

**CIHM
Microfiche
Series
(Monographs)**

**ICMH
Collection de
microfiches
(monographies)**



Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

© 1997

Technical and Bibliographic Notes / Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming are checked below.

- Coloured covers / Couverture de couleur
- Covers damaged / Couverture endommagée
- Covers restored and/or laminated / Couverture restaurée et/ou pelliculée
- Cover title missing / Le titre de couverture manque
- Coloured maps / Cartes géographiques en couleur
- Coloured ink (i.e. other than blue or black) / Encre de couleur (i.e. autre que bleue ou noire)
- Coloured plates and/or illustrations / Planches et/ou illustrations en couleur
- Bound with other material / Relié avec d'autres documents
- Only edition available / Seule édition disponible
- Tight binding may cause shadows or distortion along interior margin / La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure.
- Blank leaves added during restorations may appear within the text. Whenever possible, these have been omitted from filming / Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.
- Additional comments / Commentaires supplémentaires:

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

- Coloured pages / Pages de couleur
- Pages damaged / Pages endommagées
- Pages restored and/or laminated / Pages restaurées et/ou pelliculées
- Pages discoloured, stained or foxed / Pages décolorées, tachetées ou pliquées
- Pages detached / Pages détachées
- Showthrough / Transparence
- Quality of print varies / Qualité inégale de l'impression
- Includes supplementary material / Comprend du matériel supplémentaire
- Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image / Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.
- Opposing pages with varying colouration or discolourations are filmed twice to ensure the best possible image / Les pages s'opposant ayant des colorations variables ou des décolorations sont filmées deux fois afin d'obtenir la meilleure image possible.

This item is filmed at the reduction ratio checked below /
Ce document est filmé au taux de réduction indiqué ci-dessous.

			14x			18x			22x			26x			30x					
		12x		16x		20x		24x		28x		32x								

The copy filmed here has been reproduced thanks to the generosity of:

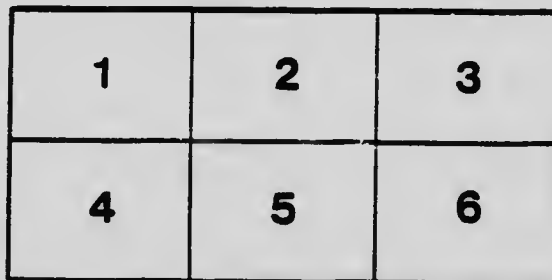
Library
Agriculture Canada

The images appearing here are the best quality possible considering the condition and legibility of the original copy and in keeping with the filming contract specifications.

Original copies in printed paper covers are filmed beginning with the front cover and ending on the last page with a printed or illustrated impression, or the back cover when appropriate. All other original copies are filmed beginning on the first page with a printed or illustrated impression, and ending on the last page with a printed or illustrated impression.

The last recorded frame on each microfiche shall contain the symbol \rightarrow (meaning "CONTINUED"), or the symbol ∇ (meaning "END"), whichever applies.

Maps, plates, charts, etc., may be filmed at different reduction ratios. Those too large to be entirely included in one exposure are filmed beginning in the upper left hand corner, left to right and top to bottom, as many frames as required. The following diagram illustrates the method:



L'exemplaire filmé fut reproduit grâce à la générosité de:

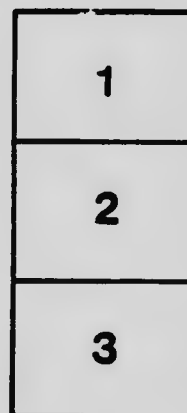
Bibliothèque
Agriculture Canada

Les images suivantes ont été reproduites avec le plus grand soin, compte tenu de la condition et de la netteté de l'exemplaire filmé, et en conformité avec les conditions du contrat de filmage.

Les exemplaires originaux dont la couverture en papier est imprimée sont filmés en commençant par le premier plat et en terminant soit par la dernière page qui comporte une empreinte d'impression ou d'illustration, soit par le second plat, selon le cas. Tous les autres exemplaires originaux sont filmés en commençant par la première page qui comporte une empreinte d'impression ou d'illustration et en terminant par la dernière page qui comporte une telle empreinte.

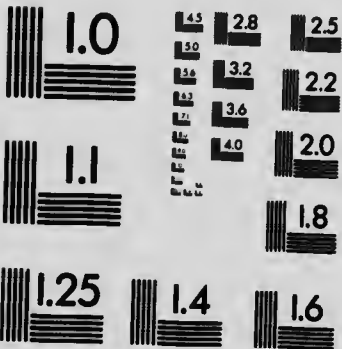
Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole \rightarrow signifie "A SUIVRE", le symbole ∇ signifie "FIN".

Les cartes, planches, tableaux, etc., peuvent être filmés à des taux de réduction différents. Lorsque le document est trop grand pour être reproduit en un seul cliché, il est filmé à partir de l'angle supérieur gauche, de gauche à droite, et de haut en bas, en prenant le nombre d'images nécessaire. Les diagrammes suivants illustrent la méthode.



MICROCOPY RESOLUTION TEST CHART

(ANSI and ISO TEST CHART No. 2)



APPLIED IMAGE Inc

1653 East Main Street
Rochester, New York 14609 USA
(716) 482-0300 - Phone
(716) 288-5989 - Fax

Ontario Department of Agriculture

FRUIT BRANCH

HORTICULTURAL EXPERIMENT STATION

Peach Growing in Ontario

F. M. CLEMENT AND A. G. HARRIS.

INTRODUCTION.

When prices are high or above normal for any particular product the tendency is to produce more. With crops that are produced from seed or plants each year, such as onions and cabbage, the tendency is toward extreme variations in price each year. With tree fruits the extremes of variation in price must, of necessity, be several years apart. Peaches are no exception. Comparatively high prices for the product led to heavy plantings for a number of years. These plantings are now at their best or coming into their best. It was predicted by the leading fruit men several years ago that the price would be low when the young orchards came into bearing. It was even felt by some that quantities of fruit would be unmarketed. These conditions, however, have not been so serious as expected. Production has increased as was assured from the largely increased acreage, and prices for the years 1913 and 1915 have been comparatively low (1914 was a complete failure), but no great quantity of fruit has gone to waste. Good fruit has been in demand.

With the improved distribution of the past season, the aid of advertising, the improvement of packages and packs, and the more extended use of refrigeration, it is reasonable to expect that the markets will recover. One other factor seems to be pointing in an upward direction. The planting of young trees was heaviest during the years of 1908, 1909 and 1910, gradually decreasing to the years 1913 and 1914. The 1915 plantings were comparatively light, and at the time of writing prospects for heavy plantings in 1916 are not bright. No figures are available for the last few years, but it is apparent to the observer that the tendency to plant heavily is not as strong as from five to seven years ago.

Peach-growing in most of the tender fruit sections of Ontario has long passed the experimental stage, but habits and customs are changing constantly. It is only fair to expect, however, that the number of plantings will centre around normal until high prices again coax the growers into sudden and extensive plantings.

HISTORICAL.

The first record, available to the writers, of peaches grown in Ontario is taken from the diary of Mrs. Simcoe, Niagara, July 2, 1793: "We treated them with cherries, we having large May Duke cherry trees behind the house and three stan-

dard peach trees which supplied us last autumn for tarts and desserts during six weeks besides the number the young men ate. My share was trifling compared with theirs, and I ate thirty in a day. They were very small and high flavored. When tired of eating them raw, Mr. Talmau roasted them, and they were very good."

The next record appears in the journal of Captain Langslow, who visited Niagara in 1817, and spoke of peaches being very plentiful. There is, I believe, also a written record of Mr. Dennis Woolverton, of Grimsby, selling natural fruit in Hamilton market as early as 1820. In 1856, Mr. C. E. Woolverton, of Grimsby, planted five acres of commercial orchard of such varieties as Barnard, Crawford, Old Mixon and Mountain Rose, and was the first to ship by express to distant Ontario markets.

When the Prince of Wales visited Toronto in 1860, on the menu card of the Queen's Hotel occur the words: "Brown's peaches," showing that the trees must have been planted many years before this date. This orchard was near Niagara-on-the-Lake, and from written records we are given to understand was on a commercial scale.

It was not, however, until about the year 1890 that peaches were planted generally. The years following this date they were planted very heavily. In the winter of 1897 and 1898 the severe freezing did much to delay the growth of the industry, but by 1904 and 1905, it had grown to such proportions that the demand was scarcely equal to the supply. In 1904, the first car was sent West as far as Winnipeg by freight. The following years saw heavier shipments and the extension of markets elsewhere. This relieved for the time all possibility of congestion and fair to good prices prevailed until 1913. The situation brought to a head in 1913 is still faced, but relief is looked for in better marketing and extensive advertising. Generally speaking, the growth of the industry has been steady and prices have been such that the greatest quantities ever produced in Ontario are being marketed at the present time.

EXTENT OF THE INDUSTRY.

ONTARIO PEACH CENSUS, 1911

County	Non-Bearing 1910	Bearing 1910
Brant	2,525	3,159
Bruce	1,217	2,628
Elgin	18,800	19,331
Essex	83,822	48,932
Grey	1,110	1,123
Haldimand	2,234	2,618
Halton	5,649	5,394
Huron S.	3,733	4,863
Kent	33,710	33,408
Lambton	64,227	32,727
Lincoln	491,886	398,320
Middlesex	5,180	3,416
Norfolk	34,685	19,216
Oxford	3,529	4,611
Perth S.	558	445
Waterloo N.	352	736
Welland	61,261	45,382
Wentworth	67,623	155,535

The above list includes areas with a total of at least 1,000 trees. The total for Ontario, according to the 1911 census was as follows:—

Non-bearing.....	890,455
Bearing.....	794,192
Total.....	1,684,647 Trees

County lines cannot, however, be said to mark the commercial areas. The industry is well established in but five sections of the Province: Niagara District, Leamington District, Forest District, Cedar Springs District, and Sparta District. A number of other sections are experimenting with varying degrees of success and give promise of development. The county lists show the Niagara District has approximately 1,250,000 trees; Leamington District, 130,000 trees; Forest District, 100,000 trees; Cedar Springs District, 60,000; Sparta District, 50,000.

Climate, soils and conditions vary somewhat in these districts, but in many respects they are very similar.

Soil conditions are very similar, in that the most successful orchards are on land that is warm and dry and in which the root systems of the trees have an opportunity to spread.

Atmospheric conditions are very similar. Either the district is influenced directly by a large body of water or the trees are on a gravel ridge some distance from the water, so high that they are directly influenced by air currents.

LIMITING FACTORS.—Many trees are planted outside of and beyond the commercial districts, and consequently a few words on the factors limiting successful production may not be amiss.

The native home of the peach is almost sub-tropical, but many years of growth under very varied conditions have gradually fitted it for severer climates. Undoubtedly we can reasonably expect that varieties will be developed that will withstand severer climates and more adverse conditions than our present varieties. At present, however, a minimum of 20 degrees F., not continued for more than a few hours is considered the limit of hardiness of wood and bud. The tree must be well prepared, or it will not stand even this extreme.

A soil either too wet or too dry is not the most protective to the roots. A wet soil freezes deeply and is conducive to sappiness in the new growth, consequently conducive to weakness. A soil too dry cannot readily replace the evaporation loss from the twigs, and a shrivelling is noted which leads to loss.

A soil too rich in nitrogen also is conducive to a sappy growth which will not stand the extremes of cold.

Generally speaking, the medium rich, deep, warm, well-drained soils produce the hardiest trees. A disregard of any one of these factors is fatal. The smaller, slower growing varieties are hardiest, and the limit of 20 degrees F. below zero may be set as a mark even under the most ideal conditions.

VARIETIES.

The selection of the best varieties is one of the first and most important steps in successful peach culture. In some cases, varieties entirely unsuited to the demands of the market have been planted. White-fleshed peaches cannot be said to be in demand, but a few varieties are mentioned for home use and early market.

4

TREE: vigorous; very productive; an early bearer.

FRUIT: large and flattened; color a deep cream; very downy.



GREENSBORO.



SECTION OF GREENSBORO.

FLESH: cream colored, tender, melting, very juicy, almost a free stone.

QUALITY: good.

SEASON: mid-August.

A good early peach for nearby markets.



CARMEN.

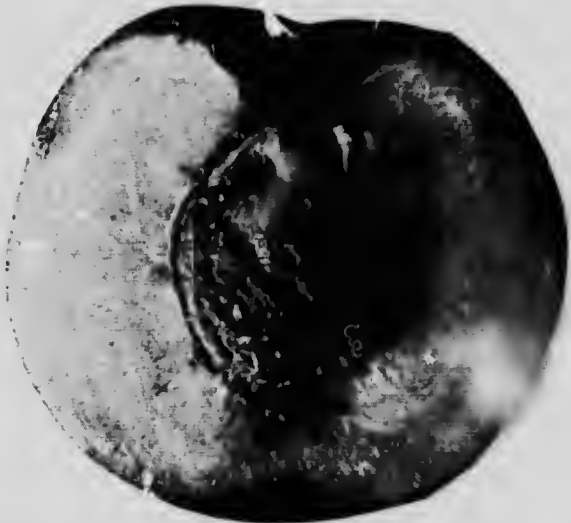
TREE: hardy, vigorous and productive.

