20·0	11·6	1·9
" x Bethel	1·1	6·0	0·0
" x Fameuse	5·2	9·5	26·3
" x Duchess	24·5	8·8	26·6
" x Dudley	31·9	7·4	0·5

Of the various varieties used as male parents Crimson Beauty, Transparent, Fameuse and Dudley ranked better than Duchess and Wealthy in 1924.

The poor showing of the various varieties used on McIntosh is consistent. Examination of the yield record for this tree, however, showed that 1924 was the off-year (only 5 gallons produced) for this particular tree. It also will be seen that the low set was influenced by nutritional conditions of the tree since the previous year (1923) it had borne its heavier crop (17 gallons). The somewhat low set of various varieties on Bethel is similarly explained as examination of yield records show this tree to be in a declining state of vigour as far as yield goes—52 gallons in 1921, 53 in 1922 falling to 25 gallons in 1923 and to but 16 gallons in 1924 though a large well grown tree.

It would appear that if any significance is to be attached to results through such cross-pollination work as this we must carefully study all the nutritional conditions underlying. A tree to be used for a study of the comparative value

of pollen of different varieties should be in the on-bearing year and in a fruitful, not over-vegetative, condition. The condition of various trees used for this work should then be as nearly comparable as far as being in a good fruitful condition to make comparisons of results of value. A comparison of the results in compatibility work show some consistencies and but few results which coincide for the two years 1923 and 1924. Among the results which coincide for the two years the following might be cited.

Wealthy is an excellent pollinator for Duchess, while Duchess on Wealthy, though satisfactory, did not result in as high a set either year as did the reciprocal cross. Duchess proved an effective pollenizer for Wealthy and Dudley in both 1923 and 1924. Bethel gave an almost negligible set when used on Wealthy for both years, but gave satisfactory sets when used on Dudley, McIntosh, Fameuse, Duchess and Crimson Beauty. Yellow Transparent gave the highest set of fruit on Bethel, Wealthy, Crimson Beauty, Dudley and Duchess, while Dudley gave the best set used on Wealthy, Duchess and Crimson Beauty. The reciprocals of some of these crosses, Crimson Beauty on Dudley, Wealthy and Duchess, for example, were equally effective. Duchess in 1924 proved to give a high set when pollen of Crimson Beauty, Wealthy, Bethel, Fameuse, Yellow Transparent or Dudley was used on it, but in contrast with these 1924 results, while Wealthy and Dudley were effective pollenizers in 1923, Crimson Beauty gave a much lower set (about 3 per cent) in 1923 as compared with 53 per cent in 1924. In explanation of these results poor spur-selection could not be the cause altogether of the lower yield in 1923. Selection of a number of non-fruitful spurs might cause a reduced set, but even if some poor spurs were included there would also have been included a high percentage of fruitful spurs. The fact that McIntosh, a good pollinator, gave only 9 per cent set would indicate that the Crimson Beauty tree used in 1923 for the work was not in its best bearing condition or that other environmental factors influenced a result so different from that obtained in 1924. The influence of these environmental nutrition factors in pollination work and particularly in the compatibility tests to date show that such work must be carried on over a period of years and the results compared before results of real value are assured. It would appear that in the past much data has been published for a single year's work without a sufficiently careful study of the underlying nutritional conditions, which must and often do have a direct bearing on the set obtained, as for example the low set of McIntosh as a female parent compared with other varieties and with its previous performance.

It is apparent that before trees are chosen for pollination the following factors should be considered:

All spurs used should be spurs that are capable of being fruitful.

Trees should be in the bearing not the non-bearing year.

Trees should not be in a state of declining vigour, or in an overly vegetative condition.

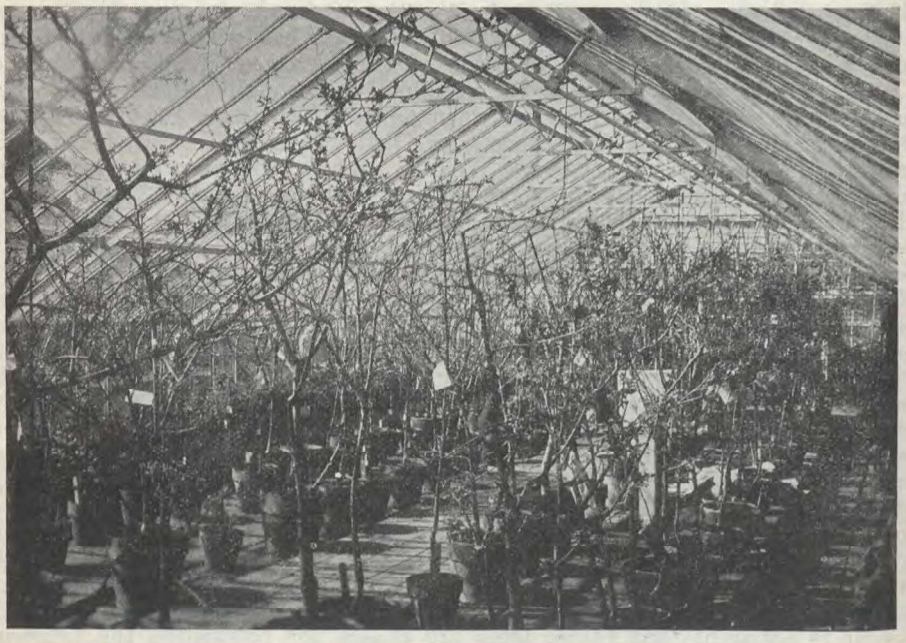
All trees used should be on a comparable basis as regards age.

Either all trees should receive nitrate or none should be used that have been nitrated.

OBSERVATIONS ON WIND POLLINATION

A study of how much pollen is distributed by wind was also undertaken. Slides were placed in various positions in a number of trees before full bloom and coated with glycerine. After petal fall these slides were examined for the amount of pollen which had adhered to the slide. Of the twenty-four slides carefully examined under the microscope it is extremely doubtful if pollination of stigmas would have resulted from such a quantity of pollen as was found on sixteen of the twenty-four used. On seven of the remaining slides pollination might have resulted from the pollen deposited, although it is somewhat

doubtful and in the case of one slide there was sufficient to cause pollination. However, the slides were attached in such a way that this particular slide might have swung into a blossom covered branch and such an accident might thus explain the quantity of pollen in this instance. The fact that but one slide of twenty-four showed pollen sufficient to affect fertilization points to the latter cause and not to wind as the main factor. On the other hand high winds which prevailed and even caused eddies of dust and mud to be lifted in the air might also readily cover the slide with such a quantity of pollen. The fact remains, however, that the bulk of the slides did not receive enough pollen to cause fertilization and we may, therefore, conclude that wind alone cannot be depended upon to secure a set and that insect visitors particularly bees (wild and honey) are essential.



Fruit trees in pots in a greenhouse for cross-breeding investigations—Central Experimental Farm, Ottawa.

DESCRIPTIONS OF NEW VARIETIES OF APPLES ORIGINATED IN THE HORTICULTURAL DIVISION WHICH HAVE BEEN NAMED DURING THE YEAR 1923-24

Each year new crosses are made between varieties of apples in the Horticultural Division, and many crosses are made with other kinds of fruit as well. A large number of these fruit each year. The best of these are named, from time to time, and given a wider test than they have previously had to learn if they are likely to prove desirable to introduce.

During the past year the following varieties have been named:—

Foreland (Lowland Raspberry x Forest).—Fruit above medium to medium; form oblate to roundish, conic, ribbed; cavity open, medium depth to deep, sometimes russeted; stem medium to long, stout; basin open, medium depth, wrinkled; calyx partly open or closed; colour yellow well washed with deep but

lively crimson; predominant colour deep crimson; seeds medium size, acute; dots moderately numerous, yellow, distinct or conspicuous; skin moderately thick, tender; flesh white, much tinged with red, crisp, tender, juicy; core medium, open; flavour subacid, pleasant; quality good; season October to February or later. No marked resemblance to either parent. Handsome in appearance.

Macearly (Seedling of Lawver x McIntosh).—Fruit medium to below medium; form roundish, conic; cavity deep, medium width, russeted; stem long and slender to medium and moderately stout; basin open, shallow to medium depth, wrinkled; calyx open or closed; colour yellow well washed with crimson; predominant colour crimson; seeds above medium, acuminate; dots few, yellow, distinct; bloom thin, bluish; skin thick, moderately tough; flesh dull white or yellowish, crisp, tender, juicy; core medium size, open; flavour subacid, pleasant; quality good; season mid-August to early September. Resembles McIntosh considerably in colour of skin and flesh. The fruit of this variety should be thinned, otherwise it is liable to be below medium in size, but it is the earliest apple of the McIntosh type fruited at Ottawa.

Macfor (McIntosh x Forest).—Fruit below medium to medium; form roundish, conic; cavity narrow, shallow to medium; stem medium length to short, stout; basin medium depth and width, wrinkled; calyx open; colour yellow well washed with deep crimson; predominant colour deep crimson; seeds medium size, acute; dots numerous, grey or white; conspicuous; bloom thin, pinkish; skin moderately thick, moderately tough; flesh yellowish, firm, juicy; core medium; flavour subacid, pleasant; quality good; season probably January to April. No marked resemblance to either parent. A good keeper. Flavour somewhat like Forest.

Rosena (Winter Rose Seedling).—Fruit medium; form oblate, ribbed but regular; cavity open, medium depth to deep; stem medium length, stout; basin open, medium depth to shallow, wrinkled; calyx open; colour yellow well washed with dark red; predominant colour dark red; seeds medium size to below, irregular, obtuse; dots moderately numerous, small, yellow distinct; bloom heavy, bluish; skin thick, moderately tender; flesh yellow with traces of red, crisp, moderately juicy to juicy; core small; flavour subacid, pleasant; quality good; season November probably to March. No marked resemblance to Winter Rose. Very handsome in appearance. Seems a better keeper than McIntosh.

FURTHER APPLE LEAF STUDIES

In the study of characteristics of the leaves of various varieties of apples, which was continued during 1924, one variety was added to the number already studied and described in the 1923 Report of this Division, namely Alexander.

Alexander.—Stipules small; petiole short to medium length, slender; leaf medium-green in colour, tapering toward base and often with greatest breadth nearer apex than base, somewhat reflexed, folded, slightly wavy; leaf of medium thickness, fair amount of pubescence; serrations coarse, alternate serrations deeper often; sometimes quite blunt at apex, but tip has spiral turn; lobes of leaf not always even at the base.

Opportunity having arisen for a comprehensive test of the value of a knowledge of the leaf characters of the seventeen varieties studied, the results obtained afford some criterion of what can be done with such a system of identification. The actual time required is not great; mixtures can be detected in a variety and the identity of the interlopers ascertained while walking slowly down the nursery row.

A small nursery was the first inspected. Here, however, owing to the limited extent of the nursery, the small number of varieties grown and the extreme care taken in this nursery all stock was found to be absolutely true to name. A

second and fair-sized nursery growing 15,000 to 20,000 trees annually provided a better field for operations. Between 20,000 to 25,000 trees, two and three years old, were carefully gone over. The varieties in all the two-year-old trees were Alexander, McIntosh, Wealthy, Golden Russet, Fameuse, Lowland Raspberry, Melba, Wolf River, Milwaukee and Yellow Transparent. In the McIntosh twelve to fifteen trees of Wealthy were found and also, in fifteen or more places, twenty to forty trees of Alexander. In Alexander, in eight to ten places, anywhere from eight to fifteen trees of McIntosh were found in each place. In Wolf River one tree untrue to name was found. In Milwaukee four McIntosh were located, and in Yellow Transparent two McIntosh were found. The fact that most trees untrue to name were McIntosh or Alexander would suggest that these varieties became exchanged during grafting, that scions were taken from the wrong trees or, which is less likely, that the exchange was made in setting the grafts out.

In the three-year-old trees not as many mistakes were found. Fameuse, Lowland Raspberry, Golden Russet, Yellow Transparent, Alexander, Milwaukee and Wealthy were the varieties gone over. Two Yellow Transparent trees were found untrue. In Alexander, McIntosh were found in three places and in Wealthy McIntosh was found in one place; in each instance where a mixture occurred from eight to ten trees and upwards were found. The fact that McIntosh was one of the principal varieties grown at this nursery would account for its frequent occurrence as an interloper in the three-year-old varieties.

In every case, except for three trees, identification of the mixed trees was possible and positive identification of these interlopers as McIntosh, Alexander or Wealthy, as the case might be, was made. In the case of this nursery the method proved not only efficient but the total time involved was not a serious factor, since between 20,000 and 25,000 trees were gone over thoroughly in about eight hours, at the same time carefully labelling all mixtures with their actual identity. In the trees gone over the total number untrue to name was very close to 500, which was 2 to 2½ per cent of the total number examined. But, while 2 per cent of trees untrue to name does not seem a high average, if a grower were to have his stock dug from a place where such mixtures occurred he might readily get as many as fifty to a hundred trees which were untrue to name. Moreover, if such mistakes were found to occur in a small nursery, where the owners were men with a good reputation for honesty and integrity, what shall we expect in the case of larger nurseries, where much more labour is employed, where the amount of stock handled yearly is much greater and where the opportunity for mistakes to creep in is many times multiplied by existing conditions.

The methods which have been used to date have practically proven their efficiency in the work done thus far, and it remains only for even wider application of this work to be made. The number of varieties studied is easily capable of expansion to thirty or thirty-five, which would include all the varieties more commonly grown, and the application of this knowledge can be made either at the nursery by examination of many varieties before they leave the nursery, or by verifying the identity of young trees just set out in the orchard. Thus far, however, a real beginning has been made and these studies and their application to date would seem to point the way to the eventual removal of a difficulty which has long been a source of inconvenience and annoyance to the orchardist.

