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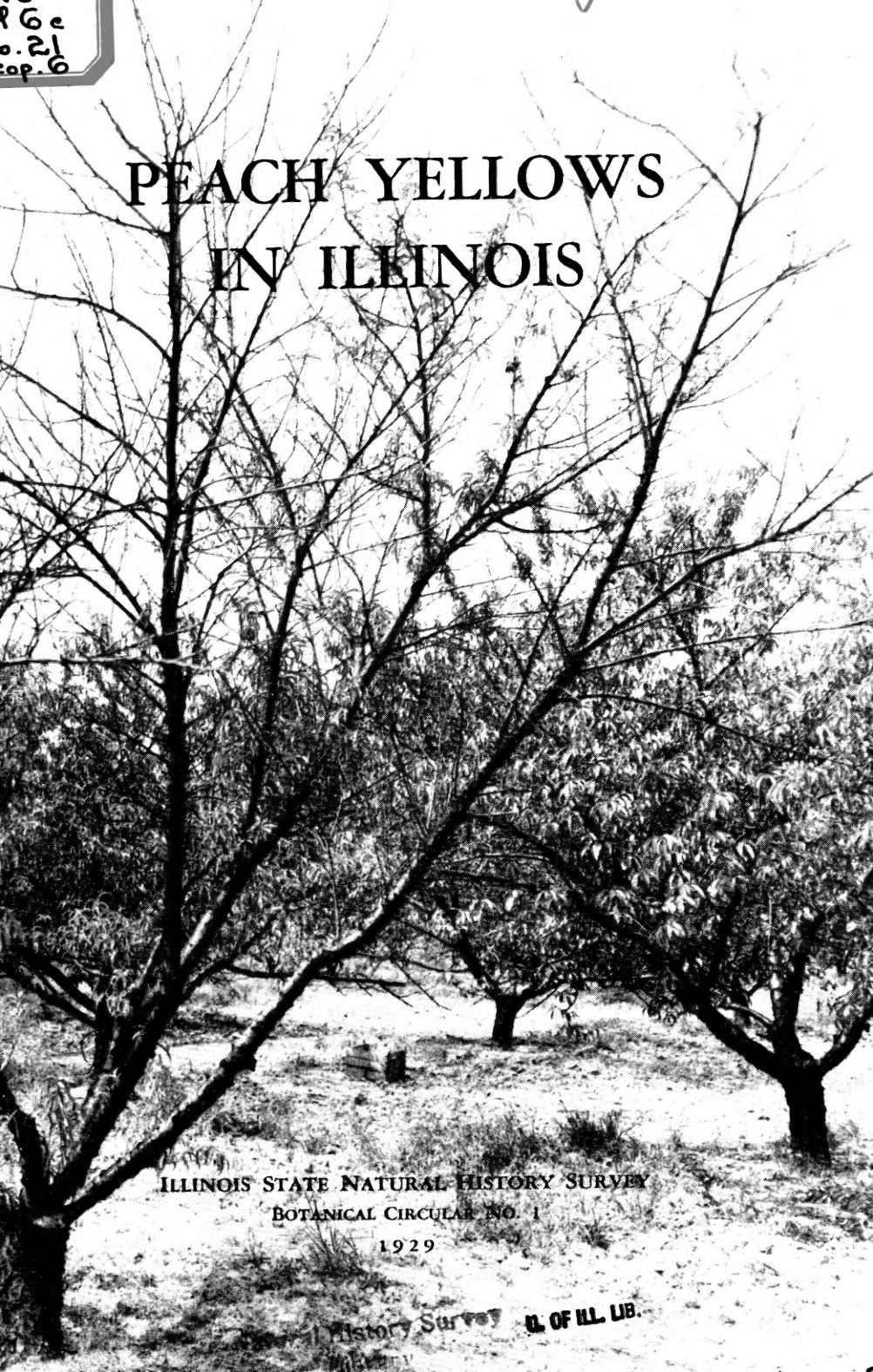
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PEACH YELLOWS IN ILLINOIS



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Peach Yellows in Illinois

By

L. R. TEHON AND G. L. STOUT



STATE OF ILLINOIS

DEPARTMENT OF REGISTRATION AND EDUCATION

STATE NATURAL HISTORY SURVEY DIVISION

S. A. FORBES, Chief

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Circular No. 1

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PEACH YELLOWS IN ILLINOIS

BY L. R. TEHON AND G. L. STOUT

The first authentic case of peach yellows in Illinois since 1900 was discovered by Professor M. J. Dorsey, of the University of Illinois, in a large orchard near Centralia, in the early part of August, 1927. Inasmuch as the peach orchards of the state had been supposed to be free of yellows, Professor Dorsey's discovery seemed to indicate a recent introduction of this destructive disease. There had been a great increase in peach production within recent years; and it was realized that peach yellows, if allowed to spread unchecked, might become a very serious menace. Hence, a survey of peach orchards was undertaken, first by the State Natural History Survey's botanical section and subsequently, for more detailed searching in special regions, also by the State Division of Plant Industry, to determine how common and widespread the yellows had become.