FRUIT: a handsome, white flesh peach, easily bruised, large, resembling Elberta, creamy white with deep red blush.

FLESH: white, tender and of fine flavor.

QUALITY: Very good. Is at present quite popular.

SEASON: early September.



SECTION OF CARMEN.



ADMIRAL DEWEY.

TREE: vigorous, hardy and productive.

FRUIT: medium size, yellow flesh; semi-cling to free stone.

FLESH: yellow and firm.

QUALITY: fair to good but will not hold up well. Rots badly in damp weather.

SEASON: just before the Yellow St. John.

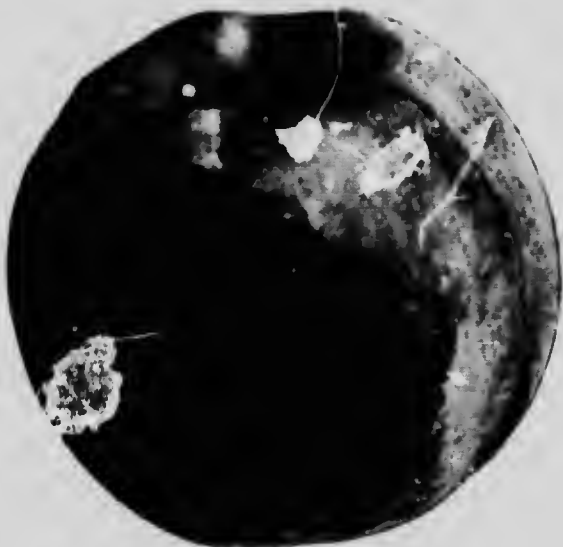


SECTION OF ADMIRAL DEWEY.

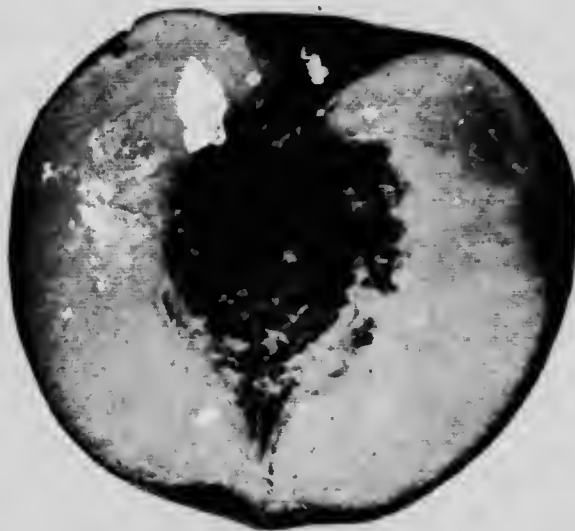
TREE: vigorous and productive.

FRUIT: form round, size large, skin yellow with dark red cheek.

FLAVOR: sweet, rich and agreeable.



ST. JOHN.



SECTION OF ST. JOHN.

QUALITY: dessert, very good; canning, good.

SEASON: late August.

By a great deal the best early yellow fleshed peach.

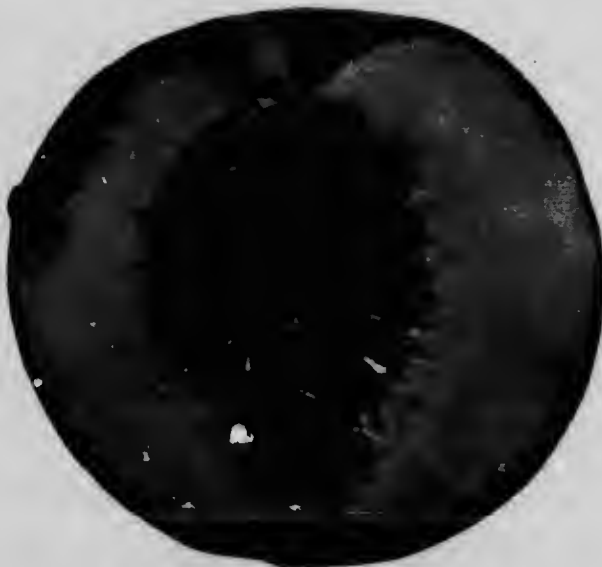
TREE: vigorous; productive.

FRUIT: large, of the Crawford type, roundish oval, color, yellow with red cheek.

FLESH: yellow, free stone, texture tender, very juicy, flavor rich.



BRIGDON OR GARFIELD.

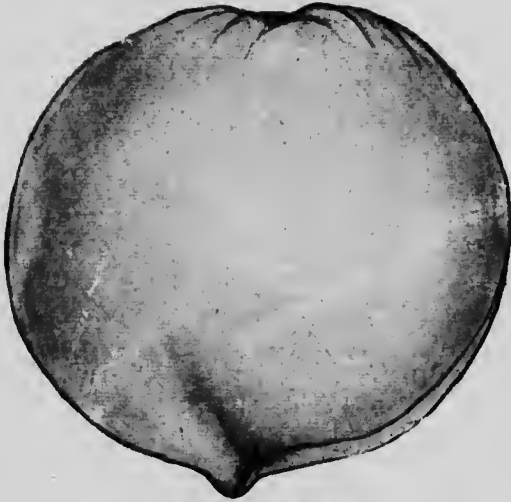


SECTION OF BRIGDON OR GARFIELD.

QUALITY: first-class for all purposes.

SEASON: late August to early September.

Very good peach; better bearer than Crawford, but a little smaller in size.



EARLY CRAWFORD.

TREE: vigorous, productive under favorable conditions, but in many orchards a light bearer.

FRUIT: large to very large, oblong, apex prominent, color golden with red cheek.

FLESH: color yellow, freestone.

FLAVOR: sweet, rich.

VALUE: first-class for market.

QUALITY: dessert and canning very good.

SEASON: early September.

This variety has given its name as a market term to other varieties of the same season.



SECTION OF EARLY CRAWFORD.



NEW PROLIFIC.

TREE: healthy, vigorous, very productive.

FRUIT: size medium, form round color yellow with bright red cheek.

FLESH: yellow, slightly red at the pit, texture tender, flavor sweet and delicious.

QUALITY: dessert fair; canning good.

SEASON: mid-September.

Bears very heavily and very often requires thinning.



SECTION OF NEW PROLIFIC.



ELBERTA.

TREE: vigorous, hardy and very productive.

FRUIT: large, roundish oval, one side larger than the other, lemon yellow with fine red cheek.

FLESH: yellow, texture coarse, but moderately juicy.

QUALITY: dessert fair, good for canning.

SEASON: late September.

This peach is desirable in every orchard owing to its productivity and its good shipping qualities. Elberta is the standard in commercial peaches.



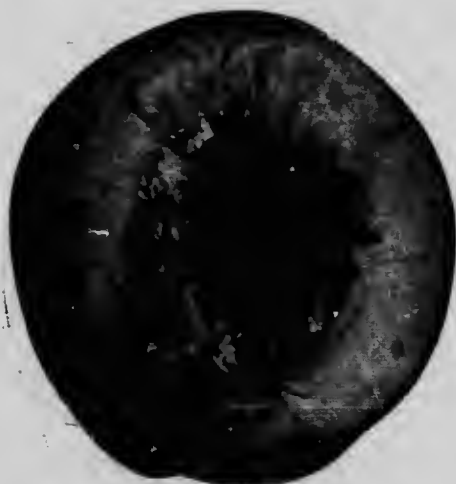
SECTION OF ELBERTA.

TREE: moderately vigorous, productive, wood brittle.

FRUIT: large oval, color orange with red cheek, bloom heavy, apex slightly extended.



SMOCK.



SECTION OF SMOCK.

FLESH: Color yellow, red at pit, free stone, texture tender, mealy, flavor agreeable but not sweet.

QUALITY: cooking or drying good.

SEASON: early October.

WHITE FLESH.**MAYFLOWER.**

TREE: fairly vigorous, thrifty, hardy, productive.

FRUIT: medium size, light colored with red cheek, round oval, slightly flattened, cling stone; flavor fair.

SEASON: the earliest peach ripened August 2nd at the Vineland Experiment Station. It is not recommended except for home use.

SNEED.

TREE: vigorous, but slender in young growth; productive; an early bearer.

FRUIT: small, light colored with red cheek, white, downy, firm, roundish oval, slightly flattened, semi-clingstone.

FLESH: white, tender, juicy.

SEASON: early August.

Recommended for home use and nearby markets.

STEVEN'S RARERIPE.

TREE: vigorous and productive.

FRUIT: medium size, roundish ovate, color whitish with a dark red cheek.

FLESH: white with red streaks at pit, freestone, tender and juicy.

SEASON: mid-October.

A popular, late, white flesh peach and a good shipper.

ALEXANDER.

TREE: vigorous, hardy, productive.

FRUIT: medium size, greenish color covered with dark red, firm, roundish, flesh, white.

FLESH: color, greenish white; texture, firm; clingstone.

QUALITY: dessert fair; poor cooker.

SEASON: early August.

Some other varieties are equally good or better.

BELLY OF GEORGIA.

TREE: hardy and productive

FRUIT: very large; skin v white with red cheek.

FLESH: white and firm.

QUALITY: fair to good.

SEASON: with Elberta.

MOUNTAIN ROSE.

TREE: vigorous, productive.

FRUIT: size medium, form roundish, color white with red cheek.

FLESH: creamy white, texture tender, melting, flavor excellent.

QUALITY: first-class for dessert.

SEASON: mid-September.

This is an exceptionally good peach for home use, but does not ship well and is subject to rot.

YELLOW FLESH.**ARP BEAUTY.**

TREE: hardy, vigorous and productive.

FRUIT: large, roundish, oblong, skin yellow, splashed with purple.

FLESH: yellow, texture coarse, moderately juicy, semi-cling, to clingstone.

SEASON: late August.

One of the best peaches of its season and worthy of further trial.

LATE CRAWFORD.

TREE: vigorous, only fairly productive.

FRUIT: large, color yellow, dull green with red cheek.

FLESH: Deep yellow, red at the stone, texture juicy and melting, rich flavor.

QUALITY: dessert good; cooking very good.

SEASON: late September.

The tree is not very productive, and has gradually been discarded in spite of its quality.

JACQUES RARERIPE.

TREE: vigorous, healthy and productive.

FRUIT: size large, form roundish oblate, color dark yellow, shaded with red.

FLESH: color deep yellow, free stone, flavor good.

QUALITY: dessert very good; canning excellent.

SEASON: mid-September.

LEMON FREE.

TREE: medium strong grower; hardy, productive.

FRUIT: small to medium greenish yellow turning to yellow when ripe.

FLESH: yellow, free stone, texture coarse and juicy.

QUALITY: excellent canner.

SEASON: early October.

Very productive.

CAPTAIN EDE.

TREE: quite large, hardy, productive.

COLOR: yellow with red cheek.

FLESH: deep yellow, free stone.

QUALITY: dessert and canning, fair to good.

SEASON: immediately following Elberta.

The following list is a personal choice for commercial orchards that might be extended from the descriptions previously given. St. John, Garfield, New Prolific, Elberta, Captain Ede.

For the information of those who wish to select varieties for their particular districts, the following lists are given:

The varieties most hardy in wood are: Hill's Chili, Crosby, Steven's Rareripe, Kalamazoo, Wager, Greensboro.

The varieties most hardy in bud are: Crosby, Hill's Chili, Triumph, Steven's Rareripe, Kalamazoo.

The varieties most tender in bud are: Early Crawford, Late Crawford, Chair's Choice, Reeves' Favorite, Elberta.

The varieties recommended in the first list may be considered medium hardy or medium tender in bud. As a general rule the smaller growing rather than the large growing trees are hardiest, and these, when on a warm, dry, gravelly soil, show the greatest resistance to cold.

LOCATION AND SITE.—The location of an orchard has to do with its general surroundings. It may relate to transportation facilities, convenience to markets, general climatic conditions, or to any of the economic factors that influence success in fruit growing.

The site has to do with the particular piece of land occupied by the trees. It relates to the slope, atmospheric drainage, and other natural factors, which in turn affect growth and habit of fruit and tree.

Many promising orchard undertakings have failed to give the expected results because of bad roads, distance from loading station, poor transportation facilities, convenience to markets, and other economic factors that have not been given careful consideration. An isolated individual, unless there is a home demand for his produce, has little hope of success. A community where all growers fight diseases and insect pests, where all take an interest in the community, and where there is an efficient selling organization, has every chance of success. A location in such a community is desirable. These points, however, require little discussion here, as they are discussed fully in all good horticultural works. The same principles that apply to apples usually discussed apply to peaches and other fruits also.