SUSCEPTIBILITY AND RESISTANCE OF CERTAIN VARIETIES OF RASPBERRY TO MOSAIC

During the past few years mosaic disease among raspberries has been assuming a very important role in commercial raspberry production and is now receiving a great deal of attention from the plant pathologists all over the continent.

As there was a considerable amount of this disease prevalent in the plantations of this division it gave an excellent opportunity for the exposure of our collection of varieties to the disease with the possibility of observing their comparative susceptibility to infection. In the estimate here attached, notes are given from two plantations, the old plantation set out in 1917 and a new plantation propagated from the old but located at a distance of over three miles from it and set out in 1922.

The notes were taken by two individuals separately and independently and where the observations of the two observers did not check closely they were gone over again, so that the estimate here attached is the result of the combination of two independent observations.

This is not advanced as a degree of resistance of these varieties, but is merely given for the benefit of those interested, with the explanation that all varieties were exposed to the disease and the fact that certain varieties almost succumbed while others showed a fair amount of resistance should indicate to a certain degree that there is a marked and variable difference in the susceptibility of varieties to mosaic.

TABLE 10—ESTIMATE OF COMPARATIVE RESISTANCE OF VARIETIES OF RASPBERRIES TO MOSAIC

Variety	New Plantation Diseased	Old Plantation Diseased
	p.c.	p.c.
Brighton	70	50
Columbian	Not in new plantation	90
Count	20–25	2
Cuthbert	50	90–100
Deacon	Free	25
Dr. Reider	40	75
Eaton	Free	20
Erskine Park	Free	1
Fewthorn	Not in new plantation	Free
Golden Queen	100	100
Heebner	20	10
Henry	10	3
Herbert	20–25	5
Highland Hardy	50	90
Hiram	50	10
Idaho	Free	25
Jumbo	Free	
June	30	75
King	90–100	30
Latham	95–100	75
La France	Not in new plantation	2
Louboro	50	85
Marlative	100	90
Newman No. 1	10–15	10
Newman No. 5	Free	1
Newman Dwarf	Not in new plantation	75
Newman No. 23	5	2
Newman No. 24	Free	25
Newman No. 20	Free	2
Ohta	5	5
Ontario	Not in new plantation	3
Ranere	Free	1
Royal Purple	Not in new plantation	1
Ruby	60–75	75
Sarah	30	3
Shinn	50–60	50
Sir John	5–10	15
Smooth Cane	Not in new plantation	3
Spineless	" "	75
Starlight	" "	Free
St. Regis	Free	25–30
Sunbeam	5–10	25
Superlative	80–90	6
Viking	Not in new plantation	Free

CULTIVATION OF THE BLUEBERRY IN CANADA

During the past season further attention was paid to an investigation of the possibilities of cultivating the high bush blueberry in Canada. A visit was made to the New Jersey areas, especially the grounds of Joseph J. White, Inc., where the United States Department of Agriculture is conducting some phases of its work in the improvement of this species.

A fairly detailed search of areas in Yarmouth and Digby counties of Nova Scotia was conducted in an endeavour to locate the presence of the high bush blueberries in the wild, which had been reputed as growing in one particular locality. Upon investigation this report was found to be correct and on an island in Salmon River lake, Maxwelton, Digby county, was found a large number of high bush varieties. Upon further search specimens of these similar species were found in parts of Yarmouth county, as well as specimens of what appeared to be high forms of V. pennsylvanicum and possibly natural hybrids. These latter ranged from 3½ feet to 5 feet in height, while the higher species in most cases were from 5 to 9 feet in height. Hardwood cuttings were taken from specimens of these bushes and sent to Ottawa in an attempt to propagate the best for eventual trial distribution.

The sites available for blueberry production in these counties, with a few exceptions, do not possess the characteristics of the New Jersey barrens or bog lands. They are much drier and, with the exception of possessing high acidity, resemble general agricultural lands more than the New Jersey areas. On these sites the low bush varieties grow profusely and the few specimens of high bush sorts which may be located upon search are found in particularly adaptable small areas or pockets, with the one exception of the island referred to, which is low lying and very moist throughout the season. On account of these very different moisture conditions it is quite possible that the existing improved varieties of V. corymbosum will not be found especially adaptable to these counties, in which event hybrid forms will have to be developed and tested for their suitability.

Three trial areas were located in Yarmouth county for the testing of the Whitesbog varieties. These areas are located as follows: One at Carleton, where two distinct types of soil were selected, one type consisting of arid upland now growing low bush varieties, and one type consisting of swamp land more nearly approaching the moisture requirements of the high bush sorts; another area at Chegoggin, near the town of Yarmouth, where two sites were selected, one an arid upland and the other a sort of peaty bog or marsh with more suitable moisture conditions. The third area is located on the outskirts of the town and, while it is a sort of meadow representing a considerable available area, the soil acidity is not as high as in the other sites above mentioned.

The most promising of the present cultivated varieties will be planted on these five different sites in 1925 and it is hoped that in a few years' time definite data and recommendations will be available for the prospective growers of these localities.

In addition to these areas planted in Nova Scotia one was located at Kazubazua in the Gatineau region of the province of Quebec, near Ottawa, and another in the peat bogs at Alfred, Ont., between Ottawa and Montreal.

The Kazubazua area is located on what is called Kazubazua Plains, where the low bush sorts now grow in profusion. The soil is of a very light, sandy texture, high in acidity, but with rather poor moisture conditions. The peat bog at Alfred on the other hand possesses not only a high degree of soil acidity, but also very desirable moisture conditions and would appear to be probably the most likely location for the successful culture of the high bush blueberry.

VEGETABLE GARDENING

TRUENESS TO NAME TEST OF VEGETABLES

The testing of varieties for trueness was continued this season but not as extensively as during the former season, as it was deemed that many of the varieties that had been found reasonably good did not require a further trial until later. In all 810 samples were collected by the Seed Branch, and submitted to this division for trial. Since there was a very full complement of work being conducted on the available ground at Ottawa, this year's test was carried out at the Harrow Experimental Station, where a very uniform piece of land was available for the work. The Harrow Station is situated in a highly specialized vegetable-growing district and is an appropriate location for such a trial. This year more space was available and as a consequence larger plots were allotted to each variety. Considerable interest was taken in these plots by growers from the district.

In tables 11 and 12 will be seen the results of the 1923 test followed by the summary of the 1924 test. In these tables it will be noted that the same crops were tested both seasons but fewer samples of each, as just mentioned.

From observations made concerning the two years' trials, it is quite apparent that in the 1923 table the percentage of samples rating 100 per cent was quite larger than in 1924. It will also be noticed that in the 1923 table only four crops fell below 50 per cent in the 100 per cent column, while for the 1924 test it will be noticed that six crops fell below 50 per cent in the 100 per cent column. It seems evident that the strains which proved unsatisfactory the previous season, when tried again proved in a much reduced test to maintain the impurities previously found.

A very large part of the impurities and variations in the majority of cases would seem due to improper care in growing the seed, either in the way of cross fertilization with other varieties which closely resemble one another, or most likely through the method of mass selection without proper attention to a fixed type. Fixed types may be difficult to obtain, but there seems to be only one method of improvement and that is by the establishment as far as possible of pure-line strains traceable to the progeny of one or more plants.

One of the next steps that seems to be necessary is the establishment of acceptable standard types, and these types fixed and placed in the hands of growers that would be interested in their careful multiplication. No doubt the colleges and experimental stations through the country could do considerable to further this work, combined with the co-operation of the seedsmen.

TABLE 11.—VEGETABLES—TEST OF TRUENESS TO NAME—1923

Vegetables	Total number of samples	Per cent of total 100 per cent true to name	Per cent of total number 99 per cent true to name	Per cent of total 98 per cent true to name	Per cent of total 97 per cent true to name	Per cent of total 96 per cent true to name	Per cent of total 95 per cent true to name	Per cent of total number under 95 per cent true to name
Celery	169	36·0	.....	.....	.....	.....	0·5	63·5
Lettuce	382	59·0	.....	.....	0·5	.....	2·0	38·5
Radish	488	49·0	0·4	3·4	1·4	2·2	1·8	41·8
Beet	273	40·0	.....	.....	0·3	2·0	.....	57·7
Peas	469	87·0	.....	0·2	.....	0·2	0·8	11·8
Parsnips	90	57·0	.....	.....	.....	.....	.....	43·0
Onion	391	71·1	.....	0·8	6·9	6·2	3·8	11·2
Carrots	298	27·0	0·6	0·6	0·3	.....	.....	71·5
Beans	507	51·0	.....	.....	.....	0·3	0·5	48·2
	3,067							

TABLE 12.—VEGETABLES—TEST OF TRUENESS TO NAME—1924

Vegetables	Total number of samples	Per cent of total 100 per cent true to name	Per cent of total 99 per cent true to name	Per cent of total 98 per cent true to name	Per cent of total 97 per cent true to name	Per cent of total 96 per cent true to name	Per cent of total 95 per cent true to name	Per cent of total number under 95 per cent true to name
Celery	48	45·8	2·0	12·0	6·2	4·1	2·0	27·6
Lettuce	110	32·7	.....	.....	.....	.....	.....	67·3
Radish	159	52·2	3·8	8·1	.....	2·5	.....	33·4
Beet	127	22·0	3·9	5·5	1·5	0·8	0·8	65·5
Peas	54	85·1	.....	.....	.....	.....	.....	14·9
Parsnips	23	13·0	.....	.....	.....	.....	.....	87·0
Onions	50	76·0	12·0	8·0	4·0	.....	.....	.....
Carrots	145	35·1	.....	2·0	2·0	1·3	.....	59·6
Beans	93	49·4	.....	.....	.....	.....	.....	50·6
	809							

In addition to the testing of the various varieties of vegetable seeds for trueness to variety there was also a considerable number of new introductions submitted for trial to ascertain if they were eligible for introduction and sale under license, under the regulations of the new seed act. The kind of vegetable and number of samples of each are as follows: asparagus, 1; beans, 4; cauliflower, 1; chard, 1; chicory, 1; collard, 1; corn, 3; lettuce, 3; mustard, 1; muskmelon, 2; pepper, 1; squash, 1; tomato, 2.

A favourable report was made upon the asparagus, beans, cauliflower, chard, chicory, two samples of corn, mustard, muskmelons and one variety of tomatoes.

SWEET CORN BREEDING AND IMPROVEMENT

Since the sweet corn crop has taken such an important place in the field of vegetable gardening it seems very necessary that continuation with breeding and selection be carried on for some time yet. To the present very favourable reports have been received from growers of sweet corn in western Ontario, and specially concerning the Pickaninny. One of the growers reports as follows: "The Pickaninny corn was planted May 20 and the first ears were ready as green corn July 20 and by the 26th of July the first batch of ears, 80 dozen, was taken to the Hamilton market. The people were prejudiced at first, on account of the colour, but came back for more. The ears were well filled, and the yield was quite satisfactory. This was the first corn on the market this year, and a quantity of seed was saved with which to plant one acre the spring of 1925".

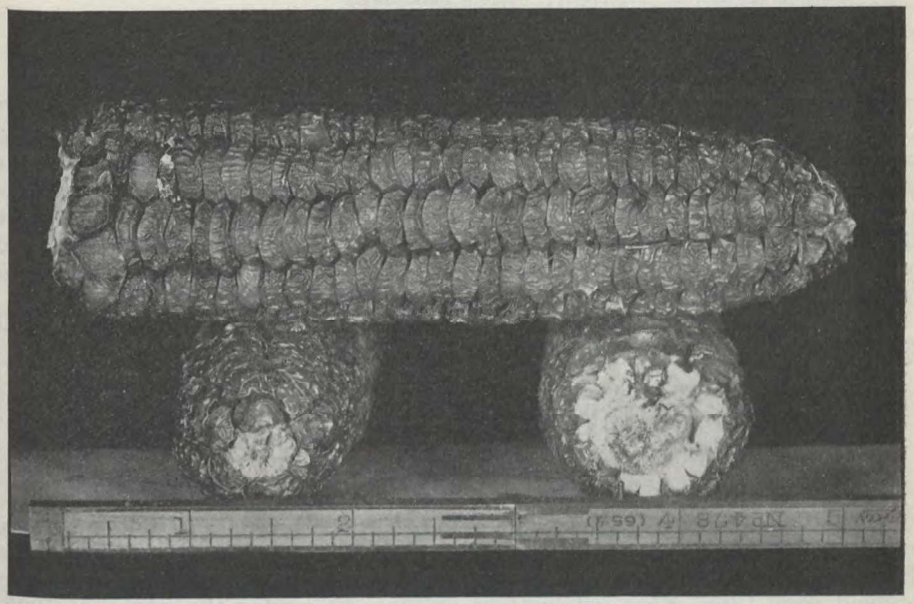
Further proof of the value of this early corn is in the fact that at Fort Vermilion Experimental Sub-station, north of lat. 58 on the Peace river, this variety matured sufficiently to be fit for seed, whereas all other sweet varieties tested did not mature. The only other kinds to mature being the small native flint and Howes Alberta Flint. These latter are poor sorts for table use.

Pickaninny corn has been tested in many countries outside of Canada and found to be of great value. One of the co-operators in testing this corn in France, stated that it was the only sweet corn to fully mature under northern France conditions, and reported the variety as being of great promise to their trade.