This survey has not been extensive enough to reveal all cases of peach yellows; but the number and distribution of the diseased trees thus far found has demonstrated that the disease is not entirely new to Illinois and that it certainly is not limited to the section where it was first found.

Both because of the time required for such a task and because of the great expense involved, a comprehensive search of all the peach orchards in Illinois for peach yellows can not be made at once. Hence this circular is published in order to furnish a means by which peach growers can familiarize themselves with the characteristics of the yellows disease and to show how they can protect themselves against its unsuspected presence in their orchards.

PEACH YELLOWS IN THE UNITED STATES

The peach, which is supposed to be a native of China, was brought to America from Europe as a cultivated tree sometime between 1629 and 1633, and it is known to have been attacked by the yellows disease at least as early as 1791. In fact, North America is the only region in the world where peach yellows occurs.

For many years, yellows was a menace to peach production in eastern states; and before its contagious nature was understood it brought ruin to entire orchards in many places. With the westward movement of peach culture, the disease moved westward also. It now is known to occur in greater or less abundance throughout eastern states, in Ontario, Michigan, Georgia, and west to the Mississippi River.

Like many other diseases, it breaks out periodically in severe epidemics. Such outbreaks are known to have occurred in 1806-1807, 1817-1821, 1845-1858, 1874-1878, and 1886-1888. These periods have been followed, it appears, by years when the disease has been comparatively quiescent. It is the general opinion among those familiar with the present yellows situation in the east that another epidemic period is at hand.

PEACH YELLOWS IN ILLINOIS

Concurrently with the outbreak of peach yellows in 1886-1888, an investigator was employed by the United States Department of Agriculture to undertake a scientific study of the disease, and a countrywide survey was made to determine its distribution and prevalence. An article concerning yellows, printed in the report of the government's statistician for 1887, states: "Investigation in Illinois, through orchardists in different parts of the State, revealed no existing disease, except near Duquoin, Perry County, and in the neighborhood of Villa Ridge, Pulaski County, both in Southern Illinois. It was introduced into Perry by trees from the Eastern States, and into Pulaski by trees brought from Delaware." However, some doubt is cast upon the validity of these reports by this later sentence: "Professor Burrill, of the University of Illinois, is credited with the opinion that the disease is not certainly known to have occurred in Illinois."

No further reports of peach yellows in Illinois are to be found in the printed literature pertaining to Illinois horticulture; but in the Natural History Survey's mycological collection there are a number of examples of peach disease collected in the summer and fall of 1900. These samples were labeled as peach yellows by the collectors and, though they are now old and much broken, they still show some of the characteristics of the yellows disease, particularly the willowy shoots and short, narrow, yellowish leaves. They were collected chiefly in Perry County, near Duquoin, but there is also one specimen each from Jackson, Adams, and Franklin counties.

Following the finding of the case of peach yellows near Centralia in 1927, the Natural History Survey made further examinations in that

region and discovered several other diseased trees. In 1928, more diseased trees were found in the same region; and in 1929, with the aid of a scouting crew provided by the State Division of Plant Industry, still other diseased trees were found.

Up to the present time, peach yellows has been found in 11 Illinois orchards. It is known to occur in Marion, Jefferson, Pulaski, and Pike counties. The total number of trees found with unmistakable symptoms is 37; but a considerable number of other trees have been marked as suspicious and deserving of further observation in 1930.

CHARACTERISTICS OF PEACH YELLOWS

Peach yellows is a contagious systemic disease which always results in the death of the tree. Its cause is not known, and there is no known cure. When it has once entered an orchard, the only step that can be taken against it is to prevent its further spread by digging out and destroying every diseased tree. Because of its contagious nature and the short time it requires to attain destructive proportions, it is essential that growers should familiarize themselves with its appearance.

There are two, and only two, absolutely dependable symptoms by which yellows can be recognized. These are premature ripening of the fruit, which occurs ten days to two weeks or more before the usual time, and the production by diseased trees of a peculiar type of watersprout growth best described by the term "willowy." Certain other characters may or may not appear, but their presence alone can serve only to cast suspicion upon a tree and cause it to be watched carefully.

