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Canada

DOMINION OF CANADA
DEPARTMENT OF AGRICULTURE
DOMINION EXPERIMENTAL FARMS

DIVISION OF HORTICULTURE

REPORT
OF THE DOMINION HORTICULTURIST

W. T. MACOUN, D.Sc.

FOR THE YEAR 1930

Part of rock border, Central Experimental Farm, Ottawa.

Published by authority of the Hon. Robert Weir, Minister of Agriculture,
Ottawa, 1931

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REPORT OF THE DIVISION OF HORTICULTURE

W. T. MACOUN, D.Sc., DOMINION HORTICULTURIST

This is the forty-fourth annual report of the Division of Horticulture, and, as in the past, it has been prepared by members of the staff, those contributing being Mr. M. B. Davis, Chief Assistant; Mr. T. F. Ritchie, Assistant in Vegetable Gardening; Mr. H. Hill, Assistant in Research; Miss Isabella Preston, Specialist in Ornamental Horticulture; and Miss Ethel W. Hamilton, Canning Specialist. The articles contributed by them are indicated throughout the report. The parts of the report where the authorship has not been indicated have been prepared by the Dominion Horticulturist. It has, however, been the co-operation of all members of the staff in the offices, field, and laboratories, which has made possible the assembling of the data for this report.

The Dominion Horticulturist was sent, in 1930, as a delegate to the Ninth International Horticultural Congress, held in London, England, in August, 1930, and read two papers there, one on "National Tastes in Apples," and the other on "A Co-operative Investigation to Determine Factors Affecting the Fruitfulness of Apple Trees, and Especially the Set of Fruit".

He also attended the Imperial Horticultural Conference at London, on August 5-7, and read a paper on "Experiences of Horticultural Research in Canada—Centralized".

He was also at the Fifth International Botanical Congress, which was held at Cambridge, England, August 16-23.

Mr. M. B. Davis, Chief Assistant, was also a delegate to the Horticultural Congress and Imperial Horticultural Conference.

Most of the Experimental Farms and Stations in Canada were also visited by the Dominion Horticulturist.

A bulletin on "Modern Orchard Practices," with a section on Insects Affecting the Apple by the Entomological Branch, and a section on Apple Diseases by the Botanical Division, was published during the year.

There were 12,067 letters received and 11,247 despatched in 1930.

THE SEASON

A brief account of the kind of weather experienced at Ottawa has been given each year for the past thirty-two years in the annual report of the Division of Horticulture. The summer and winter temperatures, time and amount of precipitation, and snow covering in winter all have a bearing on the success or failure of the different horticultural plants.

The month of January, 1930, was moderately cold on the whole, the very cold spells being of short duration. It was below zero twelve times during the month, the lowest temperature being —26° F. on the 26th. The next lowest was —18° F. on the 5th. There were about twenty-four inches of snow on the level at the beginning of the month and but eighteen inches at the end as during the first half of the month there was much mild weather.

Although there was some very cold weather in February, it was but a moderately cold month. The lowest temperature was —30° F. on the 6th, and the next lowest —25° F. on the 17th, and below zero on fourteen days during the month, but the temperature was above freezing on eleven days, the highest being 47° F. on the 19th.

March was a mild month, and, as there were only about six inches of snow on the level on March 1, the fields were practically bare by the end of the

month. The lowest temperature was —1° F. on the 4th, and it was up to freezing or above on twenty-four days during the month.

April was mild also, the lowest temperature being 18° F. on the 23rd, and the highest 72° F. on the 30th. The precipitation was rather low, there being but one and three-quarter inches during the month. It was possible to dig on April 12, which is one day later than the average, which is April 11 for the past thirty-three years.

The month of May was warm on the whole. The highest temperature was 86° F. on the 6th, and the lowest was 30° F. on the 18th, which was the last spring frost recorded and the only day of the month on which there was frost. The temperature rose to 70° F. and above on fourteen days during the month. There was a well distributed precipitation of 2·65 inches.

June was warm also, the highest temperature being 89° F. on the 5th, and it was 80° F. and above on twelve days during the month. It was warm throughout the month, and this, with a precipitation of 4·18, ensured good growth on most plants.

July was not quite as warm a month as June, though it was warm. The highest temperature was 89° F. on the 19th, and on eight days it was 80° F. and above. There was also a good precipitation of 4·44 inches in July.

August was warm, with the highest temperature 86° F. on the 4th, and with 80° F. and above on twelve days. There was a rather low precipitation of 1·15 inches.

September was also warm for September with a maximum temperature of 87° F. on the 2nd. There was a light frost on the 10th, when the thermometer registered 32°, the only time during the month when the temperature was down to freezing. There was a precipitation of 2·42 inches. Owing to the warm weather of September, grapes ripened particularly well this year and late apples matured better than usual.

The weather in October was moderately warm up to the middle of the month, the latter part being cool. The highest temperature was 83° F. on the 12th and the lowest 23° F. on the 22nd and 27th. The first killing frost was on the 4th, when the temperature was 28° F. It was a fine October, the precipitation being only 1·20 inches.

November was mild for that month, there being only thirteen days on which the temperature went below freezing. The highest temperature was 57° F. on the 13th, and the lowest zero on the 29th. The precipitation was light, being 1·99 inches.

Winter may be said to have set in on November 26, 1930, with the ground freezing hard and practically no snow. The average date for winter to set in for the past thirty-three years is also November 26. The soil was unusually dry when it froze up.

December was mild also. There were only four days on which the temperature was below zero. The lowest temperature was —19° F. on the 16th, and the next lowest —12° F. on the 2nd. There were about four inches of snow on the level on December 1, and about ten inches on the level at the end of the month. It thawed on ten days during the month.

POMOLOGY

While the fruits wintered well on the whole, the crop of apples was light in 1930, but the crop the previous year had been very heavy. There was also a light crop of pears and plums, but an average one of bush fruits and strawberries. The dry season shortened the raspberry crop somewhat.

Grapes were good, and the crop ripened particularly well in 1930, owing to the warm autumn.

It is not possible, in this report, to deal with more than a few of the many projects in pomology.

PROMISING CRAB APPLES ORIGINATED AT THE CENTRAL EXPERIMENTAL FARM

There have been published in the annual reports of the Division of Horticulture for the past few years names and descriptions of varieties of apples originated in the division. The report for 1926 contained a list of names given to new apples up to that date. The report for 1927 had a descriptive list of the best varieties of the McIntosh type; that for 1928, a list of the best varieties of the Northern Spy type; that for 1929, a lisit of the best varieties of other types, and following will be found a descriptive list of the best crab apples originated on the Central Experimental Farm, Ottawa. All of these crab apples, except Rondo, are the results of the work of the late Dr. Wm. Saunders in crossing *Pyrus baccata* with certain cultivated varieties of apple. Of these, the Osman and Columbia are from the first generation, Lora from the second generation, and all the others are the result of second crosses; that is, varieties originated from the first cross were recrossed with cultivated varieties of apple. This cross has given varieties larger in size than the first cross, but, while the size is larger, the flesh of most of them is quite crab-like in being hard and breaking. The largest varieties of the first cross were one and one-half inch in diameter and very few of the second generation were any larger, but the largest fruit of the second crosses was two and one-half inches in diameter. These second crosses have given some excellent varieties of crab apples, which may eventually take the place of such varieties as Transcendent and Hyslop. As for the Osman and Columbia, they have been found of outstanding hardiness, and are proving very useful in the Prairie Provinces.

ANGUS (DEAN x ONTARIO).—Size very large for a crab (2 by $2\frac{3}{8}$ inches), below medium to small for an apple; form oblate to roundish, ribbed; cavity narrow, medium depth; stem long, slender; basin open, medium depth, wrinkled; calyx closed or partly open; colour pale yellow washed with dull crimson or pinkish red; predominant colour dull crimson; seeds medium size for an apple, acuminate; dots few, indistinct; skin thin, tender; flesh yellow, crisp, tender, juicy; core medium size, open; flavour subacid, sprightly, little flavour; quality above medium; season October and perhaps later. One of the largest and best of the second crosses. No marked resemblance to Ontario. Flesh, skin and stem crab-like. Seeds apple-like.

COLUMBIA (P. BACCATA x BROAD GREEN).—"Tree a very strong grower and a fair bearer. Fruit, size 1·8 inch across and 1·6 inch deep; nearly conical, distinctly ribbed; calyx protruding and persistent; stem of medium length; colour red with stripes and dots of a deeper shade; flesh yellowish, lightly streaked with red, juicy; subacid, with a pleasant flavour, slightly astringent; quality fair to good; season late September and October." (Hardy Apples for the Canadian Northwest.)

This crab apple has proved to be one of the hardiest and best of the original Saunders' hybrids.

ELKHORN (JEWEL x GIDEON).—Size large for a crab, small as an apple, $1\frac{3}{4}$ by $2\frac{1}{4}$ inches; form oblate to roundish; cavity open, medium depth; stem long, slender; basin open, wrinkled; calyx closed, persistent; colour yellow well washed with crimson; predominant colour crimson; seeds small for an apple, acute; dots obscure; skin thin, tender; flesh yellowish, crisp, breaking, juicy; core above medium; flavour acid, pleasant; quality above medium; season late September to December. This should make a good late crab apple for any part of Canada. No resemblance to Gideon. All marked characters are crab-like. No astringency. Handsome.

GRETNA (PIONEER x NORTHERN SPY).—Size very large for a crab, 2 by $2\frac{1}{4}$ inches, small for an apple; form oblate; cavity deep, open; stem medium to long, stout to moderately stout; basin open, medium depth, wrinkled; calyx open or closed; colour yellow washed and splashed with crimson; predominant colour crimson; seeds below medium for an apple, large for a crab, acute; dots few, white, distinct; skin moderately thick, tender; flesh yellowish, crisp, breaking, juicy; core medium; flavour briskly subacid, pleasant, sprightly; quality good; season November to January. Resembles Northern Spy considerably in colour, flesh and flavour. Promising. Not crab-like except in being small.

LORA (PROGRESS SEEDLING).—Size large for a crab, $1\frac{3}{4}$ by 2 to $2\frac{1}{4}$ inches; form roundish to oblate, conic; cavity narrow, shallow to moderately deep; stem long, slender; basin shallow, open, slightly wrinkled; calyx closed or partly open, persistent; colour pale yellow splashed and washed with orange red approaching crimson; predominant colour dull orange red; seeds small for an apple, large for a crab; dots numerous, yellow, distinct; bloom thin, pinkish; skin thin, tender; flesh yellowish with traces of red, crisp, breaking, juicy; core medium; flavour subacid, slightly astringent; quality above medium; season mid to late September. Quite crab-like.

MCPRINCE (PRINCE x MCINTOSH).—Size very large for a crab, 2 by 2 inches, small for an apple; form roundish, conical, slightly ribbed; cavity deep to medium depth, medium width, sometimes lipped; stem usually medium length and moderately stout, sometimes long and slender; basin deep, open, wrinkled; calyx closed or partly open; colour pale greenish yellow washed with deep crimson; predominant colour deep crimson; seeds medium size for an apple, acute; dots obscure; bloom thin, bluish; skin thin, tender; flesh yellowish stained with red, crisp, tender, juicy; core medium; flavour briskly subacid, pleasant but not high, sprightly, no astringency; quality good; season October probably to December. No marked resemblance to McIntosh except in colour of skin, which is very similar. Less crab-like than many, particularly in flesh, but really quite crab-like. Very handsome. A livelier colour than Hyslop.

MARTIN (PIONEER x ONTARIO).—Size below medium, $2\frac{1}{4}$ by $2\frac{3}{8}$ inches; form roundish; cavity narrow, medium depth, russeted; stem medium length to long, slender; basin medium depth and width to shallow, almost smooth; calyx open; colour pale yellow washed with pinkish red; predominant colour pinkish red; seeds medium for an apple, acuminate; dots obscure; skin moderately thick, tender; flesh yellowish, crisp, tender, juicy; core medium size, open; flavour subacid, pleasant; quality good; season October to mid-December. This apple has no astringency and is a good dessert fruit. It is too small for commercial purposes where the larger apples succeed. Resembles Ontario in flesh.

OSMAN (P. BACCATA x OSIMOE).—"Tree a fair grower and a good bearer. Fruit above medium size, a little smaller than Transcendent; colour pale yellow, well washed with crimson; flesh tender, breaking; flavour acid but pleasant, only slightly astringent; season latter half of August." (Hardy Apples for the Canadian Northwest).

The Osman is a very hardy crab apple, and is proving very useful for the coldest parts of Canada. It appears to be the hardiest of the Saunders' hybrids.

PIOTOSH (PIONEER x MCINTOSH).—Size above medium for a crab, $1\frac{3}{4}$ by $1\frac{7}{8}$ inches; form roundish; cavity medium depth and width; stem long, moderately stout; basin open, medium depth, wrinkled; calyx closed, persistent; colour yellow well washed with bright crimson; predominant colour bright crimson; seeds below medium for apple, large for a crab, acute; dots obscure; bloom pinkish; skin thin, tender; flesh yellow tinged with red near skin, crisp, breaking, juicy; core medium; flavour subacid, pleasant, no astringency; quality good for

a crab; season late September to late October. A handsome crab apple somewhat resembling Transcendent, but more highly coloured. No marked resemblance to McIntosh except in colour of skin. Larger and better than Transcendent.

PRINTOSH (PRINCE x McINTOSH).—Size large for a crab, $1\frac{7}{8}$ by 2 inches, small for an apple; form roundish to oblate; cavity narrow, medium depth; stem medium length to long, moderately stout to slender; basin open, shallow, nearly smooth but calyx tube is open and deep; calyx dehiscent; colour pale yellow washed with pinkish red; predominant colour pinkish red; seeds below medium, acute; dots moderately numerous, pale yellow, indistinct; skin moderately thick, moderately tender; flesh white with traces of red, crisp, breaking, juicy; core medium, water cored slightly; flavour subacid, pleasant; quality good; season September and October. No marked resemblance to McIntosh except in having a good flavour.

REDMAN (PRINCE x McINTOSH).—Size very large for a crab, 2 by $2\frac{1}{4}$ inches, below medium for an apple; form oblate to roundish; cavity medium depth and width, russeted, sometimes lipped; stem long, stout; basin open, shallow to medium, wrinkled; calyx closed; colour yellow well washed with dark crimson; predominant colour dark crimson; seeds above medium size even for an apple, acute; dots few, yellow, distinct; bloom bluish, moderate; core medium; season evidently September. A handsome apple. May be useful on the Prairies. Colour of skin suggestive of deeply coloured McIntosh.

RONDO (SALOME SEEDLING).—Size small, about size of Martha Crab, $1\frac{3}{4}$ by $2\frac{1}{8}$ inches; form oblate to roundish, regular; cavity narrow, medium depth; stem very long, slender; basin open, shallow, slightly wrinkled; calyx closed; colour yellow practically all covered with bright attractive crimson; predominant colour bright attractive crimson; seeds medium size, acute; dots few, yellow, distinct; bloom bluish; skin moderately thick, tender; flesh deep yellow, firm, crisp, breaking; core medium size, open; flavour briskly subacid, little flavour, slightly astringent; quality medium to above; season December to late February. A winter crab apple of very handsome appearance. Crab characteristics in stem, skin, flesh and flavour. No resemblance to Salome. Should be excellent for Christmas decoration.

ROSILDA (PRINCE x McINTOSH).—$2\frac{1}{8}$ by $2\frac{1}{4}$ inches, below medium as an apple but very large for a crab; form roundish; cavity shallow, russeted, open; stem moderately long, 1 inch, moderately stout; basin open, medium depth, wrinkled; calyx partly open or open; colour pale yellow well washed with bright crimson; predominant colour bright crimson; seeds below medium for apple, acute; dots moderately numerous, white, indistinct; bloom thin, pinkish; skin thin to moderately thick, tender; flesh yellowish tinged with red, firm, crisp, breaking, juicy; core above medium, open; flavour briskly subacid, pleasant; quality good; season early September. Handsome. Resembling McIntosh somewhat in colour though brighter. Promising as a large crab apple. Perfumed.

RUTH (PYRUS PRUNIFOLIA x PEWAUKEE).—Size small for an apple, $1\frac{5}{8}$ by $1\frac{3}{4}$ inches to $1\frac{7}{8}$ by $1\frac{7}{8}$ inches, but as large as Martha crab apple; form roundish to roundish conical; cavity medium width to open, medium depth, russeted; stem long, slender; basin deep, medium width, wrinkled; calyx open, persistent; colour yellow well covered with deep crimson; predominant colour deep crimson; seeds medium for crab, acute; dots moderately numerous, white, distinct; skin thin, tender; flesh yellow stained with red, tender, juicy; core above medium; flavour subacid, pleasant, no astringency; quality good; season October to November. A handsome cross-bred apple of good appearance and quality. May be useful as a commercial variety on account of lateness and size.

TOSHPRINCE (PRINCE x McINTOSH).—Size above medium for a crab, $1\frac{3}{4}$ by $2\frac{1}{8}$ inches; form roundish, ribbed; cavity medium depth and width; stem long, stout, but thin; basin open, shallow to medium, wrinkled; calyx closed, persistent; colour yellow well washed with crimson; predominant colour crimson; seeds medium size for apple, acute; dots obscure; skin thin, tender; flesh yellowish, tender, breaking, juicy; core large; flavour mildly subacid, pleasant; quality good; season probably September. Quite crab-like. Resembles McIntosh in colour. May be useful. Attractive in appearance.

TRAIL (NORTHERN QUEEN x RIDEAU).—Size large for a crab, $1\frac{1}{2}$ by $1\frac{7}{8}$ inches, a little larger than Martha; form oblate, almost roundish; cavity medium depth and width; stem very long, slender; basin open, deep, nearly smooth; calyx closed; colour pale yellow splashed and washed and striped with orange red and crimson; predominant colour orange red; seeds below medium for an apple, large for a crab, acute; dots few, indistinct; bloom slight, pinkish; skin thin, tender; flesh yellowish, firm, crisp, breaking, juicy; core medium; flavour subacid, sprightly, very pleasant; quality good to very good; season late August and September. Crab-like in all prominent characteristics, namely, in stem, skin and flesh, but is not astringent. Should make an excellent commercial crab, though not quite attractive enough, and is also a pleasant dessert apple.

WAPELLA (DEAN x ONTARIO).—Size below medium for an apple but very large for a crab apple, $2\frac{1}{4}$ by $2\frac{1}{4}$ inches; form oblong, conical, ribbed; cavity medium depth and width to deep, russeted at base; stem long, slender to moderately stout; basin deep, open, wrinkled; calyx closed or partly open; colour pale yellow washed with crimson; predominant colour usually crimson, sometimes pale yellow; seeds medium size, apple-like, acuminate; dots very few, indistinct or obscure; skin moderately thick, tender; flesh yellowish, sometimes tinged with red, firm, crisp, breaking, juicy; core medium; flavour briskly subacid, sprightly, pleasant; quality above medium to good; season late October to March. Resembles Ontario somewhat in flesh and in flavour. One of the largest of the second crosses.

DESCRIPTIONS OF VARIETIES OF APPLES ORIGINATED IN THE HORTICULTURAL DIVISION PUBLISHED FOR THE FIRST TIME

A few more of the new varieties of apples originated in the Division of Horticulture were named during the past year, and descriptions of these are now given.

FORMAC (McINTOSH x FOREST).—Size medium to below medium; form roundish, conic; cavity medium depth and width to narrow, shallow, russeted; stem short to medium stout; basin open, shallow to medium, wrinkled; calyx open; colour greenish yellow well washed with deep attractive crimson; predominant colour deep attractive crimson; seeds medium to above medium, acute; dots moderately numerous, small, yellow, distinct; skin thick, moderately tough; flesh yellowish, firm, crisp, tender, moderately juicy; core small to medium; flavour subacid, pleasant; quality good; season November to March or later. No marked resemblance to McIntosh except slightly in flavour. Resembles Forest somewhat in colour of skin. Sometimes not quite large enough. A nice dessert apple.

FORIN (McINTOSH x FOREST).—Size medium to below medium; form roundish conic to conical, ribbed; cavity open, shallow to medium; stem medium length, stout; basin narrow, shallow to medium, wrinkled; calyx closed; colour pale greenish yellow well washed with crimson, has a line of yellow usually; predominant colour crimson; seeds medium size, acute; dots moderately numerous, yellow, distinct; skin moderately thick, moderately tough; flesh dull white, tender, juicy to moderately juicy; core medium size to above, open;

flavour subacid, pleasant, high; quality good to very good; season November to February. No marked resemblance to Forest but resembles McIntosh much in colour of skin, flesh, and flavour, and has a perfume like McIntosh. Attractive in appearance. A nice dessert apple.

SPITONE (NORTHERN SPY SEEDLING).—Size medium; form roundish, ribbed; cavity deep, open; stem medium length, stout; basin deep, medium width to open, wrinkled; calyx partly open; colour greenish yellow washed and splashed with deep crimson; predominant colour deep crimson; seeds medium size, acute; dots moderately numerous, white, distinct; bloom thin, bluish pink; skin moderately thick, tender; flesh white and yellow, crisp, juicy; core medium size, open; flavour subacid, pleasant, spicy; quality good; season December probably to February or later. Resembles Northern Spy somewhat in colour of skin, in flesh, and a little in flavour.

*THE CLOSELY PLANTED WEALTHY ORCHARD

In our 1927 report we gave a review of the results from the closely planted Wealthy orchard which has been growing at this Station since 1896. From the time the orchard came into bearing, viz., 1899, until the year 1928, this orchard has shown a yearly net profit per acre of very substantial proportions and, as pointed out in the 1927 report, has produced average yearly yields per acre in five-year periods ranging from 99 to 175 barrels. On account of age and the loss in removal of trees, the orchard is now on the decline and for the ten years ending 1927 had dropped to an average yield of about 150 barrels per acre. In 1928 the yield was only 23 barrels per acre, rising to 174 in 1929 and dropping to 25 barrels in 1930.

For the first time since reporting on the yields of this orchard there was a net loss in 1928 of $36.12 per acre, followed by a net profit of $495.47 in 1929 and a loss of $41.65 in 1930. The number of trees is now reduced to 58, as compared to the original number of 139. The trees were planted 10 by 10 feet apart.

It might be well to point out again, at this point, the outstanding achievement of this orchard, especially in view of the fact that much interest has been centered around the advantages of using dwarf stocks to induce early bearing. By close planting, as was practised here, we have been able to induce early bearing through competition and attained at a very early age, viz., six years after planting, a yield of 300 barrels per acre. It is doubtful if the use of dwarf stock could do much better, if as good. This yield of 300 barrels per acre is, for this country at least, an exceptionally good yield per acre for an orchard in full bearing. The fact that such a yield was obtained six years after planting and that satisfactory acre yields have been maintained for thirty-three years offers food for much consideration by those who contemplate aiming at early production on a profitable basis.

DETAILED RETURNS FROM WEALTHY ORCHARD IN 1930

Expenses	
Mowing, 6 hours at 34 cents	$ 2 04
Spraying, 4 times	4 80
Material for spraying	12 20
Picking, 20 hours at 34 cents	6 80
Packing, 11 hours at 34 cents	3 74
Fertilizer and applying	10 00
Rent of land	3 96
71 baskets at 7 cents	4 97
Total	$ 48 51
Receipts	
71 baskets at 50 cents	35 50
Net loss	$ 13 01

N.B.—No charge for pruning this year, as orchard was not pruned in 1930.

* Prepared by M. B. Davis.

RETURNS FROM CLOSELY PLANTED WEALTHY ORCHARD SINCE DATE OF PLANTING

Net profit per acre 1896-1920	$ 3,522 06
" 1921	411 10
" 1922	131 28
" 1923	475 30
" 1924	102 78
" 1925	377 83
" 1926	7 53
" 1927	464 96
Net loss per acre 1928	36 12
Net profit per acre 1929	475 47
Net loss per acre 1930	41 65
Average yearly net profit per acre	168 34

THE CULTIVATION OF THE BLUEBERRY

In previous reports we have made mention of the fact that a certain amount of work was being undertaken to improve the wild blueberry and to test out the possibilities of growing blueberries under cultivation in Canada. The difficulty in extending the cultivation of blueberries has been the apparent lack of large areas possessing the correct soil conditions. Even land on which they grow wild in abundance, when brought under cultivation, fails to provide a very happy home for them. This may be accounted for by the fact that on this unbroken or new land there is an accumulation of vegetative matter to the depth of a few inches. This top layer is generally of an acid nature and appears to provide the blueberry with the conditions it demands. On ploughing, this acid layer of humus material is turned under and the land rendered less suitable for blueberry growing. Soils of a peaty nature, where the peat is in an acid condition, should prove suitable for cultivation. Areas now being used in North America for the successful cultivation of blueberries, such as the area at Whitesbog, are of a peaty nature to a considerable depth, with which is mixed a proportion of white sand. These soils run about 3 to 3·8 pH value as determined by a potentiometer, but we have succeeded in growing perfectly normal bushes at a pH value of 4·4, as will be described later.