In addition to the Pickaninny, there is the Banting, a variety of quite recent origin, which was bred and selected by the Horticultural Division, and being an early maturing yellow sweet corn, gives every promise of becoming very popular in the near future. This new corn is as early as, and has a flavour

which compares very well with Pickaninny. It resembles Golden Bantam in colour and length of ear. The ear has a range of from eight to ten rows. Only seed from the choicest strains was saved for propagation, some of which was also supplied to the branch Farms for trial to ascertain if the variety would be of commercial value in the various regions of Canada.

It is expected that by the close of another season there will be a small surplus of this corn for extension work and possibly for general disposal.



Banting corn, originated in the Horticultural Division at Ottawa. The earliest yellow sweet corn known.

Another cross-bred corn has been segregated which has a great deal of promise, namely Gaspé x Golden Bantam. The object of this cross was to combine the hardiness, earliness, and prolific character of the Gaspé yellow flint corn, which grows and matures successfully under Gaspé conditions every season, with the good quality and size of Golden Bantam. At present, it is rather soon to make any statement regarding the commercial value of this corn, except that a very promising yellow wrinkled early sweet corn, quite dwarf in size, has been obtained.

Other crosses have been made between the various varieties of pop corn and Golden Bantam for the purpose of combining the multiple ear habit of the pop corn with the quality of the Golden Bantam. This work has just been started and should be productive of valuable results.

TOMATO BREEDING

For a considerable time work has been carried on with the crossing of tomatoes for the production of improved early maturing varieties with comparatively good results. In fact the Alacrity, Alacrity x Earlibell and Alacrity x Hipper crosses have proved of outstanding value in the Canadian Northwest. In these varieties though, there is rather much of the Alacrity type and character, which renders these early sorts of less value in the tomato-growing regions of Ontario. To overcome the difficulties experienced in these former sorts, new

combinations have been made that promise yielding kinds nearer the types considered suitable for the tomato regions of Ontario and also valuable for regions in the west. In table 13 is a list of the crosses made in the season of 1923.

Cross	Reciprocal cross
Alacrity x Bonny Best	Bonny Best x Alacrity
" x Chalk Jewel	Chalk Jewelx "
" x John Baer	John Baer x "
" x Livingston Globe	Livingston Globe x Alacrity
" x Greater Baltimore	Greater Baltimore x "
" x Hudson Valley Maid	Hudson Valley Maid x "

During the season of 1924 the first generation of plants was grown out-of-doors in comparison with the other commercial varieties. It was noted that the hybrids showed considerably more vigour than the original varieties. Seed was saved from fruits that were hand-pollinated for further work. To expedite the segregation, another generation of plants was grown in the greenhouse, and from the progeny of this generation some extremely promising material was obtained. Pollination was carried out by means of a watch-glass.

With a limitation of space it was found impossible to grow progeny of all the crosses so the work was confined to the following:—

Q-7063—Alacrity x Bonny Best 1-2
Q-7072—Livingston Globe x Bonny Best 2-3
Q-7073— " x Alacrity 2-3
Q-7078—Chalk Jewel x Livingston Globe 4-5
Q-7079— " x Hudson Valley Maid 5-6
Q-7080— " x Alacrity 2-5

Some very fine segregations were obtained from the Alacrity x Bonny Best, Livingston Globe x Bonny Best, and Livingston Globe x Alacrity. In fact the Alacrity x Bonny Best cross was the first to ripen, but ripe fruit was also obtained from three other segregations in time for sowing the spring of 1925. However, to the present, the cross between Alacrity and Bonny Best seems to give promise of being the earliest of the crosses.

VARIETY TEST OF TOMATOES

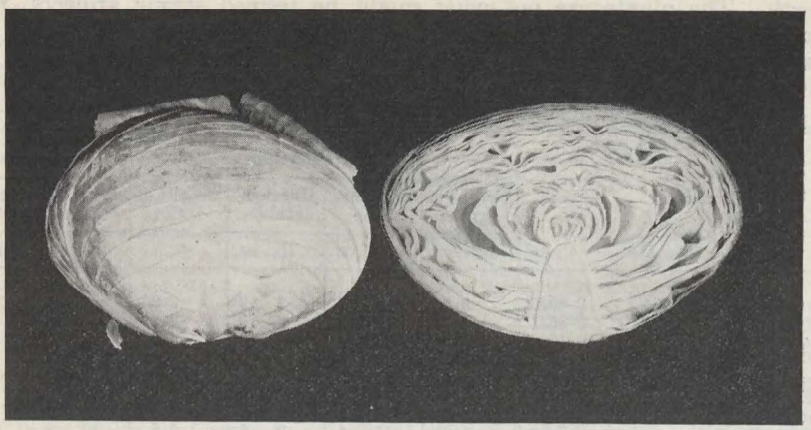
The continuation of the variety test of tomatoes during the past season has yielded some very interesting figures regarding the early ripe fruit producing ability of the various varieties, in comparison with the Alacrity variety and its crosses. The seed for the tomato crop was sown April 16 in the greenhouse and by June 11, when the plants were planted out in the field, all were in bloom and a considerable number had fruit set on the first truss. Ten plants of each variety were trained to one stem on stakes, and the yields were recorded to cover the first two weeks of the tomato season, which dated from August 2, when the first ripe tomatoes were picked the first month, and the balance of the crop for the season. As earliness is a prime factor the results for the early part of the season are given in this report only.

In all, forty-seven varieties with some of their strains were under test, and while a number of varieties and strains from various sources did very well, yet it will be noticed that the Alacrity is high up in the list for early production. It will also be noted that one of the Alacrity x Earlibell crosses yielded the largest return for the first two weeks of the season. This is a cross-bred variety originated by the Horticultural Division, and has been carefully selected for earliness, quality and smoothness. Nevertheless, there is a strong resemblance to the Alacrity parent in the plants in foliage and type

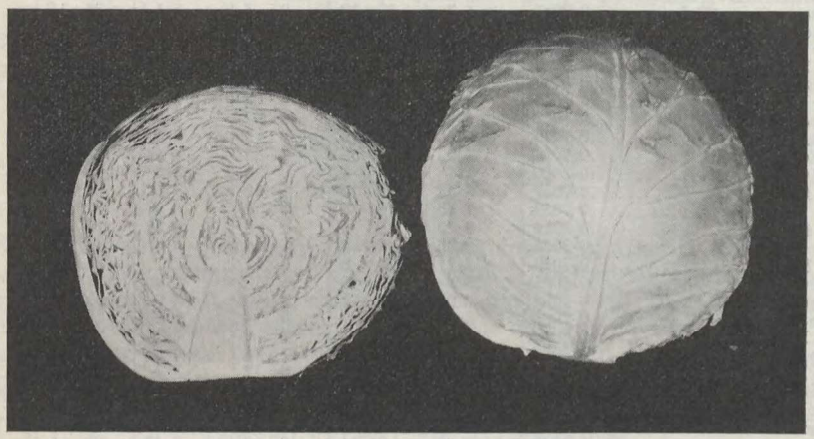
of growth. The plants are not what might be termed strong growers, rather the opposite, which is a character associated with almost all of the early maturing sorts.

TABLE 14.—TOMATOES—VARIETY TEST

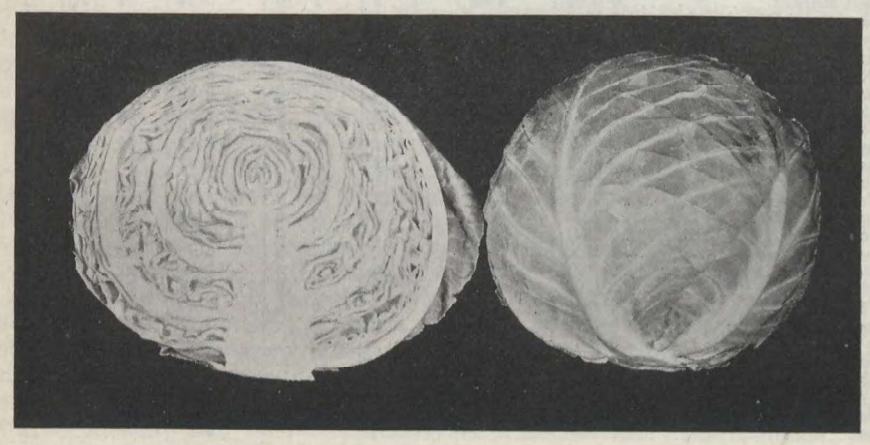
Variety	Average weight of fruits in ounces	First two weeks				Average weight of fruits in ounces	First month			
		Marketable		Unmarketable			Marketable		Unmarketable	
		lb.	oz.	lb.	oz.		lb.	oz.	lb.	oz.
Alacrity x Hipper 5-2.1-7.1.....0-8025.	3·6	16	4	1	13	3·96	33	0	3	4
Alacrity 1-8.1-3.1.....0-8031.	4·04	15	13	4	10	4·7	34	0	6	13
Alacrity 1.....0-17062	4·5	15	10	2	10	4·6	28	5	6	14
Alacrity 10-4.2-2.1.....0-8030.	4·2	15	1	1	12	4·38	30	6	2	7
Alacrity 10-4.2-2.1.....0-8032	4·4	14	9	1	5	5·35	35	1	5	10
Sparks Earliana.....0-7079.	3·4	14	4	0	2	4·87	31	5	0	7
Canadian x bred No. 123.....0-7083.	5·23	13	14	1	0	6·13	35	5	5	9
Earliana Gr. 3.....0-7098.	4·03	13	4	0	8	5·6	33	9	2	0
Canadian x bred No. 823.....0-7084.	5·25	12	14	2	5	7·36	34	13	5	0
Earliana.....0-7081.	5·4	11	13	0	0	7·06	32	9	5	3
Earliana.....0-7096.	3·8	11	7	0	9	5·4	26	5	4	15
Earliana semi ripe 20.5.....0-7085.	4·7	10	10	0	5	5·4	26	15	1	3
John Baer.....0-7094.	5·9	9	15	0	10	9·8	35	10	2	0
Alacrity K.....0-8007.	4·12	9	5	1	13	4·75	27	8	4	9
North Dakota.....0-8013.	3·61	8	14	0	10	4·31	21	4	1	15
Bonny Best.....0-8000.	5·4	7	14	0	0	5·8	35	6	0	0
Amager Market.....0-7044.	2·53	7	13	0	5	3·2	23	7	0	9
Pink No. 1 1.1-3.1B.....0-8019.	5·38	7	12	0	7	4·88	20	12	0	11
Burbank.....0-7076.	5·86	7	10	2	5	6·11	37	14	4	10
Chalk Early Jewel.....0-7093.	6·9	7	6	0	12	4·48	31	12	3	7
Earlibell.....0-8006.	4·1	7	4	0	5	5·63	25	0	3	8
Danish Export.....0-7052.	3·43	6	12	1	3	4·5	24	7	3	2
Hudson Valley Maid.....0-7059.	7·4	6	5	0	0	5·0	37	12	0	3
First of all.....0-8014	9·89	6	5	0	8	5·38	19	8	6	10
Lowden.....0-7056.	0·36	6	4	0	6	5·9	33	5	1	11
Danish Export.....0-7049.	2·7	6	0	0	11	.....	22	15	0	15
Prosperity B.....0-8005.	5·3	5	10	1	13	5·06	19	3	3	5
Matchurm.....0-7082.	6·03	5	9	1	5	5·9	34	13	2	3
Earliana Semi Ripe 21.2.....0-7086.	3·53	5	7	0	4	4·06	27	14	0	8
New 50 Days.....0-8010.	4·85	5	3	2	0	5·16	22	6	3	12
Ignotum.....0-8003.	4·30	5	0	1	14	5·5	25	2	3	0
Milletts Dakota.....0-7095.	5·9	4	13	0	12	5·4	34	12	1	14
Bonny Best.....0-8001.	4·68	4	11	0	0	6·46	33	1	1	2
Crimson Canner.....0-7091.	7·8	4	9	0	13	7·6	33	4	1	5
Red Head.....0-7067.	7·9	4	7	1	6	6·3	44	1	0	0
Lucullus.....0-7043.	2·68	3	14	0	0	2·43	26	5	0	3
Danish Export.....0-7051.	3·46	3	9	1	0	3·3	36	2	0	0
Self Pruning.....0-7057.	5·88	3	8	0	12	3·43	34	6	2	0
Earliest Market.....0-8009.	4·69	3	5	1	10	5·24	24	12	2	4
Earliana Semi Ripe 22.10.....0-7088.	3·4	3	4	0	7	4·1	30	7	0	0
Bartholdy.....0-7045.	4·04	3	4	0	7	0·30	20	14	0	10
Kondine Red.....0-7042.	3·82	2	8	0	0	3·24	24	13	0	2
Brookside Picnic Pink.....0-7055.	3·52	2	2	0	4	3·43	17	4	0	7
Comet.....0-7047.	3·25	1	14	0	0	3·86	29	12	0	4
Gulf State Market.....	3·22	1	13	0	0	5·13	16	7	0	8
San Jose Canner.....0-7092.	5·5	1	10	0	9	7·76	25	5	1	1
Comet.....0-7046.	4·25	1	3	0	0	3·27	15	5	0	15
Glory.....0-8017.	6·0	0	12	0	0	6·82	16	0	3	1
Comet.....0-7048.	2·65	0	11	0	4	3·6	14	14	2	9
Brookside Picnic Scarlet.....0-7053.	3·83	0	11	0	8	5·14	31	7	1	10
British Exhibition.....0-7054.	4·5	0	9	0	6	5·14	27	0	2	5
Nittany.....0-7041.	3·5	0	7	0	0	4·4	22	14	0	11
Improved Pepper.....0-7090.	3·0	0	6	0	0	4·7	23	7	0	6
S.S. Greater Baltimore.....0-8011.	3·0	0	6	0	0	6·72	21	15	0	8
Early Prosperity.....0-8004.	5·25	0	6	0	9	7·8	13	2	5	9
Red Rock.....0-8012.	3·0	0	3	0	0	6·42	17	7	1	11
Liebegs Export.....0-7050.	.....	.....		.....		2·71	20	1	0	2
Rosy Morn.....0-8015.	.....	.....		.....		4·91	17	8	0	0
Albino.....0-7089.	.....	.....		.....		7·96	13	13	16	8
Abraham Lincoln.....0-8016.	.....	.....		.....		13·04	8	3	5	8
New Ponderosa.....0-8008.	.....	.....		.....		7·72	6	12	15	4
No. 400.....0-8018.	.....	.....		.....		8·95	2	0	22	4
Diener.....0-7058.	.....	.....		.....		9·2	.....		11	0



Babyhead cabbage.