The natural means by which yellows spreads from diseased to healthy trees has never been determined, but it has been demonstrated many times that healthy peach trees can be inoculated artificially by transplanting buds taken from diseased trees. The length of time required, thereafter, for symptoms of the disease to appear varies to a great extent; but once the symptoms make their appearance, the malady quickly follows its course, and within three to five years the diseased tree dies.

Though a great deal of time and effort has been expended in studying yellows, the cause of the disease has never been discovered. In many ways it is similar to certain systemic diseases of other plants, which have been named "yellows" also. In almost every case, "yellows" is an important disease of the plant it attacks. In some instances, particularly in the case of aster yellows, the cause has been proved

to be a substance called a "virus." Though far different from bacteria and fungi, various kinds of "virus" substances are nevertheless able to cause disease in both plants and animals. Presumably yellows in peaches is caused by a virus also; but the fact has never been proved, and it has never been possible to transmit yellows from diseased to healthy peach trees by means of insects or by direct transfer of juices, as can usually be done with virus diseases.

SYMPTOMS OF YELLOWS INFECTION

In Illinois, peach yellows has thus far been found only on trees of bearing age. In most cases, the age of the infected orchards has ranged from eight to fourteen or more years. With but few exceptions, the diseased trees discovered thus far have been found because the willowy growth mentioned above was seen by a scientific observer who, upon inquiry, invariably learned from the owner that the suspected trees had, for one or more seasons previously, ripened their fruit prematurely by from ten days to two weeks or more.

Prematurely Ripened Fruit. It is therefore obvious that the first marked symptom of yellows apparent to a grower in an orchard is prematurely ripe fruit. Peaches on a diseased tree will color and soften from ten days to two or three weeks sooner than the fruit on other trees of the same variety, and ripening is accompanied as a rule, but not always, by a deep red blotching or speckling of the skin. This speckling is distinctly different from the usual red blush found on the ripe fruit of healthy trees. It is not usually very evident on Elbertas. The flesh of a peach taken from a diseased tree lacks the usual good flavor of the variety, being insipid or even slightly bitter, and usually contains numerous red spots and an excess of redness about the pit. Red coloring in the flesh, however, is not at all constant; and when the healthy fruit of the variety is naturally red at the pit, this characteristic can not be relied upon for diagnosing the disease, except in the hands of an expert.

In its early stages, yellows often appears to be present in only one or two of the large limbs of the tree, where its presence is indicated by the early ripening of the fruit, the fruit on the rest of the tree ripening at the proper time. This difference in time of ripening on the several branches of the same tree furnishes a striking contrast, which the grower will be very likely to observe; and he should at once suspect such a tree of being diseased.

Willowly Growth. The other important and dependable symptom of peach yellows is the production of willowly growth. Sometimes this may occur on a diseased tree before premature ripening of the fruit is observed, but as a rule it follows pre-ripening.

This willowly growth, as may be seen from Fig. 5, is always distinguishable from the normal twigs and water sprouts by its slenderness, uprightness, and blanched yellowish color, and by the large number of very small, yellowish, usually red-spotted, willow-like leaves. It usually develops later in the season than the normal foliage and is always produced in greatest abundance in the last stages of the disease. In fact, as Fig. 7 shows, a diseased tree may appear entirely dead except for this willowly growth.

The photographs used herewith to illustrate the appearance of the yellows disease show what a peach grower may reasonably expect to see, if he has had yellows-infected trees in his orchard for any length of time. Fig. 1 shows a peach tree that has been diseased for at least two years. Although the tree itself is rather a poor specimen, it illustrates very well the abundant growth of fine, wiry, upright, willowly twigs that first attracts attention as one walks between the rows. When one goes close to such a tree he frequently sees the condition shown in Fig. 2. From the main limbs arises a veritable thicket of slender twigs, and if yellows is present, these twigs will be of two kinds. There will be water sprouts, such as the one arising from the bend in the large limb in the right fore-ground, with properly colored stems and well-spaced, normally sized, and usually rather healthily green leaves; and there will also be a number of much more wiry and slender, upright, very yellow twigs, several of which can be seen just to the left of the center of the picture, with small, narrow, yellowish, crowded leaves.

The contrast in appearance between normal growth and the willowly growth characteristic of peach yellows is made to stand out very clearly in Fig. 3 by the use of the white background. The lower part of the interior of the tree is filled with a tangle of this growth, which, for the size and abundance of its leaves, can be readily compared with the normal foliage in the top of the tree and with the two natural water sprouts on the limbs at the right.

A closer view of these willowly twigs is shown in Fig. 4 to illustrate how they arise on the main limbs from obscure or dormant buds. Their tendency to grow in broomy or brush-like clusters can also be seen well in this picture.