SOIL.—The soil is very important. It must be warm, dry, and deep. Warmth is an indication that the soil is dry and the absence of excessive moisture is an indication that the soil is warm. A dry soil is not necessarily one that will not retain moisture, but one that retains the necessary moisture and allows to escape only excess moisture. Depth of soil includes also the openness of the subsoil. Peach roots should have a minimum of thirty inches of open drained soil in which to feed and grow. If the natural drainage is not such that this depth is available, tile drainage will aid a great deal. The kind of soil—sand, sand loam, loam, clay or clay loam—is not so important if the other factors, those of warmth, dryness, and depth, are placed first. Peaches are doing equally well on all kinds and grades of soils, but the most favored by growers are the sands, sand loams, and gravels. These are apparently the deeper, warmer, and drier.

The soil for peaches must be moderately fertile. One very rich in nitrogen is not to be recommended, as it is likely to induce an excessive growth of foliage. On the other hand, a poor soil is equally undesirable.

ROOTS FOR PEACHES.—In an attempt to decrease the loss due to adverse soil conditions and from winter freezing, an effort was made at the Vineland Experi-

ment Station to grow peaches commercially on plum roots *Prunus americana*. The soil was a heavy clay with a ve. .rd subsoil about eight inches below the surface.

The plum root is very dwarfing to the peach. Part of the trees in the experiment were removed in the fall of 1915 at seven years of age, and part are still standing. The trees on the plum roots have not made more than one-half to two-thirds the growth the trees on peach roots have. The union, in most cases, though fairly good, has not been (Fig. 1) as complete as could be desired. Owing to the fact that *Prunus americana* is shallow-rooted on such a soil, many trees were blown sideways or completely over when the soil was soft and wet. This is due to the heavy top on the small root system. This root is also inclined to sucker and



Fig. 1. Peach on plum root. Notice the constriction at point of union of root and trunk.

become a general nuisance. The trees have not yet borne a crop of fruit, but every year from three years of age except 1914, scattered fruits have been produced.

The loss in trees from various causes has been as great as in the adjoining blocks where the trees are on their own roots. From our observations so far peaches on plum roots have no place in orchard practice under conditions similar to ours.

NURSERY STOCK.—Buy the trees from a reputable nursery firm. Any firm represented by any agent does not always offer the best trees. A low price is not a guarantee of cheapness. The stock, besides being of good quality and size, should be free from insect pests and diseases and not injured by careless handling or careless fumigation methods. Experiments show that fumigation will completely destroy all scale without injury to the tree. Insist on fumigated trees. Trees from one locality are as good as another. If well ripened when dug and carefully stored,

it is policy to buy from the firm that can give the best grade of trees for the least money. Consider well, also, freight charges and duty if purchasing from a distance.

Seedling peach trees are grown from pits of the ripened fruits. A few years ago it was thought that pits from the natural fruit found growing in the mountains in the South-Eastern States were hardier and produced stronger root systems than the pits of cultivated varieties. Now the practice is to some extent discontinued and the pits of hardy Northern varieties are used.

The pits may be either planted in the fall or spring. If in the fall, they may be planted in rows three to four feet apart in places where the trees are expected to grow. The action of the frost and moisture cracks the stone, so that in the spring the kernels come in contact with the soil.

If stones are to be planted in the spring, they may be stratified or bedded in the fall in moist sand. In the spring, they are sifted from the sand and stones, cracked, and the kernels are planted in the field in rows or in beds to germinate. The seedling plants from these beds are then set in the field in rows. The usual method of propagation is by budding. The stock should be large enough to receive the bud by August, of the year the pits are planted. The buds are taken from a bearing tree of known variety or from the nursery row of known variety and budded about four inches from the ground. The operation of budding is very complicated to a beginner, but practice is practically all that is required.

The bud is usually cut about three-quarters of an inch long. Most budders cut from below upwards. It does not matter how the bud is cut so long as a clean cut is made and as little wood as possible is left adhering to the bark; the slit or wound to receive the bud is made by two incisions, one vertical and one transverse, made by a rocking motion of the blade. In most illustrations these are shown to be horizontal, but in actual practice it is found that they are usually more or less at an angle. The cut is so made that the corners can easily be lifted by the blade of the knife and the bud inserted.

The bud is placed and then requires to be tied. This is done with raphia which has previously been soaked in water, beaten out and cut to the desired length; the bud is tied by this raphia being wrapped twice below the petiole, then three or four times above it. A single knot is made. Supposing this operation to be done in the first week in September, the raphia will be ready to be cut in about ten days. To do this simply take a knife and sever the wrap on the opposite side to the one on which the bud has been inserted. This is left until the following spring, then the seedling stock is cut away just above the bud. This is then allowed to grow, and should be ready for orchard planting in the fall of that year.

Only thrifty, well-grown trees should be planted. This does not mean necessarily the largest trees. Medium sized trees are often just as desirable for planting as the large ones. Small trees are not advisable to plant, as frequently they have poor root systems.

When trees are delivered from the nursery it is essential that the root be kept from drying out. The most satisfactory way of doing this is to "heel in." This consists of completely covering the roots with soil. A trench wide enough to admit the roots and about eighteen inches deep is dug and the roots of the trees placed in a slanting position in it.

FALL VS. SPRING PLANTING.—Experiments indicate that the only safe time to plant peach trees is in the spring of the year as early as the ground can be put in a good state of cultivation. Practically every tree has been lost when fall-planted at the Experiment Station. If banked up carefully, they invariably freeze down to the top of the mound of earth when planted in the fall.

PREPARATION OF THE LAND.—Land that is to be planted to peaches should be prepared the previous season. This may be done by growing a hoe crop, such as potatoes, tomatoes or corn or by plowing the sod quite early in the season, and cultivating until it is in a good state of tilth. The habit of planting in sod cannot be too strongly condemned. The tree loses too much on the start. It is cheaper to wait a year than to plant in unprepared soil.

DISTANCE TO PLANT.—The distance apart to plant depends on several things:

- (1). The fertility of the soil.
- (2). The topography of the land.
- (3). The pruning system to be followed.
- (4). The preference of the individual grower.

The distances recommended are 18 ft. x 18 ft., 18 ft. x 20 ft., 16 ft. x 20 ft., and 20 ft. x 20 ft., requiring respectively 134, 121, 136, and 108 trees per acre. Some growers plant as close as 16 ft. x 16 ft.

This table, taken from Bulletin No. 201, shows the distance apart trees were planted previous to 1910

Orchards.		Orchards.	
18 ft. x 18 ft.....	129	20 ft. x 20 ft.....	57
16 ft. x 16 ft.....	111	16 ft. x 18 ft.....	45
15 ft. x 15 ft.....	89	16 ft. x 20 ft.....	19
18 ft. x 20 ft.....	62	Other distances	137

The tendency today is to use the greater distances, 18 ft. x 18 ft. and 20 ft. x 20 ft., or to plant wide one way and close the other, such as 16 ft. x 20 ft.

PLANTING.

In setting out an orchard great care should be taken to plant the trees in straight rows, and also to have them in perfect lines in both directions.

Where the orchard is to be from small to medium size, stake out the land before setting the trees. There are two common methods:

Place the first row of stakes along one side of the field. About the centre run another row at right angles to the former row across to the far side of the field. Take a pole the length of which is the distance apart the trees are to be set, and placing one end of each against a stake in each row, swing the free ends till they meet, and then set a stake at that point. Continue this till the whole field is staked. Care must be taken to get the first row straight and the second one perpendicular to it.

When the orchard is to be a large one and the necessary labor has been secured, the following method may be used to advantage. Place a row of stakes along two opposite sides of the field, with the stakes the required distance apart. Stretch a wire cable with *the distance apart the trees are to be set marked on it* between two corresponding stakes. Plant the trees at the marks on the wire, at the same time having a second wire stretched for the next row. With this method no stakes are set and planting goes on continuously. Watch the wire carefully and plant accurately to avoid error.

Before planting a tree it is always advisable to prune the roots, that is, cut away any bruised or damaged parts, and if the roots are very long cut back to eight or ten inches or to the vigorous parts. Dig the hole large enough to admit the roots without bending or cramping. To fill the hole use only finely pulverized

earth and work it in around the roots carefully. After the first soil has been put in and worked around the roots, partly fill the hole, tramp the soil to make it firm, then completely fill the hole, being careful to leave a mulch of loose soil on top to check evaporation.

PEACHES AS FILLERS.—The peach cannot be said to be an ideal tree for a filler. In a few cases peach trees have been planted with other trees with the hope of obtaining fruit while the trees were reaching bearing age. The various fruits are somewhat different in their cultural requirements. The peach is also very thrifty and rapid growing, and in four years attains as great a size in both top and root as the average apple does in eight to ten years. Either the permanent tree or the filler must suffer. Ordinarily the tree that suffers will be the one that is not yielding immediate returns.

PRUNING.

The subject of pruning is one of wide discussion, and it is doubtful if the methods and systems of any two growers are exactly alike. The subject has been studied definitely but little, but a few suggestions are offered. There are, however, certain rules that may be considered basic:

(1). Have a definite system of pruning and do not change without some good reason.

(2). Consider the variety and prune to suit its fruiting habits.

(3). Have good tools; both money and time are saved by their use.

(4). Prune regularly.

The object of pruning:

(1). To modify the vigor of the tree.

(2). To construct a framework, make the tree shapely, and keep it within bounds.

(3). To open the tree top so as to admit air and sunshine.

(4). To remove branches that are adding nothing to the economy of the trees.

(5) To aid in stimulating the development and proper distribution of fruit buds.

(6). To facilitate the harvesting of the fruit.

HEADING.—For the past ten years about 75 per cent. of the orchards planted have been low-headed; to-day, a few growers are returning to the medium height. With the low-headed trees, spraying, pruning, and harvesting are more easily accomplished; with the medium high-headed tree cultivation can possibly be carried on more readily. However, with the extension disk and other modern orchard implements, the principal objection to the low-head is overcome. A tree that is too low is possibly objectionable, and one that is too high is a hindrance to the efficiency of labor. Fifteen to twenty inches, with a maximum of twenty-four inches to the first branch, is a good convenient height.

PRUNING AFTER FIRST YEAR.—Trees are pruned ordinarily in late winter or early spring. Pruning for the first year consists of selecting the branches which are to form the framework of the tree and removing all others. Care must be taken to have these branches so spaced that they all have separate unions with the trunk. A tree that has all its branches radiating from one common union is usually weak, and often the weight of foliage and fruit causes splitting.

Having selected the branches that are to form the main limbs of the tree, cut these back to within eight or nine inches of the trunk, then remove the other branches entirely. Cut back to a bud that points outward.



Fig. 2. A typical tree before pruning.



Fig. 3. Same tree as Fig. 2, thinned out, but not cut back or headed in.



Fig. 4. Another good type of tree, thinned out, but not cut back. The branches all come out at one height on the trunk.



Fig. 5. Tree showing a very heavy wood growth.

AFTER SECOND YEAR.—This year pruning simply consists in thinning out the tree, choosing the main branches, and cutting out the others. Cut out all central leaders that appear at this period.

AFTER THIRD YEAR.—By the end of the third year the tree will be setting a few fruit buds. The main limbs and branches are already formed and pruning consists largely of cutting back and thinning out growth.

PRUNING OLD ORCHARDS.—Orchards that are yielding crops annually require regular and careful pruning. The system most practical is to thin out the tree, then cut back the remainder to twigs which show fruit buds. This is the most popular system.

Another plan that is followed by some is that of thinning out and not cutting back at all. Both large and small limbs are removed. It is maintained that when-



Fig. 6. A low-headed tree fairly pruned. It is both thinned out and headed in or cut back.

ever a tree is cut back, especially at the top, new growth is forced out and color on the fruit is sacrificed to some extent. Those who follow this latter system sacrifice ease of picking in order to obtain color. The regular cutting back or heading in undoubtedly keeps the fruit nearer the ground.

FRUITING HABITS.—The fruit buds of the peach are normally axillary, and only very rarely is one found terminating a twig. They are borne always on one-year-old branches and short twigs, the latter sometimes very much resembling true fruit spurs. These buds open and produce a single flower but no leaves. They are borne singly in the axils of single leaves or in pairs, one on either side of a leaf bud, the three buds being borne in the axils of as many leaves.

The first type of flowering is found in trees very lightly pruned or on weak shoots in well-pruned trees, with certain variations, depending on the variety. Some of our best varieties bear a large percentage of their buds singly. Fig. 7 shows the two types of buds, the single buds on the smallest and weakest grown shoot, and a majority in the three bud formation on the strongest shoots. The stronger type with the triple buds is most desirable. However, some of the best varieties bear their fruit buds mostly single, even on strong twigs, as a reference to Fig. 8 shows.



Fig. 7. Greensboro.



Fig. 8. St. John.

In Fig. 8 most of the buds are leaf buds, and the fruit buds may be noted as being more rounded at the apex and a little stouter throughout. In most varieties shoots that do not make a growth of over ten or twelve inches bear their fruit singly. The triple buds are found on the stronger one-year-old wood.

In reference to Fig. 9, it will be seen that the centre shoot, which is the strongest, bears far more of its buds in the triple formation than the laterals, which are shorter and weaker and have most of their buds borne singly. Fig. 10 shows a branch in which all buds are single and but few of which are fruit buds.



