

**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 piquées
- 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.

10x																				
										✓										
		12x		16x		20x		24x		28x		32x								

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

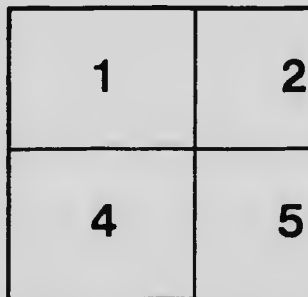
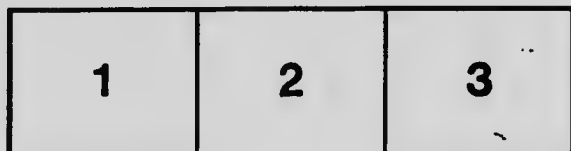
Library
Agriculture Canada

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 diagrams illustrate the method:



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

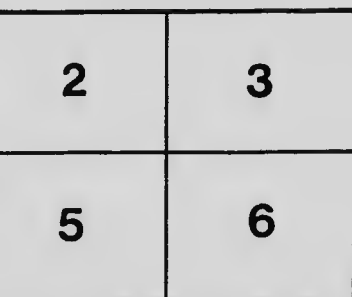
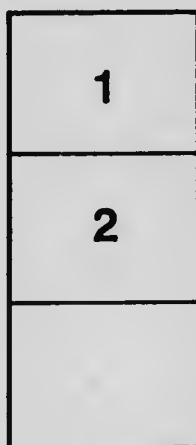
Bibliothèque
Agriculture Canada

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.

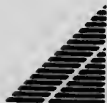
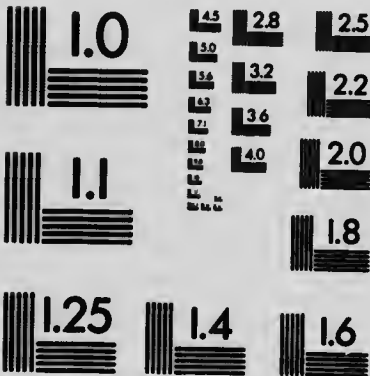
Un des symboles suivants apparaîtra sur la dernière image de chaque microfiche, selon le cas: le symbole \rightarrow signifie "A SUIVRE", le symbole ∇ signifie "FIN".

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

ONTARIO AGRICULTURAL COLLEGE.

Little Peach Disease

BY LAWSON CAESAR, DEPARTMENT OF BIOLOGY.

The object of this Bulletin is to give peach growers the most up-to-date information that I have been able to obtain on the disease known as Little Peach, and at the same time to warn them of the danger of allowing trees attacked by it to remain in their orchards. Some do not need any warning, because they take no chances with diseased trees, but by far the majority are careless, largely because they have not yet realized that *Little Peach is a very destructive disease, much more destructive than Yellows.*

Trees attacked by Little Peach can probably be found here and there throughout the entire Niagara district and the other peach-growing districts of the Province. If there are any districts where the disease does not occur to-day, it may be expected to make its presence known in a few years. Hence this subject concerns every peach-grower in the Province. In some districts the disease has already made such progress that whole orchards have become diseased and worthless and many trees in orchards nearby attacked.

To make the symptoms of Little Peach clearer by comparison, I shall first mention those of Yellows.

SYMPTOMS OF YELLOWS.

(1) The most characteristic symptoms of Yellows are the premature ripening and red spotting of the fruit. It may ripen from a few days to several weeks before the normal time. The surface of such fruit is regularly highly colored and mottled or spotted with red. Inside, reddish streaks extend through the flesh from the skin to the pit, and the flesh around the pit itself is redder than normal. Sometimes only one branch or even one twig will show these symptoms, but the presence even of a single fruit is enough to prove that the tree has the disease. Cutting off such branches will not save the tree. The first year the fruit is often somewhat larger than usual, but after this, as the tree becomes weakened with the disease, the fruit tends to become smaller.

(2) The appearance on the trunk and main branches of upright, tufted growths composed of small, slender shoots with narrow, pointed, yellowish leaves. These wiry, bushy growths are by no means always present, especially in the early stages of the disease.

(3) The premature bursting of buds in the axils of the leaves that should remain unopened until next year.

(4) In well-advanced stages of the disease the leaves become a sickly, yellow color, roll upwards somewhat, and droop. In early stages, however, the foliage is a rich green and looks perfectly healthy, so that were it not for the characteristic appearance of the fruit one would not suspect the presence of the disease.

SYMPTOMS OF LITTLE PEACH.