(Photo by Reuser Studio, Pittsfield, Ill.)

Fig. 1.—A peach tree with pronounced symptoms of the yellows disease. An abundance of willowy growth fills the interior of the tree, and the same type of growth can be seen beyond the fork of the small limb at the left. This is what a grower should look for when examining his orchard for peach yellows.



(Photo by Reuser Studio, Pittsfield, Ill.)

Fig. 2.—A closer view, showing the twiggly growth in the interior of the tree pictured in Fig. 1. Arising from the limb at the left and from the limbs in the center of the tree are several short, spindly shoots with very small, crowded leaves. These willowy twigs contrast strongly in size and appearance with the nearly normal water sprout that rises from the bend in the limb at the right.



(Photo by Reuser Studio, Pittsfield, Ill.)

Fig. 3.—The willowy growth characteristic of the peach yellows disease shows clearly against the background. Its slender shoots and small, crowded leaves are very different from the water sprouts standing on the limb at the left and from normal foliage in the upper part of the tree.



(Photo by Reuser Studio, Pittsfield, Ill.)

Fig. 4.—Another and closer view of some of the willowy growth shown in Fig. 3. The manner in which the willowy twigs arise from old buds on the large limbs shows clearly against the background. The presence of a single shoot like the one growing out of the right side of the limb at the right is conclusive evidence of yellows infection.

Because yellows has not hitherto been recognized in Illinois peach orchards, it is probable that many infected trees will already be in advanced stages of the disease when they are found; and the recognition of the disease in these cases will be aided by the presence of willowy growth. All the characteristics of this growth are shown in Fig. 5. The slenderness of the twigs is apparent, and a good notion of their yellowness can be obtained by comparing them with the water sprout which shows in the lower foreground to the right of the center of the picture. In the same way, an understanding can be gained of the abundance, small size, and crowding of the leaves on the willowy twigs. The sickliness of these leaves is well brought out in the picture. As a further sign of disease, they are badly spotted, the spots showing dark in the figure but being red when seen on the tree.

A further characteristic of this willowy growth is also shown in Fig. 5. Water sprouts, as is well known, generally make a very considerable growth in a single season; but the buds formed at the base of their leaves remain dormant. On the willowy twigs, however, these buds very often push out into short, thickly-leaved, sickly, lateral shoots as soon as they are formed. On the willowy twig at the left in Fig. 5, six of these shoots can be seen, and three of them, as can be judged from their length, had started to grow only a few days before the photograph was taken. Only a single season was required to produce all the willowy growth shown in this picture.

The general appearance of a tree in an advanced stage of the yellows disease is often very characteristic. In Fig. 6 such a tree is pictured. Most of it appears to be dead, though some foliage has been produced in the upper part of the tree at the right and on the low limb at the left. The yellowness of all these leaves is indicated by the contrast they make with the healthy foliage of the trees in the background. Against the blanket, which serves as a background in the left of the picture, numerous willowy twigs can be seen, and the peculiar growths of larger foliage are characteristically plume-like. By carefully examining the lower part of the middle limb, the reader may discern the willowy growth pictured in Fig. 5 arising near the old limb scar.