Fig. 9. Greensboro.



Fig. 10. Crawford.



Fig. 11. Greensboro.



Fig. 12. St. John.

Figs. 11 and 12 show the buds of the two types at the opening stage. Fig. 11 is triple bud formation, in which the centre is a leaf bud supported by the fruit buds on either side. This is the large flowering type of peach, while Fig. 12 is of the small flowering type. The latter shows the single buds opening and the uneven distribution of leaf surface, while there is a good percentage of fruit buds. This point is well to remember, as it has considerable significance in "heading-in" fruiting wood for the purpose of thinning the fruit.

Fig. 13 shows the triple bud flowering type—two blossoms, one leaf bud—where there is an abundance of bloom and an even distribution of foliage, also even bloom on short laterals or spurs on two-year-old wood. In this illustration the branch at the right was cut from the branch at the left, and all parts are one-year-old wood except the heavy portion of the branch on the left. Fig. 14 shows the type with the



Fig. 13. Greensboro.



Fig. 14. Crawford.

single bud formation, and consequently the scarcity of leaves along that portion of the branch where most of the fruit is borne. The petals of the flowers have fallen. In this latter case it is inadvisable to thin the fruit by heading-in the fruiting wood because a large percentage of leaf surface is lost, with the consequent poor nourishment of the fruit. Where the tree has made poor growth and where the fruit buds are borne singly, pruning can be employed as a means of thinning the fruit only in so far as whole branches can be spared. With the triple bud formation heading-in may be resorted to for fruit thinning purposes without fear of loss of leaf surface. The fruiting wood, with its fruit buds in pairs with a branch bud between—that is, the triple bud formation—may be cut back to even its last pair of fruit buds. The branch bud will continue the growth of the twig. Such a type of fruiting wood can only be developed by severe pruning. Some of these strong twigs will grow in the tops of poorly pruned trees, but to grow them in the centre of the tree the top must be pruned back severely. It is almost impossible to main-

tain a fruiting depth of more than four to six feet. Little is gained by growing a peach tree fifteen feet in height when the bottom seven feet is barren. It is better to keep the trees down to a height of ten feet with fruiting wood within three feet of the ground. A well pruned tree will grow thirty inches or more of new top each year, but if the tree is to continue productive, a very large portion of this must be removed each year. It is safe to say that in a well pruned peach tree from one-



Fig 15. Greensboro.



Fig. 16. Crawford.

third to three-quarters of the one-year-old growth is removed at each pruning season.

Figs. 15 and 16 show the two types of bud-bearing wood in fruit. Fig. 15 is that of the triple bud formation, and shows that while it bears an abundance of blossoms very close together the fruit that sets has ample room and will develop normally, although some of them are very close and may require thinning. Fig. 16 shows the fruit well scattered from the single bud formation.

CULTIVATION.

To give a method of cultivation that will suit every condition is impossible.

The objects of cultivation are:

- (1). To improve the physical condition of the soil.
- (2). To check evaporation and also increase the water-holding capacity of the soil.
- (3). To hasten the decomposition of organic matter and free plant food in the soil.

The usual method of cultivation is to plow as soon as the ground is dry in the spring. Whether to plow up to or away from the tree must be left to the discretion of the grower. It is usual to plow up to the trees in the fall and away in the spring, but circumstances alter cases, and it is often advisable to plow up to the trees in the spring.



Fig. 17. A bad crotch, attacked by canker, unable to carry its load.

Cultivation throughout the season consists of keeping the soil well worked and free from weeds. To do this properly, it is necessary to cultivate about every ten days and as soon after rains as possible.

Before winter sets in the trees should be well ridged up with the plow or banked up by hand. This prevents surface water from damaging the roots.

COVER CROPS.—The uses of cover crops are:

- (1). To prevent washing.
- (2). To check fall growth.
- (3). To add humus.
- (4). To add nitrogen.
- (5). To hold the snow and leaves.
- (6). To prevent deep freezing, and consequently winter injury to roots.

Cover crops may generally be classed under two heads—leguminous and non-leguminous. Of the former the most common are red and crimson clover, vetch and cow peas. Of the non-leguminous, the more common are oats, buckwheat, rye, rape and turnips. Very often “chickweed” (*Stellaria media*) is encouraged to grow in a peach orchard to serve as cover crop.

The cover crop is sown when the orchard is given its last cultivation for the season, usually the second or third week in July, although the exact time is regulated by the weather conditions:

Leguminous	Amt. per Acre	Cost per Acre
Red Clover	12 lbs.	\$ 3.00
Crimson Clover	15 "	1.50
Hairy Vetch	1 bu.	6.00
Cow Peas	1.5 "	4.50
NON-LEGUMINOUS		
Oats.....	1 bu.	.50
Buckwheat.....	3 pecks	1.20
Rye.....	1.5 bu.	2.47
Turnip.....	6 lbs.	2.10
Rape.....	6 "	.48

Seed prices vary a great deal; the above prices are only comparative.

LEGUMINOUS CROPS.—*Vetch* has not proven an attractive cover crop at the Experiment Station. It grows very slowly in the fall and must of necessity be left quite late in the spring before plowing to get the necessary quantity of material to plow under. Once it becomes thick and matted it is very difficult to plow under. When well grown, it adds both nitrogen and organic matter in quantity to the soil.

Cow Peas.—This crop has been used to some extent in the apple orchards of Ontario, but is not recommended for extensive use.

Crimson Clover.—This crop grows very readily and will make a fairly good stand in the fall. The main objection to it is that it kills out very easily in the winter. It is recommended for positions that are not windswept and are likely to hold the snow. When it does not winter-kill, it is one of the very best of the legumes.

Red Clover.—This crop is well known to all and is excellent when a good stand can be obtained. The main objection to it is the high price per pound and the chance that a catch may not be obtained at that season of the year.

NON-LEGUMINOUS.—*Oats.*—This is a cover crop that is not used extensively but has proven to be one of the best at the Experiment Station. When sown at the rate of a bushel and one-half per acre or at the rate of one bushel per acre with ten pounds of red clover, it makes excellent growth, holds the snow, and adds organic matter to the soil. The objection to it lies in the fact that it winter-kills. It is never difficult to obtain a good stand of this crop.

Buckwheat.—This is important as a cover crop as it will grow on almost any soil and leaves the land in good condition. It is also used to smother weeds, particularly in the case of twitch grass. It holds snow well, but may attract mice and rabbits.

Rye.—Rye is a very good cover crop, and will grow almost anywhere. It makes a good covering for the land, prevents drifting of the snow, furnishes a good supply

of organic matter, and retains soluble plant food. The disadvantage lies in the fact that it must be plowed early in the spring or will become tall and difficult to plow under.

Turnips and Rape.—Either of these is a cheap cover crop. They will grow anywhere. Their main disadvantage lies in the fact that the leaves and tops retain moisture and consequently are disagreeable to work among. Rape is an especially good crop when carefully handled.

INTERPLANTED CROPS.—Very few growers can afford to let the trees come into bearing without intercropping for at least two years. The practice is of no advantage to the tree, and cannot be compared with thorough tillage, but if interplanted crops are wisely selected and the interest of the tree always remembered, no serious injury results.

A crop for interplanting ought to be one which requires the same tillage as the peach, and care should also be taken to plant crops that will not require cultivation late in the season. Early potatoes are very good, but late potatoes are objectionable.

Corn is quite often used, but if planted close to the trees is harmful because it shades them.

Whatever crop is planted a strip of three to four feet should be left on either side of the tree.

PROTECTION FROM MICE AND RABBITS.—In a few localities mice and rabbits do damage by girdling. One method that has been proved to be quite practicable but expensive is the wrapping of the trunks of the trees with tarred paper up to a height of 18 to 24 inches, depending on the length of the trunk of the tree and the depth of snow common in the locality. Tie the paper loosely with a piece of twine. In most cases it is much easier to bank up the tree with earth to a height of eight inches to one foot. This requires time, but is generally effective.

MANURES.—*Manure and Cover Crops.*—Cultivation is the cheapest and most valuable fertilizer at the disposal of the fruit-grower. Orchards on sandy loam soil have been known to produce good crops for six or seven years in succession without farmyard manure or commercial fertilizer, but they have always had a good supply of humus and thorough cultivation. The best cover crops are largely the same composition as farmyard manure, and with the exception of being unable to seed the soil with the organisms of decay, can take their place in every particular. The following is the chemical analysis of the three most prominent cover crops compared to farmyard manure. The figures show the average percentages:

	Nitrogen	Phosphorus	Potash	Water
Vetch .....	.65	.146	.457	79.15
Red Clover .....	.41	.13	.45	.80
Rye (green) .....	.33	1.5	7.5	
Manure .....	.5 to .75	.5 to .75	.25 to .375	

Vetch and red clover are legumes, and consequently take a large supply of their nitrogen from the air, and when they decay give it to the soil. Rye is not a legume, but has the power of breaking up, absorbing, and making available a large quantity of potash. It supplies a large quantity of the much needed organic matter. Rye when left too long before plowing becomes tough and fibrous, and does not decay readily, but if handled at the proper time it is in no way objectionable.

As the table shows, any one of the three crops mentioned gives, when plowed under green, almost as much plant food ton for ton as farmyard manure.

COMMERCIAL FERTILIZER.—Commercial fertilizers without humus have no place in orchard management, and therefore must be used in conjunction with a cover crop or farmyard manure. Nitrate of soda is the only fertilizer that can be readily absorbed without humus. Others require the action of humus to bring about the chemical changes which are necessary before the fertilizer can be absorbed. Potash is applied either as the muriate of sulphate, the former being in most general use. Phosphorus is applied in a number of forms, such as Kainite, ground bone, superphosphate, etc. The very fine ground bone and acid phosphate are used for quick returns.

The following methods of fertilizing are submitted for reference:

(1) 10 tons farmyard manure at	\$1.50	\$15.00	\$15.00
(2) 6 " " " "	1.50	9.00	
200 lbs. bone meal	" 1.50 per cwt.	3.00	
100 " muriate	" 2.15 "	2.15	14.15
(3) 30 " vetch	" 6.00 per bu.	3.00	
200 " bone meal	" 1.50 per cwt.	3.00	
100 " muriate	" 2.15 "	2.15	8.15
(4) 20 " red clover	" 9.00 per ton	3.00	
200 " bone meal	" 1.50 per cwt.	3.00	
100 " muriate	" 2.15 "	2.15	8.15
(5) 1 bu. rye	" .95 per bu.	.95	
20 lbs. vetch	" 6.00 " "	2.00	
200 " bone meal	" 1.50 per cwt.	3.00	
100 " muriate	" 2.15 " "	2.15	8.10

THINNING.—Thinning by hand is not practiced extensively. It is desired if possible to thin the fruit by heavy cutting back and by the removal of unnecessary small twigs and branches. The desired end cannot, however, always be accomplished by pruning. The better practice would undoubtedly be to thin by hand, but very often help is not available and the expense is considered too high.

The following is the result of an experiment concluded on fifteen St. John trees in the summer of 1910: The trees were healthy, of average size, nine years of age, and headed and pruned rather high. The previous year they had borne no fruit at all—the first time they had ever failed—and at the time of thinning they were very heavily loaded. These trees were chosen because they gave a chance to observe the greatest extremes. The thinning was done on June 25th and 27th. It required approximately two days to do the work. Distances in thinning can only be guessed at, and a statement of distance must necessarily convey widely different ideas to different persons.

Natural means that the tree was left with what fruit, in the opinion of the experimenter, it could mature properly.

Firsts	Seconds	Culls
Unthinned.....	32½ lbs.	194½ lbs.
1 to 3.....	201½ "	328 lbs.
3 to 5.....	245½ "	62½ "
5 to 7.....	252 "	9 "
Natural.....	253½ "	183½ "
		219½ "
		30 "

Unthinned	6,392	peaches, weighing	555.25	lbs., worth	\$ 7.75
1 to 3	4,508	"	667.75	"	22.01
3 to 5	3,466	"	550.25	"	20.76
5 to 7	2,595	"	446.25	"	17.55
Natural.....	3,209	"	502.75	"	18.73

It will be noticed that the returns from the unthinned trees are very low. This is accounted for by the fact that the trees were extremely heavily loaded. The trees thinned from one to three inches, or just so two peaches when fully developed or ripe would not touch each other, as nearly as could be judged, in the early part of the season, gave the highest gross returns. Thinned the greatest distance or so, not more than one peach was left on each twig, unless it was exceptionally large, gave the lowest returns. This, however, would not have been the case if the fancy fruits had been graded as such and sold at the price for fancy. Also, it was a year in which there was a good demand for almost any grade of fruit. The value is reckoned at seventy-five cents a basket for firsts and fifty cents for seconds. Some of the best sold for one dollar, but as the exact amount is not known no account is taken of it here.