Aside from this question of acidity, two other factors appear to influence the production of blueberries, namely, constant moisture conditions and soil temperature. The peat layer provides a more constant moisture supply than is found in ordinary soil and also provides a lower soil temperature, particularly during the heat of summer.

In an effort to grow blueberries at the Central Experimental Farm, on ordinary garden land of a heavy sandy loam nature, these points were taken into consideration. The soil used has a pH value as high as 7·6, being somewhat on the alkaline side. The area was planted to seedlings of the low bush blueberry and divided into plots to receive different fertilizers, combinations as follows:—

	Rate per 100 square feet
I—Aluminum sulphate	0·97 pounds
Sulphate of ammonia	0·69 "
Muriate of potash	0·21 "
Acid phosphate	0·97 "
II—Sulphate of ammonia	0·69 "
Muriate of potash	0·21 "
Acid phosphate	0·97 "
III—Nitrate of soda	0·97 "
Muriate of potash	0·21 "
Acid phosphate	0·97 "
Aluminum sulphate	0·97 "
IV—Aluminum sulphate only	1·94 "
V—Aluminum sulphate	1·85 "
Sulphate of ammonia	1·16 "

	Rate per 100 square feet
VI—Nitrate of soda only	1·0 pounds
VII—Sulphate of ammonia only	0·75 "
VIII—Nitrate of soda	1·0 "
Muriate of potash	0·25 "
Aluminum sulphate	1·0 "
Acid phosphate	1·0 "
IX—No fertilizer.	
X—Aluminum sulphate	1·0 "
Mulched with peat	
XI—Mulched only with straw.	
XII—Mulched with straw.	
Aluminum sulphate	1·0 "
XIII—Mulched with straw.	
Aluminum sulphate	1·0 "
Nitrate of soda	1·0 "
Muriate of potash	0·25 "
Acid phosphate	1·0 "
XIV—Mulched with straw.	
Nitrate of soda	0·97 "
XV —Mulched with straw.	
Sulphate of ammonia	0·83 "
XVI—Mulched with peat.	
Aluminum sulphate	0·97 "
XVII—Aluminum sulphate	1·09 "
Nitrate of soda	1·09 "
Muriate of potash	0·16 "
Acid phosphate	1·09 "

These treatments were given to single plots only, consequently, there being no replications, the determinations of small differences is not possible. Attention, therefore, will be confined to outstanding differences, concerning which there can be little doubt.

In the first place the plots receiving the peat mulch were by far the outstanding plots of the series. (See figs. 1 and 2.) They made easily twice the growth of any other plots. It has already been stated that the pH value of the soil was 7·6. The pH value of plot X was reduced to 5·5 and XVI to 5·7 by the treatment of peat and aluminum sulphate.

The next best plot, as judged by vegetative vigour, was plot XVII, followed by V, IV and I in the order named. These plots all received aluminum sulphate. The pH value of the soil was only very slightly shifted by the aluminum sulphate, namely, from 7·6 to 6·1 in the case of plot XVII and 7·1 in the case of the others. There would appear to be some relation between the pH value of the soil and the response of the plants.

In no other instances did the fertilizers appear to have any effect upon growth.

From the results to date it can be safely inferred that:—

(1) Soil acidity is one limiting factor in the growth of blueberries.

(2) Ordinary garden soils can be made to grow satisfactory blueberry plants by a mulch of peat mull having a pH value of 4.

(3) To the peat mull an annual dressing of aluminum sulphate, at the rate of one pound per hundred square feet, will further improve the growth of the plants.

(4) While aluminum sulphate added to the soil, without any peat mull, lowered the pH value temporarily it was not sufficient to promote what might be considered as first class growth.

(5) The peat mull, in addition to increasing acidity, also provides cooler and moister conditions for the roots.

31487—2½

FIG. 1.—Blueberry bushes of the low bush type grown under a mulch of peat mull.

FIG. 2.—The low bush blueberry grown on ordinary garden soil. The larger bushes to the left are under peat mull mulch. (See Fig. 1.)

PROPAGATION OF BLUEBERRIES FROM CUTTINGS

Considerable difficulty has been experienced here with the propagation of blueberries by layering and by cutting and, while the method referred to below is by no means cheap, it has at least made possible the propagation of bushes which, when layered, refused to propagate. After having tried taking cuttings at intervals from November 1 to April 1 we have found the middle of March to be, on the whole, the most satisfastory time to remove the cuttings from the bush. Wood of the previous season is, of course, taken. This is cut into lengths of about 6 inches as soon as taken, planted in boxes of peat mull and placed in a cellar or cold room at approximately 40° F. The boxes used for planting have a wire screen about 2 inches from the bottom so that good drainage and aeration of the lower portion of the box is thus ensured. The boxes of cuttings are left in the cold cellar for two weeks, then removed to a greenhouse, with night temperatures running about 50-55°. Handled in this way the average take has been about 80 and 85 per cent of good healthy plants. Omitting the two weeks in cold store, results in a take of about 5-10 per cent and taking the cuttings from the bush much earlier than March 15 results in lower takes proportional to the difference in time of taking. Cuttings handled in this manner are taken to cold frames during late June and transplanted to nursery positions in the fall or early spring.

*APPLE POLLINATION WORK IN QUEBEC IN 1930

WEATHER DURING BLOOMING PERIOD

Exceptionally high temperatures during the early part of May caused a very rapid development of blossom buds, so that by the fifteenth of the month fifty per cent of the central bloom of Fameuse and Duchess was open. This is fully nine days sooner than these varieties reached the same stage the previous year. Beginning with this date the weather turned cold and wet and, with the exception of one day, heavy showers occurred throughout each day from the fifteenth until the twenty-first. During this period 1·60 inch of rain fell and the highest temperature recorded during this time was 67°, with consistently low temperatures, from 40 to 45°, during the night. These conditions had the effect of almost completely stopping blossom bud development. Many of the central bloom of the above-mentioned varieties were injured, the anthers shrivelled and turned brown. During the next four days the weather was ideal for pollination, bright sunny days with the lowest night temperature about 60° and the day temperature between 75° and 80°. Just when the petals were beginning to fall the weather again turned cold and wet, the thermometer registering between 45° and 50°. Throughout the blooming period of eleven days only four days were suitable for pollination and a considerable percentage of the opened central bloom was injured by the cold temperatures. Despite these climatic drawbacks, open pollination counts compare quite favourably with those of the previous year, when the weather was eminently suitable. The varieties Fameuse and Wealthy were infested with a severe epidemic of fire blight which affected the set on these varieties.

Open Pollination Counts	1929 per cent set	1930 per cent set
Fameuse	19·6	12·4
McIntosh	9·0	13·1
Wealthy	13·7	9·2
Golden Russet	13·0	18·0
Duchess	16·1	9·9

* Prepared by H. Hill.

Counts were made at different times of the number of insects present on fifty clusters. The number of insects increased as the temperature rose, which also corresponded with the majority of bloom open. It will be noticed that there was always a larger count on the variety Duchess, due probably to the very large quantity of free pollen produced by that variety.

INSECT RECORD—NUMBER OF INSECTS FOUND ON FIFTY BLOSSOMS

Variety	Time of day	Temperature	Weather	Condition of bloom	Tame bees	Wild bees	Others	Total
Duchess	21/5/30—3 p.m.	67° F.	Sunny	Almost full	5	4	4	13
G. Russet	21/5/30—3 p.m.	67° F.	"	50 per cent full	2	0	1	3
Fameuse	21/5/30—3 p.m.	67° F.	"	75 per cent full	1	2	2	5
Duchess	22/5/30—10 a.m.	68° F.	"	Full	10	2	2	14
G. Russet	22/5/30—10 a.m.	68° F.	"	60 per cent full	1	0	1	2
Fameuse	22/5/30—10 a.m.	68° F.	"	85 per cent full	2	0	3	5
Duchess	23/5/30 noon	82° F.	"	Full	11	3	4	18
G. Russet	23/5/30 "	82° F.	"	Full	5	1	2	8
Fameuse	23/5/30 "	82° F.	"	Full	13	2	2	17
Duchess	24/5/30 "	78° F.	Sunny and windy	Falling slightly.	13	4	3	20
G. Russet	24/5/30 "	78° F.	"	"	4	0	2	6
Fameuse	24/5/30 "	78° F.	"	Falling	7	0	2	9

BLOOMING DATES

Weather conditions caused the blossoming period to be lengthened four days over that of 1929. It also had the effect of lengthening the interval between the commencement of bloom of such varieties as Fameuse and McIntosh and Fameuse and Wealthy. (See chart.) In 1929 Fameuse began to bloom almost three days before McIntosh, while in 1930 this interval was lengthened to six days. In the variety Fameuse 75 per cent of the central bloom was open on the 15th. On the 18th 25 per cent of the lateral bloom was open. On the 21st, when all the central bloom of Fameuse had been open for two days and 60 per cent of the laterals were open, only about 10 per cent of the central bloom of McIntosh was open and none of the laterals. Free pollen was not noticed on McIntosh until the 23rd, eight days after Fameuse commenced to bloom. Records kept at Rougemont gave a five-day interval between the commencement of bloom with these two varieties. This would probably give a seven-day interval before McIntosh was liberating pollen. From this two-year record it is indicated that McIntosh alone is not an efficient pollenizer for Fameuse since a considerable portion of the bloom would be past the receptive stage before McIntosh pollen was liberated. On the other hand, since Fameuse pollen is available when McIntosh commences to bloom, it should prove a good pollenizer for McIntosh. Duchess and Melba began to bloom about the same time as Fameuse and, with free pollen available on the 18th, should prove good pollenizers for Fameuse. Bloom on Wealthy was rather irregular. Commencing to bloom some time before McIntosh, it received a check by cold wet weather and was somewhat later than McIntosh in reaching a full bloom.

POLLEN CHARACTERISTICS

Excellent results were secured in ripening pollen for artificial pollinations. The anthers were placed in open petri dishes beneath a Coleman lamp and bright, healthy pollen was obtained without any burning or shrivelling. Germination tests were made of all lots of pollen before being used for pollinating purposes.

FAMEUSE.—Anthers from this variety gave a fair amount of free pollen. Good germination, averaging 35 per cent, was obtained, with long strong tubes averaging 702 microns. The lowest per cent germination of any sample used was 19 per cent.

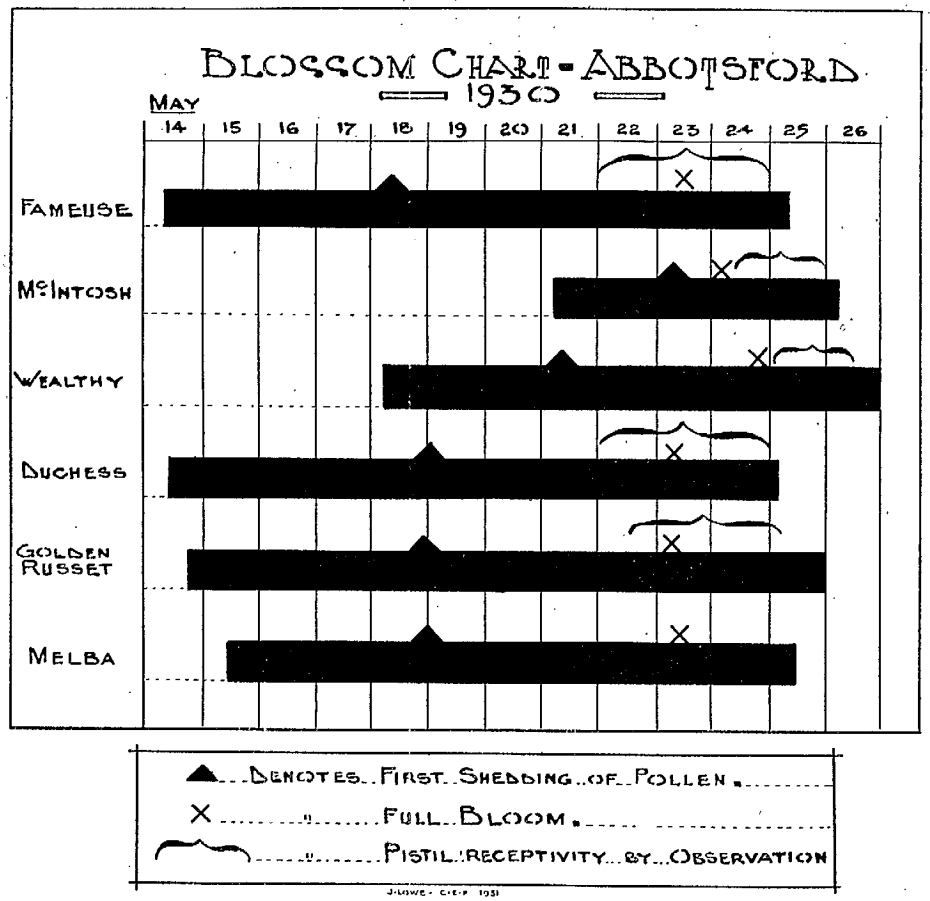
DUCHESS.—Very large amount of free pollen, grains regular, average germination 22·8 per cent, tubes strong and long, averaging 402 microns.

WEALTHY.—Pollen grains regular, tubes long and strong, average length 732 microns; average germination 27 per cent.

GOLDEN RUSSET.—Pollen grains regular, tubes strong, average length 560 microns, average germination 20·5 per cent.

MCINTOSH.—Grains regular, tubes strong, average length 706 microns, average germination 26 per cent.

MELBA.—Good bright pollen, germination 30 per cent, tubes 498 microns.



CROSS-COMPATABILITY TESTS

The same technique was followed as in the previous year. Clusters were bagged before opening to prevent open pollination. Unopened flowers of the various varieties were gathered, carried into the laboratory and the pollen ripened by gentle heat. When the pistils were observed to be receptive the

pollen was applied with a brush, the bag replaced and a tag attached to the cluster bearing the number of blossoms fertilized, the date and the name of the varieties concerned in the cross.

On Fameuse an appreciably lower set was obtained with all varieties than in the previous year. This was probably due to the very severe epidemic of fire blight attacking this variety. The set from open pollination was also materially reduced. As in the previous year, Duchess as a male on Fameuse gave the best set and largest number of fruits harvested. Using McIntosh as a female, fairly good results were obtained with all varieties used as males, though all hybridization counts were somewhat below the crop obtained by open pollination. It will be noticed that a fairly satisfactory crop was obtained using McIntosh pollen on McIntosh. A harvest of 1·6 per cent was also obtained in 1929 with this cross. Using Wealthy, Russet or Duchess as females a very satisfactory crop was obtained with all varieties used as males. Fameuse and McIntosh gave a suitable crop when used as males on Melba. Results obtained from two seasons' work indicate that there is no cross-incompatibility between the varieties mentioned.

SELF-FERTILITY TESTS

1. Clusters were bagged before opening to prevent open pollination and then left to pollinate themselves. No set was obtained with Fameuse, Wealthy and Golden Russet. Very slight set was obtained with McIntosh and Duchess.

2. Clusters were bagged as before but pollinated at various intervals by brushing the pollen across with a brush. No set was obtained with any variety except Duchess and this was practically self-sterile.

3. Clusters bagged as before but pollinated upon receptivity with pollen from the same variety ripened in the laboratory. Fameuse, Wealthy and Duchess were almost completely self-unfruitful. McIntosh was fairly self-fruitful.

Fameuse was the most self-unfruitful of these varieties, with McIntosh the most self-fruitful. Duchess and Wealthy were very slightly self-fruitful. McIntosh selfed gave a fair crop but much less than McIntosh open pollinated.

	Females																	
	Fameuse			McIntosh			Wealthy			G. Russet			Duchess			Melba		
	July, per cent set	August, per cent set	Per cent harvested	July, per cent set	August, per cent set	Per cent harvested	July, per cent set	August, per cent set	Per cent harvested	July, per cent set	August, per cent set	Per cent harvested	July, per cent set	August, per cent set	Per cent harvested	July, per cent set	August, per cent set	Per cent harvested
Fameuse	0·5	0·2	0·2	7·8	6·9	5·5	17·0	8·8	8·1	27·1	20·0	19·3	14·9	12·2	10·2	18·3	11·6	7·3
McIntosh	15·8	8·5	7·2	4·6	4·4	3·6	9·2	4·9	4·7	12·5	7·3	6·7	27·1	19·0	16·2	10·7	6·9	5·6
Wealthy	6·3	2·6	2·2	11·6	9·1	7·4	1·7	0·5	0·5	19·7	12·7	11·9	17·3	15·1	10·1	.....	.....	.....
G. Russet	9·4	5·6	4·4	10·0	9·6	8·6	12·2	7·1	6·7	0	0	0	14·0	10·9	9·1	.....	.....	.....
Duchess	17·9	11·6	10·4	4·8	4·3	3·0	11·9	4·7	4·2	14·3	4·9	4·5	1·4	0·8	0·4	.....	.....	.....
Melba	10·9	5·4	4·0	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Selfed	0	0	0	0	0	0	0	0	0	0	0	0	0·6	0·5	0·3	.....	.....	.....
Closed bags	0	0	0	·06	0·1	0·1	0	0	0	0	0	0	0·1	0·1	·07	.....	.....	.....
Open pollinated	12·4	5·6	6·0	13·1	11·3	9·2	9·2	5·6	5·0	18·0	10·7	9·6	9·9	7·9	6·0	.....	.....	.....

FIRE BLIGHT IN QUEBEC ORCHARDS

During the past season many of the Quebec apple orchards were visited with a severe epidemic of fire-blight, which caused a decided reduction in set and assumed the form of a severe menace for future years. This disease, though not of annual occurrence, has appeared in epidemic proportions at irregular intervals. Owing, perhaps, to its irregular habit not sufficient stress has been laid upon the necessity for treating sources of infection, holdover cankers, etc. Suitable environmental conditions at blossoming time, such as prolonged rains, similar to the weather we had this past season, tend to initiate and spread the disease from local hold-over sources of infection.

It is common knowledge that there exists a wide range in varietal susceptibility. Such inferior varieties as Alexander and Winter Arabka are particularly susceptible and several growers have thought it best to get rid of such varieties on this account.

Our knowledge of this disease and its control is very limited and it was suggested that by curtailing our fertilizer applications, especially nitrogenous fertilizers, we would curtail growth and by this means render the trees less susceptible to infection. To obtain some information in this regard arrangements were made with Dr. Machacek of Macdonald College to determine the amount of infection on representative plots of each fertilizer treatment in the Buzzell orchard at Abbotsford, and following are the results obtained:—

FIRE BLIGHT AND FERTILIZERS, JULY 1930

Plot treatment	Number of twigs counted	Percentage spur blight	Percentage twig blight	Length of twigs
				in.
VARIETY FAMEUSE—				
5A. Check plot	767	10·1	0·52	4·5
1A. Nitrate, 6 pounds	973	6·4	1·7	8·0
4A. Sulphate, 4 pounds	823	4·3	1·8	11·0
2A. Nitrate and phosphoric acid	859	11·9	2·3	12·0
3A. Nitrate, phosphoric acid and potash	854	7·02	1·8	11·0
5B. Check plot	959	19·3	1·9	13·0
1B. Nitrate, 6 pounds	924	16·2	3·03	13·0
4B. Sulphate, 4 pounds	969	13·7	2·7	14·0
2B. Nitrate and potash	899	23·1	4·2	9·0
3B. Nitrate, phosphoric acid and potash	819	23·8	4·15	13·0
VARIETY WEALTHY—				
1. Check plot	929	22·17	0·3	5·0
5. Nitrate, phosphoric acid and potash	908	21·14	1·2	13·5

It will first be noticed that the B plots all had a relatively higher percentage of infection than the A plots. The former were closer to the primary source of infection, a block of Winter Arabka trees, so that, as the distance from the source of infection increased, the percentage of infection decreased. The percentage of spur blight in the check plot was higher than that in the nitrate or sulphate plots, both in the mulch and non-mulch areas.

The amount of twig blight was a little higher in the nitrate and sulphate plots than the check but the difference was not significant.

The data supplied does not substantiate the theory that the application of nitrogenous fertilizers causes the tree to be more susceptible to fire-blight infection.

*FERTILIZER POT CULTURE EXPERIMENT WITH APPLE TREES

It has been the general practice to advocate the application of nitrogenous fertilizers early in the spring, when soil nitrification and nitrates in the soil are low, although it may be possible to send a tree into winter with enough stored food, including proteins, to carry it through this critical period. Accordingly it was decided to compare spring and fall applications of a nitrogenous fertilizer by growing trees in sand cultures in pots. Two-year-old whips of the Joyce variety of apple were used. The trees were divided into the following groups:—

Group I: From 1926 to 1928 inclusive the trees received all elements except nitrogen, which was withheld throughout the season. Commencing with the spring of 1929 the trees received all elements, including nitrogen, with the nitrogen applied as nitrate of soda in the spring.

Group II: From 1926 to 1928 inclusive the trees received all nutrients, including nitrogen, with the nitrogen applied as nitrate of soda in the spring. Commencing with the spring of 1929 the trees received all elements except nitrogen, which was withheld throughout the season.

Group III: The trees received all nutrients in the spring, except nitrogen, which was applied in the fall in the form of nitrate of soda.

Group IV: The trees received all nutrients in the spring, including nitrogen, and again received nitrogen in the fall. The total amount of nitrogen applied was equal to that in groups II and III.

It must be remembered that, commencing with the third growing season, the spring of 1929, the treatments for groups I and II were reversed. Group I received spring applications of nitrate of soda while group II was starved for this element.

Following are the formulæ employed:—

Full Nutrient Solution—A

$MgSO_4 7H_2O$	20 gms.
KH_2PO_4	20 gms.
$NaNO_3$	75 gms.
KCl	10 gms.
H_2O	875 cc.

Full Nutrient Solution—B

$CaCl_2$	30 gms.
$CaSO_4$	20 gms.
H_2O	950 cc.

Both A and B were diluted 1 to 6 and then mixed together. Each pot received 400 cc. of solution.

SUMMARY OF NOTES

1927

There was very little difference, if any, between the beginning of growth in the spring in the four groups. Group I, and also III to some extent, was characterized by light greenish foliage. The foliage of the other two groups was healthy. In the fall group I was the first to become completely defoliated, followed by groups IV, III, and II, in the order named.

1928

Group IV was the first to commence growth in the spring, followed very closely by groups I, III, and II, in the order named.

*Prepared by M. B. Davis and H. Hill.

Throughout the summer group I was characterized by sickly yellow foliage, leaves much reduced in size and very limited growth.

Group II had very healthy, dark green foliage with excellent wood growth.

Groups III and IV were both characterized by having foliage somewhat light green in colour, with the latter series having somewhat better colour and more intensive growth. After the fall application of nitrate the foliage of groups III and IV improved considerably in colour. On October 9 group I was completely defoliated, while group II still held its foliage, orange to brown in colour. The bark in group I was a very bright red, while that of group II was a deep dark red. This characteristic was very outstanding.

In groups III and IV the foliage was still green. The season's growth appeared to be well ripened in all groups, the terminal buds formed.

The root system of two trees was examined from each group. In group I there was a surprisingly good root system for the sickly looking top. There was a good production of fibrous fine feeders, but scarcely any coarse roots.

Groups II and III had a fair root system with fine feeders and coarse roots evenly divided.

Group IV had the most extensive root system of the four groups, with fine and coarse roots evenly divided.

1929

There was little difference between the initiation of growth in the spring.

The effect of applications of nitrogen to group I was speedily shown, the foliage taking on a good green colour with rapid wood growth. The lack of nitrogen in group II was shown by a lighter coloured foliage as the season advanced.

Group II matured most rapidly in the fall. On October 19 the leaves were orange coloured, the terminal buds formed and beginning to shed foliage. Group I still retained all their foliage, the leaves being yellow to orange in colour and the terminal buds not so mature as in group II.

In groups III and IV the foliage was still quite green with the terminal buds not mature.

1930

Groups III and IV commenced growth somewhat ahead of the other two groups.

Throughout the season group I was characterized by healthy coloured foliage and vigorous growth.