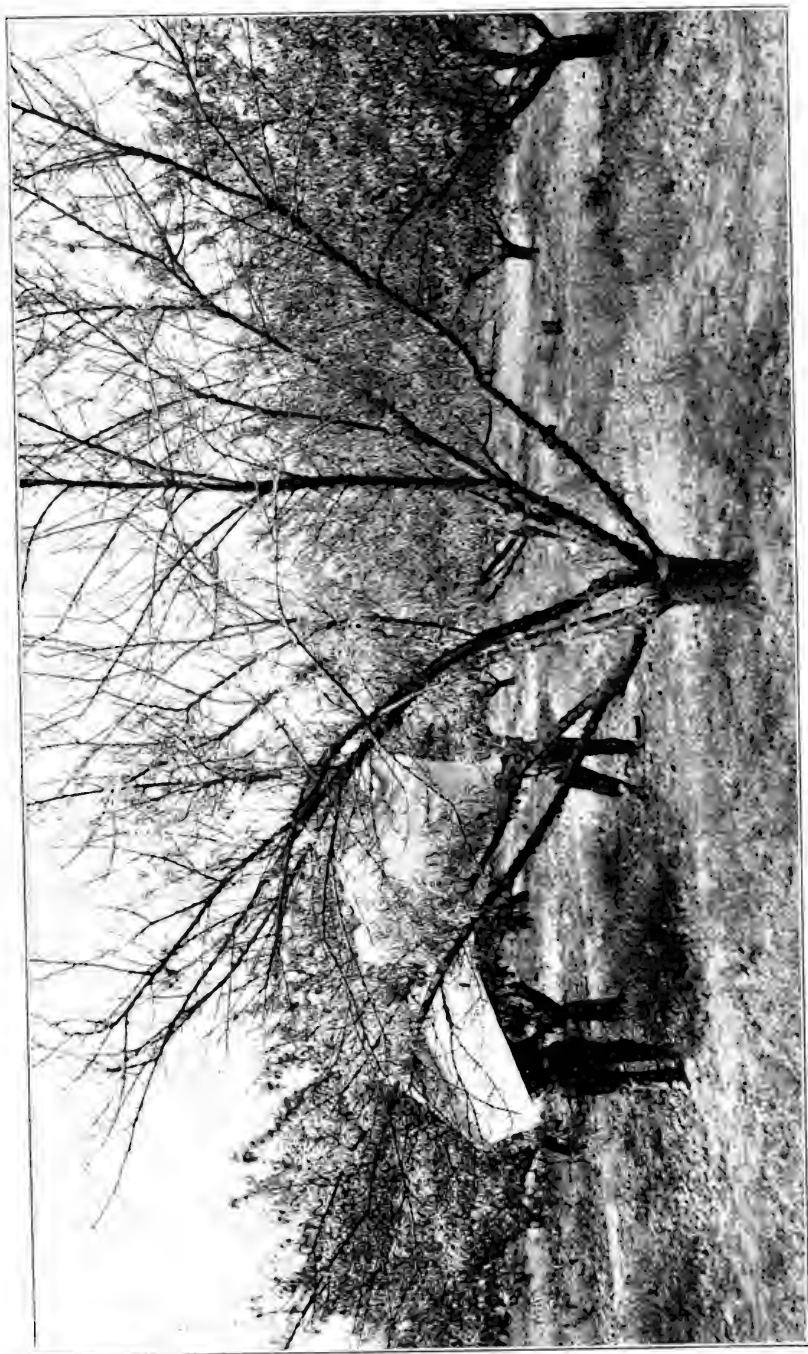
In its final stage, peach yellows is unmistakable. The tree pictured in Fig. 7 has produced only a very few normal leaves; its final crop still hangs, as dark-red, rotten mummies, on the uppermost branches. Its vitality has been completely expended in producing from its latent buds a mass of dwarfed, yellowish sprouts and typical willowy growths. How thoroughly this tree has exhausted itself in forcing its obscure and dormant buds into a last weak and feeble effort to live

is shown in Fig. 8; and in Fig. 9 it may be seen how stunted and dwarfed this growth is. A few normally sized leaves can be found in the top of this picture, and the willowy twigs that identify the disease are plainly visible near the crotch of the left branch.



(Photo by Spieth Studio, Centralia, Ill.)

Fig. 5.—Willowy growth is a dependable symptom of peach yellows. Notice the slenderness of the twigs, the light color of both twigs and leaves, the small size and abundance of the crowded leaves, and the round spots on the leaves. Compare these twigs with the nearly normal water sprout. Young willowy shoots may be seen on the limb at the right.



(Photo by Spieth Studio, Centralia, Ill.)

FIG. 6.—A peach tree in a late stage of the yellows disease. Most of the tree is dead; but some branches have put out an abundance of upright, plume-like shoots, as can be seen against the white background.



