Scaly Bark, a Disease of Citrus Trees

C. D. Kime.

Scaly bark is a fungus disease of citrus trees occurring on the smaller limbs and on the twigs, leaves and fruit. While it has been reported on nearly all varieties, some show a remarkable degree of resistance. Of the varieties of economic importance, the sweet orange is the most susceptible, while the grapefruit and tangerine seem practically immune.

As can be seen from the specimens, the disease has a characteristic circular to more or less irregular outline. In mature spots the general appearance is very rough, with a raised center and a chestnut brown appearance, which once identified will not be easily confused. When these spots become sufficiently numerous, a scaling up of the bark occurs. This characteristic has led to its confusion with Gummosis and Psorosis, two very common and also injurious diseases.

The effects of the organism *Cladosporium herbarum* var. *citricolum* has been described in some detail, because of the fact that only certain well defined areas in the State are known to show infection. Therefore, large sections of the State are unfamiliar with the economic importance of the disease.

Scaly bark outbreaks have been reported from eleven counties, representing many prominent citrus sections of the State. The distribution of this disease is of unusual interest, because of the quarantine regulations against the movement of nursery stock from infected to non-infected territory. The Florida Plant Act, as now amended, permits the movement of stock within quarantine areas or from one of these areas to another. There are scaly bark infected areas in the following counties:

Brevard County, on the East Coast, comprises possibly the largest single area of infection. Many of the prominent growers along the coast make the assertion that no grove there is entirely free from the disease, and they continue with the statement that they have never worried about it because it causes practically no loss.

An inquiry into the situation does reveal many conflicting situations, and also the fact that we are dealing with a very peculiar disease. Scaly bark is well distributed throughout this quarantine area. Nearly every community has its scaly bark grove, with various amounts of infection. The section from Sharps to Cocoa, a distance of eight miles, is nearly solid with groves. Over practically the whole distance the land is unusually high hammock land. Probably one-half of these grove properties have shown infec-

tions of varying severity at different times. An investigation of many of these properties would easily lead to the conclusion that in its initial stages scaly bark is very slow in spreading. In all of these cases investigated, the disease was found to be restricted to a few trees in some portion of the grove. The trees, in some cases have been affected for years. There seems to be little tendency for the disease to spread to neighboring trees. Yet at times outbreaks have been found in other parts of the grove. Whether the disease was brought in from some outside source or was distributed from the infected point is a question not yet decided.

Other peculiarities of the disease have also been noted. In the Brown-Jones grove, a property of about fifty acres, three years ago about four trees were found affected with scaly bark. A year later this number had increased to nearly forty. Yet a short time ago no scaly bark could be found on any of the formerly affected trees. While these trees had some pruning, it was not done with sufficient care to explain the situation. This grove is located on high hammock land, and has just passed through two unusually dry seasons.

In the Mohawk grove the disease was first noticed on a tree somewhat near the center of the grove. It has since spread to other trees in the immediate vicinity; but at the time of my last visit, only one tree was found showing any markings. The disease was easily controlled by pruning.

In the Spafford grove, the same situation was present, but, as it was not pruned sufficiently, the disease spread more widely and a larger number of trees are affected.

On the Cocoa ridge, and in two groves on Merritt's Island, the disease appears to be easily controlled by pruning and by keeping up the vitality of the trees. The fungus shows only spasmodic attempts at spreading or becoming a serious factor.

At Indianola, on Merritt's Island, a case was noted where the disease had remained in three affected trees for about four years, and had shown no tendency to spread. In another part of this same grove, repeated prunings have failed to check the disease. It continues to spread, and causes some loss of bearing wood every year. This grove, the property of Mr. Reed, is well cared for and well pruned. The trees are about nine years of age. Three years ago one tree proved to be so badly affected that it was cut back to five-foot stumps. It is now in good bearing condition, and has only recently shown a return of the trouble. Carbolineum has been used where practicable, and with success. Another tree in this property was cut back and rebudded to grapefruit four years ago. Some of the orange sprouts, now present, show the disease, but the grapefruit is free and in excellent condition.