Rather than thin to a set distance, it is much better to thin to the tree—that is, leave on the tree just what it can ripen nicely. This requires much judgment on the part of the grower. It is very seldom that two trees, even of the same age, are alike in growth and vigor. A tree at the end of the fourth summer should produce a basket of fruit. Some produce more, some less. At the end of the next summer it should produce two baskets, at the end of the next summer four baskets, and at the end of the eighth year ten baskets, or an increase of two baskets a year up to eight years of age. This would be a maximum average, and is given only as a guide, not as a rule, to follow when thinning. Small areas have been known to produce much heavier than this for one season, but the increase cannot be expected to be so great when the trees have once reached maturity. The idea is to remove when small all fruit that the tree is not likely to ripen properly. You know the health and vigor of the tree, and how, what and how much you fed it. The tree can draw just a certain amount of food from the soil, and the question is how many fruits is this food to be divided up among. The pits always claim first attention, and it is only after they have been satisfied that the flesh and next year's fruit buds are developed. You have it within your power to say how much shall be left for flesh and buds. Ripen as few pits as possible consistent with quantity.

WINTER INJURY.—This is a form of loss that is very difficult to eliminate. Three forms are very common—killing of the fruit buds, killing of the branches and twigs, and killing of the roots.

The first form is most noticeable because it is marked by a small crop or the total absence of fruit. This form of injury is caused most largely by a very sudden drop in temperature following a warm spell in winter, such as occurred in January, 1914, or sometimes the first warm days of spring having opened the buds the blossoms are exposed to frost or cold adverse weather conditions late in the spring. Cultured methods are of little avail in such cases except in so far as good cultured methods tend to keep the tree thrifty. A site for the orchard that is not subject to these conditions is the best insurance against loss.

The second form, i.e., the killing of branches or twigs and possibly the blackening of the hearts of the main limbs and trunks, is more readily guarded against. This injury is most common in over-cultivated orchards, over-pruned trees or under

any conditions where soft, sappy growth has been produced. The remedy lies in more judicious cultural methods that will tend to keep the tree vigorous and healthy but not overgrowthy. The slower growing and slower maturing trees are the most resistant to cold.

The third form, root injury, may be due to a number of causes. Peach roots cannot withstand excessive moisture. Roots in a poor soil lacking in humus suffer from deep freezing and are themselves weak from want of food. This form of injury can be detected by the behavior of the tree in early spring. It may begin to leaf out and even open its blossoms, but in a few days begins to lose color, and in a time ranging from a few days to midsummer gradually but surely dies. It is expected that the trees are budded on the most hardy roots obtainable because beyond this there is no insurance against loss except the removal of surplus moisture by ridging up with the plow in the fall and the prevention of deep freezing by mulching with farmyard manure. A cover crop that holds the snow is an insurance against deep freezing. Judicious cultural methods are again the best form of insurance.

WHY IT PAYS TO PRODUCE HIGH-GRADE FRUIT.

The accompanying table is intended to show why it pays to produce high-grade fruit. All calculations are made from returns to growers except the cost of picking and packing one basket of fruit, which has been calculated at ten cents per eleven quart basket.

Note particularly the column headed "Per cent. of wholesale price used in marketing." Notice how rapidly it declines as the wholesale price rises. It is impossible to state any overhead expense which will apply outside of a particular case. Data from a reliable grower seems to indicate that overhead expense is about fifteen cents per basket. Taking this as an average and combining it with the data given in the table, it will be seen that it is necessary to receive a wholesale price of between thirty cents and thirty-five cents to defray the total expenses:

Retail price.	Wholesale price.	Price which growers received.	% of retail price which growers receive.	11 qt. bkts. fruit picked and packed.				Fruit on tree.	
				% of wholesale price which growers receive.	% of wholesale price used in marketing.	Price which growers receive.	% of retail price which growers receive.	% of wholesale price which growers receive.	% of wholesale price used in marketing
.20	.15	.06½	32.5	43.3	56.7	.03½	0.0	0.0	100.0
.25	.20	.11	44.0	55.0	45.0	.01	.4	5.0	95.0
.30	.25	.15½	51.6	62.0	38.0	.05½	11.6	22.0	78.0
.40	.30	.20	50.0	66.6	33.4	.10	25.0	33.3	66.6
.50	.35	.24½	49.0	70.0	30.0	.14½	29.0	41.4	58.6
.50	.40	.29	58.0	72.5	27.5	.19	38.0	47.5	52.5
.60	.45	.33½	55.8	74.4	25.6	.23½	39.1	52.2	47.8
.60	.50	.38	63.3	76.0	24.0	.28	46.6	56.0	44.0
.70	.55	.42½	60.7	77.2	22.8	.32½	46.4	59.0	41.0
.75	.60	.47	62.7	78.3	21.7	.37	49.3	61.6	38.4
.80	.65	.51½	64.4	79.2	20.8	.41½	51.8	63.8	36.2
.90	.70	.56	62.2	80.0	20.0	.46	51.1	65.7	
.90	.75	.60½	67.2	80.6	19.4	.50½	56.1	66.0	34.0
1.00	.80	.65	65.0	81.2	18.8	.55	56.0	66.7	33.3
1.10	.85	.69½	63.2	81.7	18.3	.59½	51.0	70.0	30.0
1.15	.90	.74	64.3	82.2	17.8	.64	55.6	71.1	28.9
1.20	.95	.78½	65.4	82.6	17.4	.68½	57.0	72.1	27.9
1.25	1.00	.83	66.4	83.0	17.0	.73	58.4	73.0	27.0

PICKING.—The time of picking depends on the maturity of the fruit. The degree of maturity at which the fruit should be picked depends on the market to which it is to be shipped. These are points that must be learned from experience.

Picked below a certain degree of maturity, peaches shrivel and decay before ripening. Picked above a certain degree of maturity the fruit bruises badly and will spoil before it reaches its destination. The eye is almost the sole judge for maturity in market fruits. Size and color are the deciding factors. Size is easily judged, but color is deceiving. The beginning of the development of a red cheek and the changing of the ground color from green to yellow are indications of approaching maturity. The ease with which the stem frees from the fruit and without tearing or doing damage to the tender skin is another indication of approaching maturity.

The trees are always picked over at least twice; more usually three times, and very often four or five times. In a few cases trees have been picked over eight and



Fig. 18. Heaped leno-covered baskets in Woolverton case.

ten times in order that very uniform grades of fruit for maturity might be obtained. The question of labor is, however, very often the deciding factor.

Sun very rapidly hastens ripening or maturity. As soon as a basket is filled it should be placed in the shade for immediate delivery to the packing house. Moisture is favorable to the development of fungus growth and decay. Consequently, fruit should not be put in the basket while it shows signs of moisture.

PACKING AND GRADING.—Peaches are ordinarily divided into three grades—Firsts, Seconds, and Culls. Quite often a grade of fancy is made. There are no standard sizes for Fancy, Firsts or Seconds, and consequently the Firsts in a shipment from a number of growers may vary quite as much as the Firsts and Seconds of any one grower. The size of the fruit in the grade is often also determined by the variety. The Shipping Associations are gradually developing standards, but really only a start has been made in uniform grading and packing.

The work of packing should be done in a packing house or other suitable building, and the fruit handled as quickly and carefully as possible.

No attempt is made to discuss here the methods of packing, as that is the work of a demonstrator. The most serious complaint, however, that comes back from the consumer is the fact that very often the baskets are slack, but more often have been filled too full with three layer peaches, and every peach is bruised. A basket should be level full when a patent cover is to be used.



Fig. 19. Peach Box.



Fig. 20. Georgia 6-basket carrier.

PACKAGES.—There are various sized baskets in use. The dimensions of these are fixed by law, but apparently inaccuracies of manufacture creep in and many variations are noticed.

(a). *Six-Quart.*—This is the standard grape basket, but is used also for fancy peaches—those grades that will fill the basket even full with two layers. The dimensions of this basket are fixed by law, as follows: “Four and one-half inches deep perpendicularly, fifteen and three-eighths inches in length and seven inches in

width at the top of the basket, thirteen and one-half inches in length, and five and seven-eighths inches in width at the bottom of the basket, as nearly exactly as practicable, all measurements to be inside of the veneer proper and not to include the top band."

(b). *Eleven-Quart*.—This is the basket in which is shipped the great bulk of the peach crop. It has been severely criticized as being too large, and by some too small; for others it is quite satisfactory. At any rate, with possibly certain modifications, it might be made an ideal basket.

The legal standard says: "Be five and three-fourths inches deep perpendicularly, eighteen and three-fourths inches in length, and eight inches in width at the top of the basket, sixteen and three-fourths inches in length, and six and seven-eighths inches in width at the bottom of the basket, as nearly exactly as practicable, all measurements to be inside of the veneer proper and not to include the top band."

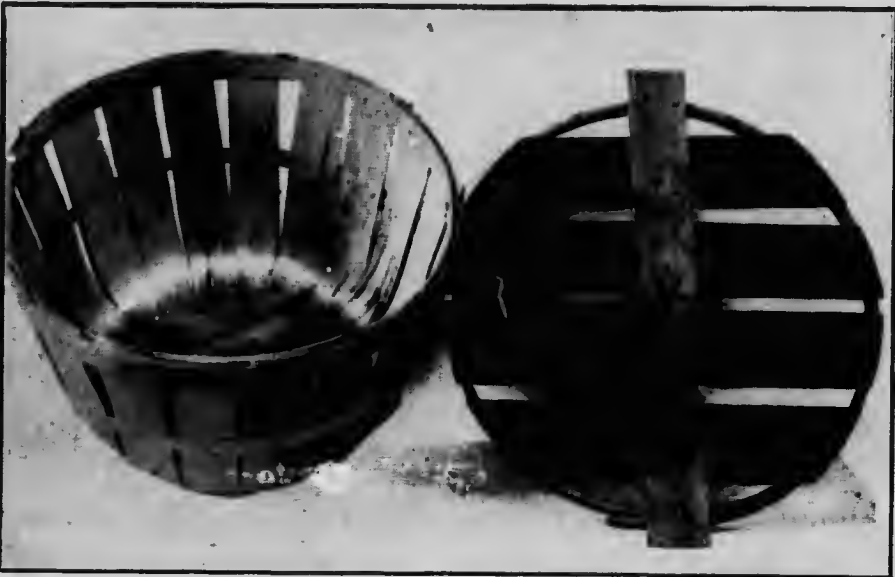


Fig 21. Good type of bushel basket, but cover weak.

(c). *Deep Eleven* is the name applied to a basket holding approximately the same as the eleven described under "b," but made a little deeper and a little smaller at the bottom. This is used to some extent to accommodate three layers of peaches a little larger than will ordinarily pack conveniently into a common eleven. The dimensions of this basket are not fixed by law.

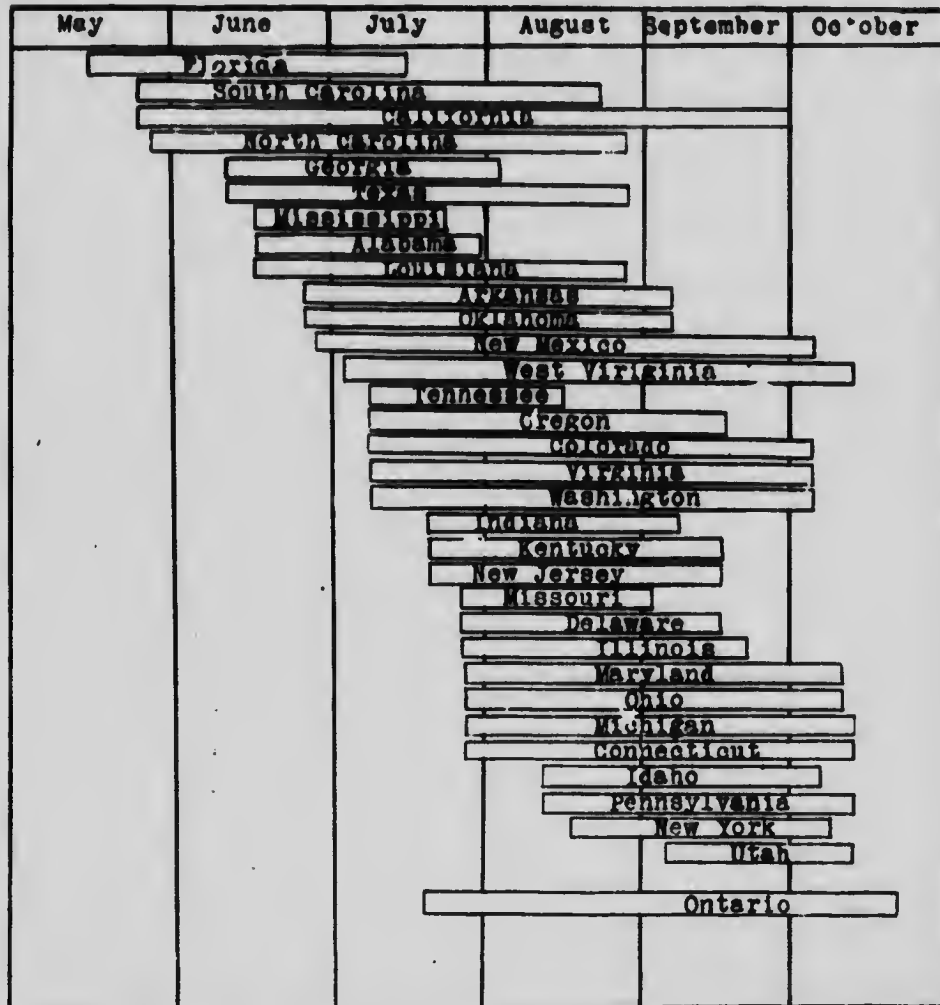
(d). "*Shallow Nines*."—This is a basket made from eleven-quart bottoms and six-quart sides, i.e., the bottom is the same as the common eleven-quart and the sides are the same as the common six-quart. This accommodates very readily two layers of Fancy fruit of most varieties. It is a legal package only when "stamped on the side plainly in black letters at least three-quarters of an inch deep and wide, with the word 'Quart' in full, preceded with the minimum number of quarts, omitting fractions, which the basket will hold when level-full."