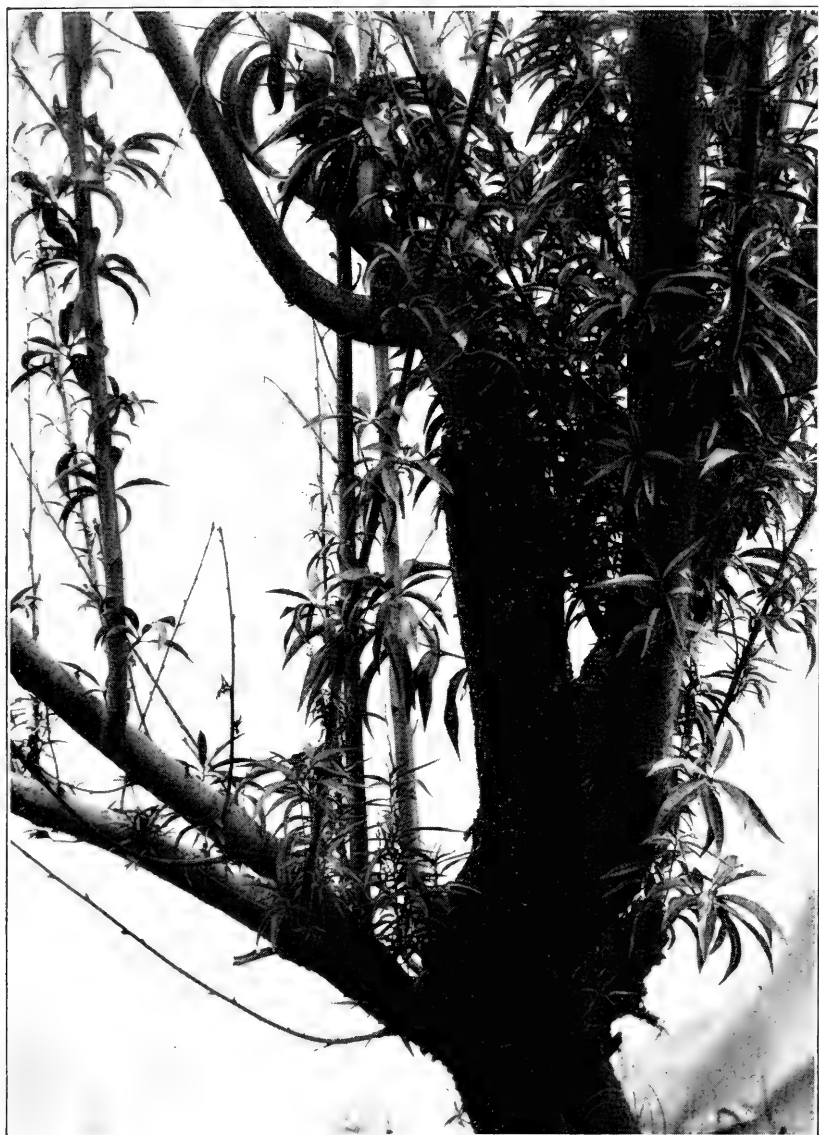
(Photo by Reuser Studio, Pittsfield, Ill.)

Fig. 7.—The last stage of peach yellows. This tree is practically dead. Only a few clumps of normal leaves can be seen; but the interior of the tree is filled with a dense growth of willowy twigs and dwarfed, yellowish sprouts. The fruits, which ripened prematurely, still cling, as deep-red mummies, to the uppermost twigs.



(Photo by Reuss' Studio, Pittsfield, Ill.)

Fig. 8.—Growth characteristic of the last stage of the yellows disease. This photograph, taken September 27, 1929, shows the interior of the tree pictured in Fig. 7. Notice the many upright sprouts, the abundance of dwarfed, small-leaved shoots, and the numerous, very short, willowy twigs.



(Photo by Reuser Studio, Pittsfield, Ill.)

Fig. 9.—A close view of the interior of the tree shown in Fig. 7. A few normal leaves can be seen at the top of the picture; but most of the growth consists of dwarfed, small-leaved shoots, which represent the tree's last effort to survive. A number of typical willowy twigs stand at the left of the crotch to tell the cause of the tree's death.

OTHER INDICATIONS OF YELLOWS INFECTION

Upon first seeing a tree in the initial stages of yellows, the grower will undoubtedly wonder why the name yellows has been applied to it. But to one who has had long experience with the disease one of the early symptoms is a slight "off-color" condition of the foliage hardly to be described except as an unhealthy yellowing. As the disease progresses, this yellowing becomes more and more pronounced. It sometimes serves to attract attention to a single branch of a tree early in the season, before premature ripening of the fruit has been observed; and in the second season it is usually quite intense. The individual leaves have a tendency to become curled and curved back against the twigs, so that the shoot has a "bunched," or later a plume-like, appearance. These foliage characteristics, though not in themselves dependable signs of the disease, often form a picture that casts suspicion upon diseased trees whose history can not be secured.

It is often true of trees infected with yellows that in the spring they open their blossoms several days in advance of the usual time. This is another indication of a general tendency to earliness, most marked in the ripening of the fruit but to be seen also in the setting of buds earlier in the fall than on healthy trees. By the arrival of winter, these buds are larger and better developed than those on healthy trees, and it naturally follows that both the leaf and blossom buds start quicker in the spring.

Indeed, the entire disease has aptly been described as one of "haste and waste," in which "the fruit ripens too soon; the buds push too soon; assimilation is disturbed; the stored starch and other food materials are wasted by excessive and unnatural growth; and the entire vitality of the tree is exhausted in the course of two or three seasons."