In group II the foliage had a typical nitrogen-starved appearance, yellow-green in colour, with the leaves covered with reddish spots. The leaves were reduced in size and the trees made very little growth.

Referring back to the notes for 1928 it will be noticed that the symptoms for groups I and II are now entirely reversed, owing to the change in treatment made in the spring of 1929.

Groups III and IV, although making fairly good growth, showed some signs of nitrogen starvation in a yellowish-green foliage.

On October 6 the foliage on group I was still quite green, with the terminal buds just beginning to mature. The trees in group II were completely defoliated on this date, with mature terminal buds.

In groups III and IV the foliage was changing from a green to brown and orange, with the terminal buds maturing. The bark of group II was characterized by a light red colour.

In general, it may be said that there was very little difference in the time growth commenced in the spring, although the series receiving fall applications of nitrogen were a little earlier in commencing growth in 1930.

The series not receiving nitrogen applications were characterized by yellow green foliage, smaller leaves and lack of growth and a brightly red coloured bark. When nitrogen was fed to the nitrogen lacking series in 1929 its effect was very rapid and pronounced. The foliage rapidly gained a good green colour and the trees made rapid growth. Likewise, the lack of nitrogen was very soon felt by the series which had been receiving nitrogen up until this time. The foliage gradually lost its green colour, became light green to yellowish green and growth practically stopped. In two seasons it was possible to bring about a complete reversion of conditions in these two series. The group not receiving nitrogen until the fall showed slight symptoms of nitrogen starvation from the middle of the summer onwards. After the application of nitrogen in the fall the foliage turned a healthier, greener colour, showing that these trees were making use of the nitrogen supplied. Considerable difference was shown in the rate of maturity in the fall. The nitrogen-starved group was the first to shed its leaves and mature its terminal buds, followed by the series receiving nitrogen in the spring. The two groups receiving fall applications of nitrogen were the last to shed their leaves and fully mature their wood. Although the fall applications of nitrogen caused the foliage to assume a greener, healthier colour, it did not induce a new growth.

In the following table are arranged the growth measurements and diameter increase of the trees from the time the experiment was initiated until the end of the 1930 growing season.

In an examination of the growth records it will be seen that the average growth for the first season was about equal in all four groups, the stored food presumably being sufficient to prevent the appearance of nitrogen-lacking symptoms the first season. However, by the second season the growth in the nitrogen-lacking group was appreciably reduced, culminating in the third season of nitrogen starvation with an almost complete lack of growth.

In 1929 the treatment of groups I and II was reversed, group I now receiving nitrogen and group II being starved for that element. Group I made an immediate response, the average growth jumping from 3 inches in 1928 to 79 inches in 1929, while group II did not show an acute lack of the element until the following year, again intimating that the stored food was able to carry the trees along for one season.

Comparing growth measurements in 1928, of groups II, III and IV, we find that group III, receiving only fall applications of nitrogen, had significantly less growth than the other two groups. In reviewing our records we find that the fall application of nitrogen in 1927 was not applied until September 15. In previous work, reported on in the 1928 Annual Report, we observed that applications of nitrogen after September 1 had little effect in promoting growth. On the other hand, fall applications in 1928 were applied the early part of August (August 6) and in the growth measurements of 1929 group III compares very favourably with groups II and IV.

In 1930 the growth measurements in group III are somewhat lower than in groups II or IV, but again the fall applications of nitrogen were delayed until August 27. It would appear that in pot culture work fall applications must be made relatively early, before the tree enters dormancy, else the nitrogen is not taken up by the tree and is eventually leached out of the pot.

Group IV, receiving half its nitrogen in the spring and half in the fall, compares favourably with group I.

GROWTH MEASUREMENT IN INCHES—APPLE RIVER SAND EXPERIMENT

—	1926		1927		1928		1929		1930	
	Total	Average per tree	Total	Average per tree	Total	Average per tree	Total	Average per tree	Total	Average* per tree
Group I.....	421·5	28	157·75	12	50·0	3·0	948·5	79·0	1,040·0	80·0
Group II.....	417·75	28	369·0	30	1,321·9	120·0	1,156·25	105·03	356·3	32·36
Group III.....	380·3	25	224·3	22	390·5	39·0	1,473·0	147·3	593·75	59·36
Group IV.....	476·8	31	307·1	25	1,207·25	92·0	1,857·75	142·94	934·50	77·84

DIAMETER IN INCHES—APPLE TREE RIVER SAND EXPERIMENT

—	1926		1928		Average gain per tree 1926-1928	1929		1930		Average gain per tree 1928-1930	Average gain per tree 1926-1930
	Total	Average per tree	Total	Average per tree		Total	Average per tree	Total	Average per tree		
Group I.....	6·5	0·433	6·3	0·484	0·051	7·31	0·562	8·09	0·622	0·138	0·180
Group II.....	6·5	0·433	6·96	0·632	0·199	7·281	0·662	7·562	0·687	0·055	0·254
Group III.....	6·62	0·441	5·06	0·506	0·065	5·875	0·587	6·406	0·640	0·134	0·199
Group IV.....	6·56	0·437	7·68	0·590	0·153	8·56	0·658	9·31	0·716	0·126	0·279

*These measurements were taken on July 22 in contrast to measurements taken in the fall of previous years.

DISCUSSION

Owing to the change in treatment during the experiment and the time variation of fall nitrogen applications, it is impossible to make any clean cut comparison between spring and fall nitrogen applications. However, under the conditions of this experiment it would appear that applications made later than September 1 are of little value in promoting growth the following season. Whether this would be so under orchard conditions is very debatable. Little leaching occurs at this time of the year and it is possible that denitrifying bacteria would fix the nitrogen which the tree was unable to take up and nitrifying bacteria would cause it to be available in the spring. It would appear that in pot culture work the trees are unable to make use of applications later than September 1 and that the nitrogen is eventually leached out of the pot. That nitrogen applied earlier in the fall was available to the tree was shown by the change of colour in the foliage without causing renewal of growth.

Fall applications of nitrogen produced a decided retardation in the hardening off of the tree, as evidenced by the green foliage and the retardation of defoliation. Since the trees were placed under cover during the winter we have no information as to the effect of fall applications on the severity of winter killing, but from the delayed ripening we would consider it a possible source of danger if applied before September 1 under field conditions.

Nitrogen starvation was characterized by yellowish-green foliage, sometimes covered with reddish spots, almost complete lack of growth and a bright red colouration of the bark. In two seasons a nitrogen-starved group, on the point of dying, was brought into vigorous, active growth by spring applications of nitrate of soda. A vigorous, healthy growing group of trees showed marked effects of nitrogen starvation during the second season of such treatment.

*THE MANUFACTURE OF CIDER FROM CANADIAN APPLES

The manufacture and sale of cider in Canada has been, up to the present, a business of rather small proportions, in fact in so far as the market has been concerned only sweet carbonated apple juice or apple juice treated and diluted has been offered to the public. Fermented ciders comparable to those found in foreign countries, such as England, France and Germany, have not been available. This has been due partly to the fact that it has been generally considered impossible to make an acceptable cider from our cultivated varieties of apples.

The main justification for research work into the possibilities of using cull apples for cider purposes is the estimate that from 1,000,000 to 1,500,000 barrels of low grade apples are produced in Canada annually. This figure is, of course, only an estimate and is referred to in the supplementary report of the Royal Commission on the Apple Industry of Nova Scotia. This same publication credits Canada with a total production of 290,000 gallons of sweet cider, or 0·03 of a gallon per person. No record of fermented cider is given. In the United States this Report states that 0·6 of a gallon per person is consumed annually, which is twenty times that used in Canada. On the other hand the consumption of cider in England, mostly of a fermented nature, is equal to almost two gallons per person per year. These figures, compared with the consumption in Canada, are extremely hopeful and at least point out the possibilities of this industry developing to such proportions as to be able to take care of a large volume of low grade apples. If half the English per capita rate of consumption could be attained, close to 1,000,000 barrels could be utilized by the cider mills of Canada.

In England the growing of apples for cider is a business of no mean proportions, as approximately 5,000,000 bushels of apples find their way into cider, the most of these being straight cider varieties. These cider apples are small crab-like fruits unsuited for domestic use. They are grown under low nitrogen conditions, i.e., under sod, and are sprayed only sufficiently to ensure the life of the tree and are shaken from the trees instead of being picked, as in the case of dessert apples.

CLASSIFICATION

As before mentioned, these varieties mostly used in England are straight cider apples, grown especially for that purpose. As there is a great deal of variation in the chemical composition of these they have been divided into three main classes according to their titratable acidity and tannin content. The classes are as follows:

Sharps—with an acid content of 0·45 per cent malic acid and above.

Sweets—with an acid content less than 0·45 per cent malic acid and less than 0·2 per cent tannin.

Bitter Sweets—with an acid content less than 0·45 per cent and a tannin content greater than 0·2 per cent.

The following analyses of representative varieties from each of these classes, as compared with some of our well known Nova Scotia dessert sorts, will reveal the difference between these and the cider apples:

* Prepared by M. B. Davis.

RESULTS OF ANALYSES OF REPRESENTATIVE VARIETIES

English Cider Apples

—	Sp. gr.	Malic acid	Tannin
		%	%
Sharp	1·078	0·89	0·24
Sweet	1·060	0·27	0·14
Bitter Sweet	1·060	0·29	0·31
Typical Nova Scotia Varieties			
Baldwin	1·046	0·64	0·08
King	1·045	0·37	0·07
Ribston	1·059	0·71	0·09
Roxbury Russet (Nonpareil)	1·058	0·61	0·12

It will be noticed that our dessert sorts are all low in tannin as compared with the English sorts. Of the Nova Scotia varieties and British Columbia varieties analysed, Nonpareil approaches the desired tannin content more closely than other sorts. The bulk of our dessert sorts fall in the sharp class and would be greatly improved by blending with apples of the bitter sweet class. This was amply demonstrated in England by comparing a cider from King with a blend of King cider and Chisel Jersey cider, the latter being a bitter sweet. The King cider alone was unacceptable, but the blend of 50 per cent of both varieties was a very good cider indeed. As will be noticed from the notes appended to this article, on the Nova Scotia varieties, acceptable ciders were made from three varieties, namely, Ribston, Nonpareil and Baldwin. In addition I might point out that R.I. Greening has been found to produce a very good cider and our work in Nova Scotia this past season indicates Pewaukee as another variety suitable for cider purposes.

While none of our apples tested to date can be said to make as high a quality cider as the best of the English sorts, those mentioned do produce a very acceptable fermented product of the English type.

EXPERIMENTAL WORK OF THE FEDERAL DEPARTMENT OF AGRICULTURE

In addition to having a test made of the vintage quality of certain Nova Scotia varieties of apples at the Research Station, Long Ashton, England, the federal Department of Agriculture has undertaken work on a rather comprehensive scale at Middleton, Nova Scotia. This work is conducted in co-operation with Scotian Gold Apple Products, Limited, and a modern, up-to-date building has been erected and equipped for the purpose. In addition to a fully equipped laboratory the plant is supplied with the latest vacuum pan of French manufacture, a super centrifuge for clarification, up-to-date roughing filters and germ-proofing filters, glass lined tank for pressure fermentation, cooler, counter pressure champagne bottler and modern bottle washing and sterilizing equipment and labelling machine.

The method of manufacture described later in this article was evolved at this plant as a result of the work this past season.

In addition to the work conducted in Nova Scotia, the department through a co-operative effort with the Ontario department has had made at the plant of the Canadian Wineries, Oakville, Ont., a small quantity of 2 per cent and 5 per cent ciders. These have been made by the Charmatt process, the only plant of its kind in Canada, and a product of the highest order has been thus produced.

KINDS OF CIDER

Several types of cider may be manufactured from the same juice, the difference in type largely being dependent upon the amount of alcohol developed, as compared with the amount of unfermented sugar left in the juice. Thus one may produce a perfectly sweet, still cider which in reality is only unfermented apple juice. This same juice may be carbonated and made into a sparkling sweet cider. Again the juice may be permitted to ferment to one or even two per cent of alcohol, at which point fermentation may be arrested and a medium sweet cider of a slightly stimulating nature thus produced. To many this type of drink is far superior to the unfermented product. The English type of fermented cider contains approximately from four to six per cent alcohol, depending upon the amount of sugar contained in the fresh juice, and in foreign countries it is this type of product which is most popular. It is evident that a high alcoholic drink cannot be made from fresh apple juice on account of the comparatively low sugar content. By concentration of the juice, however, in vacuo, with correction of the excess acidity thus created, it is possible to produce a very satisfactory cider containing over twelve per cent alcohol. Such a product, being sparkling, is a competitor of the cheaper types of champagne and quite as acceptable a drink as many of the higher priced sparkling wines of commerce.

METHODS OF MANUFACTURE

For sweet or unfermented cider one need not be as particular in selecting the varieties as when a fermented product is to be made, in fact a full flavoured juice of about 0·7 per cent acidity and with a specific gravity of about 1·045 to 1·050 is generally more suitable than a juice with a much higher specific gravity, this higher specific gravity, however, being more desirable for a fermented product. In selecting the varieties to be pressed at the same time, only those sorts which ripen approximately together should be used. If it is desired to mix the juice of early and late sorts it is better to press separately, store the juices and blend later. For best purposes apples should be in a fairly advanced stage of ripeness before pressing. After pressing, the methods of handling the juice may vary considerably.

(1) The juice may be fined, prefiltered, germ-proof filtered and stored in germ-proof containers to be bottled as sweet juice, or to be reinoculated and fermented down.

(2) Fining may be omitted and the juice simply prefiltered and pasteurized, either before or after bottling. If before, storage must be in a germ-proof container.

(3) After pressing and prefiltering the juice may be preserved by the use of some form of preservative, such as SO_2 or benzoate of soda. This practice, however, is objectionable and not to be recommended.

The method adopted at the Dominion Government Fruit Products Laboratory is to fine, centrifuge, prefilter and germ-proof filter into germ-proof containers. This method will now be explained.

Immediately after pressing the juice is run into fining vats, where it is treated with a mixture of tannin and gelatine in proportions determined by tests in the lab. Many people object to fining on the grounds that it is a chemical method which tends to destroy the quality of the product. Our experience is that when properly handled it does not destroy the originality of the juice but in many cases actually removes objectionable characteristics. Fining has made possible the utilization of rather unsuitable juices for cider purposes and, while it may interfere with the bouquet of an exceedingly high class juice, it does tend to improve juices of a lower order. Fining is based upon the fact that tannin will combine with albuminoid substances to form insoluble com-

pounds. As most of our juices are very low in tannin the addition of excess tannin aids in the removal of albuminoids which are liable to cause trouble later. The best method is to add the tannin, dissolved in water, aerate the juice by agitation for several hours, after which the correct proportion of powdered gelatine, dissolved in hot water, is added and agitation continued for half an hour. The gelatine combines with the free tannic acid not used by the proteolitic substances of the juice and the network of flocculent precipitate thus formed rapidly settles to the bottom, taking down with it the very finely suspended particles and leaving a practically clear juice on top.

In fining it is the idea to leave the juice unaltered as much as possible, unless it is desired to increase the tannin content, in which case excess of tannin may be added. Generally speaking about equal proportions of pure tannin and powdered gelatine will do this, but a laboratory test is necessary to determine this point. The following tables, showing a laboratory test by Mr. F. B. Johnston, of the Chemistry Division, reveals this a little more clearly. If too much gelatine is added the tannin content of the juice may be lowered and the protein content increased, also the colour may be too materially affected. It might be added at this juncture that fining also aids in the standardization of colour.

TABLE I

No.	Treatment			Acidity	Tannin	Colour
	Tannin	Gelatine	Cider	Per cent	Per cent	Index
1	1¼ oz. or 1 cc. 1% solution.	1½ oz. or 1·2 cc. 1% solution.	80 gal. or 100 cc.	0·654	0·100	0·71
2	" "	3 oz. or 2·4 cc. 1% solution.	80 gal. or 100 cc.	0·647	0·088	0·48
3	" "	4 1/5 oz. or 3·36 cc. 1%..	80 gal. or 100 cc.	0·647	0·086	0·40
4	" "	6 oz. or 4·8 cc. 1%.....	80 gal. or 100 cc.	0·633	0·073	0·29
5	1 cc. 1 % solution..... (Ratio of 125 to 180.)	1·44 cc. 1% solution....	100 cc.....	0·654	0·096	0·67
6	2 cc. 1%..... (2 x No. 5.)	2·88 cc. 1%.....	100 cc.....	0·647	0·090	0·49
	Original juice, filtered, unfined.....		.....	0·675	0·100	1·00

TABLE II

No.	Treatment			Acidity	Tannin	Colour
	Tannin	Gelatine	Cider	Per cent	Per cent	Index
1	1·0 cc. 1% solution.....	1·0 cc. 1% solution.....	100 cc.....	0·659	0·109	0·78
2	" "	1·1 " "	100 cc.....	0·652	0·105	0·75
3	" "	1·2 " "	100 cc.....	0·645	0·102	0·71
4	" "	1·3 " "	100 cc.....	0·645	0·099	0·70
5	" "	1·4 " "	100 cc.....	0·645	0·097	0·66
6	" "	1·5 " "	100 cc.....	0·645	0·095	0·635
7	" "	1·6 " "	100 cc.....	0·645	0·094	0·61
	Original juice, filtered, unfined.....		.....	0·675	0·100	1·00

CLARIFICATION

From the fining vats we have so far found it economical to pass the juice through a super centrifuge, although after twelve hours settling about the top four-fifths can go directly to a roughing or prefilter. In our case a Stowe's cotton pulp filter is used. The lower one-fifth, or sludge, is then put through the centrifuge, from where it goes to the Stowe filter. From the Stowe filter the juice is put through a Seitz germ-proofing filter into storage vats. Whether or not the juice can be held in an unfermented condition in the storage vats depends upon the sterility and the efficiency of the vats. Wooden vats have not been found satisfactory and cement tanks lined with a specially prepared material have been adopted.

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If fresh juice is to be bottled no further treatment is necessary, except that it is desirable, just before bottling, to pass the juice through the germ-proofing filter, after it comes from the carbonator.

FERMENTATION

The handling of juice in this manner permits of fermentation with pure yeast cultures in a clear field. Objectionable organisms have been removed and selected strains of yeast can be used to advantage. While the amount of work we have done along these lines has been very limited, it has been sufficient to indicate valuable possibilities in this direction.

It is now necessary to compare the two methods of handling generally employed abroad and the method adopted by the Government laboratory.

There are at present two widely accepted methods of manufacture. One the disgorging method and the other the artificial carbonating method. The difference between these two methods will be briefly explained.

In both cases the juice is expressed from the apples and the pomace discarded, thus reliance is placed upon the soluble sugars as contained in the expressed juice and no attempt is made to increase the sugar yield by the hydrolyzing of the starches and polysaccharides of the pomace. For the first few days fermentation, which takes place in a temperature of from 50 to 60 degrees Fahrenheit, is permitted to proceed in an open vat until the froth and sediment has pretty well come to the top or until "keeving" has taken place. At this juncture the fermenting juice is racked off into fermenting vats where an air lock is attached to prevent the admission of oxygen which would favour the growth of mycoderma aceti. Care is taken that the vats or casks are kept well filled to prevent the accumulation of air. At this juncture the two methods part and we will just consider the disgorging process.

Fermentation is permitted to proceed until close to the desired point, say, to a specific gravity of 1·032, when it is passed through a cotton pulp filter into another vat, where it is probably aged for about a month, during which time fermentation proceeds very slowly until probably a specific gravity of about 1·030 is reached. At this juncture the cider is again filtered through cotton pulp into bottles, either screw stopper or corks. If a sparkling cider of low CO_2 pressure is desired the screw stopper bottles are used and the bottles laid away on their sides for a few months. During this time further fermentation takes place in the bottle and a considerable amount of sediment is thrown down, mainly yeast plant. At the end of about three months these screw stoppered bottles are carefully unstoppered and the contents decanted to another bottle in such a manner that the sediment is left in the original container. This second bottle is a properly stoppered and wired bottle in which the product is to be marketed. If the decanting is done while the cider is cold the absorption of CO_2 by the juice is such that the loss of gas is not great and, as there is still a further slow fermentation in the second bottle, ample CO_2 is generated to produce a sparkling product. Sometimes if a sparkling cider of much higher CO_2 content is desired, or, in other words, a strict champagne cider, the first bottling takes place in the same bottle as is intended for the market. In this case disgorging is practised by inverting the bottles so that the sediment settles in the neck of the bottle. At this stage the neck is frozen and the frozen sediment dexterously withdrawn with the cork and a small amount of syrup is added to take the place of the withdrawn deposit and the bottle restoppered. This disgorging, which generally takes place about March, permits the keeping of the cider until well on to the first of the year before any appreciable amount of further sedimentation, due to further yeast growth, takes place. The sediment thus formed is, of course, not objectionable to one who knows, but as certain of the public appeared to take exception to it in their ignorance,

endeavours to get away from disgorging and sedimentation were recently introduced and we now come to the second method of manufacture.

In this method the cider is permitted to ferment in the ageing vat; that is, after its first filtration to the point where it is desired to completely stop fermentation, i.e., a few points lower than in the first method, where "after-fermentation" is to take place in the bottle. At this point the cider is put through a centrifuge, then through a Seitz sterilizing filter, then through a carbonating machine and into bottles. As all yeast is removed by the Seitz filter and as the product is passed through a sterile line-up into sterile bottles with artificial gas no further growth of yeast results and hence no sedimentation takes place. The product thus produced, however, lacks the smoothness and bouquet of the product after-fermented in the bottles and, as a consequence, the higher class manufacturers are reverting to this latter method. In fact, cider, to qualify for the English National Mark, must be made by the disgorging method with natural gas.

To overcome popular opinion with reference to the sediment, such firms as Harvey's of Bristol, who reverted to the disgorging method, have circularized their customers explaining the cause of the sediment and continually add the following to all announcements and price lists:—

> "All cider made under these conditions is apt to throw a deposit which necessitates careful handling, but in no way affects the quality or flavour."

As the first method was considered too extravagant of labour for adoption in Canada and as the artificial carbonization was not desirable, fermenting in pressure tanks has been adopted with excellent results.

The previously germ-proofed juice is placed in a glass-lined pressure tank, inoculated with yeast, sealed up and fermented to the desired point under pressure. If a high alcoholic content is anticipated the pressure of CO_2 gas is more than desired and from time to time gas has to be released. This gas may, if desired, be collected in large cylinders by means of a compressor pump and used to carbonate perfectly fresh juice or juice that has been fermented in vats that are not air-tight. In this way products can be produced with the aroma and bouquet of natural gas.

After the fermented juice has reached the desired point in the glass tank it is passed through a cooling coil, consisting of 150 feet of $\frac{3}{4}$-inch tin pipe immersed in salt and ice. From here it goes to a Stowe filter, then through a germ-proofing filter to a counter pressure champagne bottler. The cooling brings about the absorption of the CO_2 and prevents foaming during bottling. By this process perfectly clear sparkling cider has been made, quite comparable to the ciders after-fermented in the bottle.

STERILIZATION OF EQUIPMENT

Throughout this method the utmost caution is necessary in the sterilizing of equipment. The germ-proof filter is sterilized by back steaming at five pounds pressure for ten to fifteen minutes and all hose connections from it to the bottler, and the bottler itself, are likewise sterilized. The bottles themselves are soaked and washed in a 4 per cent caustic solution and later given a rinse with a 2 or 3 per cent SO_2 solution. The crowns are previously soaked for a long period in a 1 or 2 per cent solution of a chloral base sterilizing solution, and the operators are required to sterilize their hands in either the chlorine or SO_2 solutions.

CONCENTRATED APPLE JUICE

The question of cider concentrates has been attracting attention for some years, and by the use of a modern vacuum pan an excellent product can be

made. Excellent samples were produced from Nova Scotia varieties in England and recently a very excellent sample was put through the Lemale concentrator at Middleton. The Swiss firm of Toblers have already such a product on the market under the name of Pomol, which is now being introduced to Canada for household use. This product is by no means superior to our own product from Nova Scotia. The Nova Scotia product, when rediluted with carbonated water, makes a rather attractive drink and should prove of value in the home. There is also the possibility of using it at the soda fountain; in fact, we have made a very excellent sweet cider from concentrates by diluting with artesian water, carbonating with natural gas and germ-proof filtering. A cider containing 10 or 12 per cent alcohol has also been made from concentrate by using a concentrate of 1·12 specific gravity in which the acidity was corrected to about 7 per cent malic acid. This eliminates the necessity of sacharification and enables the production of a very high champagne cider of high alcoholic content.