(1) As the name indicates, the fruit is usually considerably smaller than normal, though sometimes the difference in size is not very great. Unlike Yellows, however, it does not ripen prematurely, nor have the red mottled appearance outside or the streaking inside and the abnormal reddening around the pit. On the contrary, it ripens from one to several weeks later than usual, and has the color of a healthy peach both outside and inside. The flavor may be poor, as in the case of Yellows, or it may be fairly good, differing but little, if any, from that of healthy peaches.

(2) The wiry, bushy, vertical outgrowths of shoots, with small, narrow, sickly, yellow leaves found frequently on the trunks and lower main branches of trees attacked by Yellows, are very seldom seen in the case of Little Peach.

(3) Just as in the case of Yellows, there is not uncommonly a considerable amount of premature bursting of buds in the axils of the leaves, and some pushing of concealed buds on the main branches, such buds, however, not growing out into the bushy growths referred to above.

(4) The leaves in the lower and central parts of diseased trees regularly assume a sickly, yellowish or reddish-yellow color, while those further out on the tree remain green. As the disease advances the yellowish coloring of the leaves gradually extends outward to the tip of the branches, and in severe cases the whole of the foliage becomes affected in this way.

(5) The leaves, especially in the inner and lower parts of the tree, commonly roll somewhat upwards, then by the gradual bending of the midrib droop, so that they appear to be curling downwards around the branch or twig. This gives a clustered appearance to the leaves on many branches and twigs, and when accompanied by the sickly yellow appearance or cast of the inner foliage is an excellent means of identification.

Note.—While the *fruit* is chiefly relied upon for the identification of Yellows, it is the **FOLIAGE** that must be our guide in identifying Little

Peach. The fruit in this case often helps, but everyone should study the characteristic appearance of the foliage, especially as described in 4 and 5 above. By careful comparison of diseased trees with healthy ones, a grower can learn more about the disease in half a day than any amount of printed descriptions can teach him. Most cases of Little Peach are easily identified with or without the fruit. Some cases, however, take a good deal of study. Frequently one is at a loss to know whether trees without fruit are attacked by Yellows or Little Peach, and sometimes it seems impossible to distinguish between them. But this need not be a cause of worry because trees attacked by either disease must be removed.

OTHER TROUBLES LIKELY TO BE CONFUSED WITH LITTLE PEACH AND YELLOWS.

(1) When root aphids (tiny, shining, black insects, found on the roots) attack a young tree they cause the foliage to turn reddish-yellow. Such attacks, however, can be fairly easily distinguished from Little Peach by the fact that the foliage in the former case shows the reddish-yellow color on the outer or terminal part of the trees first and the central part still remains green, while in the latter case the reverse of this happens. So far, however, as I know, there are very few examples of root aphid attacks in Ontario.

(2) Leaving the wire to which the tag was attached on young trees will girdle them and cause them to turn yellow.

(3) Borers at the base of trees frequently girdle them and cause the foliage to turn yellow.

(4) The foliage of trees turns yellow whenever there is lack of available plant food in the soil. This is nearly always the case in sod orchards and in poor soil that is not manured or fertilized in some way. Careful study of the leaves will show, however, that they lack several of the characteristics of Little Peach and also of Yellows.

(5) On trees that have been severely attacked by Leaf Curl and have lost most of their foliage, numerous concealed buds on the main branches will burst and form little rosettes of leaves. These leaves, however, are quite green and need not be mistaken for either Little Peach or Yellows, especially when one observes the traces of Leaf Curl still on the trees.

(6) Powdery Mildew often attacks the terminal leaves and gives them a peculiar rolled appearance, sometimes causing them to have a rosetted look. This should not confuse anyone if they examine the leaves and see the white, powdery substance formed by the Mildew. Wherever the Mildew works on the leaf, development is retarded and the leaf, in consequence of growth in other parts, becomes distorted.

(7) Sometimes imperfectly fertilized peaches are found along with normal peaches on a tree even as late as August. These may possibly be mistaken for Little Peach because of their small size. If, however, they are cut through with a knife it will be seen that the pit is soft and the blade can be forced through it. The kernel inside is not developed. Little Peach pits, on the contrary, cannot be cut through in this way, and, when broken, the kernel is found to be developed normally.

LITTLE PEACH IN MICHIGAN.

At the request of a number of growers, I was given permission to visit the peach districts of Michigan this autumn with a view to gaining further information on the disease than was known in Ontario and to seeing the methods taken to hold it in check and the degree of success obtained. Michigan was selected because the disease has been known in that State for a very long time and more has probably been done there in the way of combating it than in any other place.