OTHER PEACH TROUBLES LIKELY TO BE
CONFUSED WITH YELLOWS

In Illinois, peach trees often show superficially the aspect of the yellows disease from other causes; and on this account trees may be suspected of having the disease when in reality they are suffering from other troubles. Briefly, the conditions which are likely to suggest yellows are the following:

1. *Borers.* In spite of the extensive use of *PDB* in the peach orchards of Illinois, the peach borer is still one of the worst pests of the tree. Whenever severe infestations occur, the trees so attacked are apt to show a decided yellowing of the leaves and also to produce a quantity of small shoots in the center of the tree. This condition, when seen from a distance, is very suggestive of the yellows disease; but these small shoots can be easily distinguished from the willowy growths characteristics of yellows by their color, the distance between leaves, and the size and color of the leaves. The tendency of borer-infested trees to ripen their fruit prematurely is not so striking as with yellows, and when it happens the interval between pre-ripening and normal ripening is seldom more than three or four days.

2. *Wet-feet.* In many Illinois orchards, especially those on level ground, there are low places where water collects and drains off very slowly. Peach trees planted in these places usually have an excess of water about their roots after rains, and they take on, as a result, an unhealthy appearance which is somewhat like yellows in that the foliage has a yellowish cast and numerous water sprouts appear in the middle of the tree. The situation of the tree, the absence of prematurely ripened fruit, and the absence of typical willowy growth will indicate the absence of yellows in these cases.

3. *Winter injury.* Trees not properly hardened into the fall or suffering from too severe freezing in the upper layers of the soil during the winter show various abnormal conditions generally spoken of as winter injury. Parts of the tree may be dead, or there may be a considerable development of sprouts from dormant and obscure buds, as well as a general off-color condition of the foliage. The general appearance of such trees may occasionally resemble the condition produced by the yellows disease. But winter injury can very readily be distinguished from yellows by the absence of typically premature fruit and by the absence of the willowy shoots typical of yellows. As a rule, winter injury can be recognized by the abundance of dead twig ends or by the presence of a dead zone in the trunk, extending from the ground surface down through the frost zone in the soil.

4. *Mechanical injuries.* Injuries of many sorts, from the roots to the twigs, may cause a simulation of the yellows color in the foliage and cause some premature ripening of the fruit; but these cases can always be diagnosed for what they are by demonstrating the presence of the injury.

ORCHARD INSPECTION FOR PEACH YELLOWS

As was mentioned above, the purpose of this circular is primarily to enable the peach grower to protect his own orchard. The simplest procedure is to inspect the orchard systematically, tree by tree, three or four times each year, with the particular purpose of seeing that yellows has not appeared. The best times for these inspections are:

1. *At the blossoming period.* As has been pointed out already, trees about to exhibit the first sign of yellows infection may open their blossoms several days in advance of the normal time. This is especially noticeable on trees which later exhibit yellows by prematurely ripening the fruit on one or two branches; for before blossoming time these branches often may be seen in full bloom while the rest of the tree is still dormant. Early blossoming is not, however, an infallible indication of yellows infection; and trees which show this condition should only be marked for further attention.

2. *About July first.* At this time trees infected by yellows often begin to show yellowing of the leaves, and early starts of willowy growth often may be found.

3. *Ten days before ripening time.* This is the most important inspection, for it should reveal all new cases of yellows. The presence of ripe fruit on any tree, or on any part of any tree, at this time may be taken as conclusive evidence of yellows infection. And since premature ripening is the first certain sign of the disease, its discovery at this time renders it possible to destroy infected trees before they have had much opportunity to spread yellows to the healthy trees.

4. *Early fall, after September first.* As a rule this inspection is made for the purpose of settling doubtful cases. By this time, foliage symptoms usually will have become pronounced, and the presence of willowy twigs, many of which develop after picking time, can be depended upon to furnish a criterion of the presence of the yellows disease.

DISEASES COMMONLY ASSOCIATED WITH PEACH YELLOWS

Frequently associated with yellows are two other peach diseases, which are as little understood as yellows. Fortunately, neither of these is as destructive as yellows; but the fact that they commonly occur with yellows warns us to be on the watch for them in Illinois.

Peach Rosette, essentially a southern disease, is in many respects similar to peach yellows. The distinguishing characteristic is that in rosette the willowy growth is replaced by a peculiar bunching or "rosetting" of the foliage at the ends of the twigs. Trees affected with rosette die more quickly than yellows trees. When the rosettes appear, the death of the tree may be expected within a few months.

Little Peach, which is more widely distributed than peach rosette, is distinguished from yellows with considerable difficulty. Besides the absence of willowy twigs, the outstanding characteristics of little peach are that the fruit is much smaller than normal and that it ripens as much as ten days *after* the proper time.