Copenhagen Market cabbage.



Golden Acre cabbage.

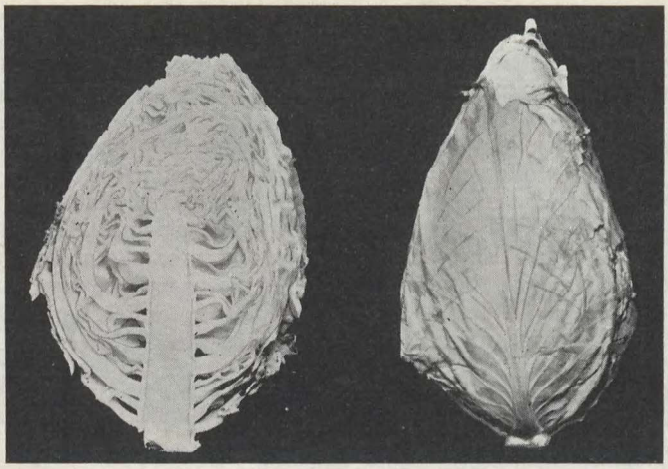
EARLY CABBAGE VARIETIES COMPARED

A comparison of fifteen varieties of early cabbage was conducted during the past season for the purpose of ascertaining if the newer sorts recently introduced could be considered of equal value to the older standard varieties that have been used by the gardeners. Recently there has been quite a number of newly named sorts offered for sale, and the question naturally arises, are these new sorts as good or have they special features which might recommend them over the older good-quality varieties. It is generally agreed that both Copenhagen Market and Early Jersey Wakefield are outstanding for quality and sure crop production, besides being the most satisfactory early market sorts. However, if, as it has been found, there is an earlier variety which compares favourably with these, there is every reason that from a money crop standpoint this new variety should be brought to the attention of the vegetable growers.

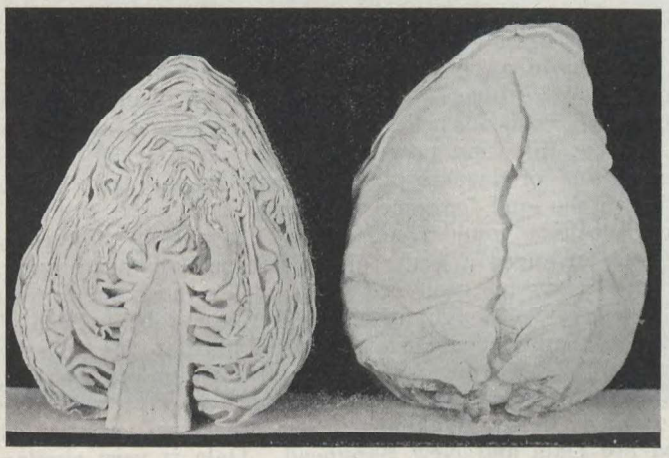
Some of the features which govern the value of a variety for market and especially for the early market are rapidity of maturity, solidity and quality of head, and season of cutting. In the first place the rapidity with which a variety will develop from seed-sowing to cutting is a prime factor. Secondly if the heads are firm and hard they are more readily saleable and stand up better when shipped a long distance, besides possessing much better quality; and thirdly, the season of cutting will influence to a large measure the net returns from a field of cabbage. In many fields it will be noticed that only a small percentage of the heads will be ready for the first and second cuttings. Where conditions of this kind prevail there is bound to be a loss, from later marketing when this product is plentiful, and at the same time preventing the preparation of the land for some other crop.

In table 15 will be found considerable information, concerning this test, with the varieties arranged in order of their respective rating number of days from planting to ready for use, season of cutting, head measurements, shape of head and the average weight of a head. It will be noticed that Golden Acre was earlier than Copenhagen Market and that the season of cutting extended over only eighteen days whereas in all strains of Copenhagen Market the cutting season was considerably over twenty days and this also held in the case of Early Jersey Wakefield. The other two varieties which should be mentioned are Dala and New Babyhead. Dala is very similar to Copenhagen Market but is a much more open head and larger in cross section. It will be noticed that the season of cutting extended over twelve days being almost the shortest season of all varieties but this character is offset by the length of season for the heads to come to marketable size and firmness. New Babyhead has been reported upon with favour in the West but is a rather open head when compared with Copenhagen Market, Early Jersey Wakefield or Golden Acre.

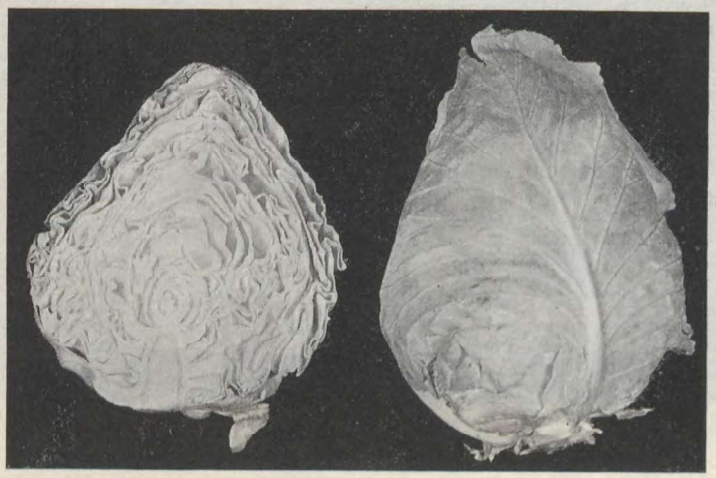
It will be noticed that earliness of maturing is associated with light weight and openness of head.



Etampes Very Early cabbage.



Early Jersey Wakefield cabbage.



Paris Market cabbage.

TABLE 15—EARLY CABBAGE—VARIETIES COMPARED

Variety	Number days planting to ready for use	Number of days from first to last cutting	Rating	Width by height in inches of head	Shape	Average width of heads
1. Golden Acre	85	18	9	7 x 6·5	Round	1·66
2. Copenhagen Market S.	104	22	10	7·25 x 7	"	1·84
3. Express, Extra Early	105	31	5	6·5 x 6	Rounded, varies	1·99
4. Early Paris Market	105	31	3	6 x 8·5	Conically pointed	1·54
5. Copenhagen Market J.	106	22	10	7·25 x 7	Round	2·54
6. Fordhook Forcing	106	22	7	9 x 7·5	Rounded, varies	1·75
7. Early June	107	19	6	8·5 x 9	Round	2·96
8. Copenhagen Market M.	107	26	10	7·25 x 7	"	2·39
9. New Babyhead	107	25	8	8 x 6	Round oval	1·71
10. Early Drumhead	107	25	7	7·5 x 8·25	Rounded slightly	1·60
11. Dala	110	12	8	8 x 8	Round, spherical	2·74
12. Early Jersey Wakefield	110	26	10	6·5 x 7·75	Conically pointed	2·14
13. Etampes Very Early	115	16	2	4·5 x 6	Elongate blunt	2·14
14. Northern Favorite	117	18	8	7·5 x 8·25	Conically pointed	1·71
15. Brandon Market	117	19	8	7 x 9	Rounded and pointed.	1·86
16. Henderson Early Summer.	117	24	5	8 x 6·75	Roundly flattened	2·78
17. x Early Flat Dutch	117	9	7	7 x 9	Round oblate	2·11

POTATOES

A trial is being conducted with potatoes to find if by starting with certified disease-free seed that the variety or strain can be maintained at a high state of productiveness. In the spring of 1923 certified seed of nine varieties was obtained and planted. During that season careful rogueing was carried out. Seed was saved from this crop for planting this season, and from the indication of top vigour and yield per plot it seems possible that the breaking down of the strains of the varieties may be avoided, but as this experiment was tried some years ago, and showed that after the second year the potatoes indicated a decided deterioration as shown by the inferior top development, and poor yield, it is just possible that similar results may be obtained from continued use of this seed. In table 16 it will be noticed that the yield per plot was maintained fairly well throughout the two seasons.

The prevalence of Leaf Roll, Mosaic, and Rhizoctonia in the potato fields of this section of the country is responsible to a very great measure for the small yields in many of the potato fields. Market growers and farmers would do well to observe the warning against the use of seed that is not known to be free from these diseases and a persistent effort made to introduce good seed from the northern potato-growing districts, in all cases insisting upon certified seed being supplied.

TABLE 16—POTATOES—COMPARISON OF CERTIFIED STOCK

Record	Variety	Origin	Calculated yield per acre	Origin	Calculated yield per acre	Average for two years per acre
			bush.		bush.	bush.
0-5046	Irish Cobbler marketable	L.H.N.	338·75	0-5046-74	426·2	382·47
	" unmarketable		53·0		76·7	64·85
0-5064	" marketable	B.L.S.	532·3	0-5064	568·3	550·3
	" unmarketable		88·7		99·5	94·1
0-5047	Early Ohio marketable		346·2	0-5047	362·9	354·55
	" unmarketable		24·2		22·2	23·2
0-5048	" marketable	W.J.H.	268·0	0-5048	477·0	372·5
	" unmarketable		53·9		26·4	40·15
0-5050	Early Puritan marketable	L.C.	603·1	0-5050	623·7	613·4
	" unmarketable		11·1		21·7	16·4
0-5049	Early Rose marketable	P.L.	483·9	0-5049	607·1	545·5
	" unmarketable		46·5		94·4	70·45
0-5051	Early Eureka marketable	J.L.D.	435·5	0-5051	565·2	500·35
	" unmarketable		27·9		38·3	33·1
0-5055	Gold Coin marketable	J. McC.	569·6	0-5055	544·5	557·05
	" unmarketable		14·8		48·2	31·5
0-5056	Dooley marketable	W.N.	333·3	0-5056	519·0	426·15
	" unmarketable		13·0		10·3	11·65
0-5072	Carman No. 3 marketable	F.B.	360·8	0-5072	619·6	490·2
	" unmarketable		4·2		11·8	8·0
0-5053	Carman No. 1 marketable	W.J.E.	446·7	0-5053	606·7	526·7
	" unmarketable		22·3		50·8	36·55

POLE BEANS

For some reason the pole bean crop has not attained the importance that the bush bean crop holds. This seems a pity since this crop can fill an important place in supplying tender green pods after the bush varieties are past their season. Besides this, it may be added that there are at the present time varieties of pole beans that compare in quality very favourably with the best of the bush sorts.

To obtain the most satisfactory results, a moderately rich soil is necessary. The manure can either be applied to the land where the bean hills are to be located, at the rate of a large-sized forkful of well-rotted manure per hill, or a general application may be made to the land as for an ordinary field crop. Pole beans will not thrive on a thin, poor soil.

As this crop requires considerably more time to reach maturity than the bush sorts, the planting should be made when the first planting of bush beans is made for the early market crop. Space the hills 4 by 4 feet apart and plant a stout 8-foot pole in the centre of each hill. These poles should be planted at least one foot in the ground and sloped slightly to facilitate the stalks twining around them.

The quantity of seed required for 100 hills ranges around one pound. In planting, it is advisable to drop five or six beans in a small circle around each pole, and when the beans are well established, to thin them, leaving three plants to develop around each pole.

The varieties which have been found most satisfactory are Golden Cluster Wax and Kentucky Wonder Wax. These two varieties are outstanding for quality and are prolific.

TABLE 17—POLE BEANS—VARIETY TEST

Variety	Date planted	Ripened	Colour pods	Yield gallons per plot. 30 feet	Yield in pounds per plot of ripe seed. 30 feet
06590 Golden Cluster	2 VI	11 X	Wax	9·5	1·31
06594 Golden Cluster	2 VI	11 X	"	9·75	0·36
06595 Golden Cluster	2 VI	11 X	"	9·5	0·86
06597 Kentucky Wonder Wax	2 VI	10 X	"	0·25	5·81
06598 Kentucky Wonder Wax	2 VI	10 X	"	0·50	5·62
06605 Kentucky Wonder Wax	2 VI	10 X	"	1·0	5·81

In table 17 it will be noticed that Golden Cluster was later in ripening than the Kentucky Wonder. For a variety to supply the market with late green beans it seems quite probable that the Golden Cluster would be of great value. It will also be noticed that a small amount of ripened seed was obtained. Of course, earlier planting would have been advantageous if the crop had been required earlier in the autumn.

THE DISTANCE APART TO PLANT BEANS

This experiment was outlined for the purpose of ascertaining the influence that thick and thin sowing of beans would have on the yield. The test has been under way for two seasons and from the yields obtained it clearly shows that two-inch-apart planting gave considerably better yields than where four- and six-inch spacing had been used. In all cases the stand of plants was very uniform. (Table 18.)