In closing it might be pointed out that a considerable quantity of sweet or unfermented cider, sparkling sweet cider containing 2 per cent alcohol, sparkling cider with 5 per cent alcohol, and champagne cider with 10 to 12 per cent alcohol are now being marketed. It is hoped that a real public demand for ciders can be created. The ciders we are putting out are all made under the most sanitary conditions, are sparkling clear, full flavoured and free of any injurious foreign substance. They meet the tastes of the most critical temperance person, or in the case of the fermented product, should satisfy the desire of the person who wishes something of a stimulating nature.

REPORT ON CIDER-MAKING FROM NOVA SCOTIA APPLES

From the National Fruit and Cider Institute, Long Ashton, Eng.

About half a ton of each of nine varieties was used. All the apples were No. 3 grade and were in good condition when received.

The apples were kept for some time until considered fit for milling and pressing and the fermenting juices were filtered with an ordinary pulp filter when the specific gravity had fallen to 1·025-1·032.

The attached table gives the chemical analyses of the fresh juices and other particulars.

The ciders were bottled directly after filtration and have so far kept well and are all in a light sparkling condition with small yeast deposits in the bottles.

The ciders were sampled at the Long Ashton Station.

—	Colour	Flavour
Quaker Beauty	Light	Clean and quite pleasant.
Baldwin	"	Very brisk and quite pleasant.
Wellington	"	Very acid, not satisfactory.
King	"	Rather peculiar and not very good.
Ribston	"	Brisk and pleasant.
Stark	"	Sweet and mild, but not good.
Ben Davis	"	Rather insipid.
Nonpareil	"	Clean and pleasant.
Fallawater	"	Poor.

Ribston and Nonpareil are considered the two best. Wellington is too high in acid content and can only be used blended with varieties with low acid content.

Compared with ciders made from English cider apples all the above ciders are somewhat lacking in what is called "body." This is principally due to the low tannin content, which in English ciders generally is about 0·2 per cent.

TABLE SHOWING THE CHEMICAL ANALYSES OF THE FRESH JUICES, ETC.

Name of variety	Date of making	Yield of fresh juice	Specific gravity of fresh juice	Malic acid	Tannin	Rate of fermentation	Date of filtering	Specific gravity at time of filtering	Present specific gravity	Alchool per cent by weight
				%	%					
Quaker Beauty	15.10.29	165 gallons per English ton	1·067	0·77	0·07	6·5	1.11.29	1·032	1·029	3·6
Baldwin	9. 1.30	169 " "	1·046	0·64	0·08	4·2	3. 2.30	1.032	1.029	2·7
Wellington	9. 1.30	180 " "	1·043	0·98	0·08	2·5	3. 2.30	1·032	1·031	1·7
King	9. 1.30	178 " "	1·045	0·37	0·07	3·0	3. 2.30	1·030	1·029	2·5
Ribston	9. 1.30	167 " "	1·059	0·71	0·09	5·2	6. 2.30	1·032	1·031	3·4
Stark	19. 3.30	161 " "	1·054	0·37	0·09	7·8	9. 4.30	1·025	1·025	3·5
Ben Davis	19. 3.30	152 " "	1·050	0·42	0·07	4·6	9. 4.30	1.025	1·025	3·0
Nonpareil	21. 3.30	160 " "	1·058	0·61	0·12	6·6	14. 4.30	1·028	1·028	3·5
Fallawater	21. 3.30	168 " "	1·048	0·38	0·08	7·6	10. 4.30	1·025	1·025	2·8

VEGETABLE GARDENING *

The spring of 1930 opened very early. The snow was practically all gone by the end of March and the frost out of the ground enough for digging to be done April 10. By April 15, the regular ploughing of the garden soil was commenced. The first seeding of onions was made April 21, which was the earliest seeding done for several years. Very fine weather prevailed until May 18, when the last killing frost occurred. Apart from this late frost the spring was very free from low temperatures. The spring being fairly dry made conditions very favourable for seeding and planting, but during June and the first half of July above average rainfall occurred. From mid-July until mid-September drought conditions prevailed, a week of quite heavy rainfall occurred which brought the average rainfall for September above normal. This was again followed by dry conditions which prevailed until the freeze-up November 28.

Despite the fact that the season was very dry, very satisfactory crops were harvested and with the long open fall the tender crops like tomatoes ripened on the vines without any serious loss. There was a slight frost September 10, when 32° F. was recorded, but this frost did very slight damage which seemed to be confined to small areas. So ideal were conditions that the total tomato crop was harvested as fully ripened fruit from the vines. This was extraordinary because there has been as a rule a large proportion of the crop every other year seriously damaged in the green state.

EGG PLANT

The production of an early maturing variety of egg plant was undertaken in the hope of obtaining a variety that would be satisfactory for the Ottawa district, at least one that could be relied upon to produce a profitable return for the average market gardener in the latitude of Ottawa. The cross that was made in 1924 between the commercial variety Black Beauty and the early maturing, small fruited variety of Nagasaki, has been under careful selection each season since that cross was made. During each succeeding season definite progress was made so that at the present time quite well fixed strains are available that are decidedly earlier in maturing marketable fruit of exceedingly good quality and colour.

In 1930 a considerable population of the most outstanding strains were grown in a manner similar to the methods that would be employed by the average grower. That is, the plants were not produced as special pot grown plants, but were grown in flats that were eleven inches wide, twenty-two inches long and three inches deep. The seed was sown March 26, pricked out two by two inches apart, and when the plants developed sufficiently they were transplanted fifteen to a flat and grown along in this condition until June 10, when they were set out in rows, thirty inches apart, with the plants eighteen inches apart in the row.

As a comparison, both varieties used as the parents in the cross, namely Black Beauty and Nagasaki, were grown in a similar manner and planted in the same range, which gave a very comprehensive idea of the earliness, yield and general value of the hybrid.

Space will not permit for a discussion of all the strains, but with a few details of strains O-7480 a fair idea may be obtained of the general character of the plants of the other strains which were much the same.

The general description of the plants of the strain O-7480 is as follows:—

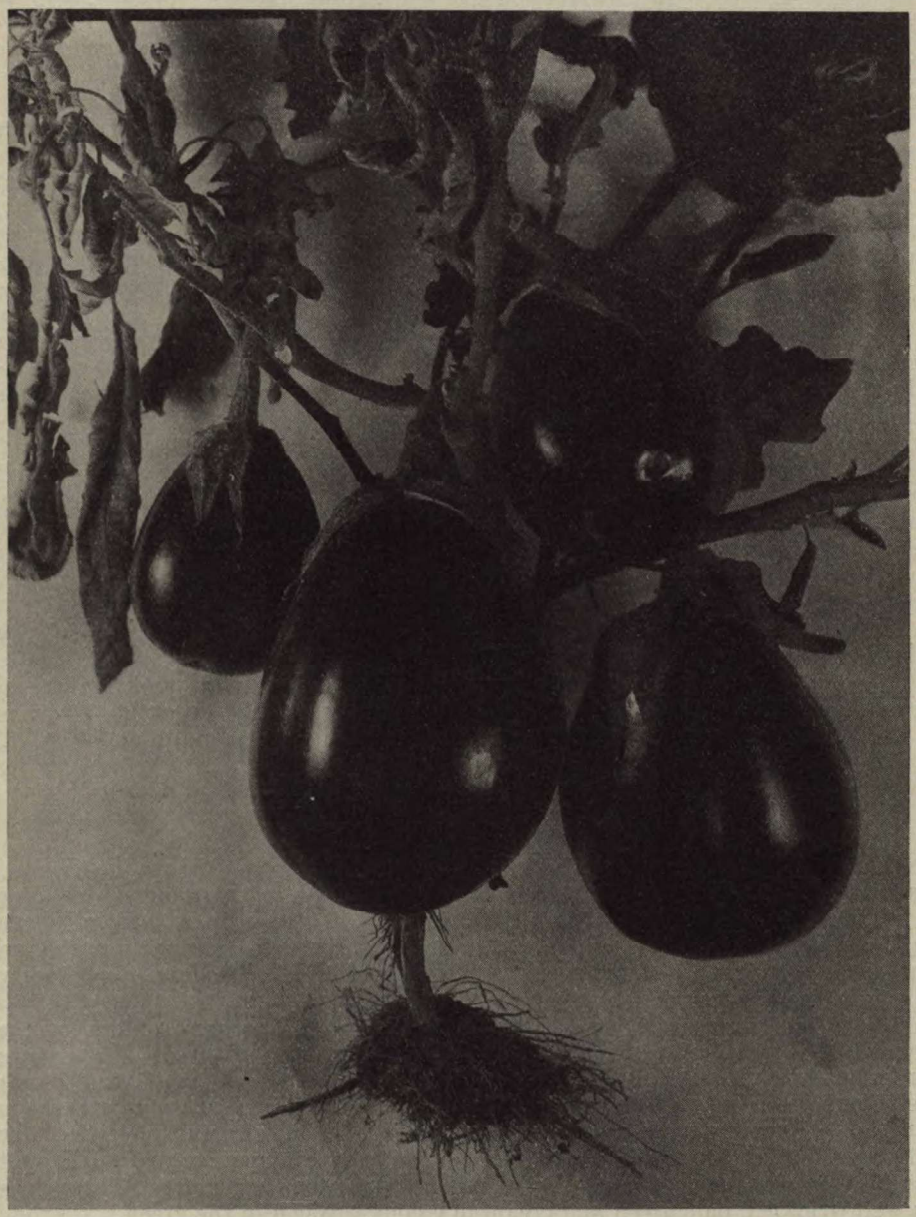
Plant.—Dwarf or twelve inches high, vigour strong, habit upright; spines, few; branches, green shaded with purple; leaves green with light purple veins.

* Prepared by T. F. Ritchie.

Fruits.—Average polar diameter of 12 fruits, six inches with an average equatorial diameter of four and one-half inches; colour, dark purple; calyx, medium size, smooth; stem medium large; shape, oblong, regular.

Flesh.—Tender, firm, good flavour.

Season.—Early, starting August 1 when fruits of the above-mentioned size were ready for use. Ripe seed was harvested from fruits from the early plants which was found to be viable.



Egg Plant—A Blackie egg plant with a good load of fruit.

It was found that some plants were not, however, as productive as others. Some of the plants produced six marketable fruits starting from August 1, while one plant matured fruit as late as August 20. Out of sixty-eight plants, nine had marketable fruit by August 1, thirty-seven had marketable fruit by August 7, twenty-one had marketable fruit by August 12, and one plant did not produce marketable sized fruit until August 20. To show the prolific character of these plants, there was harvested in all two hundred fruits, all of which were marketable. The number of fruits on the plants varied from one to seven, and showed a variation in weight from six to thirty-four ounces. The majority of the fruits would weigh about twenty ounces.

One fruit was allowed to ripen on each plant for seed production and in only rare cases did seed not mature in good condition. A splendid supply of seed was obtained.

Cooking tests were made which proved the quality of this hybrid to be very good, in fact, quite comparable with either of the parents.

In discussing the yielding ability of the parent varieties, it was found that twenty-four plants of Black Beauty produced thirty-five fruits in all, twelve of which were of marketable size and weighed nineteen pounds. Twenty-three fruits were unmarketable and weighed five pounds eight ounces. The marketable fruits were ready by September 1, which was one month later than the hybrid.

The small fruited early maturing parent, Nagasaki was, however, ready for use between August 1 and 16. That is, all of the plants had produced marketable fruit of the size for this variety by August 16. In all, sixty-nine plants were grown, with a yield of two hundred and nineteen fruits that weighed fifty-three pounds eight ounces.

From the performance of the hybrid, as mentioned in the foregoing, it would seem that a very desirable addition has been made to the list of egg plant varieties. If the crop of hybrid fruit had been marketed at the time they were ready for use, the price ranged from fifteen to twenty cents per fruit, for these sizes, in the store at that time, which would have netted a very nice return.

In view of the fact that many inquiries were received about seed of the hybrid, it was decided to name this Blackie.

Seed was sent this year to a number of the Dominion and Provincial Experimental Stations as well as Agricultural Colleges and Vegetable Growers to find out how the plants perform under a wide range of conditions.

BREEDING PEAS FOR CANNING

WING SWEET X POIS DE ROSTON

During the past few years an effort has been made to obtain a small sized pea of the wrinkled type that would run in size close to the number one type of French peas. In the report for 1929 reference to the crosses that had been made during former years and are now in the process of segregation showed that some very good material had been obtained that offered an opportunity to obtain the desired objective.

This last summer a considerable plantation of the progeny of one of the promising segregations which amounted to 181 seeds was planted. These peas were very small in size and the resulting yield from this plot was two pounds twelve ounces. To check up on the size of the seed, a dry seed count was made using five separate ounces drawn at random from the general run of seed of the 1930 crop. These separate ounces were counted and the average dry seed count was $499\frac{2}{5}$ peas per ounce, or in other words 500 dry seeds per ounce. These peas are well wrinkled, pale green and cream in colour. When in the green state they were sampled in a small way for quality and were found to be very good, tender and sweet.

So far as is known there is not at the present time a variety of wrinkled canning peas that runs uniformly small in size when mature, and it is intended to propagate these in quantity so that a careful canning test can be made by factory methods.

LARGE SIZED PEAS

The breeding of large sized peas for canning has also been under way. At the present time homozygous strains of some of the hybrids are being propagated in the hope that they will be useful to the canners in producing the large sized grades. Many of these in the large class are exceedingly big seed, and very productive. When in canning condition the seed coat is very green, tender and the peas very sweet. As an indication of the size of the seed, a dry seed count amounted to as few as 83 seeds per ounce from some of these segregations.

Of the many crosses made the one with Laxton Progress x English Wonder has yielded without doubt some of the best material.

Laxton Progress is a very dwarf, dark green foliated large podded and large seeded variety, but is a shy producer of pods. The quality of the peas is excellent. English Wonder is a dwarf variety well known to most growers, with pale foliage and produces an abundant crop of medium to small pods that are crowded full of peas that are of very fine quality.

A number of the segregations possess the dark foliage, large pods and peas like Laxton Progress and the prolific bearing habit of English Wonder, as well as the good quality of both. The vines are intermediate to dwarf in height.

At present these segregations show promise of something of value.

TOMATO BREEDING FOR EARLINESS AND QUALITY

The breeding work with tomatoes has been carried on as in former years, with very fair results. This past season the Alacrity x Earlibell cross was found to be very early maturing. In fact, it led all the varieties. The seed was sown in the greenhouse April 12 and the plants given the usual hotbed treatment, and planted in the field by June 10. The first ripe fruits were harvested July 17. All the plants were yielding ripe fruit by July 27. In all there were 42 plants of this strain. The range of ripening was 96 to 105 days.

In view of the fact that this strain has performed in a similar way with other growers it was decided to give it the name of Abel.

The plants are small in size spreading not more than three feet in diameter, branches are small, slender, leaves sparse, small in size, pale green, slightly ruffled, Earliana-like. Fruit is medium to small in size, round, almost free of ribbing, flat ovate to slightly conical; colour rich red. The quality and flavour of the fruit is very good being much better than Alacrity or Earliana. A large amount of fruit was ripened in the early part of the tomato season.

Segregations from other hybrids have been found to be very promising. The cross, Bonny Best x Alacrity crossed back to Bonny Best, has produced some very fine segregations. The fruits have been found to be of the same type as Bonny Best, but ripen somewhat earlier. The average cross with Alacrity has as a rule proved disappointing in that a very large proportion of the progeny turns out like Alacrity. This above-mentioned segregation has so far maintained the form and quality of Bonny Best as well as the earliness of Alacrity.

Samples of seed have been sent to experimenters for trial.

Livingston Globe x Bonny Best tomato cross has been segregated so that a red fruited Livingston type has been obtained that is of about the same season as Bonny Best. This segregation is a very good yielder. The fruits are large to medium in size, red in colour, smooth, with rich red sweetly subacid flavour, with outer and inner cell walls that are thick and meaty.

Samples of seed have been sent out to a number of experimenters.

Stock seed production of the Alacrity tomato is being carried on as this tomato has been found to maintain the early maturing ability. The progeny of individual plants was grown and the former early producing ability found to be maintained.

A promising tomato plant, the result of cross-breeding.

Sixty-nine varieties of tomatoes were grown with single stems on stakes. Ten plants of each variety were used. These included the leading varieties in commerce and a number of novelties that were tested to ascertain if they were of sufficient value to be included as recommendable sorts.

In the following table will be found a partial list of commercial varieties and novelties which were tested and are used in this tabulation as a comparison with some of the early maturing, heavy yielding hybrids originated in the Division of Horticulture, Central Experimental Farm, Ottawa.

RESULTS OF VARIETY TEST OF TOMATOES

Variety	Source	Number of days sowing to ready for use	Yield first two weeks		Number of fruits	Average weight	Yield for the month		Number of fruits	Average weight	Yield for the season	
			lb.	oz.		oz.	lb.	oz.		oz.	lb.	oz.
Alacrity x Bonny Best	O-7172	100	9	2	36	4·0	20	3	85	3·8	52	8
BB x 387 P 14	O-7194	103	7	5	17	6·88	26	1	73	5·7	59	5
Alacrity 39-1-32-3	O-7182	103	7	3	33	3·48	18	14	73	4·13	27	12
Abel-21-2-25-1	O-7193	103	4	8	27	2·66	17	2	80	3·42	37	4
Open Air	Sutton	110	3	8	20	2·8	19	14	100	3·18	52	14
Abb. x BB. p. 13	O-7163	100	3	5	16	3·31	15	3	63	3·85	42	14
Earliest of All	Sutton	103	2	12	26	1·69	14	4	80	2·85	52	8
Earliana	Ferry	103	2	6	11	3·45	17	0	64	4·25	51	12
Viking	NDAC	115	2	2	10	3·2	17	8	64	4·37	37	4
Penn State Earliana	Stokes	115	2	0	12	2·83	22	2	80	4·42	66	8
Bonny Best	Moore	115	1	14	7	4·28	9	12	28	5·57	49	9
Success	Harris	115	1	10	6	4·33	12	10	32	6·3	54	6
Wayahead	Bruce	110	1	8	6	4·0	10	4	38	4·31	50	10
Marvelosa	Rice	115	1	8	4	6·0	8	14	26	5·46	45	10
Bonny Best	Stokes	115	1	1	4	4·25	14	3	32	7·09	44	15
Bonny Best S. S.	"	115	0	12	3	4·0	11	12	29	6·48	46	12
Best of All	Sutton	119					11	0	48	3·6	66	4
Prince of Wales	Sutton	119					6	4	26	3·8	48	4
Fargo	NDAC	119					3	10	24	2·41	30	0

From the results obtained in this test it is evident that breeding and selection is essential to obtaining early, heavy yielding, varieties and strains.

SWEET CORN

The maintenance of stock seed of the three well known early maturing varieties of sweet corn originated in the Division of Horticulture, namely, Pickaninny, Banting, and Early Malcolm, has been continued for the purpose of having a supply of pure lines to provide stock seed for growers desiring to obtain seed stock of these varieties. In addition to maintaining the pure lines, some bulk seed of each sort was grown this year, as very frequently seed firms wish to obtain seed to supply to their customers.

All three of the above varieties are now being sold by seed firms in Canada and parts of the United States.

In the trials this year Pickaninny and Banting were the leading early maturing varieties, being earlier than Golden Gem. The latter is an origination from the North Dakota Agricultural College.

Golden Bantam is still the leading mid-season variety. Two very good strains were tested from the following firms: R. R. Moore, Norwich, Ont., and F. James, Duncan, B.C.

SWEET CORN BREEDING

The breeding of new varieties of sweet corn is being carried on for the purpose of obtaining improved early varieties possessing better quality than the present early and main crop sorts. Homozygous strains of hybrids have been obtained from three crosses that are very promising.

Golden Bantam x Pickaninny is an early maturing yellow segregation that possesses excellent quality and flavour. This corn was ready for eating in about the same season as Pickaninny. The plants are slightly stronger growing than Pickaninny and produce ears of a better size. In fact the ears are quite like the original Golden Bantam in size with kernels that are quite as attractive and of equal quality.

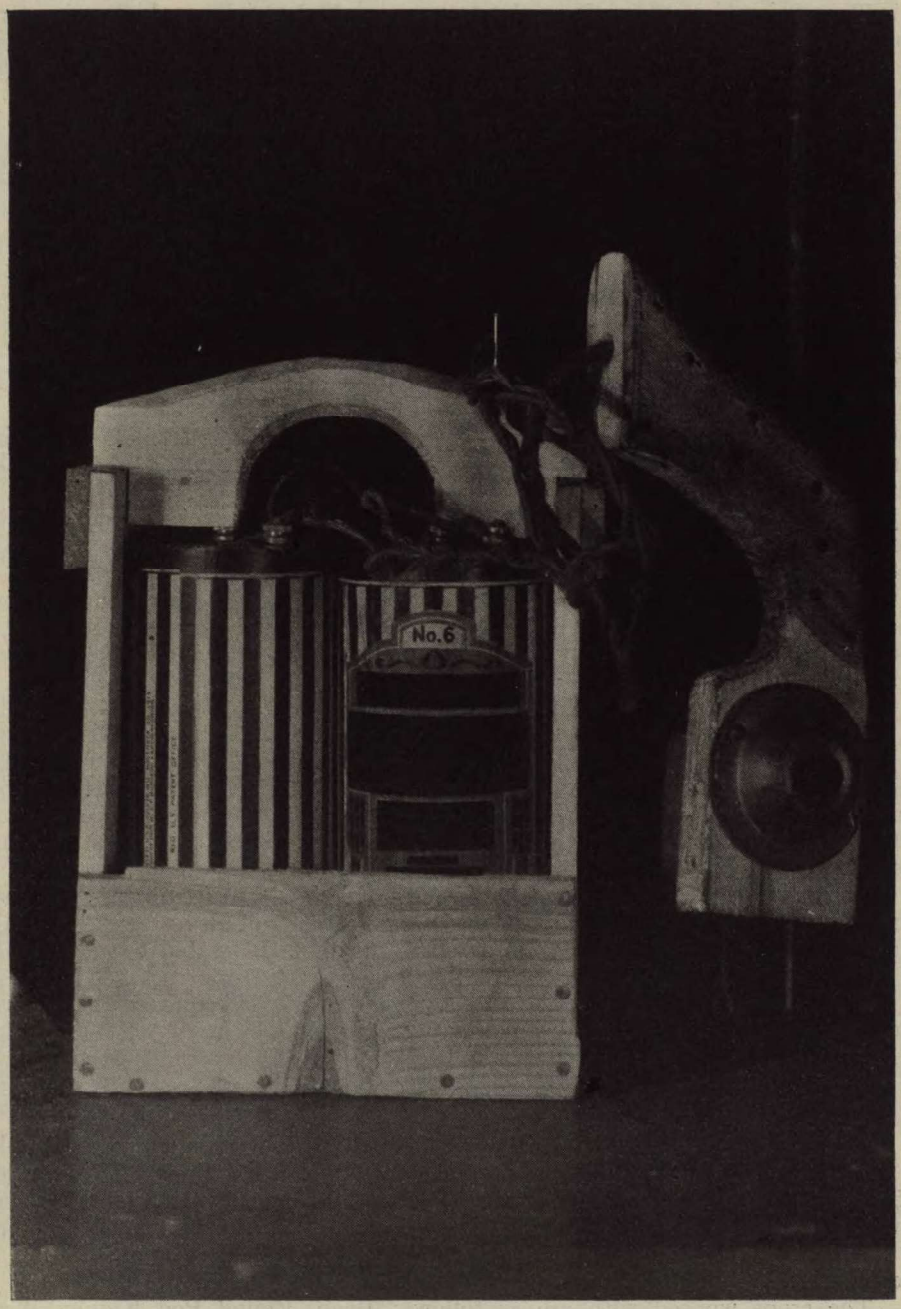
Banting x Golden Bantam is a very interesting corn that is earlier than Golden Bantam and produces yellow ears, the kernels of which are very tasty. This cross is a promising one and should be popular as a home or market garden sort.

Country Gentleman x Pickaninny is a dwarf growing white sweet corn that produces very attractive ears five to six inches long. The kernels are arranged irregularly on the cob like Country Gentleman and are deep, tender and sweet. The cobs are very small in diameter when stripped of the kernels. To those that like Country Gentleman as a table corn and cannot grow it on account of the shortness of season, this hybrid will certainly be found satisfactory since this new sort is ready for use in the season of Golden Bantam.