On the way I called at Lansing, where I interviewed several of the professors of the Agricultural College and got what information they could give me. On their advice I then proceeded to the Township of Saugatuck, about 40 miles west of Grand Rapids. Here, they said, I should find out more about the disease than in any other part of the State. It was in this district that Prof. Waite, of Washington, D.C., carried on an eradication experiment in the control of Little Peach, an experiment continued over several years and covering an area of several square miles in extent. Mr. Horace Welch, who assisted Prof. Waite in this experiment and who is believed to be the best authority in Michigan on the disease, lives in the district. On my arrival I at once called on Mr. Welch and was fortunate enough to find him at home. He very kindly volunteered to drive me around through the orchards and to help me in every possible way to gain the knowledge I was in search of. The greater part of two days was spent with him in visiting orchards, observing the degree of the prevalence of the disease, its peculiar symptoms, the methods employed in controlling it, the degree of success obtained, and other points of importance.

WHAT IS KNOWN ABOUT THE DISEASE IN MICHIGAN.

The following information applicable to Ontario peach growers was obtained:—

(1) Little Peach is a very destructive disease; in the opinion of the majority of Michigan growers it is several times more destructive than Peach Yellows. Wherever affected trees have been allowed to remain,

the whole orchard, as a rule, has become hopelessly diseased in four or five years. Mr. Welch has himself seen more than 100 orchards thus destroyed:

(2) So far as known no variety of peach tree is exempt.

(3) Japanese plums are quite subject to the disease. I myself saw three plum orchards with several of the trees attacked by Little Peach. It is clear, therefore, that they must not be overlooked when taking measures for the control of the disease.

(4) Little Peach attacks trees from two years of age upwards. (This is also, of course, true of Yellows.)

(5) The disease has been successfully controlled in Michigan and other places, but only by the removal each year as soon as possible of all clearly diseased trees and also all *suspected ones*. It is absolutely necessary to remove the suspicious cases as well as the clearly diseased.

(6) Co-operation in control measures is necessary, and, where orchards are close together, as in Ontario peach districts, is imperative; for no person can thoroughly control the disease in his own orchard by the removal of diseased trees if his neighbor only a few rods away fails to remove his. If, however, the orchards are half a mile or more apart, one may hope to be able to keep his own orchard fairly free from the disease, even independently of his neighbors.

(7) Where trees have been removed because of the disease, young trees may, if desired, be set in the same place next spring. Such trees are not any more subject to Little Peach and Yellows than any other trees in the orchard. Prof. Waite, of the Department of Agriculture, Washington, D.C.; Prof. Blake, of New Jersey, and several others, agree with this statement.

(8) The cause of Little Peach (or of Yellows) is not yet discovered.

(9) It is not definitely known in how many ways the disease may be spread. It is probably first brought into a district on nursery stock, and once in the orchard it certainly spreads from one tree to another, but just how no one knows. Many think that the time of infection is during the blossoming season. A number of things point that way, but the evidence is not conclusive.

(10) The disease can be propagated by budding, as has been proven by Dr. Smith and Prof. Waite in the case of Yellows. Mr. Welch took more than 200 buds from trees showing symptoms of Little Peach and inserted some in young seedlings and others in older trees. These took just as well as those from healthy trees, and in every case the disease developed, but not until the second year, and in some cases the third.

(11) Whether the pits from Little Peach will grow and produce the disease is not yet proven. (Prof. Phillips, of Virginia, believes a small percentage of them will do so.)

(12) The ordinary system of inspection for Yellows (as practiced in Ontario) is not sufficient for Little Peach, as this disease often does not show in trees until the latter part of September. Therefore inspection work should continue up to the coloring of the leaves by frost.

(13) It is not an infrequent occurrence to find trees with all the symptoms of Little Peach except that the fruit ripens somewhat prematurely or at the latest at the normal time. Such fruit shows no signs of Yellows. This is possibly an abnormal case of Little Peach, though some think it is due to both Little Peach and Yellows attacking the tree at the same time. Whatever be the cause, these trees must be destroyed just as if they had typical Little Peach or Yellows.

RECOMMENDATIONS.

Keeping in mind what has been mentioned above in regard to Little Peach, the following recommendations seem desirable:—

(1) That the present system of inspection of orchards for Peach Yellows and Little Peach be improved (a) by appointing more inspectors, so that each man will have a smaller area to cover and therefore be able to do his work more thoroughly; (b) by having each orchard inspected at least twice and preferably three times a year, the first beginning about August 1st or the last week in July, and the last continuing into October until the frosts color the leaves. This late inspection will be found most valuable in discovering trees that are very late in developing the symptoms of the disease; (c) by giving inspectors every encouragement to be thorough both in marking diseased and suspicious trees and in enforcing their removal within a reasonable time, in no case permitting such trees to remain until the next season.