TABLE 18—BEANS—DISTANCE APART OF PLANTING

Variety	Origin of seed		Distance apart of planting	Date of planting		Ready for use		Yield in gallon per plot of 30 feet		Average yield	Calculated yield per acre
	1923	1924		1923	1924	1923	1924	1923	1924		
											bush.
Round Pod Kidney Wax	0–1629	0–5358	2 inch.	2 VI	7 VI	26 VII	1 VIII	7·3	11·1	9·2	667·92
" "	0–1629	0–5358	4 "	2 VI	7 VI	26 VII	1 VIII	5·5	7·1	6·3	457·38
" "	0–1629	0–5358	6 "	2 VI	7 VI	26 VII	1 VIII	5·0	5·7	5·4	392·04
Stringless Green Pod	Commercial.	0–5405	2 inch	2 VI	7 VI	26 VII	1 VIII	5·9	7·1	6·5	473·15
" "	"	0–5405	4 "	2 VI	7 VI	26 VII	1 VIII	4·5	6·1	5·3	384·78
" "	"	0–5405	6 "	2 VI	7 VI	26 VII	1 VIII	2·4	6·9	4·7	341·22

PEAS

A COMPARISON OF THE GERMINATION OF COMMERCIAL SEED WITH SEED GROWN AT THE EXPERIMENTAL STATION, INVERMERE, B.C.

The value of well-grown and properly cured seed of garden peas has been impressed upon the growers very frequently, and despite all this we still find that the high standard of germination which is so important to the gardeners is lacking in many of the samples of commercial seed. In the trial grounds this year twenty-nine varieties and strains were planted in replicated plots, four plots of each, and compared with six lots of seed from the Experimental Station at Invermere. Although these varieties from Invermere were not all the same varieties as the commercial seed, yet the results obtained serve as a very satisfactory comparison of seed produced under conditions outside the Ottawa district.

In table 19 will be seen the results of the test.

From the results of this test it seems quite clear that seed of known origin and age is becoming more important every day. This may be cited as a reason for advocating the production of seed in a specialized way or by the vegetable gardeners growing seed of particular strains themselves, and making it possible for such seed to reach the gardeners directly.

LENGTHENING THE SEASON OF GARDEN PEAS

To extend the season of the green pea crop, successional sowing of an early maturing variety has been used with varying results. This experiment has been under way for considerable time and while some prefer this method of extending the season others would much rather rely upon the sowing of four varieties which mature at different dates.

The early maturing variety used in this test of four sowings was Thomas Laxton.

TABLE 20.—PEAS—SAME VARIETY SOWN AT DIFFERENT DATES VERSUS DIFFERENT VARIETIES SOWN THE SAME DATE

Variety	Average No. days sowing to ready for use	Average No. days sowing to ripe	Average yield in gal. green pods 50 ft. of row	Average yield dried seed in lbs.
Thomas Laxton, 1st planting	54·3	86·0	3·3	2·72
" 2nd "	50·3	80·3	2·1	2·94
" 3rd "	46·3	76·3	1·69	2·10
" 4th "	45·0	71·3	1·96	1·89
Thomas Laxton	54·3	86·0	3·3	2·72
Gradus	51·3	95·3	3·45	4·13
Advancer	60·3	95·3	3·35	4·5
Stratagem	69·6	98·0	4·25	3·56

It will be noticed that the yield of the different sowings decreased with the lateness of the season of sowing, and that the number of days from planting to ready for use as green peas and mature seed decreased in a similar manner.

From a comparison of the results obtained, it seems quite evident that the sowing of four varieties at the same time gave much better results.

TABLE 19—PEAS—COMPARISON OF GERMINATION OF COMMERCIAL SEED WITH SEED GROWN AT THE EXPERIMENTAL STATION, INVERMERE, B.C.

Variety	Plot No. 1—23-VI			Plot No. 2—23-VI			Plot No. 3—23-VI			Plot No. 4—23-VI			Yotal yield dry peas		Percent of plants that grew
	No. sown	No. growing	Weight yield dry peas	No. sown	No. growing	Weight yield dry peas	No. sown	No. growing	Weight yield dry peas	No. sown	No. growing	Weight yield dry peas			
			lb. oz.			lb. oz.			lb. oz.			lb. oz.	lb.	oz.	
Richard Seddon	90	5	0 3	90	27	0 11	90	21	0 11	90	24	0 14	2	7	21·38
Laxton Progress	90	0	0 0	90	1	.....	90	2	.....	90	2	.....	.....		1·38
*Champion of England	90	3	(5 peas)	90	24	0 4	90	12	0 6	90	13	0 4	0	14	14·44
First and Best	90	82	0 14	90	81	0 11	90	79	0 13	90	85	1 0	3	6	90·83
Manifold	90	21	0 9	90	17	0 5	90	44	0 11	90	42	0 11	2	4	34·44
Regal	90	35	0 9	90	57	0 7	90	63	0 6	90	48	0 8	1	14	56·38
Laxton Progress	90	36	0 8	90	23	0 1	90	18	0 5	90	38	0 6	1	4	31·94
Melting Sugar	90	23	0 3	90	7	0 ¼	90	5	0 ¼	90	22	0 4	0	7½	15·83
Snowdrop	90	12	0 ½	90	21	0 1	90	13	0 2	90	38	0 5	0	8½	23·33
Heroine	90	18	0 3	90	42	0 8	90	26	0 3	90	42	0 9	1	7	35·5
Alderman	90	18	0 4	90	28	0 7	90	21	0 3	90	56	0 8	1	6	34·16
Admiral Beatty	90	8	0 2	90	14	0 5	90	15	0 6	90	0	.....	0	13	10·27
Senator	90	8	0 3	90	18	0 6	90	13	0 6	90	7	0 2	1	1	12·77
British Lion	90	23	0 4	90	22	0 5½	90	36	0 11	90	35	0 11	1	15½	32·22
Dwarf Telephone	90	11	0 ½	90	28	0 6	90	13	0 5	90	10	0 5	1	½	17·5
Table Dainty	80	36	0 1	80	46	0 4	80	32	0 5	76	27	0 6	1	0	44·62
The V.C	90	0	0 0	90	7	0 ½	90	7	0 2	90	3	0 ½	0	3	4·72
English Wonder	90	5	0 2	90	31	0 7	90	12	0 6	90	21	0 11	1	10	19·16
Lincoln Invermere	90	27	0 7	90	65	0 14	90	36	0 12	90	61	0 14	2	15	52·5
Seedling No. 8 Invermere	90	58	1 2	90	32	0 10	90	66	0 13	90	66	0 15	3	8	61·66
" 6 "	90	85	1 4	90	64	1 2	90	84	1 4	90	82	1 9	5	3	87·5
" 3 "	70	51	0 8	70	57	0 7	70	64	0 11	70	69	0 11	2	5	86·07
" 2 "	90	72	1 1	90	63	0 14	90	90	1 1	90	69	1 4	4	4	81·66
Lincoln	90	81	1 1	90	86	1 4	90	74	1 1	90	88	1 5	4	11	91·38
Seedling No. 1 Invermere	90	62	0 10	90	58	0 10	90	23	0 13	90	68	1 3	3	4	58·61
Prosperity or Gradus	90	36	0 6	90	51	0 10	90	45	0 7	90	42	0 7	1	14	48·33
Little Marvel	90	17	0 1½	90	33	0 7	90	21	0 10	90	25	0 8	1	10½	26·66
Pedigree Ex. Early	90	87	0 9	90	77	0 12	90	75	0 13	90	88	0 10	2	12	90·83
New Everbearing	90	12	0 3	90	8	0 2	90	18	0 12	90	5	0 5	1	6	11·94
Pioneer	90	14	0 2	90	3	.....	90	8	0 1¼	90	7	0 1	0	4½	8·88
Ex. Ey. Tom Thumb	90	56	0 6	90	70	0 11	90	58	0 14	90	56	0 10	2	9	66·66
Alaska	90	85	0 6	90	90	0 13	90	83	0 13½	90	78	0 13	2	13½	93·33
Bromfield Ex. Ey. Six Weeks	90	78	0 10	90	73	0 9	90	66	0 13½	90	55	1 10	3	½	75·5
Etons Favorite	90	42	0 5	90	52	0 9	90	35	0 5	90	24	0 5	1	8	42·5
Hundred Fold	90	47	0 3	90	34	0 5	90	37	0 8	90	33	0 8	1	8	41·94

*From this plot there was not sufficient peas to give weight.

DISTANCE APART OF PLANTING PEAS IN THE ROW

A test with three varieties of garden peas has been under way for two seasons to ascertain what effect the distance apart of the plants in the rows would exert on the crop. The three sorts used were English Wonder (dwarf), Thomas Laxton (intermediate), and Stratagem. The seed of all three varieties was sown on the same day in drills 30 inches apart at the distances apart in the row as indicated in the table to follow.

It is worth while noting the results obtained from the different distances apart in the rows; the yields decrease as the distance apart in the rows increase. This particular feature holds in a more pronounced manner in the case of the dwarf variety than in either of the intermediates. However, there is a slight difference in the yields from the different plots of the other sorts.

The yields were recorded in gallons of green pods, and were harvested in seven pickings.

Another very striking feature of this test which came out was the comparison between the value of home-grown seed and commercial seed. When the experiment was started there was a supply of Ottawa-grown seed of English Wonder, but it was found necessary to rely on commercial seed for the other two varieties. The season of 1923, the germination of the three sorts was as follows: English Wonder ranged from 90 per cent down to 75 per cent; Thomas Laxton, 75 per cent down to 40 per cent; and Stratagem, 20 per cent down to 5 per cent. In 1924 there was sufficient seed of all three varieties grown under our own supervision to plant the plots, with the result that much better yields were obtained that season from Thomas Laxton and Stratagem.

PLANTING INTERVAL FOR PEAS.

Variety	Source of seed 1923	Source of seed 1924	Distance apart of plants in rows in inches	Date of sowing 1923	Date of sowing 1924	Length of plots in feet	Yield in gallons green pods 1923	Yield in gallons green pods 1924
English Wonder...	C.E.F.	C.E.F.	1	May 18	May 20	30	3·13	4·0
" ...	"	"	2	" 18	" 20	30	2·75	3·5
" ...	"	"	3	" 18	" 20	30	2·38	3·0
Thomas Laxton...	Com-	"	1	" 18	" 20	30	2·06	3·75
" ...	mercial	"	2	" 18	" 20	30	1·87	2·25
" ...	"	"	3	" 18	" 20	30	2·25	2·6
Stratagem.....	"	"	1	" 18	" 20	30	0·82	3·0
"	"	"	2	" 18	" 20	30	0·88	2·5
"	"	"	3	" 18	" 20	30	0·32	2·9

ORNAMENTAL GARDENING

BEST CONIFERS HARDY AT OTTAWA

There are, in Canada, many beautiful native species of conifers, and, as is well known, great areas of coniferous forests exist in the Dominion. Many attractive species from other countries have also been found to succeed well, and yet comparatively little planting of evergreens has been done for landscape effects. Perhaps it is because Canadians are so familiar with them in the wild that they do not show more interest in cultivating these beautiful trees.

Austrian Pine, Siberian Arbor-vitae, and White Pine.

Whether one sees the majestic yet graceful outlines of the White Pine, grown as a single specimen on the lawn and clothed with branches to the ground, or massed together in groups and showing their straight, tall trunks, one cannot but be impressed by its great beauty; and this is but one of many attractive-looking species which can be grown successfully and effectively at Ottawa, and where the climate is somewhat similar.

Evergreen conifers are very useful in taking away much of the bleakness in the Canadian winter landscape. The evergreens give a sense of cheer, which would otherwise be lacking; and, as there are good dwarf varieties, these can be planted quite close to the house. There are few of the broad-leafed evergreens, used to take the place of conifers for evergreen effects, on the West Coast of the Dominion, and in some other countries, that are hardy in Eastern Canada. The importance of evergreen conifers for windbreaks cannot be too much emphasized. In the Prairie Provinces, where there are no natural windbreaks, their value for this purpose is, perhaps, most appreciated, but where the winds are high or the cold severe, they afford much appreciated shelter for both man and beast.

Some of the best hedges are made of evergreen conifers. These help to soften the hard lines about a residence which a Canadian winter does so much to emphasize where there are no evergreens.

Many species and varieties of conifers have been tested at the Central Experimental Farm, Ottawa, since the first planting was done some thirty-seven years ago. Of the number tested a large proportion have proved hardy. It is much to be regretted that the graceful Lawson's Cypress, of which there are many attractive varieties, is not hardy in Eastern Canada, nor the Cedar of Lebanon, Deodar cedar, Redwood, Sequoia, and many fine spruces and firs which succeed so well in the coastal climate of British Columbia, but, in the following list of best conifers hardy at Ottawa, will be found many fine ornamental trees.

Abies balsamea (Balsam Fir).—The deep green, glossy foliage of the Balsam fir makes this native tree quite attractive when young, but it should not be planted where it is desired to have an ornamental tree for many years as the experience at Ottawa has been that it is only while the tree is under twenty years of age that it is attractive. After that it becomes more ragged-looking, and eventually becomes so unsightly that it has to be removed. Used as a temporary tree among other trees, it has a useful place.

Abies concolor (White or Silver Fir).—The White fir, though sometimes losing its terminal buds, has done well at Ottawa. It is often mistaken for the Colorado spruce in the distance as the bluest forms are almost or quite as blue as that species. The tree is more pleasing in outline than the Colorado spruce.

Abies lasiocarpa (Alpine Fir).—This tree is more compact than the Balsam fir, and from experience at Ottawa would seem to remain attractive for a longer time. It is native of the Rocky mountains and varies considerably in hardiness. It is important to plant trees which have come from a source where climatic conditions are most like those in Eastern Canada.