POLLINATION OF TOMATOES UNDER GLASS

For many years the old method of pollinating the tomato blossoms by hand was done with the aid of a rabbit paw or piece of absorbent cotton fastened to a wand. This was a tedious method but produced very satisfactory results. Another method that was employed was that of jarring the pollen out of the blossoms by tapping the trellis or stems of the plants. This was a much more rapid method than the former, but while more easily and quickly carried out, the completeness of pollination depended upon the condition of the blooms and the conditions in the greenhouse. There was the watch glass method also, which proved very effective, but was slow and tedious. These three methods are all well known to real growers of tomatoes.

With the desire to speed up production in all industries it seems essential that an effort should be made to find short cuts that will cut down on the



The home-made pollinator.

time for doing certain operations in the greenhouse. The age of electricity has brought with it many an easy method of doing work that otherwise was laborious tedious and costly.

Tomatoes may be pollinated by means of electricity, which of course applies to greenhouse conditions. A very inexpensive pollination outfit can be made by any handy man, which will perform the operation in a very rapid and complete manner. The materials required are:—

2 batteries, 1 volt each at 39 cents	$ 0 78
1 electric door bell	0 48
4 feet, two wire flexible lamp cord	0 25
1 door bell button	0 11
	$ 1 62

In addition to the above which cannot be bought is a handle upon which to mount the door bell and door bell button. The material required for this is a piece of pine board 1 inch thick, 5 inches wide and 7 inches long. This piece of wood is to be shaped into a pistol grip. By boring a hole $\frac{1}{4}$ inch in diameter up from the bottom end of the handle, the wire connections can be passed through to the button and bell making a very neat outfit.

The portion of metal projecting at the top of the bell frame for holding the bell, should be cut off either with a sharp file or hack-saw, and the rattler straightened out.

The batteries can be placed in a sling to be carried over the shoulder by means of a strap, thus leaving both hands of the operator, free to work the pollinator.

Equipment of a similar nature can be bought that will cost about eighteen dollars for the handle and vibrator part, without the batteries. This outfit could hardly do a more complete job than the home-made machine pictured below.

To pollinate the blossoms all that is necessary is to place the rattler or stilus close to the stem of the tomato flower, press the button and the rattler or stilus will strike a series of sharp raps, which jar the pollen out causing perfect pollination of the pistils. The pollen will fly in a very free manner quite to the amazement of the operator. The work of pollinating a whole range of plants can be done exceedingly rapidly and with very satisfactory results.

It must be admitted though, that a better average set of fruit was obtained where hand pollination was carried out. The set of fruit in an actual average count could be rated as, hand pollinated 8, machine pollinated 7, and tapped or jarred between 5 and 6.

To obtain the better set of fruits by hand work, it required about three times as long as where the electric pollinator was used.

FOUNDATION STOCK SEED PRODUCTION

To build up a supply of stock seed of the leading varieties of vegetables is the object of the program being carried out with nine kinds of vegetables, out of eleven lots assigned to the Horticultural Division, by the Plant Breeders Committee of the Canadian Seed Growers' Association. It was hoped that all of the assignments could be handled, but it was found out of the question at the present.

The crops worked with are as follows: Bean, Round Pod Kidney Wax; Beet, Detroit Dark Red; Carrot, Chantenay; Corn, Pickaninny; Lettuce, Grand Rapids; Onion, Yellow Globe Danvers, Red Wethersfield; Parsnip, Hollow Crown; Squash, Warty Hubbard.

It has not been the object of the plant breeders to build up too large a supply of such stock seed, nor is it possible to do this rapidly owing to the difficulty of obtaining satisfactory material to work with. A great many of the commercial strains while fairly satisfactory to the average grower are as a rule found to be very variable when a close study of the individual plants is strictly carried out. Therefore a large population must be grown and very thorough elimination made of all types that are not good enough. As a consequence the process of establishing satisfactory strains must naturally be slow.

Foundation Seed is the progeny of the individual plant in the hands of the original breeder, some plants of which produce only a few seeds, making it the more difficult to multiply this material with great rapidity. Another difficulty arising is that where the progeny of such individual plants splits up into undesirable strains, necessitating a fresh effort being made with some other segregation of the stock already on hand.

At this juncture it might be well to state that satisfactory progress has been made with the assignments to this Division. The strains now available are running very true.

In the report of the Dominion Horticulturist for 1926 the regulations governing the production of Foundation Seed, Elite Stock Seed and Registered Seed under the C.S.G.A. will be found. These regulations cover the work with A. Self-Fertilized Plants and B. Open-Fertilized Plants. Those interested in this work would do well to become familiar with these regulations.

MULCH PAPER

The experiment with mulch paper conducted during the season 1929, and reported upon in the Annual Report of the Division of Horticulture for that year, was again conducted during this season in the hope of obtaining results that would be more conclusive. This season the experiment was conducted in precisely the same manner as before, using the same kinds and varieties of vegetables. There was, however, one deviation from the previous year which did not affect the plants in any way, and that was in regard to a heavier type of paper. There are two types of paper. Type (A) which is thin and very tough, which comes in two widths 18 inches and 36 inches and contains 900 lineal feet, while the type (B) is heavier, comes in the same widths as the former but thicker and much easier put in place. The rolls contain only 450 lineal feet, or half the length of the former. The price of the latter paper is considerably more. Both of these papers are black and intended to be water proof.

As in the former year sixteen kinds of vegetables were used. In some cases two varieties of certain kinds were included to find the response that might be obtained from one and not the other. The arrangement of the plots was simplified in an effort to carry on the complete series to best advantage, and for a test of this kind duplicate plots were used, the kinds of crops and varieties running through mulch paper, check plot, mulch paper and check plot. Thus a fairly comprehensive idea of the influence exerted upon plants could be checked up so far as visualizing was concerned.

Land preparation was conducted the same as if the regular methods of gardening were to be pursued. Manure was applied, ploughing done, and harrowing to level and pulverize the ground. Then to put the soil in good fine condition the whole area was raked over and a light roller used to level the surface and crush any small lumps of soil.

The land used was a uniform piece of sandy loam that had been in garden crops the previous season.

Some of the difficulties of the former year experienced in connection with laying the paper in place were overcome to a great degree by using the type B paper. This paper is heavier and did not lift so easily with the wind, either while being put in place or after the paper was down and fastened. However, lifting by the wind was not the only difficulty that had to be surmounted, but this was responsible for a lot of damage, but the one which made the fastenings ineffective was the disintegration of the type A where it came in contact with the soil, under the laths and wires, or where it was covered at the ends with soil. Then the type B paper was put down in the hope that this heavier paper would last longer, but in precisely the same length of time required for type A paper to disintegrate it was found that the type B behaved identically. This required replacement of the fastenings and in some instances complete replacement of the mulch where the wind tore it away entirely. Where it was possible to keep the paper in place until the plants spread out the problem was solved simply by the plants holding the paper in place.

Mulch Paper Experiment, 1930—Hearts of Gold muskmelons on mulch paper in the foreground. Note the vigour of growth on the paper as compared with the plants in the check plot, also notice how the paper had disintegrated at the end where soil anchoring had been employed.

It was also found that in putting mulch paper in the field a calm day should be chosen, as the slightest wind will lift the paper unless the fastenings are put in place as fast as the paper is laid.

The time required for placing the paper on the ground is another factor that would run the cost of mulching very high, especially where small plots were to be planted and mulched, not speaking of the time required for preparing the ground for putting the mulch down. It was found that it took two men between fifteen and twenty minutes to lay a strip of paper three feet wide and thirty feet long, using laths and wire staples. Where soil was used as the fastening and could be pulled on at the edges, the time required for placing a strip was slightly less than with the laths and staples.

Where the seed of certain of the varieties has to be sown along the edge of the paper the only method of fastening the paper is to use the laths, strips of lumber or long wire staples placed crosswise of the strips or lengthwise of the paper with staples at intervals to keep the paper from getting from under the wire. Laths, lumber and wire all add quite materially to the cost of mulching. However, where the crop adapts itself to planting through holes cut in the paper, the edge anchoring with soil pulled on, will be found effective and less costly as long as the soil does not disintegrate the paper before the spread of the plants will keep the paper in place.

Soil temperatures were taken this year at a depth of two inches below the ground level. Maximum and minimum incubator thermometers with a long stem were used for this purpose. These were checked for range or difference between the thermometer used for the meteorological records, the necessary corrections being made in the readings. The thermometers were placed in specially constructed boxes provided with a cover and lock to prevent tampering with by the curious and as a protection against breaking the stem of the thermometer

Soil Temperature—The temperatures were obtained two inches below ground level by setting this box in a horizontal position in the ground so that the projecting piece of pipe was down the correct depth. The thermometer shown was inserted inside the tube.

a piece of three-eighths inch iron pipe was fastened to the end of the box by means of crow foot threaded bracket, and the pipe passed to the inside of the box through a hole bored in the box end. The stem of the thermometer was placed in this piece of pipe. Then the box was placed in the soil with the iron pipe exactly two inches below ground level in a horizontal position. One of the boxes was placed in a check plot and one in a plot mulched with Gator Hide.

The readings were taken twice a day at 8 o'clock in the morning and at 5 o'clock in the evening.

In the following table will be found the complete record of average maximum, minimum and mean temperatures under ground as well as those taken by the Field Husbandry Division. The latter thermometers were of a standard type placed in a box four feet above ground, only a few rods distant from where these soil thermometers were situated.

—	Under mulch paper			Check plot			Meterological record		
	Average maximum	Average minimum	Mean	Average maximum	Average minimum	Mean	Average maximum	Average minimum	Mean
	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.	°F.
May.....	64·93	45·07	55·00	63·51	45·13	52·32	61·6	42·73	52·16
June.....	80·47	60·22	70·34	81·17	58·75	69·96	77·0	55·9	66·4
July.....	80·76	58·64	69·70	76·9	57·92	67·41	76·3	55·1	65·7
August.....	78·66	57·87	68·26	79·1	58·65	68·87	76·3	53·4	64·8

An analysis of the temperatures recorded indicate quite clearly that the mulch paper gave slightly higher temperatures in the average and mean during May, June and July, but the check plot had a slightly higher average and mean temperature for August.

Comparing the mulch and soil covered thermometer temperatures with those of the Meteorological records it is quite evident that the average temperatures and mean for these months were higher under ground than above ground.

BEANS RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date sown	Date of germination	Date of bloom	Height of plants when ready for use	Date ready for use	Snap pods	Ripe seed
						in.		lb. oz.	lb. oz.
Mulch.....	Round Pod Kidney Wax..	1929	May 29	June 5	July 7	18	July 22	30 14	3 9
Check.....	" " ..	1929	May 29	June 6	July 8	17	July 22	23 14	2 3
Mulch.....	" " ..	1930	June 16	June 21	July 20	12	Aug. 8	20 0	1 13
Check.....	" " ..	1930	June 16	June 21	July 21	12	Aug. 8	17 0	1 5
Mulch.....	Stringless Green Pod.....	1929	May 29	June 5	July 6	19	July 20	31 9	5 13
Check.....	" "	1929	May 29	June 6	July 6	17	July 21	25 10	5 12
Mulch.....	" "	1930	June 16	June 21	July 20	14	Aug. 8	22 2	2 7
Check.....	" "	1930	June 16	June 22	July 21	13	Aug. 8	19 5	1 13

It will be noticed that there is a slight difference in favour of the mulch paper, with both varieties of beans, in yield of snap pods and ripe seed. This difference in favour of mulch paper is less in 1930 than in 1929. At any rate, with not enough difference in earliness and only a small difference in increased yield in favour of mulch paper it would be unfair to conclude that profitable returns could be got.

BEET—RESULTS OF PAPER MULCH TEST

Treatment	Variety	Year	Date of sowing	Date of germination	Ready for use	Number of roots ready	Number of roots pulled in autumn	Weight of late roots
								lb. oz.
Mulch	Detroit Dark Red	1929	May 13	May 25	July 30	59	65	125 0
Check	" "	1929	May 13	May 25	July 30	86	62	124 0
Mulch	" "	1930	May 10	May 18	July 5	50	50	58 0
Check	" "	1930	May 10	May 18	July 5	54	45	49 8

The difference in this crop is not significant.

CABBAGE—RESULTS OF PAPER MULCH TEST

Treatment	Variety	Year	Date of sowing	Date of planting	Ready for use	Number of plants	Number of heads	Yield
								lb. oz.
Mulch	Copenhagen Market	1929	March 22	May 14	July 3	20	19	56 9
Check	"	1929	March 22	May 14	July 6	20	19	58 5
Mulch	"	1930	March 26	May 16	July 23	20	19	54 4
Check	"	1930	March 26	May 16	July 23	20	19	59 0

The cabbage crop did not respond sufficiently to warrant the laying of mulch paper. Head for head they were equally as early in the check plots and considerably heavier, as will be noticed by the weights in the table. In 1929 the heads were ready on a few plants three days ahead of the check plots, but in 1930 there was no difference.

CARROT—RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date of sowing	Date of germination	Ready for use	Number of roots one inch	Yield of of late pulled roots
							lb. oz.
Mulch	Chantenay	1929	May 13	May 26	July 16	61	41 0
Check	"	1929	May 13	May 26	July 18	81	31 8
Mulch	"	1930	May 10	May 19	Aug. 17	94	37 0
Check	"	1930	May 10	May 21	Aug. 18	86	40 8

The results in the case of this crop are not significant.

CAULIFLOWER—RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date of sowing	Date of planting	Ready for use	Total Yield				
						Marketable			Unmarketable	
						No.	lb.	oz.	No.	lb. oz.
Mulch	Snowball	1929	March 22	May 14	June 24	15	21	11	3	1 5
Check	"	1929	March 22	May 14	June 24	12	11	7	6	4 7
Mulch	"	1930	March 26	May 16	July 10	.....	.....		14	.....
Check	"	1930	March 26	May 16	July 10	.....	.....		8	.....

The slight difference in favour of mulch paper in 1929 was not significant and in 1930 the crop failed, due to cabbage root maggot. It was found that the maggots were just as bad in the plants in mulch paper as in the check plots.

CELERY—RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date of sowing	Date of planting	Height of plants four weeks after planting	Average height at harvest	Weight of six plants
					in.	in.	lb. oz.
Mulch	Golden Plume	1929	April 9	June 24	5	.....	9 4
Check	"	1929	" 9	" 24	5	.....	8 4
Mulch	"	1930	March 22	June 25	3	24·9	7 13
Check	"	1930	March 22	June 25	3	24·4	6 12

The check plot grown celery was quite as good as that from the mulched plots.

CORN—RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date of planting	Date of germination	Average height	Number of ears	
						Marketable	Unmarketable
					in		
Mulch	Golden Bantam	1929	May 29	June 5	24·9	76	10
Check	"	1929	May 29	June 6	19·8	69	6
Mulch	"	1930	May 28	June 5	42·5	37	28
Check	"	1930	May 28	June 6	29·55	40	31

In so far as the germination was concerned mulching did hasten the emergence of the plants by about one day. In average height of plants the average was in favour of mulch plots, as well as a slight difference in yield of marketable ears when taken on the average for the two years. The check plots in 1930, however, outyielded the mulch plots.

CUCUMBER—RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date of sowing	Date of germination	Average length of vines when 3 weeks old in field	Date first fruit ready six inches long	Average vine length end of season	Total yield			
								Marketable		Unmarketable	
								No.	lb. oz.	No.	lb. oz.
					in.		in.				
Mulch	Perfection	1929	May 29	June 5	24·19	July 24–27	.....	390	388 7	83	6 8
Check	"	1929	May 29	June 6	22·66	July 27–29	.....	291	231 12	48	4 4
Mulch	"	1930	May 6	May 12	31·57	Aug 4	86·2	389	302 8	48	35 0
Check	"	1930	May 6	May 13	28·7	Aug. 6	65·5	299	224 2	39	30 0

This crop responded very well to the use of mulch paper both in length and growth of vines as well as yield of fruit.

A heading variety of lettuce was used in this test. It will be noticed that Iceberg was used in 1929, and Paris Market in 1930. In the former year a very poor stand of plants was obtained and as a result when the seed was being sown in 1930 one row of Iceberg and one row of Paris Market was sown. The Paris Market gave a perfect stand while, owing to poor germination, there was only a few plants of Iceberg that developed, consequently the records for yield were taken from the uniform row of plants.

The Paris Market seed was produced in the Horticultural Division, Central Experimental Farm.

LETTUCE—RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date of sowing	Date of germination	Ready for use	Weight of six heads
						lb. oz.
Mulch	Iceberg	1929	May 13	May 22	July 4 to 20	10 0
Check	"	1929	" 13	" 22	" 8 to 10	11 0
Mulch	Paris Market	1930	" 10	" 16	" 12	5 2
Check	"	1930	" 10	" 17	" 12	4 10

In 1929 the season of cutting was longer in the case of the lettuce on mulch paper than the check plots, but the check plots produced heavier heads on the average with a shorter cutting season.

In 1930 the season of cutting was very uniform and it will be noticed that the heads were slightly heavier from the mulch paper plots. The difference is not significant.

MUSKMELON—RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date of sowing	Date of planting	Date of blooming	Ready for use	Average yield					
							Marketable		Unmarketable		Green	
							Number of fruits	Yield	Number of fruits	Yield	Number of fruits	Yield
								lb. oz.		lb. oz.		lb. oz.
Mulch	Hearts of Gold	1929	May 4	June 5	June 20	Aug. 24	28	42 11	56	72 2	74	74 8
Check	"	1929	May 4	June 5	June 21	Aug. 26	35	43 11	32	39 9	87	90 0
Mulch	"	1930	May 6	June 10	July 6	Aug. 28	19	23 13	.....	.....	327	461 0
Check	"	1930	May 6	June 10	July 7	Aug. 28	19	27 12	.....	.....	201	224 0

Measurements of vine lengths were taken at three different dates during the season of growth and in every case the vines under mulched conditions showed greater activity than those on the check plots. The measurements following give the average length of the vines in inches.

	Mulch plot length in inches	Check plot length in inches
Aug. 8	9·32	4·03
Aug. 23	41·49	33·0
Sept. 14	111·5	99·1

These measurements show quite clearly that the vines under mulch conditions develop more rapidly than those in the check plots.

ONION

The seed was sown in a drill along the edge of the strip of paper, and covered to a depth of half an inch, then another strip of paper placed in position. The seed in the mulched plots germinated in exactly ten days, while it required twelve days for the seed to germinate in the check plots. During the season of growth the plants under mulched conditions made uniformly better growth than those in the check plots. As the season of maturity advanced the check plot plants were equally as good as those in the mulched plots. A serious infestation of root maggots destroyed a large amount of the crop rendering the final harvest useless so far as comparable yields were concerned.

From the development of the plants that remained it would seem that mulching did not produce sufficiently better plants to recommend its use very strongly.

Mulch paper does not inhibit the work of root maggot in the least.

PEPPER

To be certain that a fair degree of success could be depended upon, an early variety of pepper was chosen. The Harris Earliest variety is not a large growing sort, that is, the plants are small and fruit earlier, producing sweet peppers of excellent quality. The plants were started in the greenhouse, pricked out into hotbeds and grown there until the danger of frost was past. The rows were spaced thirty-six inches apart with the plants eighteen inches apart in the rows. The plants were set along the edge of the paper, then another strip of paper was placed on the opposite side close up to the plants allowing a space of not more than one inch between the strips of paper for the plants to grow.

PEPPER—RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date of sowing	Date of planting	Date ready for use	Ripe	Green, marketable	Green, unmarketable	Total average number of fruits
Mulch	Harris Earliest	1929	Mar. 22	June 15	Aug. 1-7	38	50	19	107
Check	"	1929	Mar. 22	June 15	Aug. 7-10	26	18	22	66
Mulch	"	1930	Mar. 26	June 17	.....	9	21	.....	30
Check	"	1930	Mar. 26	June 17	.....	4	18	.....	22

The above table gives a relative idea of the effect of mulch paper upon the crop. In 1929 a much more striking effect was produced by the mulch paper than in 1930. However, it is quite clear that the pepper crop showed a benefit from the paper. Plant growth in the mulched plots was noticeably better than in the check plots throughout the entire season.

POTATO

The method of planting employed was to first put a three-foot wide strip of mulch paper in place, then open a drill four inches deep along the edge. The potato sets were dropped twelve inches apart, covered with soil and another strip of paper put in place allowing a space of one and a half inches between the edges for the plants to develop through. Two varieties were used, Irish Cobbler and Green Mountain.

POTATOES—RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date of planting	Date of germination	Date of bloom	August 15 — 15 hills dug as early		September — 15 hills end of season	
						Marketable	Unmarketable	Marketable	Unmarketable
						lb. oz.	lb. oz.	lb. oz.	lb. oz.
Mulch	Irish Cobbler	1929	May 20	June 3-5	July 3-6	19 12	0 15	21 8	2 4
Check	"	1929	May 20	June 5-6	July 5-7	19 12	2 1	22 8	2 0
Mulch	"	1930	May 28	June 11	July 8	22 12	2 3	23 4	1 12
Check	"	1930	May 28	June 12	July 8	20 8	1 14	26 8	4 4
Mulch	Green Mountain	1929	May 20	June 4	July 3	22 0	1 7	32 4	1 10
Check	"	1929	May 20	June 5	July 4	18 1	1 6	31 12	1 8
Mulch	"	1930	May 28	June 11	July 2	24 4	2 1	30 12	0 13
Check	"	1930	May 28	June 13	July 2	16 4	1 5	31 8	1 4

In both cases where the potatoes were dug for early market there was a slight advantage in favour of mulch paper, but where the crop was left to mature completely the check plot yields were better. The plants in the mulched plots were more vigorous.

TOMATO

This test was conducted in precisely the same manner this season as in 1929, one variety, Bonny Best, being used, with the plots in duplicate. Ten plants were set out in each plot, three by three feet apart. In setting the plants in the mulch plots they were set out along the edge of the strip of paper that had been put down in place and when the planting was completed another strip of paper was put down on the opposite side and fastened down with laths and wire staples. A space of slightly over an inch was left between the strips of paper where the plants were set out. This allowed ample space for the plants to grow.

TOMATO—RESULTS OF MULCH PAPER TEST

Treatment	Variety	Year	Date of sowing	Date of planting	Ready for use	Ripe Fruit						Green	
						Month marketable		Season marketable		Unmarketable			
						Number of fruits	Weight	Number of fruits	Weight	Number of fruits	Weight	Number of fruits	Weight
							lb. oz.		lb. oz.		lb. oz.		lb. oz.
Mulch....	Bonny Best...	1929	April 13	June 10	Aug. 9	22	5 11	344	112 10	7	1 13	569	140 4
Check...	" ..	1929	April 13	June 10	Aug. 9-11	32	8 12	242	71 1	6	1 8	236	58 0
Mulch....	" ..	1930	Mar. 26	June 7	July 28-30	35	9 7	349	110 7	30	8 12	.....	.....
Check...	" ..	1930	Mar. 26	June 7	July 28 and Aug. 4	21	7 8	358	114 8	22	8 4	.....	.....

In the foregoing table will be found the results of two seasons' work with this crop. It will be noticed that mulch paper treated plants ripened fruit slightly earlier in 1929 and produced fewer early market fruits, as well as pounds of fruit, than the check plots. In 1930 the crop from mulch paper was considerably earlier as well as slightly larger during the first month period, but this difference is not significant enough to warrant the making of a strong recommendation, since the average yield of early fruit for the two years is somewhat in favour of the crop from the check plots.

It is quite evident that there was a larger crop from the mulch paper during the late part of the season but this has little bearing on the merits of mulch paper gardening when it must be remembered that at that season of the year tomatoes are very plentiful and worth very little in dollars and cents.

CONCLUSIONS.—The mulch paper project offered many difficulties again this year, as formerly. The three methods of fastening the paper, staples and laths, long wire staples crosswise on the strips of paper, and the ends and edges of the paper covered with soil, all proved quite inadequate as well as costly.

Two types of paper were used this year, type A which is thin and the type B which is much thicker and supposed to be more durable. It was found that within two weeks after being placed on the ground both types of paper had disintegrated where the fastenings held the paper down. The paper had disintegrated where the soil was used to hold it in place, thus rendering it necessary to reset the fastenings a couple of times before the plants had spread enough to hold the paper down.

The type B paper was found to withstand wind much better, was easier to put in place and to withstand treading upon by the workmen. This paper however cost just twice as much as the thin paper and is put up in rolls just half as large as the thin paper.

It is a certainty that warm season crops like melons and cucumbers do respond to the use of mulch paper.