(e). *The Leno Cover* (Fig. 18).—This package is becoming ever more popular. It is very attractive to the consuming public. The only objection to it lies in the fact that it is not readily accommodated to present facilities for shipment by rail.

Special facilities have been provided for this package for shipment by boat from Queenston and Niagara.

(f). *The Peach Box* is not yet used extensively. It is 18.5 x 11 x 4½ or 5 inches deep, and holds approximately twenty pounds net. (Fig. 19.)

(g). *The Georgia Peach Carrier* (Fig. 20) is an excellent package for fancy fruit, but is not popular in Canada except for fruit stand trade. This particular carrier was made with the handle additional.



(h). *The Bushel Basket*, holding approximately forty-five pounds net, is not used very extensively. It is an excellent package for long-distance shipment, especially if the fruit is firm. It is a very popular package in some of the States of the United States. (Fig. 21.)

SPRAYING.

Peaches are usually sprayed but once in Ontario. Any sprayings other than this are in the nature of special treatments for certain insects or diseases. A thorough application of lime sulphur, winter strength, just when the buds are swelling,

and before they show signs of bursting, is all that is necessary ordinarily. Commercial concentrated lime sulphur, home-made concentrated lime sulphur, and the old home-boiled lime sulphur all are used by various growers for the same purpose. Any one is efficient if applied thoroughly at the proper time. For other sprayings, look up under the heads of "Insects and Diseases."

THE SHIPPING SEASON.

The chart on page 35, with the exception of Ontario, is taken from U. S. Bulletin No. 298. The peach season, when considered for the United States, extends from the middle of May, when shipments begin in Florida, to the latter part of October, when they end in the Northern States.

California, with its diversified climate and great number of varieties of peaches, probably has the longest season, i.e., from the middle of May to the end of September.

The chart shows in detail the comparative seasons of the different States, and incidentally those that compete with Ontario during her shipping season.

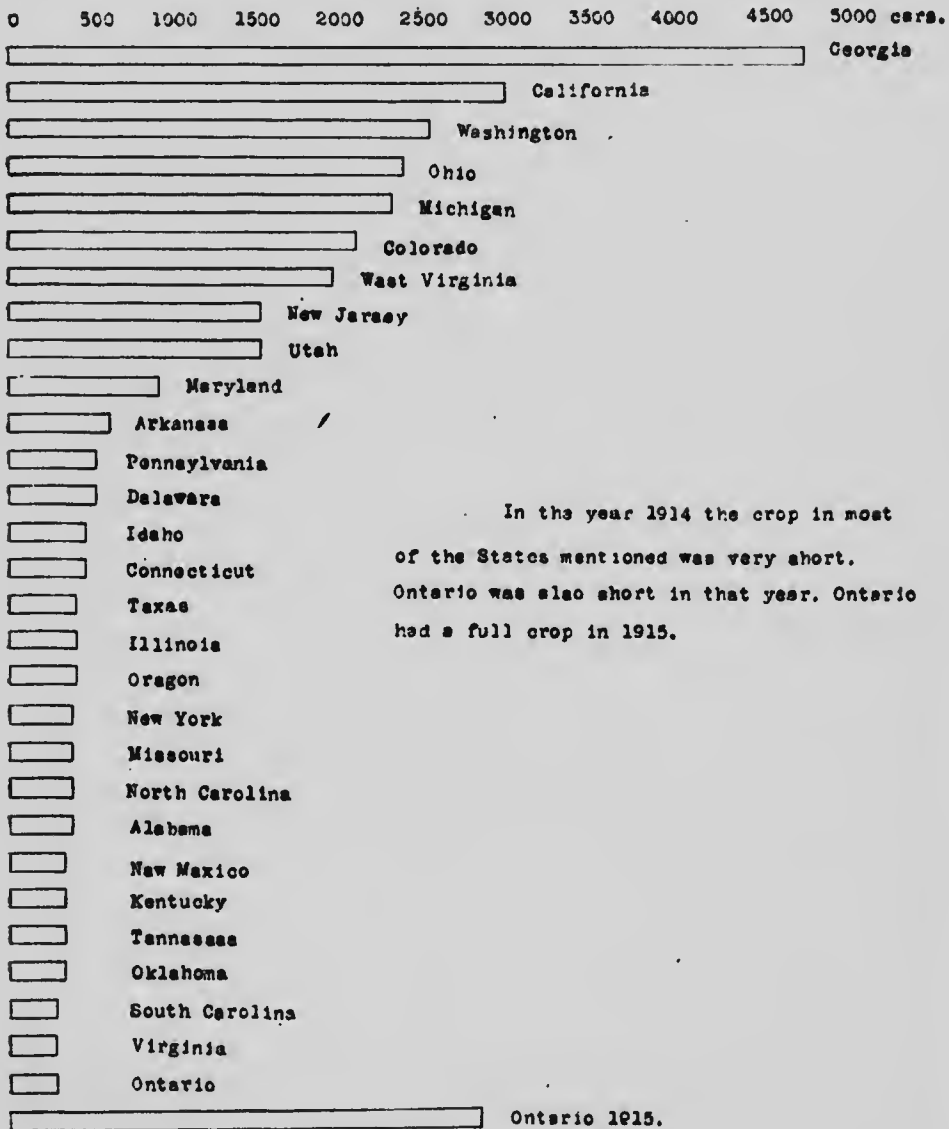
Ontario shipments are light up to approximately August 20th. They again fall off very quickly about the end of September. It can readily be seen then that the heavy shipping season is about six weeks.

PRODUCTION AND SHIPMENTS.—The 1910 census of the United States credits that country with 94,507,000 bearing and 42,266,000 non-bearing trees, peaches and nectarines, a total of 136,773,000 trees, or approximately 1 1-3 trees for each individual. The number of nectarines is comparatively very small. The 1911 census of Canada (there is no 1910 census) credits this country with 839,288 bearing and 1,056,359 non-bearing, a total of 1,895,647 trees, or approximately one-quarter of a tree to each individual in Canada. We have every reason to believe that the average production of fruit per tree is as heavy or heavier in the United States than in Canada. With these figures before us, then, well might we ask the question: If only during the last few years have the growers in the United States begun to feel the pinch in marketing where the production is comparatively four or five times as great as our own for each consumer, should the Canadian grower not still be in a position to plant heavily and sell to good advantage if the markets were properly developed and kept supplied at all times.

The home market is undoubtedly the most attractive market for Ontario peaches. Shipments to the Provinces east and west are increasing rapidly, but the great bulk of the shipments stay within our own Province. Ontario has a population of 2,523,274, of whom 1,194,785 are classified as rural. A very large part of this population has not yet been reached.

The following chart is from U. S. Bulletin No. 298, "Peach Supply and Distribution in 1914." To it has been added the shipments from Ontario. The figures going to make up the total for Ontario were carefully collected, and though they are not absolute, they are approximately so. The United States figures are for 1914, the Ontario figure for 1915. The Ontario figure represents total tonnage freight and express. The number of cars was obtained by dividing by 10. The United States figures are comparatively low, 1914 being a year of poor yield the same as in Ontario. The 1914 Ontario crop could be measured by tens, not hundreds, of cars. Two hundred cars would possibly cover Ontario's shipments for that year.

This chart, taken from U. S. Bulletin No. 298, shows the comparative volume of shipments from the leading areas as compared with Ontario:



In the year 1914 the crop in most of the States mentioned was very short. Ontario was also short in that year. Ontario had a full crop in 1915.

PEACH PRECOOLING.

EDWIN SMITH, Dominion Precooling Plant, Grimsby.

The experience of horticulturists with tender fruits has been that the peach is one of the most difficult fruits to ship long distances. The difference in keeping qualities of the varieties, the frequency of crushing, the short period for harvesting, the danger of picking too green or too ripe, the carelessness of packers in grading and packing, the roughness of help in earloading, the chance for refrigerator cars

to get side-tracked or left without ice, the sluggishness of the trade in distributing, and the ignorance of the consumer as to the handling and serving of the different kinds of peaches, have all combined to give the peach grower an immense task, and one which would not be attempted without the promise of goodly returns.

The peach, being a fruit which will grow in many climates, yet one that will only thrive and produce profitably in a few favored districts, often makes large returns. In years past this has resulted in ebb and flood tides of peach plantings. The phenomenally large prices and net returns received by the Ontario peach grower during the ten years previous to 1913 resulted in very high priced lands and large plantings. These plantings are now bearing fruit, making a surplus of peaches for the old markets, so that it is being a serious question with many growers as to whether they can afford to grow peaches longer.

To meet these conditions new markets are required, and for the most part these must be sought for at greater distances from home. The Canadian West offers this field.

To market peaches on the Canadian prairies requires from seven to fourteen days from the time the fruit is picked till it reaches the consumer. To hold the peach successfully this length of time it must be placed under refrigeration. It has been found that ordinary refrigerator cars do not offer enough refrigeration for the length of time in transit, since so slow is the process of cooling that the peaches become over-ripe and show evidence of decay before they actually reach a temperature of 45 degrees. This situation has demanded that the fruit be precooled.

RESULTS OF PRECOOLING.—During 1914 the peach crop in the Niagara District was so light that the Grimsby Plant was not afforded an opportunity to demonstrate or even experiment with the precooling of peaches. However, the work during the past season was not entered upon as an untried undertaking, since the field of precooling and cold storage of peaches had been worked upon ten years ago by the United States Department of Agriculture, so that the Dairy and Cold Storage Branch felt sure of their way in the undertakings.

FIRST SHIPMENT A SUCCESS.—The first shipment of peaches was made to St. John's, Man., and consisted of the Yellow St. John variety, which is one of the more tender shippers of the yellow fleshed peaches. The fruit was packed in the Northwest Standard box by the Department's staff for Mr. Thos. Liddle. The shipment required eight days, arrived at its destination in splendid condition, and was sold profitably without the loss of a peach. Other shipments followed to Winnipeg, Brandon, Saskatoon. The farthest Western shipment was made to Prince Albert, Sask. On all shipments where the peaches were brought to the plant in a satisfactory condition the best results followed, the peaches arriving in very good condition.

SUCCESSFUL SHIPMENT TO GLASGOW.—On the 29th of September the Grimsby Fruit Growers were making a precooling shipment of pears to Glasgow. Upon suggestion from the Department they furnished Elberta peaches sufficient for the Department's staff to pack in the ordinary commercial manner fifteen boxes. These were included in the shipment and arrived in Glasgow in good condition fourteen days afterward, the peaches selling at retail for 4d. and 6d. each.

Several Eastern shipments were made as far as St. John, N.B., including some peaches that were becoming well advanced toward ripeness.

EXPERIMENTAL CARS.—The Department purchased fruit for two experimental cars to test and demonstrate packages and also precooling. One of these cars included 855 boxes of Early Crawford peaches. These peaches were becoming well advanced

towards ripeness at the time of picking, and in order to make up the carload part were held under refrigeration eight days before shipping, and were five days in transit to Winnipeg. The shipment gave perfect satisfaction, as reported by Mr. A. H. Flack, Chief Fruit Inspector for Prairie Provinces. The other experimental car shipped to Winnipeg contained Elberta peaches in four different packages, the Michigan bushel, Woolverton crate, Hunter crate (both 6-quart and 11-quart baskets), and the Northwest box. The test showed conclusively that if peaches are picked properly and precooled that they may be shipped in any of these packages, although other shipments have shown that unless the fruit is well packed the results will not be satisfactory.

PRECOOLING FOR BRINE TANK CARS.—Brine tank cars were used in both experimental shipments of peaches. The ordinary practice has been to place block ice without salt in these cars. The results have been disastrous, even when the fruit has been precooled; however, in connection with some investigational work that the Department has been carrying on with this type of car arrangements were made with the transportation companies to have crushed ice and 5 per cent. salt placed in the tanks. Thermographs were placed near the tanks and in the centre of the car to get the highest and lowest temperatures during shipment.

The results were most satisfactory. The temperatures ranged between 30 degrees and 40 degrees, thus giving better temperatures than are ordinarily secured in block-ice cars. Inspector Flack found no evidence of damage whatever from the low temperatures near the tanks. The cars required a very small amount of ice during transit.