(2) That if it is not found possible to enforce the removal of trees under the present method of appointing inspectors, the peach-growers should hold a conference and endeavor to get such changes made as will overcome this difficulty.

(3) That each peach-grower make himself familiar with the symptoms of the disease and help his neighbor to learn them, and by his own inspection supplement the work of the regular inspector. This is the way the best men are doing to-day in every district where Yellows or Little Peach is to be found.

(4) That nurserymen, recognizing the importance to the peach industry and to their own reputation of supplying perfectly healthy stock, take every precaution in their power to secure buds from trees that are undoubtedly free from the disease. To do this means that they must entrust the work only to very reliable and intelligent men. It is not safe to take buds from trees in orchards where there is a considerable amount

of the disease, because some of the trees from which they are taken may be just contracting it and not show the symptoms later. It is necessary to go to orchards that are known to be free from this disease and Yellows. In this connection it should not be forgotten that the disease seldom shows up in the nursery rows and that it is not until the trees are set out in the orchards that it begins to make its appearance. This is because it takes from two to three years from the time the buds are inserted before Little Peach has sufficiently developed to show in the foliage.

(5) That nurserymen, moreover, should endeavor in every way to assist the inspector in keeping all the orchards within a radius of a mile or more on each side of their nursery grounds specially free from the disease so as to insure the health of their own stock.

(6) That, since there is suspicion of the disease coming from pits taken from trees that have the disease but do not show it until after the fruit is gathered or until the next year, nurserymen look into the practicability of securing pits from States as Georgia or California, where the disease does not occur, the pits being of course guaranteed as true Georgia or California pits, so that there may be no danger of their having been shipped in from canneries in outside States where Yellows and Little Peach prevail.

Note.—On this question of the danger of spreading the disease through nursery stock, I should recommend every nurseryman to write to the State Entomologist, Agricultural Experiment Station, Blacksburg, Virginia, and ask for a copy of the Seventh Report of the State Entomologist and Plant Pathologist. The report will, I believe, be forwarded free of charge to those desiring it.

CONCLUSION.

There seems to be no doubt whatever that Little Peach can be controlled with almost perfect success if growers and inspectors work hand in hand to get rid of all diseased trees and suspected ones each year, and if nurserymen take whatever precautions are in their power to send out none but perfectly healthy stock. *There is danger of growers attributing too much of the trouble to the nursery*, for it is clear that while a few diseased trees may be sent out without being known to be affected at the time, the main cause of the spread of Little Peach can clearly be proven to be due to the failure of the growers themselves to remove diseased trees in their own orchards.

In proof of the good results possible from eradication measures, let me quote what Prof. Waite says about his experiments in Saugatuck

Township. Mr. Welch, in my presence, corroborated these statements so far as they apply to his own State of Michigan.

* "*Eradication Tests.* About six years ago, when the writer's investigations led him to the conclusion that Little Peach belonged to the Yellows group, an eradication test was started in a definite area in Saugatuck Township, Michigan. This area contained about seven square miles, was thickly planted to peach orchards and had about one hundred and forty thousand peach trees. There were some four or five thousand trees diseased that were found the first season. A small proportion of these, however, were affected with Yellows. Three inspections were made and the diseased trees were removed with a fair degree of promptness after each inspection. The next year only between four and five hundred diseased trees were found, being only a small fraction of 1 per cent. A slight increase of somewhat over a thousand trees was found the third season, evidently due to a local outbreak in the neighborhood, but the total number of diseased trees in this area was less than 1 per cent. Only about one-fifth of these were affected with Yellows, the remaining four-fifths being Little Peach. Similar results were obtained by the local Yellows Commissioners in the fourth season, which was 1906, and the orchards in this area are still standing in good condition as far as the Yellows and Little Peach are concerned.

"A similar eradication test was started by the Department of Agriculture, in 1906, in an area of some six or seven square miles around Youngstown, New York, in co-operation with the Cornell State Experiment Station, through arrangements with Professors Bailey and Craig. In general it may be stated that from the eradication tests where careful records have been made over a considerable area, and from the experience of the best-worked orchards, of which there are a large number in Michigan and a good many in New York, it is considered that when ordinary conditions obtain, the annual loss from the Yellows should be reduced to less than 1 per cent. per annum where prompt and careful eradication is done."

Since this time, some of the peach-growers of Saugatuck Township have become overconfident and careless, with the result that these men's orchards are to-day again becoming diseased, while those who have kept up the fight are keeping their orchards healthy.

*Taken from Prof. Waite's address before the Fruit Growers Association of Ontario, 1908.