While some advantage was shown with a few of the crops the difference in favour of mulch paper was hardly enough to make strong statements in its favour.

The home garden plot can be readily kept free from weeds by the use of mulch paper.

Insect pests and diseases were as prevalent on the plants under mulch as in the check plots.

The temperature under the paper was slightly higher during May, June and July, but lower during August.

None of the paper used for mulch could be salvaged as it had perished badly. This would indicate that the cost of new mulch paper each year would have to be provided for by the grower.

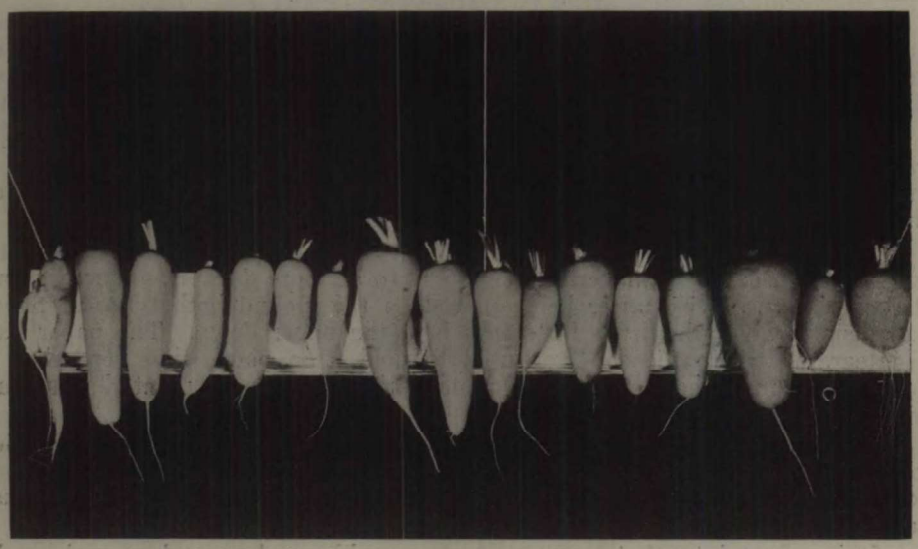
PURITY TEST

The testing of vegetable seeds for purity of variety and trueness to type, as a check up on seeds imported into Canada, was continued this season, in co-operation with the Seed Branch, Dominion Department of Agriculture. The seed samples were collected by the seed inspectors of that Branch, at the various ports of entry and other sources and submitted to the Division of Horticulture under number to be included in a field test.

A list of the kinds and number of samples is as follows: Bean 407, beet 4, broccoli 8, Brussels sprouts 1, cabbage 8, carrot 8, cauliflower 6, celery 2, corn 13, cucumber 7, borecole or kale 1, lettuce 7, onion 2, parsley 2, parsnip 1, pea 427, radish 4, rutabaga 3, spinach 3, squash 4, tomato 4, turnip 1.

In the beans and peas a large number of samples were found to be mixed. The mixing would indicate cross-fertilization in a great many cases. In others, wrong names had been used. For instance where Kidney Wax was used as the name the correct name was Kentucky Wonder Wax which is a pole variety.

Space will not permit of a discussion of all the irregularities found. This information was supplied to the Seed Branch, Dominion Department of Agriculture, in a report covering the entire list of varieties.



From One Commercial Sample of Carrot Seed—This variety was supplied for purity of variety test under the name of Perfection or Favorite.

SEED STOCK VERIFICATION

The testing of seed stock of vegetables, in co-operation with the Canadian Seed Growers' Association, for eligibility for registration was undertaken this year again, samples of seed of the various stocks were collected from the various growers by the secretary of the C.S.G.A. and submitted under number for trial. These samples were taken apparently from some very true stock since only a few of these were turned back for further work.

The kinds of vegetables and number of samples under test were as follows: Bean 6, beet 1, cabbage 2, carrot 2, cauliflower 2, celery 1, corn 6, cucumber 1, lettuce 3, onion 2, parsley 1, parsnip 1, pea 6, radish 1, spinach 1, squash 1, tomato 1.

At the conclusion of the test a report was sent to the Secretary of the Canadian Seed Growers' Association regarding the performance of these stocks. From that source information can be had as to the availability of seed of these strains.

RECOMMENDED VARIETIES OF VEGETABLES

Varietal differences in vegetables constitute one of the greatest boons to the growers in a country with a wide range of soil and climatic conditions. These differences make it possible for the gardener to choose varieties that will be suitable not only to the soil and climate but in many respects to suit the requirements of the market and tastes of the people.

The most satisfactory varieties suitable for the Ottawa district are given in the following lists:

ASPARAGUS

During the past few years an effort has been made to encourage the growers to plant highly productive strains of disease resistant asparagus. The productiveness of an asparagus bed depends to a large measure upon the choice of crowns. That is, crowns that produce shoots of large size. All crowns producing a large number of small shoots should be discarded.

MARY WASHINGTON.—Being a disease resistant variety that produces dark green shoots with purple shading over the tip. The shoots remain in marketable condition when considerably over market cutting length. This variety should be planted more extensively than it is.

PALMETTO.—A desirable variety than has been known for many years and is a very good substitute if Mary Washington is not obtainable.

BEANS (DWARF OR BUSH)

The bean crop has not received very much attention in so far as the origination of new varieties of outstanding merit goes. It would appear that selection work during the past has been the basis of improvement.

ROUND POD KIDNEY WAX (BRITTLE WAX).—For many years this splendid wax podded sort has been a leading high quality variety that yields well. The pods are a clear wax, free of strings, very fleshy, decidedly round podded, measuring about seven inches long and curved backwards.

The dry seeds being white with only a slight brownish mark on the eye side, makes this a very desirable bean for baking.

STRINGLESS KIDNEY WAX.—This is a very fine variety of much the same appearance of Round Pod Kidney Wax. The pods are, however, different in shape, being flat oval and quite straight, developing to between six and seven inches long.

The dry seeds are difficult to distinguish from the former variety having a white seed coat, but the marking on the eye side is slightly darker and not quite so extensive. Also suitable for baking.

PENCIL POD BLACK WAX.—A very satisfactory black seeded round podded wax variety. On account of being a good yielder and possessing high quality is recommended as a home and market garden sort.

DAVIS WAX.—This variety is very early maturing but being flat podded, with a lot of fibre and quite stringy, cannot be highly recommended, but being a heavy cropper and good shipper is a desirable sort for the truck gardener. The dry seeds have a white seed coat and bake very well.

HODSON WAX.—One of the best late maturing wax podded sorts. Some strains are quite free from anthracnose. If picked in the early stages the pods are very good quality with very little stringiness. Also very desirable for canning purposes.

RED VALENTINE.—A very desirable early maturing green podded variety. The quality of the pods is very good, very uniform in length, medium in size, creasebacked. A very desirable home garden sort.

STRINGLESS GREEN POD.—This is without doubt one of the best known high quality stringless green-podded varieties, surpassing all others for tenderness, fleshiness and good quality. The pods are very even in size ranging about five and a half inches long, double barrelled or creasebacked, curved backward, sharply constricted between seeds, absolutely stringless and without fibre. The seeds are dark brown occasionally flattened at one end.

POLE BEANS

Two classes exist, wax pod and green pod. Being a long season crop they require to be planted at the same time as the dwarf or bush varieties, but will be ready for use following after the bush sorts, thus giving a succession of crop.

The culture is much the same as for bush beans except that stout poles must be provided, or wires put up with stout cords attached for the plants to cling to. When planted in hills, the hills should be spaced four feet apart each way. Plant four to six seeds in each hill and when the plants are well established, thin to three to the hill. From time to time the vines should be started up the poles or twines.

When wire and string is used as a means of support, the seeds should be planted two in a place, twelve inches apart with the rows three to four feet apart. The wire is strung to posts that would be at least six feet above ground planted at the ends of the rows. One wire is close to the ground and another at the top of the posts. The intervening space may be broken by means of stakes as a support to the wire. Stout twine is used for the plants to run up on.

KENTUCKY WONDER WAX.—This variety is one of the best known of the high quality, early maturing sorts. The plants are very good climbers, productive, but are not rank growing or branching. The pods are characteristically rough in appearance with exceedingly clear waxy pale yellow colour, long, thick, fleshy, tender, when young are very tender and almost entirely stringless. Towards maturity are streaked with pink. Seeds are dark brown in colour.

GOLDEN CLUSTER.—This variety is quite late in maturing. Vines are good climbers, large, moderately branched, producing pods of a very attractive waxy yellow appearance, flat, broad, of medium length. The pods remain in good condition for a reasonably long time, are stringless in the early stages, produced in fairly large clusters.

KENTUCKY WONDER (GREEN POD).—The plants and pods are quite similar to the wax podded variety of Kentucky Wonder. The pods are a very attractive green shade and of equally as good quality. In season this variety is the same as the former. The seed coat is quite gray or drab.

BEET

Many varieties are advertised, but if the gardeners would use those varieties that are recommended there is little doubt but that satisfactory results would be obtained.

FLAT EGYPTIAN.—As the name implies it is essentially a flat type, being shallow in depth from crown to root, and growing almost on the surface of the ground. The quality is not, however, the best, but the roots mature rapidly for early market and when used in the early market stage possesses sufficient quality to warrant being used as an early sort for bunching.

CROSBY EGYPTIAN.—This is a selection of Flat Egyptian with greater depth of flesh through the centre from crown to tap root. The flesh colour is decidedly better than the former. This variety is very desirable for early sowing and main crop.

DETROIT DARK RED.—Without doubt this is one of the best all round varieties for home, market garden, and canning purposes. The roots are well rounded, smooth, deep and rapid growing. The quality is superb coupled with excellent colour. An excellent variety for successional sowings.

BRUSSELS SPROUTS

This crop has not been found entirely satisfactory under conditions in the Ottawa district. Occasional years fair success has been obtained. Improved Half Dwarf (Paris Market) and Dalkeith have done as well as any.

CABBAGE

A great many very satisfactory varieties have been in commerce for years. The market could take care, however, of more uniform maturing strains than are now available.

Golden Acre—Plants potted up in the autumn for seed, growing under controlled conditions in the greenhouse during the winter months.

GOLDEN ACRE.—This is a very early round heading strain of Copenhagen Market, but is so much earlier than the latter that it is really worth growing. The heads do not become quite so solid as the original Copenhagen Market, but the quality is excellent for an early sort.

EARLY JERSEY WAKEFIELD.—The heads of the variety are conical, compact, heavy, and of excellent quality. This variety has been used as a first early variety for many years and is still quite popular.

COPENHAGEN MARKET.—This is a leading early round heading variety becoming very popular as a first early and midseason sort. On account of the round shaped solid large heads, growers have been relying upon this variety more and more each year.

ENKHUIZEN GLORY.—As a midseason variety there is none that quite compares with this variety. It is, however, becoming quite difficult to obtain strains that are uniform. A good strain of this variety should be intermediate between Copenhagen Market and Danish Ballhead.

DANISH BALLHEAD.—There are three strains of this excellent variety all of which are very good for late fall, early winter or winter storage. These are known as the long stem, intermediate and short stem strains. The latter is to be preferred. A head of any one of these strains will be found to be very solid, heavy and possess excellent quality.

MAMMOTH ROCK RED OR DANISH STONEHEAD.—This is one of the most outstanding red varieties. The heads throughout are very fine quality and a deep red colour.

CAULIFLOWER

There are a great many varieties of this crop, but in reality if the grower uses the two which are mentioned below as good results as any will be obtained.

EARLY SNOWBALL.—To most growers this name means the height of perfection in an early good heading quality variety. As an early, midseason or late crop this variety has proved very satisfactory. The chief thing is to make successional sowings at intervals to suit the various localities, which will give maturity at the right season.

AUTUMN GIANT (VEITCH).—Of the late or long season varieties this is one of the best. The plants are large growing, thus fewer plants will be required per acre. The heads of this variety are usually very symmetrical and, with large foliage for protection, develops a very desirable marketable product.

CARROT

From all angles of vegetable gardening this crop is looked upon as one of the important ones. While there is a host of varieties that may be used to give a variety of types, yet it is in the best interest of the growers to use varieties that are best known and will produce the maximum of marketable produce. The two following varieties are used most extensively.

CHANTENAY.—This variety is one of the best of the half long type. The roots are very symmetrical, tapering gradually from a well hollowed crown to a blunt base or tip that terminates in a fine tail-like tap root. Surface smooth with a rich orangy red colour showing through the skin. The flesh or bark is quite thick around a core of medium size. This is a very fine grained, sweet, high quality sort, suitable for home, truck and market garden.

DANVERS.—This is essentially a market or truck garden variety. The quality is very much on a par with Chantenay. The roots of Danvers are more tapering to the point and have a full crown. This variety is certainly very good, but has a small percentage of bark to core when the roots are on the mature side.

CELERY

With the development of distant growing centres, during recent years, there has been a change in the choice of varieties. Popular demand is for celery of the self-blanching type, and so the growers are now using these types to supply an ever-increasing demand. The old green sorts have slowly but surely been discarded. In the self-blanching field there is, however, a number of strains that are not satisfactory, but on the whole gardeners will be well advised to use the two recommended.

GOLDEN PLUME.—The popular demand is for celery of this type. The plants grow large, possess fine texture, quite brittle, with good flavour. When ready for use the foliage and leafstalks develop a rich golden hue that makes the product very attractive.

GOLDEN SELF BLANCHING.—This variety has enjoyed the sway of market sale for many years. Many of the strains are, however, inferior being rather dwarf and poor growers. There is, however, some of the taller growing strains that are very superior.

FRENCH SUCCESS.—In some sections where celery is stored to blanch and for winter sale this green variety is without doubt of great value. The bunches grow to a good size, are compact and, when blanched, turn out very white or ivory-like, coupled with excellent flavour and texture.

CORN

The corn crop is becoming more widely grown each year and is without doubt one of the important home garden, truck garden and canning crops of this country. Corn can be grown now for table use where there is a season of 75 days, that is, free of frost. The average long season varieties cannot be grown successfully in such localities. This would indicate that corn is on the northward march.

PICKANINNY.—This variety has become very widely known in the cooler sections of Canada and the United States. The plants are very dwarf in habit, rarely growing taller than four feet. Produces ears five and a half inches long, that when ready for use are white with a slight purple fleck. Under Ottawa conditions this variety can be had ready for table use in less than seventy days. The quality is unequalled by any other variety known.

BANTING.—A yellow variety resulting from a cross between Howe's Alberta Flint and Pickaninny. This yellow variety is as early maturing as Pickaninny but has the added advantage of being yellow which makes it a very attractive sweet corn.

EARLY MALCOLM.—Where an early maturing high quality white variety is desired none can surpass this one. The ears are usually ready for use ten days before Golden Bantam, are about six and a half inches long and twelve rowed.

The above three varieties were originated in the Division of Horticulture, Ottawa.

GOLDEN BANTAM.—Ever since the variety was introduced under the present name it has increased in popularity. At times it is difficult to get true strains of the variety but, with the growing of pure line strains, growers should be able to get stock seed comparable with the original variety. The plants grow to a height of six feet, produce ears that range about six inches long, are eight rowed, with kernels that are deep, broad, thick and very tender and of a golden yellow hue, with a flavour that is not duplicated in any variety and is still the standard of quality and flavour.

CUCUMBERS

There is a very large number of varieties of cucumbers of the white spine type that are quite satisfactory. Some of these may be considered as synonyms. The leading ones are all that may be considered.

DAVIS PERFECT.—For table use this variety is undoubtedly very satisfactory owing to the early fruiting prolific habit. The fruits are of an attractive green and develop uniformly well, from 7 to 8 inches long, and remain in condition for a considerable time.

WHITE SPINE.—Under this variety name there may be considered a number of strains. The plants set fruit early and are as a rule paler green than the Davis Perfect and with more white showing.

EARLY FORTUNE.—This is another White Spine variety name that has associated with it early heavy fruiting. The plants are in many instances better setters of fruit than either of the above mentioned varieties.

SNOW PICKLING.—This cucumber is used exclusively for pickling, being of the black spine type. The fruits usually set in clusters rarely developing to any great size. In the immature stages they are picked for pickles or when about two to two and a half inches long.

KOHL RABI

At the present time this valuable vegetable which belongs to the cabbage family is not very popular. In fact the crop is not known at all in some sections. When well grown and the bulbs used when about three inches in diameter this vegetable is a very desirable one.

White Vienna is one of the best varieties. There is, however, a green and a purple variety.

LETTUCE

The importance of lettuce as a salad crop has increased many fold during the past few years, a point requiring little dilation upon. Both loose leaf and heading types are grown, but the heading types are the most popular. The heading varieties cannot be grown to perfection in all sections of the country nor can they be grown with as great certainty as the loose leaf types. Therefore both kinds are of great value.

GRAND RAPIDS.—A very rapid growing crisp, pale green, loose leaf variety that has enjoyed a good run for many years and is still very popular. The leaves are large, succulent, tender, crisp, pale green to green with a very wavy fringed-like edge.

ICEBERG.—An excellent folding crisp headed variety that has proved exceedingly good for home garden and truck farming. The heads being very firm are attractive even when shipped a long distance. The leaves are medium green with fringed edges that are slightly tinged with brown. Inside, the head is very compact, crumpled and very white.

NEW YORK.—This is a very crisp folding headed variety on somewhat the same order as the former. The leaves are deep or dark green, slightly waved or curved at the edges. When mature the heads are flatly globular, very firm inside, white, tender.

Another type of lettuce deserving of inclusion in the varieties desirable for market and home garden is the Cos type. This type is not so popular, but possessing desirable qualities not found in the former varieties should therefore be considered.

PARIS WHITE COS.—The heads are of the elongated upright type, compact, colour pale green. Leaves spathula-like, curving inwards spoon fashion with very pronounced numerous veins. The inside leaves blanch to an ivory white, very crisp, snapping, tender, sweet.

MUSKMELON

There is a greater demand for this type of melon than in former years. Some varieties are superior to others meeting the requirements of certain localities as a market crop and the tastes of the consumers, but the wide range of climatic conditions required that some consideration be given to the requirements of other localities where the most desirable varieties cannot be grown owing to the shortness of season.

EARLY KNIGHT.—One of the best of the early maturing green fleshed varieties. The flesh is slightly coarse but has very good flavour and is exceedingly sweet and tasty. A very desirable variety for an early maturing sort or where short season is to be contended with.

EMERALD GREEN.—This without doubt is one of the best of the early maturing, red fleshed varieties. The plants do not grow large, but produce, in a very prolific manner, fruits that are of medium size. When cut open the flesh is a splendid red colour, fine in texture with a rich sweet muskmelon flavour that is hard to surpass. The cavity is very small. One of the most reliable croppers.

CHAMPLAIN.—For several years this variety has been grown with good results. The fruits are much on the same order as Emerald Gem with the exception that the fruits of the strain tested were slightly larger and more uniform in size. The two varieties ripened fruit about the same time. The flesh is salmon pink inside, fine texture, sweet with a small cavity.

HEARTS OF GOLD.—Like the original Hoodoo melon, it is a good cropper. The fruits are medium to small in size, heavily netted, quite rounded to slightly oblong. Inside the flesh is a rich salmon tint, fine, sweet, excellent quality. A good main crop sort.

ONION

With a large number of varieties of onions to choose from, it is very confusing for growers to be certain of the ones best suited for the locality. The early-maturing varieties can be relied upon to produce a good crop when sown directly out of doors, without resorting to starting the plants in hotbeds and transplanting them later to the field.

EARLY FLAT RED.—For many years this variety has been grown and found to mature early. The bulbs are a good red with papery skin. Shape round, flattened around the top and decidedly so on the under side. Very shallow growing, but of the Red Wethersfield type.

RED WETHERSFIELD.—Slightly later maturing than the former. A variety that is very desirable for market and home garden. In shape the bulbs are round ovate, being quite full around the stem in the crown and quite full in the bottom, giving the bulbs an oval shape. A splendid variety for winter storage where a red variety is required.

RED GLOBE.—Where seasonable conditions are favourable this is without doubt one of the best of the red sorts. The bulbs develop to a good globe shape, very hard, firm. Flesh fine, tender, quite white with a slight red streaking in the flesh, rings thick. When well matured this is a good variety for winter use.

EBENEZER OR JAPANESE.—This is a very desirable yellow, early-maturing flat type with good quality. The bulbs do not grow large but are very firm, fine textured, and keep well in storage.

YELLOW GLOBE DANVERS.—Without doubt one of the best of the Globe type. The bulbs grow to good marketable size, mature well, and when stored keep throughout the winter splendidly. The skin is thin parchment like, yellow. Flesh fine, white, tender, sweet, not strong.

PRIZETAKER (DENIA).—For a variety for transplanting this one surpasses all others, but is late maturing, consequently should be started early in a hot-bed. The bulbs grow to a large size quite globular in shape, pale yellow skinned. The flesh is fine, tender, sweet, while the rings are thick, very mild.

EARLY BARLETTA.—One of the outstanding white, thin-skinned, early-maturing varieties, suitable for the production of pickles. The bulbs are very regular in shape, being round, flattened on the under side, consequently shallow growers.

PARSLEY

As a garnishing for the dinner plate this is possibly one of the best known and widely used. There are a number of varieties, some of which are very desirable. Of these the most outstanding are Triple Curled and Moss Curled.

PARSNIP

This crop does not seem to meet with favour in the market. One of the popular ideas is that if the roots become sprouted they are then unfit for use. This applies to the roots that are left in the ground over winter. Roots that have been left in the ground over winter will be found to be improved in flavour. To the writer's knowledge there has never been a single case of so-called poisoning result from roots that had grown good-sized tops in the spring. When the tops become large the texture of the roots becomes spoiled as they become spongy. A great many varieties are offered, but of these the one mentioned below is the best.

HOLLOW CROWN.—This is the best all round parsnip. Since this crop requires a long time in which to mature, the seed should be sown as early in the spring as soil and seasonal conditions will permit.

PEAS

There is a great range of varieties of peas that are useful for the particular purpose to which they are to be put. The following varieties will be found useful for the market and home garden:—

BLUE BANTAM.—Semi-dwarf in habit of growth, produces large pods that are usually well filled with large, dark green peas of good quality. This is considered a good early, large, wrinkled sort for market and home garden.

ENGLISH WONDER.—This early-maturing dwarf variety is an excellent producer. The pods are not large, but contain about six seeds that are tightly packed in pods that average about 2½ inches long. An excellent variety for home use.

THOMAS LAXTON.—For many years this variety has been considered the standard of good quality in garden peas. The plants are medium in height, averaging 36 inches, pale green, slender. The pods are quite large and well filled with peas of excellent quality that are very tender and sweet.

ADVANCER.—This variety follows after Thomas Laxton in season and is an exceedingly good variety. The vines grow to 36 inches high. The foliage is medium in size and density as well as fairly dark in colour. The pods are produced freely and well filled with peas of medium size that possess plenty of quality.

STRATAGEM.—This well-known large-podded, heavy-foliated, late variety is very valuable for the market garden.

BRUCE.—This variety was originated at the Dominion Experimental Station, Windermere, B.C., and being a large-podded variety is of excellent value as a market garden variety.

KOOTENAY.—Like Bruce this variety is an excellent contribution from the same source. The vines are quite long but the pods being large and well filled with large, tender, sweet peas makes this an excellent variety for the market garden.

PEPPER

The demand for peppers in this locality is fairly large, therefore market gardeners could supply a fair amount of this crop if the right varieties were used.

HARRIS EARLIEST.—A dwarf, early maturing prolific, high quality, sweet pepper. This variety produces very well every year at Ottawa and is therefore recommended.

HARRIS EARLY GIANT.—This variety is a decidedly good sort, being a slightly more gross grower and produces fruit larger in size than the former variety. It is a dependable variety for this section.

PUMPKIN

As a companion crop with corn this crop is very good. The fruits being used for pies make the crop easily disposed of. There are many varieties, but those that the vegetable gardener would be interested in are the ones that make the best product.

PIE (SWEET OR SUGAR).—The fruits of this variety are small in size being round ribbed, depressed at the stem and blossom ends. This variety has a dark grooved stem. The flesh is thick, fine grained, tender, sweet with a rich golden colour.

CHEESE OR KENTUCKY FIELD.—This is a large growing variety sometimes used for pie making, but the flesh is somewhat coarse. Skin creamy buff, ribbed, oblong to round oblong.

RADISH

There is a large number of varieties of radish, many of which are very good.

SAXA.—This variety is a very desirable round, red, early maturing variety that does not develop large leaves. It is suitable for forcing or early outdoor growing. This one remains in condition a long time.