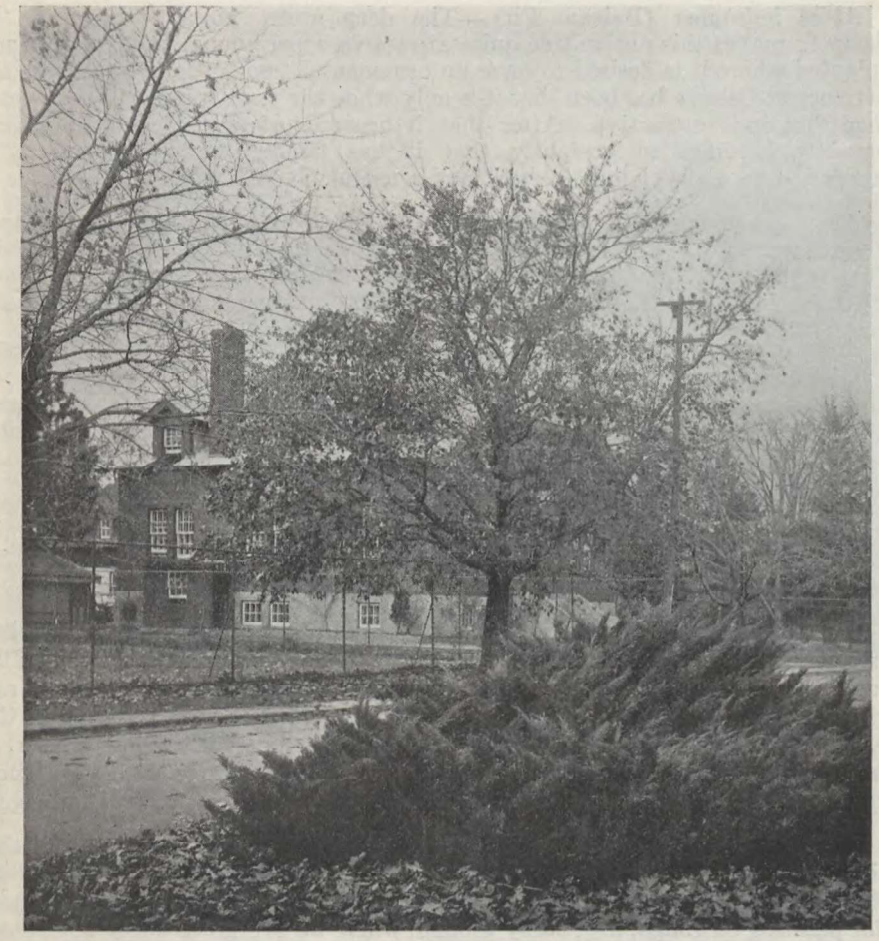
Abies sibirica (Siberian Fir).—Like the Balsam fir, this tree is more attractive when young than later on, but, as it is hardy and more distinct in appearance, it is well worth planting as a temporary tree where one has room for a collection of evergreens.

Gingko biloba (Maiden Hair Tree).—This is not an evergreen conifer, but it is such a striking and attractive tree that it should be much more generally planted than it is. The leaves remind one of the Maiden Hair fern. While not particularly graceful, being of rather upright growth, it is very pleasing to the eye, owing to its remarkable fan-shaped foliage. While a rather slow grower, it is used as an avenue tree in some places in the United States with very good effect, and is quite hardy at Ottawa where trees are now about 35 feet in height.

Juniperus communis (Common Juniper).—There are many varieties of this juniper, but the variety *depressa*, native of Eastern Canada, is the most satisfactory. This, like the Savin, is low-growing, and is useful for covering banks or for planting on rough, dry, stony ground, where an evergreen cover is desired. There is a golden-leaved variety, *aurea*, which makes a rather attractive contrast. If they were hardy at Ottawa, the upright forms of the common juniper, namely, the Irish and Swedish, var. *suecica* and var. *hibernica*, would be desirable as they are very attractive, but the tips of the previous year's growth winter-kill so often and disfigure the plants so much that they are not satisfactory. The Swedish juniper has proved a little hardier than the Irish.

Juniperus rigida (Needle Juniper).—The Needle or Japanese juniper is one of the most graceful species. Though of upright growth, the tips of the branches are pendulous. The foliage is yellowish green and the whole tree very distinct in appearance. Planted in 1896, it is now about twelve feet in height at the Central Experimental Farm.

Juniperus Sabina (Savin).—This is a very useful native juniper. It is a low growing, trailing species, of which there are several varieties, and especially valuable for planting on banks or massing in other situations. The varieties *cupressifolia* and *tamariscifolia* are two of the best, and vary in height from a few inches to three or four feet.

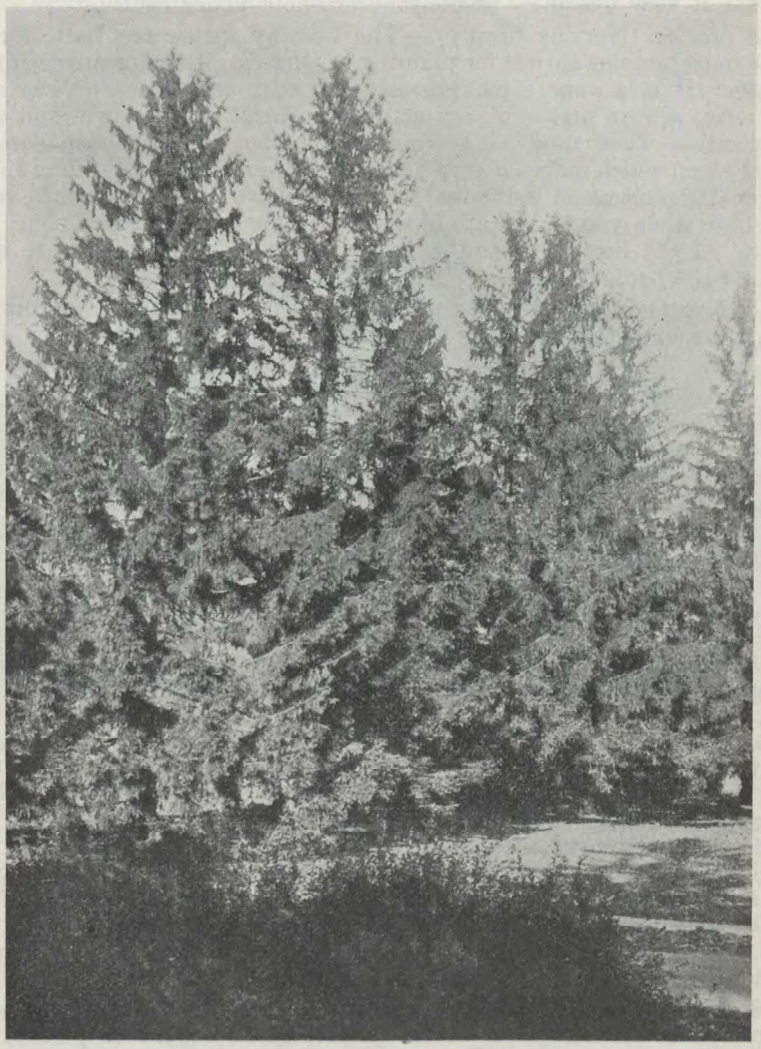


Savin *(Juniperus Sabina)*

Juniperus virginiana (Red Cedar).—This is a native tree, but the foliage of the type is dull in colour, hence is not very satisfactory for ornamental purposes. The variety *elegantissima,* however, has yellow tips to the foliage, which make it quite attractive. It is also of more graceful form than the type. Another good variety is *Schottii,* the leaves of which are brighter green than the species.

Larix dahurica (Dahurian Larch).—The Dahurian larch is very distinct from the three other species noted here, being of a very spreading habit, a great contrast to the European, which is of pyramidal form. It is well worth planting where one has room for a good collection of conifers. It is a rather slow grower.

Larix europœa (European Larch).—This has proved a very satisfactory larch at Ottawa, trees which have been planted thirty-six years being still in good condition. It is a very rapid grower of pyramidal and somewhat pendulous form.



Group of Norway Spruce *(Picea excelsa)*

Larix laricina (American Larch, Tamarack).—While not as ornamental as either the European or Japanese larch, the American larch is well worth planting in a mixed plantation, and because of its great hardiness is especially useful in the coldest districts.

Larix leptolepis (Japanese Larch).—The Japanese larch has done well at Ottawa. It is of more spreading habit than the European and quite distinct.

Picea canadensis (White Spruce).—The White spruce has a very wide adaptability in Canada, and is found wild from the Atlantic coast west to the Rocky mountains. It varies much in the colour of the foliage, some forms being very blue in colour, almost equalling the Colorado spruce, and it is of more pleasing habit than that variety. It is particularly valuable in the Prairie Provinces where the number of species of hardy evergreens is limited. Unfortunately, it is very subject to attacks from the spruce gall louse and budworm, which make it very unsightly unless they are kept under control.

Picea excelsa (Norway Spruce).—The Norway spruce has been, for many years, the most popular spruce for planting in Ontario either for ornament or for windbreaks. It is a very rapid grower, and, with this characteristic and its graceful form, it soon makes a very attractive object on the lawn, and quickly gives protection when used as a windbreak. The variety *pyramidata* is of pyramidal form, which makes a very handsome tree more compact than the type, and is very desirable as an individual tree on the lawn. The pendulous varieties are attractive when young, but are likely to become ragged after a time. Some of the best of the dwarf or semi-dwarf varieties, of which there are quite a number, are *compacta, Remontii, Clanbrasiliana,* and *pygmæa.*

Picea Engelmanni (Engelmann Spruce).—The Engelmann spruce looks somewhat like both the Colorado spruce and the White spruce. It is of more pleasing form than the Colorado spruce, being of distinctly pyramidal shape. Some of the bluer forms compare very favourably with the latter. While young, this tree, like the Colorado spruce, is well clothed with branches to the ground, and continued so at Ottawa for about thirty years, after which the branches died from the ground up even though the trees were in full sunlight.

Picea Omorika (Serbian Spruce).—This spruce is not well known in Canada, but it is one of the most ornamental hardy species, and, where one is planting several kinds, it should not be omitted. It is rather a slow grower, but the contrast in colour between the different sides of the leaves makes it very attractive, one side of the leaf being dark green and glossy and the other side having lines of white.

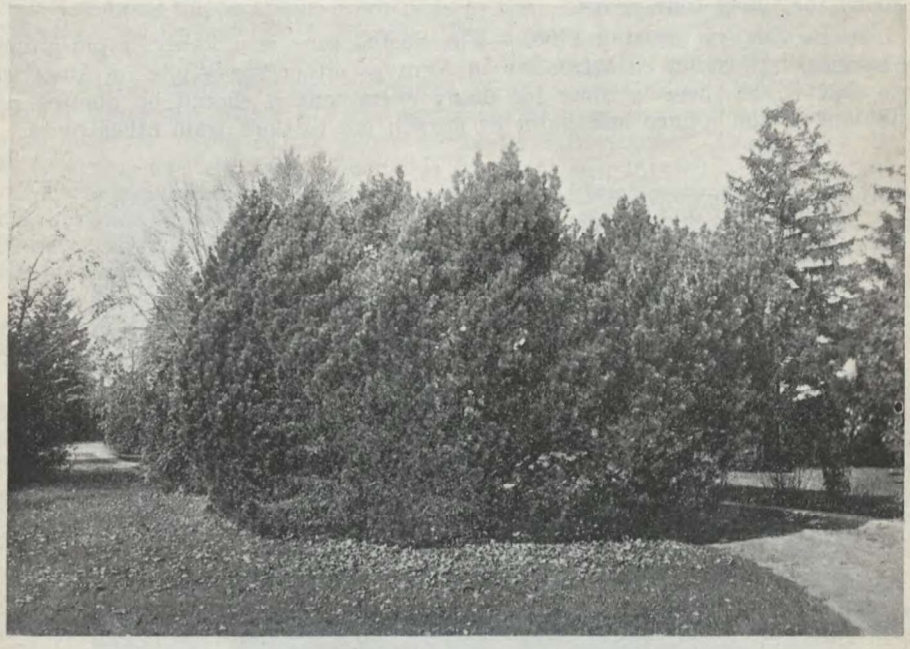
Picea pungens (Colorado Spruce).—It is the blue forms of this spruce which have made it so popular as it is not of very attractive form, being rather stiff, but the steely-blue leaves of the variety *glauca* and the form known as *Kosteriana* are very attractive to most people. At Ottawa this tree looks very well for twenty-five or thirty years after planting, when the foliage of most of the trees begins to die from the ground up, and after a few years they become too unsightly to leave. This should be taken into consideration when planting so that when removed a tree will not make too great a gap. This species does well in the Prairie Provinces. When buying this spruce, one should ask for the blue form as among seedlings there is a large proportion of green ones. The cheapest way to get good blue specimens is to buy small, mixed seedlings and grow them a few years and plant the bluest ones. They grow slowly, however.

Picea Schrenkiana (Schrenk Spruce).—Although the foliage is rather dull in colour, this is an attractive, hardy species, which should be planted where one has a collection of evergreens as it is quite distinct.

Pinus Cembra (Swiss Stone Pine).—Although a slow growing species, this is a very attractive pine. It has foliage much like the White pine, but is an upright grower and very suitable for a situation where an evergreen is desired which will not take up much space. Twenty-five years after planting a specimen at Ottawa it is only 6 feet in width at the base and 19 feet high.