DEGREE OF MATURITY OF PEACHES FOR PRECOOLING.—For successful shipment of precooled peaches the fruit must be picked when "medium-ripe," i.e., when the fruit is mature yet not ripe. With the Elberta peach this stage is reached when the ground color is turning yellow and the blush is advancing to a good splash of red, yet when the fruit is perfectly firm. This is usually two or three days before the peach would be ripe if left on the tree.

The peach is not truly a cold storage fruit, so that particular care must be used in handling it at the ripe stage. If allowed to be placed under refrigeration when ripe, contrary to common opinion, its quality becomes mealy, dry and worthless. On the other hand, if picked too green it will never advance in color, quality or flavor. Perhaps no fruit loses its flavor so quickly under refrigeration as the peach, and although it is possible to hold certain varieties of peaches for several weeks, as far as firmness is concerned, it is impossible to conserve the flavor this length of time. This is important in making peach shipments in order that as much dispatch as possible will be secured in their shipment and distribution.

THE PEACH IN COLD STORAGE.—Refrigeration may be used to great advantage in marketing the peach other than in their precooling and shipment in refrigerator cars. By means of cold storage peaches may be held several days, or even weeks in the case of some varieties, and still be handled in marketable condition. By placing peaches in cold storage gluts may be avoided. As is well known to peach growers, a few warm, hot days coming after a period of cool, slow-maturing weather ripens a variety of peaches all at once, so that the bulk have to be picked within a space of three days instead of a week or ten days. In such cases local markets receive an over-abundance of fruit and then are bare. It has been found that with cold storage facilities at hand fruit may be handled more rapidly at these periods, thus avoiding a waste from over-ripeness on the trees and at the same time bringing greater returns

for the peaches by holding them till the market strengthens after the bulk of the variety has moved. If cold storage were universally accessible to the peach grower and used at the time of gluts the tendency would be to strengthen the markets at that time by relieving them of a certain surplus.

The cold storage holds an unique place in the peach shipping industry by acting as a reserve medium. By keeping a certain amount of peaches in cold storage stock is always on hand to fill orders. By holding peaches at the latter end of the peach season many late orders are in this way taken care of that would otherwise have to be lost.

TEMPERATURE FOR STORING PEACHES.—Peaches store best at a temperature of 32 degrees. Less decay is found to follow and peaches may be held longer at this temperature than at higher temperatures.

VARIETIES.—The Triumph, Graves, Admiral Dewey, Champion, Mountain Rose and varieties of a soft nature should not be used for storage but should be shipped or used at once. Such varieties as the Belle of Georgia, Arp Beauty and Early Crawford may be held for a week under refrigeration, or may be precooled and safely shipped in refrigerator cars for several days. The Elberta is one of the best storage varieties, and if picked at the proper maturity may be stored at 32 degrees for two weeks, or longer in some cases.

THE MORE IMPORTANT INSECTS AND DISEASES ATTACKING PEACH TREES

L. CAESAR AND J. E. HOWITT.

INSECTS.

THE SAN JOSÉ SCALE (*Aspidiotus perniciosus*).—This great pest of fruit trees will thrive wherever the peach thrives, and is so destructive that if it gets on a peach tree it will in many cases, if left untreated, increase so rapidly as to kill the tree in a couple of years. The adult female scales are circular in outline, nearly flat, ashy brown in color, with usually a yellowish central area. The diameter of the scale is about that of the head of a pin. Numerous very small, immature scales are nearly always found along with these adults and serve as a better means of iden-



Fig. 22. Various stages of San José Scale, all enlarged about fifteen times: A. Adult female scale with immature young of various stages settled down around or upon it; a, an adult male scale; b, b, b, three small black scales, winter stage. B. An adult female scale turned over, revealing the insect herself beneath with bristle-like mouth parts exposed. C. a, an adult male scale; b, b, two immature black winter stage scales. D. Young active larvae soon after birth. Note the nipples and the grooves around them in A b, b, b, and in C b, b. (B redrawn from Alwood, the remainder original drawings by Miss A. Hearle.)

tification. They are mere dots in size as seen by the naked eye, but under a hand lens are seen to be circular and black, and have a little central nipple with a ring or groove around it. No other scale with all these characteristics is likely to be found on the peach. There are several broods of this scale each year, and so prolific is it that there may be more than 1,000,000 offspring from a single female by the end of the season. All parts of the tree above ground, including trunk, branches, leaves and fruit, are attacked.

Means of Control.—A single, thorough application of lime-sulphur, strength 1.035 sp. gr. (1 gallon of commercial lime-sulphur to about 7 gallons of water) will kill the scale. It should be applied early in spring before the buds have begun to swell so that it may control the leaf curl disease at the same time. In some cases late fall applications on warm days after the leaves are off have given good results. Soluble-sulphur, 12½ lbs. to 40 gallons of water, has also proven a good remedy. In the United States barium-sulphur crystals have given satisfaction, but have not been tested yet in Ontario.

THE PEACH-TREE BORER (*Sanninoidea exitiosa*).—This is the most common and next to the San José Scale the most destructive insect enemy of the peach. The injury is done by the larvæ which bore in the sapwood of the trunk, usually at or below the ground. We have removed as many as twenty of these borers from a single four-year-old tree. Badly infested trees like these become sickly and not infrequently die either as a direct result of the work of the borers or because they have in their weakened state attracted Fruit-tree Bark-beetles, or have become too weak to stand the winter. The adult insects are pretty, clear-winged moths, bluish black in color, and not unlike certain common kinds of wasps. The female has around her abdomen a broad orange band, which is absent from the male. The moths begin to appear about the middle of July in Ontario and are to be seen up to the middle of September. Egg laying takes place over much of this period. Eggs

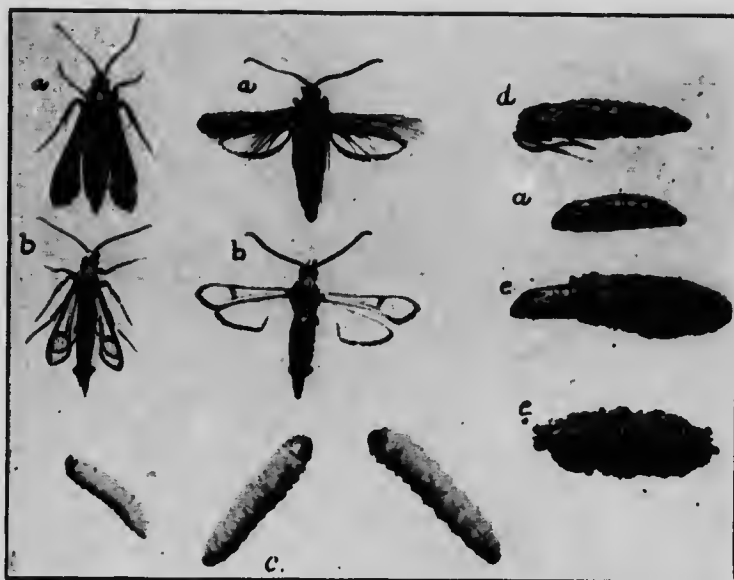


Fig. 23. The Peach-tree Borer: *a, a*, adult females; *b, b*, adult males; *c*, full-grown or nearly full-grown larvæ; *d, d*, pupæ, the upper one being empty; *e, e*, cocoons or pupa cases, the pupa protruding from the upper one; all natural size. (Original.)

are laid on the trunk, branches, leaves and occasionally in the ground near the tree. On hatching the little larvæ work their way to the base of the trunk and gradually eat through the bark. Some of them are still very small by winter; others are almost full grown. The larvæ are whitish with brown heads. During the winter they remain dormant either in their burrows or in little shelters constructed on the bark. Next spring feeding commences again and in June the largest larvæ begin to pupate, smaller ones doing so later. There is only one brood a year.

Means of Control.—The customary method, and one which has given fairly good satisfaction, is to examine each tree twice a year, once in October and once at the end of May or in early June, and with a sharp knife dig out and kill all larvæ found. In searching for them the earth should first be removed from around the trunk to the depth of three or four inches because they often work below the

surface. Their presence can nearly always be determined by the masses of gum that exude from the wounds. This should first be removed with the knife or trowel, and then by cutting along with the grain of the bark so as to do as little damage to the tree as possible, the larvæ should be sought out and killed. If earth to a height of 6 or 8 inches is heaped up around the trees at the end of June it forces the larvæ to work higher up on the trunk, and thus, when it is removed, they can be more easily found and destroyed. The earth should be put back for winter. Recently in the United States tree protectors, made by the Scott Tree Protector Co., Baltimore, Md., have been used with success. These are stout discs fitted closely around the base of the tree and fastened there firmly by a sticky substance. They are put on before the eggs are laid and prevent the larvæ from crawling down to the crown.

THE LESSER PEACH-TREE BORER (*Sesia pictipes*).—Both in the adult and in the larval stage this borer closely resembles the one just discussed. It is, however, a little smaller, and the female has not the broad orange band around the abdomen. Moreover, the habits of the larvæ are different in that it prefers to work in or alongside wounds not only on the trunk, but anywhere on the larger branches or at the



Fig. 24. The Plum Curculio on a peach fruit; enlarged about 3 times. (After Quaintance and Jenne.)

crotch. In many parts of the Niagara district there is a considerable amount of the so-called "Peach Canker" which causes wounds that afford almost ideal breeding places for these borers. Trees with smooth uninjured bark are very seldom attacked. The life history of the insect is, with these exceptions, almost the same as that of the Peach-tree Borer.

Means of Control.—From what has been said, it is clear that the best method of control would be to keep the trees free from injuries, but this cannot always be done. In cases where there are many cankers, much can be gained when pruning by cutting off any cankered branches which may be spared and burning them. The remaining wounds should be inspected about the end of May and as many of them as possible cleaned out with a draw-knife and ordinary stout sharp knife. All borers found should be killed and the wounds covered over with white lead or grafting wax.

THE PLUM CURCULIO (*Conotrachelus nenuphar*).—This Curculio attacks peaches as well as plums, cherries, pears, apples, apricots and some other fruits. It

is regularly worst in the vicinity of woods or waste lands where there is an accumulation of rubbish of any kind. Well cultivated and cared for orchards with clean surroundings are seldom troubled by it. The losses from it are caused first by the premature falling of infested fruit; and, secondly, by the Brown Rot disease which gets admission to the fruit, especially in autumn, through the wounds made in the skin by the beetles when feeding. The adults are stout, grayish black beetles about $\frac{1}{4}$ inch long, with rough wing covers and a long snout. The winter is passed in the adult stage under any good shelter such as is found in long grass and rubbish along fence corners or in the borders of woods or thickets. About the time the blossoms on the peach have fallen the beetles come out and begin laying eggs. These continue to be laid for more than a month. Each egg has a crescent-like slit made about it which serves to distinguish it from those of any other insect. The larvæ on hatching work their way to the pit and feed alongside it. Full grown larvæ are about one-third inch long, dirty white in color, curved, legless, and have a brown head. They are full grown in two or three weeks and then enter the soil a short distance to pupate. Late in July new adults begin to appear and continue to do so for some time. These do not lay eggs but feed on the surface of the fruit for some time, eating out small areas from which gum soon exudes. Later in the fall they all go into winter quarters.

Means of Control.—(1) Clean up the surroundings, leaving as little rubbish as possible in or near the orchard to serve as winter quarters. (2) Cultivate well up to as late as is desirable for the welfare of the trees. This kills the pupæ in the ground. (3) If, in spite of these steps, owing to the presence of woods or other causes, the beetles still cause trouble, spray once each year with 2 or 3 lbs. arsenate of lead to 40 gallons of water soon after the fruit is well set and the calyces are off, so that the spray material can get all over the surface. A pound or so of freshly slaked lime added to each barrel will help to insure immunity from burning of foliage.

THE FRUIT-TREE BARK-BEETLE, OR SHOT-HOLE BORER (*Eccoptogaster rugulosus*).—In many peach, cherry or plum orchards a tree or two here or there will be found with numerous small gum masses exuding from the bark of the trunk and branches. If with a knife one cuts the outer bark off these places and finds a little hole it is a proof that the gum was caused by the work of this pest. The adult insect is a tiny, reddish-black beetle, about $\frac{1}{10}$ inch long. It attacks most commonly sickly, dying, or dead trees, infesting healthy trees only when these others are absent. If a dead tree is examined the bark will often be seen to have many little holes like shot-holes in it. If it is removed the wood underneath will be seen to be engraved with numerous little tunnels running in various directions. These are the work of the larvæ, which are stout, little white grubs without any legs. The winter is passed in the larval stage in these burrows under the bark. In June they have become full grown, pupated, and begun to change into adult beetles. These soon seek the sick, dying, or dead trees, bore holes through the bark and make tunnels nearly an inch long underneath it. In these they lay their eggs. The young larvæ on hatching feed on the wood and under part of the bark, making many little tunnels in doing so, and thus give the engraved surface to the wood. There is a second brood of adults in August. These may be seen on the trees for many weeks, but they all perish before winter and only their larvæ survive.