SCARLET TURNIP WHITE TIP.—Is still a favourite.

FRENCH BREAKFAST.—Is also popular with growers.

ICICLE.—This one is one of the best of the long, white sorts.

RHUBARB

The rhubarb crop being one of the staple perennial crops receives a lot of attention. The older sorts are not so much in favour now since improved varieties have been got.

RUBY.—This variety is earlier growing and heavier yielding than Victoria. The leaf stalks are larger than the latter and have the added advantage of having a greater amount of red colouring throughout the flesh. The colour is not just below the skin but throughout the entire flesh. The plants are quite different to any other, being very compact. Leaves cordate, pointed, dark green, drooping downward, an excellent variety for home garden or market garden.

MACDONALD.—This variety is of comparatively recent origination. In this variety the leaf stalks are slightly larger than the Ruby, but the colour is carried directly under the skin with the main part of the flesh clear white. The plants are very uniform in habit of growth. Leaves pale green, fairly upright, bluntly pointed. An excellent variety for market or home garden.

SALSIFY

While this is not an important crop yet some people grow it for use in soups.

SANDWICH ISLAND.—Is the best of the white sorts.

SCORZONERA AND BLACK SALSIFY.—The roots of this variety are straighter than the former, but it is dark skinned.

SPINACH

Being one of the chief green crops in this country and one of great importance in the human diet spinach should receive a lot of attention. Spinach can be produced on muck land that is very free from grit, which is one of the common difficulties.

Early and late sowing on rich land will prove very remunerative, as well as helping to avoid the leaf miner that usually works in the leaves as soon as the weather turns warm.

KING OF DENMARK (ANTVORSKOV).—This variety is one of the best since it remains in season for a long period before bolting to seed. The leaves are large, dark green, savoyed or crumpled.

NEW ZEALAND (TETRAGONIA EXPANSA).—This is not a true spinach but thrives during dry, hot summer weather. It requires a long time to become ready for use. The seed being slow and poor to germinate should be sown fairly thickly. When the plants come up, thin to nine inches apart and later to eighteen inches apart. Since it is only the tips of the branches that are used and as the plants will grow to a spread of three feet it is quite evident that a large plantation will not be required to supply a large amount of greens.

SQUASH

A great many varieties of squash are now offered which will, if properly handled, supply this valuable vegetable through the season. Squash should be stored in a moderately warm, dry room.

YELLOW SUMMER CROOKNECK.—As an early squash has no equal. This squash should be used when about half grown. There is a straight type that is better for packing where they have to be shipped.

DES MOINES.—Is a small fruited very prolific sort. Fruits blunt at stem end, tapering bluntly to the blossom end, angularly ribbed, dark green. A good substitute for sweet potatoes.

DELICIOUS.—This variety is one of the best of the hard shelled, long keeping squash. In shape the fruits are blunt or squared off at the stem end, tapering bluntly to the blossom end. The skin colour is greyish green, smooth with shallow ribs. Flesh thick, firm, fine, with rich golden yellow colour. A very desirable variety for winter storage.

HUBBARD.—This has been recognized as a desirable sort for winter storage and known to growers for years. The fruits are medium in size depending on the strain. Skin smooth, slightly ribbed to slightly warty surface, dark green with slightly greyish markings at the blossom end. The flesh is a rich golden hue, thick, sweet, fine texture. If well ripened, carefully handled and stored in a warm room they will keep throughout the winter.

SWEDE TURNIPS

This vegetable should be sown the last week in June. The drills thirty inches apart with the plants thinned to nine inches apart in the row. Late sowing will produce roots of a nice size that will be tender and sweet for winter use.

CANADIAN GEM (NEW CENTURY OR UNIVERSAL).—This variety has been found to be one of the most satisfactory sorts for culinary purposes. The roots are quite well rounded, free from prongs. The neck is small, skin smooth, purple to about the ground level. Inside the flesh is a rich golden yellow. A very firm variety with exceedingly good quality.

TOMATO

There is a very large list of varieties some of which are very outstanding. In short season sections the early maturing varieties are very valuable.

ALACRITY.—This is without doubt one of the earliest maturing tomatoes having been successfully matured where others have failed. It is of the Earliana type but having been selected for early maturity for a long time has proved its worth. Ripe fruit can be had in 104 days from seed sowing.

BONNY BEST.—For many years a standard second early high quality variety for home, market garden, and canning purposes. The plants are stronger growing than the Earliana variety.

MARGLOBE.—A variety of recent origin that has taken the place of many of the varieties following Bonny Best. Marglobe is, however, rather late maturing to be of greatest value to the growers in this locality, since the most of the fruit become marketable when tomatoes are selling very cheap.

TURNIP

The turnip crop is not very popular, but can be grown exceedingly well.

PURPLE TOP MILAN.—This sort is extremely early in maturing; in other words, a quick-growing variety. The roots are shallow, flat, with a purple marking on the skin. The quality is very good when used when about 2 inches in diameter.

VEGETABLE MARROW

The vegetable marrow being a very desirable vegetable should be grown more extensively than it is. Plant the seeds in prepared hills spaced nine by nine feet apart. Allow three good plants to each hill.

WHITE TRAILING.—This is without doubt one of the best sorts. When the shell of the fruits has become firm they should be carefully harvested and stored in a warm room, where they will keep nicely throughout the winter.

The fruit may be used when half grown as a boiled vegetable, dressed with butter, pepper and salt to taste.

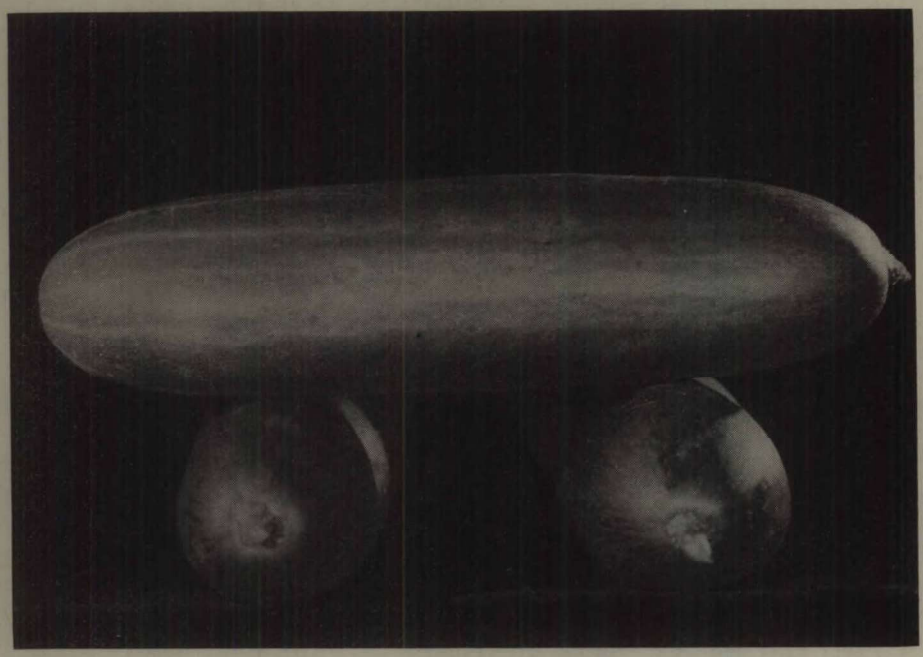
BREEDING CUCUMBERS FOR GROWING UNDER GLASS, AND CROP OF 1930

During the past nine years a cucumber has been developed in the greenhouses of the Division of Horticulture, Ottawa, which, it is believed, is of great merit and worthy of being widely grown under glass. This work was begun in 1921, when the variety Hescrow, developed at the Experimental Station, Vineland, Ont., especially for growing under glass without pollination, was crossed with the Deltus, a deep green variety, and one of the best greenhouse cucumbers.

From the resulting cross some very promising varieties were obtained. These were grown for comparison, and only those retained which approached nearest the desired type, which is a dark green cucumber of about 8 inches in length when ready to market, cylindrical in shape, and with a small seed cavity.

Selections have been continued each year since, and other crosses made, and the strains grown in 1930 were very good indeed.

The illustration of this cucumber in this report shows its contour.



Cucumber—Hescrow x Deltus, originated in greenhouses, Division of Horticulture, Ottawa.

OBJECT OF THE EXPERIMENT.—To test the progeny of six selections from individual well-shaped, deep green cucumbers from individual and separate plants of Hescrow x Deltus and Abundance x Hescrow x Deltus 2B No. 6 saved from the crop of 1929, in order to learn how true the selections came to type, their habit of cropping and amount of crop, and whether it was a desirable type for the trade, and to select from this crop individual cucumbers as near the desired type as possible.

WHERE AND HOW THE EXPERIMENT WAS CONDUCTED.—The vegetable house (No. 7) was used for this experiment. The soil was rotted sod and manure. The lowest night temperature was 60°.

The strains used were:—

Abundance x Hescrow x Deltus 2B No. 6.
Hescrow x Deltus 1D No. 1.
Hescrow x Deltus 2C No. 1B.
Hescrow x Deltus 2B No. 5.
Hescrow x Deltus 2C No. 1D.
Hescrow x Deltus 2B No. 6E.
Hescrow x Deltus 2B No. 6A.

Date of sowing seed, March 19, 1930.
Date of planting in bed and benches, April 8, 1930.
Distance apart of planting in bed, 3 feet.
Distance apart of planting in single row on benches, 4 feet.
Total number of plants in house, eighty-three.

Area of house occupied by plants: bed, 440 square feet; benches, 408 square feet.

Method of training: benches, fan-shape; bed, single stem.
The flowers were pollinated by hand.
Date of first picking, May 5.
Date of last picking, July 5.

TOTAL YIELD OF ALL PLANTS FROM WHOLE HOUSE

Situation	Number of plants	Number of marketable fruits	Weight marketable fruits		Weight unmarketable fruits		Average yield per plant whole season
			lb.	oz.	lb.	oz.	lb.
Bed	45	990	925	2	3	6	20·56
East Bench	19	523	479	5	1	2	25·23
West Bench	19	530	485	8	–	4	25·25
Total	83	2,043	1,889	15	4	12	22·77

AVERAGE YIELD OF EACH STRAIN FROM WHOLE HOUSE FOR WHOLE SEASON

Strain	Number of plants	Number of fruits	Weight marketable fruit		Weight unmarketable fruit		Average yield per plant for whole season
			lb.	oz.	lb.	oz.	lb.
Abundance x Hescrow x Deltus 2B No. 6	6	115	106	2	.....		17·69
Hescrow x Deltus 1D No. 1	11	279	259	0	.....		23·55
" x " 2C No. 1B	25	636	586	5	1	2	23·45
" x " 2B No. 5	10	244	226	11	–	12	22·67
" x " 2C No. 1D	10	248	230	10	1	12	23·06
" x " 2B No. 6E	11	267	246	11	1	2	22·43
" x " 2B No. 6A	10	254	234	8	.....		23·45
	83	2,043	1,889	15	4	12	22·77

TIME SPENT ON VARIOUS OPERATIONS

	hours
Preparation of soil	20
Sowing seed	5
Planting in beds and benches	7
Tying	10
Pollination	157
Watering	109
Harvesting	32
Cutting down vines	5
Total	345

RECEIPTS

2,043 cucumbers at $1.19 per doz (average price obtained per dozen)	$ 202 60

EXPENDITURE

345 hours of labour at 37 cents per hour	$ 127 65
	$ 74 95

Average price obtained for cucumbers at first sale, May 20	$1 66
Average price obtained for cucumbers at end of first two weeks' sale	1 26
Average price obtained for cucumbers at end of first four weeks' sale	0 84
Average price obtained for cucumbers at end of season's sale	0 85

NOTES ON THE CROP.—The plants grew well and nearly all of them remained healthy until pulled. The wider distance of planting this year proved an advantage.

*CANNING

The principal work of the Canning Department of the Division of Horticulture is to test the various fruits and vegetables to obtain the best method of preservation for each variety. Preservation includes canning, jellies, jams, conserves, marmalades and pickling. Fruits and vegetables are tested under the above headings according to their kind; for example, a fruit may be canned, or made into jam or jelly, and from this can be ascertained the best method of preserving that fruit.

In previous years the experimental work on canning was carried on chiefly by one method; that is the hot water bath. This year several other methods were tested more extensively. These include the steam pressure cooker, the waterless cooker and the electric oven method.

The steam pressure cooker is constructed of pure aluminum cast with a cover which fits securely into the cooker and fastens with several clamps. This enables the steam to be held under high pressure and temperature. It is fitted with a petcock, a safety valve and pressure gauge. The gauge registers both pressure and temperature. By proper manipulation the cooker can be brought up to a certain temperature and pressure and remain constant at that pressure as long as may be required. Fluctuation in pressure as from 10 to 15 pounds and down again may result in loss of liquid in the jar. The advantage in the pressure cooker is that it shortens the time of sterilization and is a much safer method of canning non-acid vegetables, such as peas and corn, which are more readily attacked by bacteria. All bacteria are killed at a temperature of 240 to 250° F. and 10 to 15 pounds pressure, and a pressure cooker is the only apparatus available to procure this temperature and pressure at the same time. The disadvantage of the pressure cooker is that the initial cost is much more than the average housewife can afford to pay.

The waterless cooker is merely a deep aluminum pot with a heavy fitted cover and an insulating base which is separate from the cooker. The cooker sits in the base so does not actually touch the stove. Fruits and vegetables sterilized in the waterless cooker are superior in colour and appearance.

The disadvantages of the waterless cooker are:—

(1) It is not waterless as in the case of canning and could be described as a glorified steamer. Enough water is needed to create steam and prevent burning.
(2) There is no way of showing when the cooker reaches the required temperature for sterilizing, therefore it is not accurate.
(3) The initial cost though not so great as the pressure cooker is more than the water bath equipment, and the only advantage is in colour and appearance and shorter time is required to reach boiling point.

In the oven method the jars are placed on a rack above the drip-pan. This method is quicker than the water-bath, as it takes a shorter period of time to bring the oven up to the desired temperature. No water except the liquid in the jars is used. No special equipment is needed, but this method is adaptable only to an electric or gas oven fitted with a thermometer. Its disadvantage is that the finished product is not so attractive as the jars can be filled only to one inch of the top before processing. This is to prevent the liquid from boiling out of the jars. This method should meet with much approval in cities, towns and country places where electricity and gas are installed. It will require more experimenting before a time table for oven canning can be published as accurate.

The water-bath method requires very little equipment; a wash boiler with cover and rack is all that is necessary and may be used on any stove, whether

* Prepared by Ethel W. Hamilton.

it be electric, gas, coal oil, coal or wood. The intermittent method of the water bath which involves three successive days of sterilization takes care of the canning of non-acid vegetables. The water-bath method is the best all round method of home canning. The pressure cooker is better for commercial canning.

In the laboratory this year experiments on fruits and vegetables were carried on by the above methods. Vegetables canned this year include asparagus, spinach, beans, beets, carrots, cauliflower, tomatoes. Fruits include strawberries, raspberries, gooseberries, pears, plums and rhubarb.

In addition to canning of fruits, jams, jellies and conserves were tested, i.e., strawberry, plum, grape, raspberry jam, raspberry, plum, grape and crabapple jelly. Conserves include pineapple and rhubarb. As in previous years a number of pickle recipes were also tested. Two new recipes were originated, namely, Green Tomato Pickle and Cucumber Relish.

As it is not possible in the short period of time which elapses between the canning of the fruit and the end of the year to judge every variety and tabulate them in this report, raspberries are being dealt with this year and the results of the other fruits will appear later.

RESULTS FROM THE WATER-BATH METHOD WITH DIFFERENT VARIETIES OF RASPBERRIES

Variety	Proportion of sugar	Colour	Flavour	Texture	Remarks
Latham	1 c. sugar 2 c. water	9	9½	9	Juice and berries a bright red, flavour good, slightly soft but fairly attractive.
Newman 23	1 c. sugar 2 c. water	8½	7½	9½	Juice bright red, berries faded, lacking in flavour, fruit whole and very attractive.
Herbert	1 c. sugar 2 c. water	9	9½	8½	Juice and berries red, pleasing flavour, slightly broken.
Newman 20	1 c. sugar 2 c. water	8½	6½	9	Juice red and berries faded, lacking in flavour, berries whole and fairly attractive.
Syracuse Red	1 c. sugar 2 c. water	8	8	8	Juice red, berries pale, fairly good flavour, slightly broken.
Smooth Cane	1 c. sugar 2 c. water	7½	6½	7	Juice dark red, berries faded, flat taste, slightly broken, unattractive.
J-6	1 c. sugar 2 c. water	9½	7½	7½	Juice deep red, peculiar flavour, badly broken up.
Viking	1 c. sugar 2 c. water	8	8	6½	Juice dark red, berry very faded, flavour only fair, very broken and small.
Adams	1 c. sugar 2 c. water	5	6½	6	Juice pale red, berries very faded, flat taste and very unattractive.
Ohta	1 c. sugar 2 c. water	5½	6½	6	Juice pale, berries very faded, flat taste, seedy and very soft.

RESULTS FROM THE ELECTRIC OVEN WITH DIFFERENT VARIETIES OF RASPBERRIES

Variety	Proportion of sugar	Colour	Flavour	Texture	Remarks
Latham	1 c. sugar 2 c. water	9	9½	8	Juice and berries bright red colour, good flavour, whole and attractive.
Newman 23	1 c. sugar 2 c. water	9	8½	9	Juice a bright red, berries faded, lacking in flavour, whole and attractive.
Herbert	1 c. sugar 2 c. water	9	9½	8½	Juice and berries red, pleasing flavour, berries slightly broken.
Newman 20	1 c. sugar 2 c. water	8½	6½	9	Juice red, berries faded, lacking in flavour, whole and fairly attractive.
Syracuse Red	1 c. sugar 2 c. water	8	8	8	Juice red, berries faded, fairly good flavour, slightly broken up.
Smooth Cane	1 c. sugar 2 c. water	7½	6½	7	Juice dark red, berries faded, flat taste, berries broken and unattractive.
J-6	1 c. sugar 2 c. water	9	7½	7½	Juice deep red, berries faded, peculiar flavour, badly broken up.
Viking	1 c. sugar 2 c. water	8	8	6½	Juice deep red, berries very faded, flavour only fair, very broken and small.
Adams	1 c. sugar 2 c. water	5	6½	6	Juice pale red, berries very faded, flat taste and very unattractive.
Ohta	1 c. sugar 2 c. water	5	6½	6	Juice and berries pale, flat taste, seedy and very soft.

RESULTS FROM THE WATERLESS COOKER WITH DIFFERENT VARIETIES OF RASPBERRIES

Variety	Proportion of sugar	Colour	Flavour	Texture	Remarks
Latham	1 c. sugar 2 c. water	9½	9½	9½	Juice bright red, berries good colour and good flavour, texture slightly soft, quite attractive.
Newman 23	1 c. sugar 2 c. water	9	7½	8½	Juice red, berries slightly faded, sour flavour, texture good but seedy, fairly attractive.
Herbert	1 c. sugar 2 c. water	9	9½	8½	Juice red and berries slightly pale, flavour good, berries slightly broken.
Newman 20	1 c. sugar 2 c. water	7	6½	7	Juice quite red, berries very faded, flavour flat, texture soft and not very attractive.
Syracuse Red	1 c. sugar 2 c. water	8½	8	8	Juice red, berries pale, fairly good flavour, slightly broken.
Smooth Cane	1 c. sugar 2 c. water	8	6½	7	Juice dark red, berries slightly faded, flat taste, slightly broken, not attractive.
J-6	1 c. sugar 2 c. water	9	6½	7½	Juice and berries good colour, peculiar flavour, and berries broken up.
Viking	1 c. sugar 2 c. water	8½	8	6½	Juice dark red, berries very faded, flavour fair, very broken and small berries.
Adams	1 c. sugar 2 c. water	5	6½	6	Juice pale red, berries very faded, flat taste, texture very soft, very unattractive.
Ohta	1 c. sugar 2 c. water	5½	6½	6	Juice pale, berry very faded, flavour flat, seedy, very soft.

RESULTS FROM THE PRESSURE COOKER WITH DIFFERENT VARIETIES OF RASPBERRIES

Variety	Proportion of sugar	Colour	Flavour	Texture	Remarks
Latham	1 c. sugar 2 c. water	9	9½	9	Juice and berries bright red color, flavour good, slightly soft but attractive.
Newman 23	1 c. sugar 2 c. water	8½	7½	9½	Juice bright red, berries faded, lacking in flavour, whole and attractive.
Herbert	1 c. sugar 2 c. water	9	9½	8½	Juice and berries red, pleasing flavour, berries slightly broken.
Newman 20	1 c. sugar 2 c. water	8½	6½	9	Juice red, berries faded, lacking in flavour, whole and fairly attractive.
Syracuse Red	1 c. sugar 2 c. water	8	8	7½	Juice red, berries faded, fairly good flavour, slightly broken up.
Smooth Cane	1 c. sugar 2 c. water	7	6½	6½	Juice dark red, berries faded, flat taste, berries broken and unattractive.
J-6	1 c. sugar 2 c. water	9	7½	7½	Juice deep red, berries faded, peculiar flavour, badly broken up.
Viking	1 c. sugar 2 c. water	8	8	6½	Juice deep red, berries very faded, flavour only fair, very broken and small.
Adams	1 c. sugar 2 c. water	5	6½	6	Juice pale red, berries very faded, flat taste and very unattractive.
Ohta	1 c. sugar 2 c. water	5	6½	6	Juice and berries pale, flat taste, very seedy and soft.

In this test Latham and Herbert made the best canned product.

*ORNAMENTAL GARDENING

The following new plants originated by the Division of Horticulture, Central Experimental Farm, are here described for the first time:—

LILACS

x Syringa Prestoniae

CASSANDRA (No. 24-14-135).—Flower panicle 11 inches long, 7½ inches wide, massive and stout, widest in the centre. Bud, tourmaline pink to laelia pink; expanded bloom, palest laelia pink within, pale rose purple without. Tube slender, funnel-form, lobes horizontal.

CORDELIA (No. 20-14-157).—Flower panicle 9 inches long, 7 inches wide, conical, with two laterals which bloom later. Bud, magenta to rose purple; expanded bloom, palest rose purple within, pale rose purple without. Tube slender, funnel-form, lobes erect.

DORCAS (No. 20-14-19).—Flower panicle 7 inches long, 5½ inches wide, rather compact, widest in the centre. Bud, schoenfeld's purple to rosolane pink; expanded bloom, white with tinges of colour within, pale rosolane pink without. Tube funnel-form, lobes erect.

KATHERINA (No. 20-14-34).—Flower panicle 12 inches long, 7½ inches wide, conical, with secondary branches. Bud, tourmaline pink to laelia pink; expanded bloom, palest laelia pink edged with white within, pale laelia pink without. Tube funnel-shape, lobes erect.

* Prepared by Isabella Preston

VALERIA (No. 20-14-149).—Flower panicle 11½ inches long, 10½ inches wide. Bud, vinaceous purple to tourmaline pink; expanded bloom laelia pink tipped with white within, dark laelia pink without. Tube narrow funnel form, lobes opening at right angles.

The colour names of the Syringa refer to Ridgeway's Colour Chart.

ROSES

ROSA RUGOSA HYBRID CREE (No. 20-09-01).—This is a cross of an unnamed double white variety of R. rugosa female and R. spinosissima hispida (Arboretum No. 6094) male. This is a handsome bush with distinct foliage. The leaves are bright glossy green with seven leaflets. The flowers are large, single, pale pink on opening, fading to white. It blooms in the middle of June and is hardy without protection at Ottawa.

LILY

x LILIUM DAVMOTTIAE (No. 20-05).—This is the name that has been given to the lilium hybrid described under the name of Ottawa hybrids in the Report of the Dominion Horticulturist for 1928.

CLIMBING ROSES

There is a large number of climbing and rambling roses listed by growers and it is sometimes difficult to make a selection. The following notes on the varieties that have been grown at the Central Experimental Farm, Ottawa, may prove helpful. It must be remembered that none of these roses is hardy at Ottawa without protection. They are taken down from their supports and covered with boxes which are filled with dry leaves. The lids are placed on the boxes so as to prevent rain and snow from entering. This is done late in fall and removed in spring when the snow is melted and the weather is beginning to warm up.

The name of the originator is given where possible.

ALBERIC BARBIER (BARBIER).—Yellow bud, changing to creamy white, double. This variety lived two years but never bloomed.

ALBERTINE (BARBIER).—Coppery salmon, fragrant, double, in clusters. Blooms well first week in July.