CONTROL OF PEACH YELLOWS

Ever since the infectious nature of peach yellows began to be realized, growers have resorted to the destruction of infected trees as the only means of protecting their orchards against complete annihilation by the disease. Many remedies have been proposed for yellows, ranging from the cutting out of the first diseased branches to complicated processes for adding to or changing the nature of the soil's fertility; but none of these has ever affected a single cure, and today the only effective step that can be taken against the disease is prompt and complete destruction of every tree that contracts it.

This is a drastic measure. And it is therefore one that the grower not familiar with yellows will hesitate to use. Nevertheless, it must be realized that this method alone has stood the test of time. The hard-bought experience of many years with yellows in the peach orchards of Michigan, Pennsylvania, New York, and other eastern states has shown beyond a doubt that only by this means can an orchard be made to survive after it has become contaminated.

The rapidity with which yellows spreads throughout an orchard after once having gained entrance is little short of marvelous. A typical case from the East is the following. An orchard of 2,400 trees grew very thriftily from the time it was set out and after four years was acknowledged to be the finest in the neighborhood. In its fourth

year it yielded 3,200 baskets of peaches. But in the same year yellows appeared in a few trees on the east side of the orchard. Some of these, *but not all*, were taken out, and the next year over 600 trees showed evidence of disease, while in the following year over 1200 additional trees were diseased. Within three years of the first appearance of yellows, 88 per cent of the trees had become infected, and yellows had brought ruin to an orchard which had given promise of abundant and profitable yields.

Conditions now obtaining in certain Illinois orchards that have come under our observation present evidence that, if left to itself, yellows may follow the same destructive course.

By taking drastic steps against peach yellows as soon as it appears, the grower will lose the one, or perhaps two, crops of insipid and worthless fruit that the diseased trees would bear; but he will thereby prevent the disease from spreading to healthy trees and may easily avert the early ruin of his orchard. And he has, besides, the certain assurance that he can at once set a new tree in the spot occupied by the diseased one, with no danger of the new tree becoming infected.

In certain states, it is the law that trees diseased with yellows shall be destroyed. In Pennsylvania the law requires that such trees be removed within 10 days after being marked by the inspector, and an inspection service for the identification of the yellows disease is maintained. The results obtained are convincing. In 1920, when the inspection service was begun, 8 per cent of the trees in the orchards inspected were diseased. In 1921, the inspection revealed a decrease in yellows to 4.5 per cent, in 1922 to 2.5 per cent, in 1923 to 2.2 per cent; and in succeeding years the percentage has steadily fallen. In 1927 only 1,846 diseased trees were found among a total of 802,033 trees inspected, representing a decrease in yellows infection to less than one-fourth of one per cent.

COMBATING PEACH YELLOWS IN ILLINOIS

As may be judged from our previous statement of the results of our orchard survey, the peach yellows situation in Illinois at present is far from alarming. However, the disastrous experiences of eastern peach growers with the disease are sufficient warning that protective steps ought to be taken in Illinois before the disease attains to serious proportions.

In view of the success that has attended the eradication programs in eastern states, particularly in Pennsylvania, we confidently recommend to Illinois peach growers the following program:

I. Systematic tree-by-tree inspection of orchards four times every year.

1. *Just before blossom-time*, when trees too early in bloom can be marked as suspicious.
2. *About July first*, when any unnatural yellowing and curling of the leaves will draw attention to suspicious trees and when the willowy growth may first be seen.
3. *Ten days before the ripening time* for each variety. Trees which show part or all of their fruit prematurely ripened at this inspection may safely be marked as diseased.
4. *Shortly after September first*. This final inspection should determine, in most cases, whether trees previously suspected are actually diseased. The criterion of yellows infection at this time is the presence of the well-developed willowy twigs.

II. Immediate destruction of all trees ascertained to be infected with yellows.

The tree need not be removed from the orchard at once. It is both safe and practical to chop off the limbs and pile them over the trunk. Later, when they are dead and dry, they can be removed from the orchard along with the trunk and larger roots, which must be dug out also, and used for fuel or burned outright.

III. Setting new trees in the places formerly occupied by the diseased trees.

This will tend not only to prolong the profitable life of individual orchards but also to preserve the peach industry in Illinois. Young trees set in the place of diseased trees do not become immune; but if they do contract yellows, it will be from other trees and not from the soil in which they have been set.

IV. Preservation of all trees not ascertained to be suffering from yellows, unless they are otherwise unprofitable.

The services of plant disease specialists are available through the Natural History Survey. Whenever a grower finds himself unable to determine with certainty whether one or more of his trees are suffering from yellows, he may request the aid of these experts and thereby secure a reliable diagnosis.



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