Means of Control.—Owing to the fact that this insect can breed only in dead or dying wood, there will very seldom be any damage done by it if all dead or dying fruit trees or branches are removed and burned each spring before the end of May.

No brush heaps, or even piles of cordwood made up of the larger branches and trunks of fruit trees should be left. If the latter are desired for fuel they should be stored in a woodshed or cut in the fall, dried and burned before the above date. Healthy trees that have been attacked and become covered with gum should not be cut down because the gum drives out the beetles and so no eggs are laid in them. They should instead be severely pruned, and the soil well fertilized and cultivated to stimulate growth. In such cases they usually completely recover.

If beetles are found attacking an individual tree, they may be kept off by covering the tree at once with a coating of thick whitewash containing $\frac{1}{4}$ lb. of salt to each pailful.

DISEASES.

PEACH YELLOWS AND LITTLE PEACH.—These two diseases are so closely related that they may be discussed together. They have caused a great deal of alarm to peach-growers, and a few years ago were so prevalent and destructive throughout the Niagara peninsula that several otherwise excellent orchards had to be destroyed and many growers believed that the peach industry would soon be ruined. All efforts to discover the cause of either disease have resulted in failure. Moreover, we are still to a very large extent ignorant of how and when they are spread from tree to tree. We do know, however, both from our own experiments and those of others that if buds are taken from diseased trees and inserted into healthy ones the latter will in all, or nearly all cases, become diseased. It is also clear that either disease will spread to other trees from infected trees that are allowed to remain long in an orchard. The spread may be very slow, and it is quite possible that weather conditions may some years almost totally prevent it. Our experiments prove that even where diseased buds are inserted into healthy trees, the disease seldom shows up for two years, so one can understand that it will take considerable time, except under very favorable conditions, for Yellows or Little Peach to travel through a whole orchard. We have, however, seen entire orchards perish by the time they were eight years old. It has been claimed that pits from diseased trees will not grow, but we have demonstrated that as high as eight per cent. under favorable conditions may do so, but there is little or no proof yet in our experiments that the seedlings from these will develop into diseased trees.

Symptoms of Yellows.—On a diseased tree some of the fruit will usually be seen to ripen prematurely, be more highly colored than normal, blotched outside with red, streaked inside with this color, and the flesh around the pit redder than usual. Sometimes only one branch will show these symptoms and all the rest of the tree bear quite normal fruit. The foliage on at least some of the branches soon begins to assume a yellowish color, and in many cases the leaves begin to curl and cluster as if they were affected by Little Peach. This is especially true when the disease is far advanced. On such trees we sometimes also find arising from the main branches little upright growths of slender, much-branched twigs with narrow, yellowish leaves.

Symptoms of Little Peach.—The fruit on a typical diseased tree or part of a tree ripens later than usual, is smaller than normal, but has no unusual color markings. In many cases, however, we find diseased trees in which the fruit ripens at the usual time and is about normal in size, but the foliage shows clearly that the trees are diseased. The symptoms on the foliage are the curling and clustering of the leaves, especially on the inner parts of the tree, and the sickly yellowish or reddish yellow color that they assume. In younger trees the leaves on

the outer branches will usually remain quite green for a long time after those in the centre of the tree have clearly begun to show the disease. If the centre of the tree looks healthy but the outer branches, because of their reddish yellow color, look diseased, it will nearly always be found that such trees are not attacked by Little Peach, but are merely in need of better nourishment.

Means of Control for Both Diseases.—There is only one means of control, namely, to inspect the orchard in early August and again in September, mark all diseased trees and remove and burn them, root and branch, promptly. Inspection need not begin before the last week in July or August 1st, because it is very diffi-



Fig. 25. Branch of Little Peach tree just beginning to show the cluster and curling of leaves near the base. (O. S. Al.)

cult to detect the disease any earlier than this. No tree that gives clear symptoms of either disease, even in a single branch, can be cured by cutting off such branch or in any other known way. All diseased trees are useless after the first year. It is illegal to sell diseased fruit. Every tree left standing for any length of time in the orchard after it has begun to show the disease is a menace to all the other trees. Therefore, common sense should lead every man to get rid of such trees quickly and to help the local inspectors in their work. That good inspection and prompt removal will control the disease has been well demonstrated by the fact that in 1911 nearly 60,000 trees had to be marked and destroyed, and by 1914 this number was reduced to 3,000. Japanese plums are also subject to both diseases and should be inspected with equal care. When diseased trees are removed it has been found safe to replant in the same place the next spring.

PEACH LEAF CURL. (*Exoascus deformans* (Berk.) Fusckel).—This is the most common and most injurious fungus disease of peaches in Ontario. It is familiar to every peach-grower, and very frequently seriously impairs the vitality of his trees.

It affects the leaves as they expand in the spring and they become distorted, curled, thickened, and yellowish white, pinkish or purplish in color. A little later in the season they turn brown and fall. The disease may spread into the shoots and destroy them. In severe attacks of Peach Leaf Curl the trees are almost completely defoliated, the fruit is stunted or drops to the ground, and the vitality of the trees is so impaired that they are very likely to be severely injured by the cold the following winter. It is also probable that proper development of fruit buds is prevented. Young trees may be killed the first year they are set out if they are defoliated before they have recovered from the shock of transplanting. Peach Leaf Curl is always most severe in cold, wet springs.



Fig. 26. Peach Leaf-curl.

Life History.—The fungus which causes Peach Leaf Curl is carried over the winter as spores adhering on or between the bud scales. In the spring, when the buds begin to swell with warmth and moisture, the spores germinate and infect the unfolding leaves; hence the necessity for early and thorough spraying. In cold, wet springs the opening of the buds is retarded, while the germination of the spores and the development of the fungus is favored by the excessive moisture and not retarded by the cold. Thus the fungus has plenty of time to get established in the tender tissues of the developing leaf. This explains why Peach Leaf Curl is always worse in cold, wet springs.

Means of Control.—Spray with lime-sulphur, using the strength recommended for San José Scale, viz.: Concentrated lime-sulphur, strength, 1.035 specific gravity, which equals one gallon commercial lime-sulphur to seven gallons of water. The

spraying must be done early in the spring before the buds have started to swell, and care must be taken to see that every bud is thoroughly covered. Success depends upon early and thorough spraying, as can be understood from a consideration of the life history of the fungus. Somewhat weaker solutions of lime-sulphur or Bordeaux mixture will prevent the Leaf Curl but will not kill San José Scale, which is apt to be found wherever peaches are grown, and therefore it is advisable to use the strong solution of concentrated lime-sulphur as recommended above.

Brown Rot (*Sclerotinia fructigena* (Pers.) Schroet).—This disease, which is so common on plums and cherries, also destroys peaches. Certain varieties, such as the Triumph, are particularly susceptible to it.



Fig. 27. Brown Rot Disease. (After Duggar).

It attacks the blossoms, twigs and fruits. It is to the fruit, however, that the disease does most damage. On this a small, dark brown spot first appears. This spot increases in size until the whole fruit becomes soft, brown, and rotten. The surface of the fruit becomes covered with ashy-colored, spore pustules. For awhile affected fruits retain their form, but gradually they shrivel up and become hard, dry mummies. These are frequently seen hanging on the trees, or lying on the ground beneath them.

The fungus, which causes the Brown Rot may spread into the twigs and small branches on which the affected fruit is borne. These are girdled by the fungus near the point of attachment of the fruit and the portion of the twig above this point is killed. These blighted twigs are common in an orchard after the fruit has been destroyed by the rot.

Life History.—The disease is spread during the summer months by means of spores produced on the surface of the rotting fruits. It spreads very rapidly during warm, muggy weather, especially when the fruits are close together and the foliage

is so thick as to keep out the sunlight and prevent the free circulation of the air. It is carried over the winter by means of spores adhering to the bark, bud scales and mummied fruits, and by dormant fungus threads (mycelium) in the mummied fruits.

Means of Control.—1. Prune the trees so as to let in light and air.

2. Destroy the mummied fruits. Knock them off the trees in the fall, and either gather and burn them or plough them under early in the spring.

3. Thin peaches so that they do not touch each other.

4. Spray with concentrated lime-sulphur, strength specific gravity 1.035, early in the spring before the buds begin to swell. Spray with self boiled lime-sulphur about a month after the fruit is set and again about a month before the fruit ripens.

PEACH SCAB OR BLACK SPOT (*Cladosporium carpophilum*, Thun.).—This disease is seldom destructive in Ontario. It is, however, very frequently seen on low grade peaches, especially the white-fleshed varieties.

It produces small, circular, sooty black spots on the surface of the fruit. These may be scattered all over the surface or may be more or less confined to certain areas. In severe attacks the spots may be so numerous as to badly disfigure the fruit and occasionally, as a result of the injury, cracking of the fruit may occur. Twigs and leaves are also sometimes affected, but seldom to a noticeable extent here in Ontario.

Life History.—The fungus which causes the Scab is thought to winter over in the twigs and produce fresh crops of spores in the spring.

Means of Control.—Give the early spraying with lime-sulphur as directed for Peach Leaf Curl, and in addition spray with self boiled lime-sulphur about a month after the fruit is set.

POWDERY MILDEW (*Sphaerotheca pannosa* (Wallr.) Lev.)—This mildew attacks both the rose and the peach. It is most commonly seen on young peach trees which have not yet come into bearing. It frequently severely injures nursery stock. It does, however, sometimes occur on older trees. Certain varieties are said to be particularly susceptible to it.

It attacks the leaves, young shoots, and rarely the fruit. The leaves become distorted, stunted, curled, pale, sickly, more or less folded lengthwise and covered with a dense powdery white substance which extends over the twigs on which the leaves are borne. The mildew is easily recognized by this dense, white, powdery covering on the affected leaves and shoots. It develops most vigorously in warm, moist weather, and is usually worst in late summer and autumn.

Means of Control.—At the first sign of the mildew dust with flour of sulphur and repeat at intervals of ten days as often as may be required to hold the disease in check. Spraying with self-boiled lime-sulphur is also recommended. It is often advisable to discard very susceptible varieties.

CROWN GALL (*Pseudomonas tumefaciens* (Erw. Smith & Townsend).—This is a bacterial disease which affects many other trees and plants besides peach trees. It is easily recognized by the woody, knot-like swellings it causes on the trunk and roots. These galls vary in shape and size; some are not as large as a walnut, while some may be as large or larger than a man's fist. When these galls are on the trunk they are usually just below the ground. The extent of injury done to the trees by the Crown Gall is an open question. Many affected trees continue to grow and appear to thrive normally. There is no doubt, however, that some trees are weakened and stunted, if not killed, by the presence of the galls.

Prevention.—In order to be on the safe side, do not plant any trees showing any indication of Crown Gall. Such trees should be returned to the nurseryman with a request for healthy trees to take their place. It is not advisable to plant peach trees where raspberries have grown, as raspberries are very subject to this disease.

CANKER OR GUMMOSIS OF PEACH TREES.—In certain localities in the Niagara district, especially at Queenston, Niagara-on-the-Lake, St. Catharines, and in a few orchards at Winona, it is a common thing to see large, black, gum-covered cankers, chiefly on the upper side of large branches. These cankers do not heal over but



Fig. 28. Small Cankers on peach branches; natural size.
(Original.)

continue to widen out and enlarge until finally the whole branch dies. This usually takes several years.

The cankers have been attributed to various causes. Mr. W. A. McCubbin, of the Dominion Laboratory, who has made a special study of Peach Cankers, writes as follows concerning their origin:—

- *“1. A very small percentage arise from holes made by borer larvæ.
- “2. They may come as an after-effect from small cracks in the trunks or limbs. The percentage thus formed is also very small.
- “3. A small number start from gum blisters under the bark.
- “4. A few arise at the bases of twigs killed by Brown Rot. The Brown Rot fungus works back from the rotten fruit into the twig and then starts a canker in the larger limb.
- “5. Wounds made by scraping the limbs, etc., are accountable for a small number.

" 6. Quite a few cankers start at pruning wounds.

" 7. By far the greatest proportion of cankers are formed on the limbs at the bases of dead twigs. There is presumably a fungus concerned here which, after establishing itself in the dead twig, runs back into the larger limb and there starts a canker."

Field observations, however, made by the writers incline them to think that heavy pruning and heavy fertilizing, in combination with wet weather early in the growing season, may also have much effect in inducing the formation of cankers.

Means of Control.—Mr. W. A. McCubbin, after conducting many experiments on the healing of Peach Cankers, makes the following recommendation in regard to their prevention and control: Removal of the dead twigs from the main limbs, since it is found that these twigs are the starting points of the disease in such a large number of cases; destruction of Brown Rot mummies; painting of all the larger pruning wounds; removal of small limbs showing cankers, and the treatment of cankers on trunk or large limbs by cleaning out the cankers immediately after rain when the bark and gum are soft, and disinfecting the wounds with formalin diluted one to ten, or corrosive sublimate, one in a thousand, and coating them with lead paint free from turpentine.

The field observations of the writers recorded above indicate that care should be taken not to over prune or over fertilize peach trees, as such treatment apparently tends to induce the formation of cankers.