Pinus contorta latifolia (Lodge-pole Pine).—While there are several pines hardy in Eastern Canada which are more ornamental than the Lodge-pole pine, it has proven a satisfactory pine for ornamental purposes in the Prairie Provinces, at least when young, being more attractive than the Jack pine, *Pinus Banksiana.*

Pinus koraiensis (Korean Pine).—This pine has done very well at Ottawa and has proven quite hardy. It is suggestive of the White pine in foliage but darker, and is of more compact habit and a slower grower. A tree planted in 1896 is about twenty-one feet high. It is very attractive in appearance, and should be more extensively planted for ornament.



Mugho Pine *(Pinus montana Mughus)*

Pinus montana Mughus (Mugho Pine).—The Mugho or Dwarf Mountain pine is one of the most useful, hardy species. It is of bushy habit, and is excellent either as an individual specimen or in masses. Trees planted thirty or more years ago are 19 feet high and 28 feet across.

Pinus nigra var. Austriaca (Austrian Pine).—Next to the White pine, the Austrian pine is, perhaps, the most ornamental, hardy pine. It is not so graceful as the White pine nor are the leaves of as attractive a colour, but it makes an excellent single specimen or group on the lawn. It is one of the easiest pines to transplant and does well under very trying, dry conditions or poor soil.

Pinus ponderosa (Western Yellow Pine or Bull Pine).—This is even more attractive than the Austrian pine, especially while it is young. It has glaucous green and somewhat twisted leaves, and are three in a cluster. It has a massive look both when young and later, and it is well worth planting where one has room for several pine trees. It is a native of the dry districts of British Columbia.

Pinus resinosa (Red Pine).—The Red pine is a native species, which somewhat resembles the Austrian pine, but it has not proved as ornamental, after the first few years becoming too open in habit to be very attractive.

Pinus Strobus (White Pine).—One or more pines should be on every home grounds where the area is large enough to have a few trees, and this native species cannot be surpassed by any of the others which are hardy enough to grow in Eastern Canada. It is better known as a timber tree than as one for ornamental purposes, but when it has sufficient space for the side branches to develop well it becomes one of the most graceful evergreens. Its leaves, which are of a lively green, do not become as dull in winter as some others. This tree makes an excellent hedge also at Ottawa, where it has been kept trimmed for thirty-four years.

Pinus sylvestris (Scotch Pine).—The Scotch pine is a hardy, rapid-growing species, but is not so attractive in form as either the White or Austrian pines, but where there is room for many evergreens it should be planted as the colour of the foliage and habit of growth are distinct from other pines.

Douglas Fir *(Pseudotsuga Douglasi)*

Pseudotsuga Douglasi (Douglas Fir).—The Douglas Fir, a native of Western Canada, has done well at Ottawa, and, after thirty-five years continues to be one of the most attractive evergreen trees. It makes a very stately tree, and is more graceful in its habit than most of the spruces and other hardy firs. It is desirable to get the trees from the colder and drier parts of its range. Individual trees vary much in the colour of their leaves, some having a much more bluish tint than others. The Douglas fir has proved very satisfactory as a hedge.

Retinospora pisifera (Sawara Retinospora).—The Retinosporas really belong to the genus *Chamaecyparis* or Cypress, but they are so generally known under the above genus that it is used here. *Retinospora pisifera* is fairly satisfactory at Ottawa, but, from time to time, the tips are browned by winter sometimes to a considerable extent. The variety *plumosa* is very ornamental, but it also is injured more or less, and is often rendered unsightly, and *plumosa aurea*, a very attractive variety where hardy, is also injured at Ottawa. The variety *squarrosa*, which is a fine sort when it is not browned by winter, suffers even more so. None of the above are really satisfactory. The variety *filifera* is, however, entirely satisfactory. It has not been injured at Ottawa in any way and has made a very graceful and beautiful lawn specimen. It has drooping branches and slender threadlike pendulous branchlets. Specimens thirty years or more planted are now about eighteen feet in height. This is one of the best hardy evergreens.

Taxus canadensis (Canada Yew).—The Canada yew is a low-growing hardy species, which may be used with good effect for covering banks in shady places or as an undercover among tall trees.

Taxus cuspidata (Japanese Yew).—The English yew, which is so common in Great Britain, is not hardy in Eastern Canada, but in the Japanese yew there is a splendid substitute, which is perfectly hardy at Ottawa. A specimen planted in 1896 is now 10 feet high and 15 feet broad. It may be used with good effect for massing, or as single specimens; and for hedge purposes the foliage is attractive. The Canadian yew, *Taxus canadensis*, is a low-growing hardy species, which is very useful for undergrowth.

Thuja occidentalis (American Arborvitae).—The American arborvitae is valuable both as an ornamental tree and for hedge purposes. It makes the best evergreen hedge at Ottawa. As it is a very common native tree in Eastern Canada, it is very easy to procure it at little or no cost. While the ordinary form is attractive, some of the cultivated or horticultural varieties are, at least, of more striking habit and give greater variety in the landscape. A large number of these have been tested at Ottawa during the past thirty-seven years, but many have, in some winters, been injured. Some of those which withstand the climatic conditions at Ottawa best are var. *robusta* or *Wareana*, the Siberian arborvitae, which seems to be hardier under cultivation than the typical form, and does better on the prairies than others. It is of compacter habit and has brighter green foliage than the species. The variety *globosa* is also very hardy, and makes an interesting shrub of globose form. This is a rather dwarf form, a specimen being only six feet in height after thirty-five years since planted. The variety *Ellwangeriana* is one of the most distinct hardy forms. It has small foliage, which gives it a soft appearance, and is of semi-dwarf habit, being only about fifteen feet high after over thirty years. The variety *Douglasi pyramidalis* is hardier than the better known pyramidal variety *fastigiata*, though it is not so columnar in form, but has distinct foliage. The pyramidal arborvitae, var. *fastigiata* or *pyramidalis*, makes a very striking object on the lawn or wherever placed. At Ottawa, specimens over thirty feet in height are only six feet across near the ground. A large proportion of the specimens planted

thirty-five years ago have, however, been so disfigured by injury in some winters that they have had to be removed. However, others are still in good condition, and it is, on the whole, very satisfactory. Another variety which has remained in good condition is *Vervaeneana*. This has yellowish foliage but not a distinct enough yellow, but it is more graceful than the species. There are many other attractive forms, which, no doubt, would succeed better in milder parts of Ontario than at Ottawa.

Thuja plicata (Giant Arborvitae).—The Giant arborvitae, which is native west of the Prairies, has been little planted in Eastern Canada. It is a beautiful species, the tree being of more graceful habit than the American arborvitae and the foliage of a brighter green. Success in growing this tree will depend on the source of the stock as, if obtained from the milder parts of Canada or the United States, it is almost sure to winter-kill, or be badly injured, but if the stock comes from Montana or from a somewhat similar climate in Canada, where it is cold and relatively dry, it should do well and make a very attractive lawn specimen, as it has done at Ottawa.

Tsuga canadensis (Canada Hemlock).—This hemlock, native of Eastern Canada, is one of the finest evergreen trees. It is very graceful in habit, and the small foliage is of a pleasing shade of green. Although it eventually makes a large tree, it grows slowly and it is a rather long time before it becomes very conspicuous on a lawn. When grown in the open also it is liable to be injured by winter. It does best when growing in the partial shade of other trees or on banks with a northern or eastern exposure. The variety *gracilis* is a charming tree with smaller foliage and of slower growth than the species. The Canada hemlock makes a very attractive hedge, and may be kept quite small because of its slow growth.

The Iris garden at the Central Experimental Farm, Ottawa, where hundreds of varieties are tested. Lists of recommended varieties are given in this report.

EXPERIMENTS WITH VARIETIES OF IRIS

There is a large collection of Tall Bearded iris at the Central Experimental Farm, in which the best of the older varieties are being compared with the most advertised and best of the newer ones, of which a large number are introduced each year. Careful notes are made of each variety in order to learn if these new sorts are improvements over the old or introduce new colours and colour combinations that are pleasing.

In the annual report of the Dominion Horticulturist for the year ending March 31, 1921, a list was published of what were considered at that time the best sixty tall bearded irises, the best twenty-four, and the best twelve varieties. These were arranged in thirteen colour groups. Since that list was published a large number of the newer varieties have proved themselves superior to the old, and in the following lists will be found a large proportion of the recently introduced sorts. Some of these are still rather expensive, but most of them are now quite reasonable in price, and there are enough of the cheaper ones in the longer lists to enable one to get a good collection without a great expenditure of money.

In the following list of seventy-five best varieties, fourteen colour groups are used, thirteen being the same as in the former list, the fourteenth being an additional one to provide for blended colours of some of the most attractive sorts. The varieties in all the groups, except seven and eight, are arranged in order of merit, but in groups seven and eight there are so many shades of colouring in otherwise equally lovely varieties that it is more a matter of personal taste. In the lists of thirty and fifteen the varieties are arranged alphabetically.

BEST SEVENTY-FIVE TALL BEARDED IRIS TESTED AT OTTAWA. ARRANGED IN FOURTEEN COLOUR GROUPS

1. White predominating on standards and falls.—Florentina, White Knight, Mrs. H. Darwin, Innocenza, Kashmir White, La Neige.
2. White feathered or suffused with bluish-lavender and bluish-purple.—Mrs. G Reuthe. Camelot, Fairy, Ma-Mie, Anna Farr.
3. White, or white and purple standards and purple falls.—Rhein Nixe, Mary Williamson, Victorine.
4. Yellow predominating on standards and falls.—Mrs. Sherwin Wright, Flavescens, Shekinah, Aurea.
5. Pale yellow standards and violet purple falls.—Princess Victoria Louise, Loreley, Darius, Gracchus.
6. Yellow standards and brownish or maroon falls.—Iris King, Marsh Marigold, Knysna, Honourable.
7. Lavender blue and bluish-purple predominating on standards and falls, mainly Pallida varieties.—Lord of June, Morwell, Queen Caterina, Eden Philpotts, Lady Chas. Allom, Ballerine, Albert Victor, Juniata, Dalmatica where it blooms well.
8. Bluish-purple standards and bluish purple or deep purple falls.—Lent A. Williamson, Alcazar, Crusader, Rodney, Amas (Macrantha), Magnifica.
9. Pale purple standards and purple falls.—B. Y. Morrison, Perfection, Walneri, Salvatori.
10. Purple standards and purple or dark purple falls.—Dominion, Souvenir de Madame Gaudichau, Parc de Neuilly, Archeveque, Monsignor, Kharput, Black Prince.
11. Pink, lilac, and rose predominating on standards and falls.—Mlle. Schwartz, Dream, Delight, Mrs. Alan Gray, Queen of May.
12. Reddish purple predominating on standards and falls.—Asia, Sweet Lavender, Mount Penn, Caprice, Lohengrin, Anne Leslie, Opera, Medrano.
13. Dusky or dull coppery standards and rich maroon falls.—Ambassadeur, Deuil de Valery Mayet, Prosper Laugier, Jacquesiana (Jacquiniana), Nibelungen.
14. Buff lilac and fawn blends predominating on standards.—Afterglow, Isoline, Dejazet, Dora Longdon, Sherbet.

There is such a large number of new varieties being introduced each year that it is expected that this list will need frequent revision in order to recommend

the best after they have been tested at Ottawa. Some of the newest which have received great praise elsewhere have not been tested long enough to recommend.

BEST THIRTY VARIETIES OF IRIS TESTED AT OTTAWA

Afterglow, Ambassadeur, Anna Farr, Archeveque, Asia, B. Y. Morrison, Crusader, Dominion, Dream, Florentina, Iris King, Isoline, Juniata, Lent A. Williamson, Lord of June, Mlle. Schwartz, Mrs. G. Reuthe, Mrs. Sherwin Wright, Morwell, Opera, Parc de Neuilly, Princess Victoria Louise, Queen Caterina, Mrs. Alan Gray, Rhein Nixe, Rodney, Shekinah, Souvenir de Madame Gaudichau, Sweet Lavender, White Knight.

There are many varieties very similar to some of the above which might be put in their places, and others of the newer sorts, which, if more thoroughly tested at Ottawa, might have replaced some of those included in the above list. The above list is based on the experience at the Central Experimental Farm, Ottawa. Alcazar, for instance, does not appear on this list. It is very similar to Lent A. Williamson, but the latter has multiplied more rapidly. A good range of colours will be found in this list.

BEST FIFTEEN VARIETIES OF IRIS TESTED AT OTTAWA

Afterglow, Ambassadeur, Asia, B. Y. Morrison, Crusader, Dominion, Dream, Iris King, Lent A. Williamson, Lord of June, Mlle. Schwartz, Mrs. G. Reuthe, Mrs. Sherwin Wright, Souvenir de Madame Gaudichau, White Knight.

One could make many lists of fifteen that would contain varieties quite as good as some of these. It is largely a matter of personal taste in a small list such as this. With more experience with some of the newest sorts, the writer would make some changes in the above list, but this gives a good range of colour of proven satisfactory varieties. To include some of the lavender and bluish-purple varieties one would add Queen Caterina, Morwell, and Juniata.

GARDEN LILIES

Lilies, though not so well known as many flowers, are among the most beautiful, and should be grown in every garden. Many species are easy to grow, hardy and long lived, so they are worth the rather high price which is charged by nurserymen for them.

Perfect drainage is the chief essential and ordinary good garden soil, well dug to a depth of twelve or eighteen inches, is all that is necessary. If the soil is heavy, surround the bulb with sand, and mix some gravel and leaf mould with the soil. Stem-rooting lilies should be planted from ten to twelve inches deep as this prevents the bulb from feeling the changes of temperature and also gives space for the stem-roots to develop. No manure nor artificial fertilizers should be used, as they tend to make the bulbs diseased. The following species have all been grown at the Central Experimental Farm, Ottawa, in recent years.