ALIDA LOVETT (VAN FLEET).—Bright shell pink with shading of sulphur at the base of the petals. Large flowers, very double, not a vigorous climber at Ottawa. Blooms well for first two weeks in July.

AMERICAN PILLAR (VAN FLEET).—Bright rose, white centre, medium size, single flowers in clusters. Fine glossy foliage, vigorous. Blooms well all through July.

ANEMONENROSE (SCHMIDT).—Silvery rose, single. Not hardy enough for Ottawa conditions.

ARDS ROVER (A. DICKSON & SONS).—Dark crimson. Blooms end of June. This variety has not proved satisfactory at Ottawa.

AVIATEUR BLERIOT (FAUQUE ET FILS).—Yellow, medium size, double, in clusters. Blooms well first three weeks in July.

BALTIMORE BELLE (FEAST).—White, faintly blushed, double, medium size, in clusters. Blooms well all through July. This is a very old rose and has been growing at the Farm for many years.

BESS LOVETT (VAN FLEET).—Bright crimson, large, double. Not a vigorous climber at Ottawa. Blooms well during July.

BLOOMFIELD DECORATION (THOMAS).—Cerise pink with white centre, small, single, in clusters. A continuous bloomer but not hardy enough for the Ottawa climate.

BLOOMFIELD MAGIC (THOMAS).—Light salmon to cream, semi-double, fragrant. Blooms continuously from end of June to October.

BLUSH RAMBLER (CANT).—Blush rose, small flowers in large clusters. Planted in 1929, it has not yet bloomed.

CHAPLIN'S PINK RAMBLER (CHAPLIN).—Soft pink, large, semi-double, in clusters. This new English Gold Medal rose was planted in the spring of 1930 and made good growth during the season.

CHATILLON RAMBLER (NONIN).—Clear pink, semi-double, in large clusters. Very vigorous and floriferous, one of the best and hardiest climbers at Ottawa. Blooms all July and for a few days in August.

CHROMATELLA (COQUEREAU).—Yellow, large, double. This is not hardy enough for Ottawa.

CLIMBING CAROLINE TESTOUT.—Several climbing Hybrid Teas were tried but none could be considered as climbers under Ottawa conditions.

CLIMBING MRS. W. H. CUTBUSH (CUTBUSH).—Deep pink, medium large, semi-double, in clusters. Blooms fairly continuously all season but the foliage and habit of the plant is not attractive.

CRIMSON RAMBLER (TURNER).—Crimson, double, small flowers in clusters. It is a vigorous grower and one of the hardiest varieties. It is rather susceptible to mildew, especially if grown near buildings or where the air circulation is poor. Blooms the last three weeks of July and first week in August.

DEBUTANTE (WALSH).—Rose pink fading to cameo pink, medium size, double, in clusters, fragrant. Blooms four weeks in July.

DOROTHY JEAVONS (BAKERS).—White, double, in large clusters, vigorous. Blooms last three weeks in July.

DOROTHY PERKINS (JACKSON & PERKINS).—Rose pink, medium size, double, in clusters, vigorous and floriferous. Blooms from second week of July until middle of August. This is one of the best and hardiest of the climbing roses tested at the Farm.

DR. HUEY (THOMAS).—Dark crimson maroon with yellow stamens, semi-double, in small clusters. Blooms in mid-July. This variety is not very vigorous at Ottawa.

DR. W. VAN FLEET (VAN FLEET).—Light shell pink, double, in small clusters. Blooms the first three weeks of July. This is one of the most beautiful of hardy climbing roses and the flowers, particularly in the bud stage, resemble hybrid teas. The foliage is glossy and very attractive also. One plant has been growing in the Rose Garden at the Farm since 1911, so it is a long-lived variety.

DUNDEE RAMBLER (MARTIN).—White with pink edges, double in clusters. Blooms last week of June and into July.

EMILY GRAY (WILLIAMS).—Golden yellow, medium large, semi-double, in clusters; foliage glossy bronzy green. This has not proved hardy at the Experimental Farm but it is such a beautiful plant and flower that it is worth trying.

EUPHROSYNE.—Pale pink, small, semi-double, in clusters. This is an early blooming variety, opening in the middle of June and lasts about two weeks.

EVANGELINE (WALSH).—Pale pink with white centre, large, single, in clusters, very fragrant. Blooms all July and into the first week of August. This is a very desirable rose because of its delightful perfume, glossy foliage and delicate flowers. It is one of the hardiest varieties grown at Ottawa.

Chatillon rambler rose.

EXCELSA (WALSH).—Bright rosy crimson, double, in clusters. Blooms all July and the first week of August.

FERNAND RABIER (TURBET).—Deep scarlet, medium large, double, in large clusters. This variety has been growing in the garden since 1923 and bloomed fairly well in 1926 and 1927; since that date it has not bloomed.

FLOWER OF FAIRFIELD (SCHULTHEIS).—Bright crimson, medium size, double, in clusters. This resembles Crimson Rambler but has a much longer blooming season, beginning the first week in July and continuing all through August and sometimes into September.

FORTUNE'S YELLOW (FORTUNE).—Orange yellow, shaded red. This is not hardy enough for Ottawa conditions.

FRANÇOIS JURANVILLE (BARBIER).—Deep fawn pink, double, fragrant, in clusters. Blooms well during July.

GARDENIA (MANDA).—Bright yellow, changing to cream, double, in clusters. Although this variety has lived since 1921 in the garden, it has never bloomed satisfactorily.

GERBE ROSE (BARBIER).—Deep pink, large, very double, fragrant. Blooms last week of June and July with scattered flowers all through the summer.

GLENN DALE (VAN FLEET).—Lemon coloured buds, opening white, large, double, in small clusters. Blooms three weeks from the third week in June.

GOLDFINCH (PAUL).—Yellow bud opening cream, small, semi-double, in clusters. Blooms first three weeks in July. This is one of the hardiest of the creamy yellow varieties.

HAVERING RAMBLER (PEMBERTON).—Pink, small, double, in large clusters. Blooms three weeks in July.

HEART OF GOLD (VAN FLEET).—Crimson, shading to white at centre, with yellow stamens, single, in clusters. Blooms last week in June and into July.

HELENAE (WILSON).—White, small, single, in large clusters, faint musk scent. This is a species but is so floriferous that it is well worth growing. At Ottawa the long canes winter-kill for about half their length. Blooms the last week of June and the first two weeks in July.

HELENAE VAR. PATRICIA.—This is a seedling of *R. Helenae* with double, white flowers, originated at the Central Experimental Farm, Ottawa. It is described and illustrated in the Report of the Dominion Horticulturist for 1928.

HENRI BARRUET (BARBIER).—Deep yellow bud, opening paler with reddish veinings, medium size, in large clusters. Blooms end of June and first three weeks of July. This is not a very satisfactory variety at Ottawa.

HIAWATHA (WALSH).—Crimson with white eye, small, single, in large clusters, very floriferous. Blooms for six or eight weeks in July and August.

JAMES SPRUNT (SPRUNT).—Crimson, double. Blooms two weeks in June and July with a few scattered flowers later. It has lived at Ottawa for nine years but is not sufficiently vigorous to be recommended.

KEW RAMBLER (EASLEA).—Apple-blossom pink, single. This is not hardy at Ottawa and never bloomed.

LADY GAY (WALSH).—Rose pink, medium size, double, in clusters. Blooms all July and two weeks of August. This rose is very like Dorothy Perkins.

LEONTINE GERVAIS (BARBIER).—Salmon rose, tinted yellow, large, fragrant, very few blooms. Not very hardy at Ottawa.

LEUCHSTERN (SCHMIDT).—Rose with white centre, small, single, in clusters. Blooms last week in June and first week of July.

MARY LOVETT (VAN FLEET).—White, large, double. Blooms well during the last week of June and first two weeks of July.

MARY WALLACE (VAN FLEET).—Warm rose pink, large, semi-double, several together on long stem, moderately fragrant. Blooms well first three weeks in July. This variety could not be considered a climber at Ottawa.

MAX GRAF (BOWDITCH).—Bright pink, single, large, in small clusters. Foliage rugosa-like. Blooms last week of June and all July. Although this has rugosa blood in it, it is not any hardier than many other climbing roses.

MINNEHAHA (WALSH).—Pink, fading white, small, double, in large clusters. Blooms last three weeks of July and first three of August.

MISS HELYETT (FAUQUE).—Bright carmine pink, large, double, several on a stem. Although this variety lived for several years it never bloomed much.

MRS. F. W. FLIGHT (FLIGHT).—Tyrian rose, large, semi-double, in clusters. Blooms well all July.

MRS. G. C. THOMAS (THOMAS).—Salmon pink, passing to orange at centre, large, semi-double. Blooms second week in July until end of August.

PAUL'S CARMINE PILLAR (PAUL).—Carmine red, large, single, in small trusses. Blooms last week of June and first of July.

PAUL'S SCARLET CLIMBER (PAUL).—Vivid scarlet, semi-double, medium size, in large clusters. Blooms from third week in June until the end of July. This is the most brilliantly coloured climbing rose there is and the colour does not fade.

PEARL QUEEN.—This is a very old variety, not listed in catalogues, with clusters of small flowers of faint blush pink. Blooms early in July.

PEMBERTON'S WHITE RAMBLER (PEMBERTON).—White, medium size, double, in large clusters. Blooms all through July and for two weeks in August.

PHILADELPHIA RAMBLER (VAN FLEET).—Scarlet crimson, medium large, double, in large clusters. Continuous bloom from early July to September.

PHYLLIS BIDE (BIDE).—Carmine pink, shaded yellow at the base, semi-double, in loose clusters. Blooms during all July and August.

PINK RAMBLER.—Pink, in clusters. Blooms end of June and first two weeks of July.

PRAIRIE BELLE (FEAST).—Also called Queen of the Prairie and Beauty of the Prairies. Bright pink, large, very double, fragrant, in clusters. Blooms all July. This is very conspicuous when in bloom because of its large, double, flat flowers.

PURITY (HOOPES & THOMAS).—White, large, semi-double, in small clusters. Blooms last three weeks of July.

RENÉ ANDRÉ (BARBIER).—Yellowish orange, medium size, semi-double. Blooms well last week in June and three weeks in July.

ROMEO (EASLEA).—Deep red, double, good shape, in small clusters. Blooms first three weeks in July. Not very vigorous at Ottawa.

ROSERIE (WITTERSTAETTER).—Tyrian pink, white base, large, semi-double. Blooms last week in June and first two weeks in July.

SANDERS WHITE RAMBLER (SANDERS).—White, double, fragrant in clusters. Blooms all July.

SODENIA (WEIGAND).—Tyrian pink, medium size, double, in clusters. Blooms well all July and first week of August.

SOURCE D'OR (TURBAT).—Amber yellow, fading cream, large, very double, fragrant, in clusters. Blooms well all July.

SYLVIA (PAUL).—Pale lemon yellow, passing to cream, double, in loose sprays. This is being tried at Ottawa as it is extremely hardy at St. Andrews, N.B., where it covers the whole side of a house.

TAUSENDSCHON (SCHMIDT).—Deep rose pink, fading paler, large, semi-double, in clusters. Blooms well the last week in June and all July. This rose is practically thornless.

TEA RAMBLER (PAUL).—Salmon pink, double, in clusters. This lived in the garden at Ottawa for several years but flowered very little and is now dead.

THALIA (LAMBERT).—White, small, double, in large clusters. Blooms last week of June and first two weeks in July.

TRIER (LAMBERT).—White with slight shade of rose, medium size, semi-double, fragrant, in clusters. Blooms from third week in June until second week in August with a few blooms in September.

WHITE TAUSENDSCHON (PAUL).—Like Tausendschon except that the buds are pale pink and open flower white.

WILLIAMS EVERGREEN.—White, in small clusters. Blooms second and third week in July. This is an old variety which is not listed in catalogues.

WILLIAM C. EGAN (DAWSON).—Flesh pink, large, double, in clusters. Blooms three weeks in July. Not very hardy.

ZELIA PRADEL.—White, semi-double, in clusters. Blooms from the last week of June until September. This variety is very like Trier.

ZEPHERINE DROUHIN (BIZOT).—Bright pink, medium size, fragrant. Blooms all July with scattered blooms all through the season. It is not sufficiently vigorous to be considered a climber at Ottawa. It has no thorns.

The varieties recommended for general use are: American Pillar, Chatillon Rambler, Crimson Rambler, Dorothy Perkins, Dr. W. Van Fleet, Evangeline, Flower of Fairfield, Gerbe Rose, Goldfinch, Hiawatha, Paul's Scarlet Climber, Pemberton's White Rambler, Philadelphia Rambler, Prairie Belle, Sodenia, Source d'Or.

TALL BEARDED IRIS

The main collection of tall bearded iris at the Central Experimental Farm was established in 1895. Since then it has been the aim to add to the collection the newer varieties which it was felt might be improvements over the older ones and the prices for which were not prohibitive, the object being to maintain a collection of the best. A very few, for which the price is yet too high, are not included.

Varieties of tall bearded iris should not be grown on wet ground. A soil which is usually dry in mid-summer suits them best. They bloom most freely in the open where they will get most sunlight, though when they are screened from the sun during the hottest part of the day the individual blooms last longer. They may be planted successfully almost any time when there is no frost in the ground, but the best time is, perhaps, during the month of August, as this gives time for them to be well rooted before winter. The tall bearded iris should be planted quite shallow, the top of the rhizome or thickened root being at, or very near, the surface of the ground when planted.

The last list of best varieties of bearded iris was published in the Annual Report of the Division of Horticulture for 1927. Many new varieties are introduced each year, so that it seems desirable to revise the list then published.

The varieties are divided into colour groups, though, in some cases, it is difficult to know into what group they should be placed.

BEST VARIETIES OF TALL BEARDED IRIS

1. White predominating on standards and falls.—Florentina, White Knight, Milky Way, Mystic, White Queen.
2. White feathered or suffused with bluish-lavender and bluish-purple.—Mrs. G. Reuthe, Camelot, True Charm.

3. White, or white and purple standards and purple falls.—Mary Williamson, Rhein Nixe, Mildred Presby.
4. Yellow predominating on standards and falls.—Chasseur, Aliquippa, Gold Imperial, Moonlight, Shekinah, Flutterby, Amber, Virginia Moore.
5. Pale yellow standards and purple or violet purple falls.—Princess Victoria Louise, Vingolf.
6. Yellow standards and brownish or maroon falls.—Flammenschwert (Flaming Sword), Iris King, Citronella.
7. Lavender blue and bluish-purple predominating on standards and falls, mainly Pallida varieties.—Ballerine, Lord of June, Morwell, Queen Caterina, Lady Chas. Allom, Juniata, Souvenir de Lœtitia Michaud.
8. Bluish-purple standards and bluish-purple or deep purple falls.—Crusader, Aurelle, Magnifica, Lent A. Williamson, Alcazar, Wedgewood, Majestic, Zulu.
9. Pale purple standards and purple falls.—B. Y. Morrison, Perfection.
10. Purple standards and purple or dark purple falls.—Mount Royal, Souvenir de Mme. Gaudichau, Parc de Neuilly, Archevêque, Harmony, Monsignor, Tropic Seas, Geo. J. Tribolet.
11. Pink, lilac, and rose predominating on standards and falls.—Dream, Mrs. Marion Cran, Susan Bliss, Lady Byng, Delight.
12. Reddish-purple or violet-purple predominating on standards and falls.—Opera, Imperator.
13. Lavender or pale bluish standards and reddish-purple or violet-purple falls.—Asia, Sweet Lavender.
14. Dusky or dull coppery standards and rich maroon falls.—Ambassadeur, Bruno, Deuil de Valéry Mayet.
15. Buff, lilac, purple, and fawn blends predominating on standards and falls.—Afterglow, Isoline, Mme. Durrand, Lord Lambourne, Valencia.

Iris at the Experimental Farm, Ottawa.

SIBERIAN IRIS

The Siberian, which is becoming quite popular, unlike the tall bearded iris, succeed best in rather wet soil, although, as they bloom early in the season, a soil that is moist during May and rather dry throughout the summer suits them very well. They are fine for massing on the bank near water, their tall stems and grassy leaves seeming to suit such a situation very well. The finest dark coloured variety in the collection at Ottawa is Cæsar, originated by F. Cleveland Morgan.

EXPERIMENT WITH SWEET PEA IN GREENHOUSE

There will be found in the following table the results from the experiment in comparing the yields of different varieties of sweet peas in the greenhouse for 1929-30, and, in addition, the average yield from most of these varieties for the four seasons, 1926-27, 1927-28, 1928-29, and 1929-30.

There were fifty-four different lots of sweet peas grown. The seed was sown in 2½-inch pots on November 6, 1929, and the plants were set out in the bed on December 19. The soil was rotted sod and manure. The plants were set six inches apart in rows twenty-five inches apart. The plants were supported with binder twine. The average night temperature was 50° F. The total number of plants was 552, and the area occupied by the plants was 576 square feet. The plants were pulled on May 30, 1930. They were about twelve feet in height when pulled and were still growing vigorously. The total number of stems cut from all varieties was 37,393, or 64·9 stems per square foot.

RESULTS OF TEST OF VARIETIES OF SWEET PEAS IN THE GREENHOUSE

Variety	Number of plants	Date of first bloom	Date of first cutting	Date of last cutting	Number of cuttings	Average number of flowers per stem first cutting	Average number of flowers per stem all cuttings	Average length of stem first cutting	Average length of stem all cuttings	Number of stems cut first two weeks from time earliest variety was cut	Number of stems cut first month from time earliest variety was cut	Total number of stems cut	Average number of stems per plant 1929-30	Average number of stems per plant 4 crops 1926-27, 1927-28, 1928-29, 1929-30
								in.	in.					
Ball's Orange—orange	8	Mar. 22	Mar. 24	May 28	18	2	3	12	14	2	44	819	102	102x
Ey. Primrose—soft lavender	8	" 25	April 4	" 27	20	2	3	16	15	.....	7	759	95	95x
Burpee's Blue Jacket—dark blue	8	" 19	" 3	" 28	16	2	3	14	13	19	35	719	90	90x
Rose Queen—rose pink	12	" 19	Mar. 24	" 28	20	2	3	15	16	5	61	1,066	89	90
Ey. Daybreak—light pink	8	" 19	" 24	" 28	20	2	3	13	14	.....	31	707	88	88x
Mrs. W. G. Harding—Harding blue	12	" 19	" 24	" 27	19	2	3	14	13	23	87	975	81	85
Ey. Lavender King—lavender	8	" 19	" 24	" 27	20	2	3	12	13	3	24	760	95	83
Miss Louise Gude—shell pink	12	" 22	" 24	" 28	18	2	3	13	15	3	54	1,212	101	82xxx
Fordhook Pink and White—pink and white	8	" 25	April 4	" 27	19	2	3	12	12	.....	15	672	84	79
Harmony—clear lavender	8	" 19	Mar. 24	" 27	20	2	3	14	13	1	20	531	66	76
Eldorado—orange	8	" 21	" 24	" 28	17	2	3	14	13	5	42	739	92	75xxx
Burpee's Peach Blossom—pale pink	8	" 19	" 24	" 27	21	2	3	13	14	2	30	722	90	75xxx
Ey. Bluebird—light blue	8	" 19	" 24	" 28	17	2	3	12	13	7	32	672	84	74
White Star—white	8	" 21	" 24	" 29	17	2	3	12	14	1	37	575	72	72x
Columbia—pink and white	8	" 25	April 3	" 27	18	2	3	13	13	.....	14	642	80	72
Burpee's Illumination—salmon orange	12	" 28	" 3	" 27	18	2	3	16	15	.....	25	791	66	71
Pink Profusion—rich pink	12	" 21	Mar. 24	" 27	18	2	3	14	16	4	50	820	68	69
Burpee's Glorious—rosy purple	12	" 21	" 24	" 27	19	2	3	13	13	10	41	653	54	67
Milkmaid—white	8	" 20	April 2	" 30	17	2	3	12	13	.....	34	648	81	67
Snowstorm Imp.—white	12	" 19	Mar. 24	" 28	18	2	3	12	13	10	59	774	64	66xxx
Burpee's True Blue—light violet blue	8	" 19	" 24	" 28	18	2	3	12	13	1	28	607	76	66xx
Ey. Enchantress—rose pink	12	" 3	" 10	" 28	19	2	3	10	14	35	86	881	73	66xxx
Mrs. H. Hoover—blue	12	" 20	" 24	" 27	19	2	3	14	15	2	23	784	65	65x
Zvolanek Rose—bright rose	12	" 25	April 3	" 27	18	2	3	14	15	.....	28	1,154	96	65
Cheerful—begonia rose	12	April 9	" 15	" 27	17	2	3	14	13	.....	.....	754	63	63
Penrose—rose pink suffused lemon bronze	12	Mar. 25	" 3	" 27	18	2	3	14	14	.....	20	566	47	63
Burpee's Fire King—cerise scarlet	12	" 25	" 3	" 27	18	2	3	13	13	.....	12	653	54	62
Ball's Rose—rich rose	8	" 19	" 3	" 28	16	2	3	14	15	13	26	495	62	62x
Mauve Beauty—rosy mauve	12	" 22	Mar. 24	" 27	20	2	3	12	14	5	59	735	61	61x
Glitters—fiery orange	8	" 28	April 5	" 27	18	2	3	14	14	.....	2	559	70	61
Superior pink—pink suffused salmon	8	April 3	" 5	" 27	17	2	3	14	14	.....	10	494	62	60xxx
Sunburst—salmon pink	12	Mar. 19	Mar. 24	" 28	17	2	3	12	14	4	38	717	60	60x
Spring Song—rose pink	12	" 22	" 24	" 28	17	2	3	12	14	2	30	807	67	59xx
Flamingo—orange pink	12	" 22	" 24	" 28	19	2	3	13	15	4	30	690	57	59
Early King—bright crimson	12	" 19	" 24	" 27	20	2	3	13	13	4	29	703	59	59x
Jeanne Mamitsch—rose pink	12	" 19	" 24	" 27	18	2	3	14	14	2	31	746	62	58xxx
Gilda Gray—pink and salmon	12	" 27	April 2	" 27	18	2	3	12	13	.....	22	840	70	58xxx
Mrs. Kerr—salmon suffused with orange	12	" 22	Mar. 24	" 27	20	2	3	12	11	1	13	467	39	58
Giant Rose—rose pink	12	" 20	April 2	" 27	18	2	3	16	14	.....	9	546	45	58
Sunlight—rose cream pink	8	" 19	Mar. 24	" 27	21	2	3	14	14	6	31	596	74	58

Ey.-flg. Yarrawa—rose pink	8	April 3	April 9	May 27	17	2	3	14	14	.....	.....	456	57	57x
Loveliness—suffused pink	8	Mar. 3	Mar. 10	" 28	19	2	3	10	12	43	67	463	58	57xx
Charm—rose pink	12	" 19	" 24	" 27	20	2	3	13	13	2	31	803	67	57xxx
Vulcan—scarlet cerise	12	" 29	April 2	" 27	17	2	3	14	15	.....	18	600	50	56xxx
Chevalier—rose	12	" 29	" 2	" 27	17	2	3	18	16	.....	28	828	69	56xxx
Gleam—bright pink	12	April 3	" 5	" 27	16	2	3	16	15	.....	22	762	63	55xx
Grenadier—scarlet	12	Mar. 21	Mar. 24	" 27	19	2	3	14	16	2	15	517	43	55
Burpee's Orange—orange	8	" 22	" 24	" 28	18	2	3	12	13	1	24	590	74	55
Mrs. Calvin Coolidge—salmon pink	12	" 25	April 4	" 27	17	2	3	14	14	.....	27	725	60	54xxx
Sweet Lavender—clear lavender	8	" 25	" 5	" 27	18	2	3	12	12	.....	3	523	65	54xxx
Miss Spokane—peach red standard, orange scarlet wings	12	" 19	Mar. 24	" 27	19	2	3	14	14	1	31	698	58	52xx
White Harmony—white	8	" 29	April 2	" 28	15	2	3	12	13	.....	16	433	54	47xxx
Burpee's Gorgeous—salmon rose	8	" 19	Mar. 24	" 28	15	2	3	13	13	10	41	653	54	44xx
Burpee's Lavender—light lavender	12	" 19	" 24	" 19	18	2	3	14	14	3	35	526	44	44x
	552	.....	.....	.....	.....	.....	.....	.....	.....	227	1,594	37,393	68	65

x Grown only one year. xx Grown only two years. xxx Grown only three years.

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