L. auratum, the golden-rayed lily of Japan, has large white wide open flowers, with a gold band on the centre of each petal, dotted with crimson spots. It is not one of the easiest species to grow, and frequently dies out after a year or two. July and August.

L. canadense, the native Canadian lily with bell-shaped flowers, reflexed at the edges, colour yellow or orange. July.

L. candidum, the well known madonna lily of old country gardens, pure white with golden anthers, needs protection from early spring winds. June and July.

L. concolor, an upright star-shaped vermilion flower. July.

L. croceum, L. umbellatum, L. elegans and *L. davuricum,* are much confused by nurserymen. They are all upright flowering species in shades of orange

and orange-red. The height of the plant and number of flowers vary. *L. croceum* is the old-fashioned orange lily and is very hardy. July.

L. Davidi, has reflexed petals of nearly scarlet colour, dotted with black. The flowers are medium size. This is a very attractive species and is easily grown from seed. July.

L. Grayi, a native American lily, is not of much value as a garden plant.

L. Hansoni, a very handsome turncap of a beautiful shade of yellow. It bleaches in hot sun, so should be grown where the flowers can get some shade. June.

L. Henryi, sometimes called the orange speciosum, has flowers very similar in shape to that well-known species, but the colour is a beautiful shade of orange-yellow, with a green furrow down the centre of each petal. The colour bleaches in hot sun, otherwise it is one of the finest lilies, and is easily raised from seed. August and September.

L. longiflorum, the well-known Easter lily, cannot be considered a very hardy lily, but several plants of the Formosum variety have lived out in the garden at the Central Experimental Farm for two winters.

L. Martagon, the common turncap lily of European countries, does not thrive in the light sandy loam at the Central Farm; probably it needs heavier soil. The variety album is the most beautiful form, though dalmaticum, a deep maroon, appeals to many. Two hybrids of this with *Hansoni, Marhan* and *Dalhansoni* have done well at Ottawa.

L. monadelphum (colchicum) is an early-flowering yellow lily. June.

L. pardalinum, a native of the Western States, is frequently called a bog lily, but it grows well in the sandy soil at the Central Farm. The petals are reflexed, the lower portion orange-red shading paler towards the tips and the whole sprinkled with heavy dark spots. July.

L. philadelphicum, the upright flowering lily of the Prairies and further east, has not been successfully established at the Central Farm.

L. regale is a recent introduction, but is rapidly gaining favour amongst all classes of gardeners. It is a white tubular lily with a golden-yellow throat and pinkish flushes on the outside of the petals. It is hardy and easily raised from seed.

L. Sargentiae was introduced about the same time as *L. regale,* but it is not so easy to grow and probably that is the reason why it is still unknown to many gardeners. It blooms about two weeks later, the flowers are pure white within, and the tube is longer than in regale. It also can easily be distinguished from that species by the bulbils in the axils of the leaves.

L. speciosum, the well-known fall lily grown by florists. The white petals strongly marked and dotted with red are reflexed. The bulbs are hardy but, being so late in blooming, the flowers are frequently spoiled by bad weather. September.

L. superbum is the common Canadian lily of stream sides, but it grows well in the garden. July.

L. tenuifolium, the Siberian coral lily, seems particularly happy in the garden at the Central Farm and seeds freely every year. It has small scarlet turncap flowers. The bulb is not long-lived, so it is well to sow a few seeds every year. June.

L. testaceum.—This lily has never been found in nature, and is supposed to be a hybrid. The petals are reflexed, and the colour is pale apricot with faint dark spots. June.

L. tigrinum, the common tiger-lily of gardens, flourishes everywhere and can very easily be propagated by the bulbils in the axils of the leaves. The double form is also worth growing. July-September.

L. Willmottiae is of recent introduction, and though the flowers resemble those of *L. Davidi*, the habit of the plant is quite distinct. The dark green leaves are thickly clustered on the stem and the lax flower stalks give the plant a drooping appearance. This species is easily raised from seed. July.

GREENHOUSE EXPERIMENTS

FLORISTS' FLOWERS

During the past year a new greenhouse, 108 by 40 feet, was erected for the Horticultural Division, which has made possible the carrying on of more experiments under glass, and new work with plants and flowers used by florists is now in progress. Especial attention is being paid to chrysanthemums, carnations, sweet peas, antirrhinums, cyclamens and ferns. A large collection of the latter was procured in order to determine the relative value of the different species and varieties. The comparison of novelties of florists' flowers with the standard sorts and the breeding of new ones are the chief directions the experimental work is taking.

The following are chrysanthemums of great merit, which have been originated in the Horticultural Division:—

Lady Byng (White Mensa x H. Marie Totty).—Originated in Horticultural Division, Experimental Farm, Ottawa, Ont., 1921. Single pink with white centre; petals somewhat twisted or cactus-like; good stem; season late.

J. R. Booth (Sport of Nag-ir-roc).—Originated in Horticultural Division, Experimental Farm, Ottawa, 1919. An exhibition variety; double; reflexed; lemon-yellow in colour.

J. H. Grisdale (Cross between H. Marie Totty (female) and White Mensa (male).—Originated in Horticultural Division, Experimental Farm, Ottawa, 1921. Bloomed in 1922. Flower single; colour brownish-red with yellow centre.

E. S. Archibald (Sport of Gloriana).—Originated in Horticultural Division, Experimental Farm, Ottawa, autumn of 1922. Flower single; colour brick red.

FORCING HEAD LETTUCE

Head lettuce continues to be imported into Canada during the winter months and sold at prices which make it possible for many people to buy it. The result is that the Canadian growers of loose-leaf lettuce are, in many instances, finding that there is little if any profit in continuing to grow it. As they are unsuccessful in growing head lettuce in winter they are abandoning the growing of this very popular salad plant.

The reason that it has not been possible to grow head lettuce in Canada in the winter is that under winter conditions, where the greenhouses have to be heated and where it is not possible to give sufficient ventilation, the head lettuce usually grown for market, such as the New York, Iceberg, and Big Boston, scald badly and are unfit for sale. The importance of obtaining a head lettuce that would not readily scald was recognized by the Horticultural Division some time ago, and experiments were begun in the winter of 1917-18 to obtain a scald-resistant variety. Twenty-three varieties and strains of head lettuce were tested in previous years, and it had been found that the Early Paris Market was the most resistant to scald, it being little or not at all affected. This variety has-

been grown each winter since with good results so far as obtaining a good scald-free crop was concerned, but, unfortunately, the head of this variety is too small to compare favourably with the New York and Iceberg varieties, which are imported into Canada, and the price obtained for it is too low to make it profitable to grow. Selections have been made from it in the desire to obtain larger heading strains, and it is hoped that crosses between the Early Paris Market and New York and Iceberg will prove successful.

Following are the results from a test of different selections from Early Paris Market made in the winter of 1924-25.

The price obtained for Canadian grown lettuce in that winter was very low, the highest price being 99 cents per dozen and the average only 48 cents per dozen. At these prices there is, of course, little profit in growing lettuce, and in this experiment there is no record of the cost of heating the greenhouse, it not being possible to determine the cost in this case.

OBJECT OF THE EXPERIMENT.—First, to make a commercial experiment with Early Paris Market Lettuce, which had been tested in the Horticultural Greenhouses for some years and had been found to be the most satisfactory variety for growing under glass at Ottawa.

Second, to compare the results from plants grown from seed from plants selected for size and firmness of head in 1923.

An additional object was to again compare other head varieties with Early Paris Market, Iceberg and Big Boston being used.

HOW THE EXPERIMENT WAS CONDUCTED.—The vegetable or west house was used for this experiment, and the plants were planted both in the bed and on the benches.

The average night temperature was 50° F.
The soil was sod and manure.
Date seed sown: October 27, 1924.
Date of transplanting into flats: November 12, 1924.
Date of final planting: January 2, 1925.
Distance apart of plants: 7 by 7 inches.
Date of first harvesting: February 18, 1925.
Date of main harvesting: February 20, 1925.
Date of last harvesting: March 12, 1925.
Total area occupied by plants in bed: 440 square feet.
Total area occupied by plants on benches: 408 square feet.
Plants of each selection planted:

Early Paris Market:

Selection 1	488	plants
" 2	485	"
" 3	398	"
" 4	485	"
" 5	488	"
" 6	398	"
" 7	174	"
1923 seed	87	"
Total	3,003	plants,

plus 165 plants Iceberg and 55 plants Big Boston.

Total number of plants Early Paris Market in house	3,003
" " " Iceberg	165
" " " Big Boston	55
Total number of plants in whole house	3,223

TABLE 21.—HEAD LETTUCE—TOTAL YIELD OF ALL PLANTS

Early Paris Market: (Bed)

—	No. of plants	Date of first harvest	Date of main harvest	Date of last harvest	No. of market-able plants	Weight of market-able plants		No. of unmarket-able plants	Weight of unmarket-able plants		Average Weight of market-able plants
						lb.	oz.		lb.	oz.	oz.
Selection 1...	174	18/2/25	4/3/25	6/3/25	145	31	8	29	3	4	3·47
" 2...	261	18/2/25	25/2/25	6/3/25	240	49	9	21	2	0	3·30
" 3...	174	20/2/25	4/3/25	12/3/25	158	35	11½	16	1	7	3·61
" 4...	261	18/2/25	27/2/25	7/3/25	249	55	3½	12	1	9	3·54
" 5...	174	20/2/25	27/2/25	5/3/25	162	39	11	12	1	6	3·91
" 6...	174	5/3/25	6/3/25	12/3/25	157	35	3½	17	1	9	3·58
" 7...	174	25/2/25	6/3/25	12/3/25	170	37	1	4	..	6	3·48
1923 Seed.....	87	2/3/25	.....	12/3/25	81	17	8½	6	..	11	3·46
Total.....	1,479	.....	.....	.....	1,362	301	8	117	12	4	3·54

Early Paris Market: (East Bench)

—	No. of plants	Date of first harvest	Date of main harvest	Date of last harvest	No. of market-able plants	Weight of market-able plants		No. of unmarket-able plants	Weight of unmarket-able plants		Average Weight of market-able plants
						lb.	oz.		lb.	oz.	oz.
Selection 1...	202	20/2/25	5/3/25	6/3/25	188	38	2	14	2	7½	3·24
" 2...	112	18/2/25	2/3/25	5/3/25	110	24	8½	2	..	11	3·56
" 3...	112	18/2/25	2/3/25	5/3/25	110	22	3½	2	..	4	3·23
" 4...	112	18/2/25	2/3/25	6/3/25	108	23	4	4	..	9	3·44
" 5...	112	2/3/25	.....	6/3/25	109	22	14	3	..	2½	3·35
" 6...	112	2/3/25	.....	6/3/25	112	24	2	.....	.....		3·44
Total.....	762	.....	.....	.....	737	155	2	25	4	2	3·37

Early Paris Market: (West Bench)

Selection 1...	112	18/2/25	20/2/25	7/3/25	100	16	10	12	1	0	2·66
" 2...	112	18/2/25	20/2/25	5/3/25	102	24	5	10	..	13½	3·81
" 3...	112	18/2/25	20/2/25	5/3/25	110	30	6	2	..	3	4·41
" 4...	112	18/2/25	20/2/25	5/3/25	98	21	4	14	1	2½	3·46
" 5...	202	18/2/25	20/2/25	7/3/25	185	36	13	17	2	3½	3·18
" 6...	112	18/2/25	5/3/25	7/3/25	105	21	8	7	1	4	3·27
Total.....	762	.....	.....	.....	700	150	14	62	6	10½	3·46

TABLE 22.—HEAD LETTUCE—TOTAL YIELD OF EACH SELECTION, FROM ALL SITUATIONS

Selection	No. of plants	No. of market-able plants	Weight of market-able plants		No. of unmarket-able plants	Weight of unmarket-able plants		Average weight of market-able plants
			lb.	oz.		lb.	oz.	oz.
1.....	488	433	86	4	55	6	11½	3·18
2.....	485	452	98	6½	33	3	8½	3·48
3.....	398	378	88	5	20	1	14	3·73
4.....	485	455	99	11½	30	3	4½	3·50
5.....	488	456	99	6	32	3	12	3·48
6.....	398	374	80	13½	24	2	13	3·45
7.....	174	170	37	1	4	..	6	3·48
1923 Seed.....	87	81	17	8½	6	..	11	3·46
Total.....	3,003	2,799	607	8	204	23	0½	3·47x

—	No. of plants all selections	No. marketable plants all selections	Average weight of marketable heads all selections
			oz.
Bed	1,479	1,362	3·54
East Bench	762	737	3·37
West Bench	762	700	3·46
Total	3,003	2,799	3·45x

xNOTE.—These two averages would be the same if they had been carried out to further decimal points.

TIME SPENT ON VARIOUS OPERATIONS:		
Preparation of soil	48	hrs.
Seeding	½	"
Transplanting	60	"
Final planting	40	"
Cultivating	8	"
Harvesting	38	"
Watering	13	"
Total	207½	"
RECEIPTS FROM SALE OF LETTUCE:		
2,799 heads at 48 cts. per doz	$	111 96
TIME AND COST OF WORK:		
207½ hrs. at 37 cts. per hr		76 78
Balance	$	35 18

The plants grew and developed well, and the experiment was a good one. A few plants of Iceberg and Big Boston were grown in this house to again compare them with Early Paris Market for scald. There was very little scald on Early Paris Market, but Big Boston was badly scalded and Iceberg considerably. Some selections of Early Paris Market seemed to have larger heads than others when growing. Plants were saved for seed from largest and best heads.

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