Four years ago the grove of Mr. Andrix, also of Indianola, was so badly affected that four rows adjacent to a neglected property on the north were cut back and rebudded to grapefruit. These trees are now in excellent condition. By severe pruning the disease has been controlled in the rest of the grove. The

rebudded portion of the property is on a lower part of the hammock land, where the disease was noticed first eight or nine years ago. Four years later the trees mentioned as being rebudded were so severely affected that drastic measures were necessary. Mr. Andrix does not live on the place, and at that time had no caretaker. The old grove on the north of the Andrix property showed scaly bark on everything from limbs four inches in diameter to leaves. The dead wood of several years' standing carried the old scars, telling more plainly than words the fate of neglected properties, and emphasizing by the parallel across the fence the urgent need for more adequate protection.

In only one property investigated was the claim made of benefit from spraying. This grove, at Georgianna, was so badly affected at one time that it was used to illustrate the difference between canker and scaly bark in the training of canker inspectors. Whether the results accomplished are to be attributed to the ammoniacal spray, or to care, fertilizer and much pruning, or to all together, it is certain that this property is remarkably clean at the present time. Gummosis is much more in evidence here than is scaly bark. The type of soil is high, sandy scrub, with yellow sand subsoil.

The last property investigated, and the one from which the specimens were taken, was immeasurably the worst. At the same time, it is most interesting from the standpoint of infection and historic interest. It is what is known as the Peter Whitfield place, and it, years ago, shipped the grade of fruit that made the Indian River orange famous. As late as the season of 1915-16, one hundred and fifty boxes of good fruit were picked from about eighty trees. At that time scaly bark was present, but not bad. A visit to this place today shows scaly bark on practically every tree. The trees are affected from the ground to their topmost branches. Marked leaves are numerous.

Several sour orange trees were examined for markings, but without success. This speaks well for the high resistance of this species. The grove lies on a rather steep slope towards Indian River. The back portion of the grove is on high sandy land. This portion is in bad shape, but is remarkably free from scaly bark.

The statement has been made that scaly bark does not attack nursery trees. While such attacks may be rare, they have occurred repeatedly. Scaly bark was found in a rough lemon nursery near Frostproof. The seed bed was isolated. No groves in that section were known to be infected, yet the attack was severe. No one had worked in this grove who had also worked in scaly bark territory. No buds had ever been used in the nursery. It was a seed bed only. Upon investigating the question of where the seeds came from, it was found that they had been secured from three different points, and, further, that each of these points was infected with scaly bark. The seed had been shipped in the fruit, and it is to be presumed that the peel had been carelessly thrown around. Another case of seedlings becoming infected is reported from Safety Harbor, and still another from the nursery of W. T. McCullough at Mims.

We are, therefore, forced to the conclusion that the disease can be transmitted on the fruit, and that seedling nursery stock can become infected.

From the observations made and the evidence so far obtained, it appears that scaly bark is very slow in spreading in certain locations and at certain times, but rapid in other locations or at other times. The disease is capable of killing and does kill good-sized limbs if it is unchecked. It seems to be more active in low hammock groves and on the inside of the tree and on the more upright growing limbs. Sprays, whitewashes, pastes or liquids have proven insufficient, or more injurious than helpful in controlling the disease. Severe losses of bearing wood and of fruit have occurred. Severe cutting back, careful and constant pruning, fertilizing and general care have given the best results.

More investigation is necessary to establish: (a) the actual amount of loss that can occur and that is occasioned to the trees and to the fruit by the disease; (b) the method by which the disease is disseminated; (c) the influence of soil and location on the severity of the attacks.

Titusville, Fla.

Discussion.

Mr. Skinner: I live in the midst of a scaly bark territory. In regard to the transmission of this disease, an instance which came under my observation may be of interest. In one of our groves, scaly bark was quite prevalent in a seedling grove, and had also started on the budded grove. The foreman had another grove about eight miles away. He went to work this grove, and carried a few oranges along with him to eat that came from a scaly bark tree. He told me two or three years afterwards that right where he peeled and ate those oranges a severe outbreak of scaly bark occurred.

I think every one of the groves I own or control has scaly bark, or has had it. We think that spraying the ground with Bordeaux mixture or ammoniacal solution of copper carbonate is a good plan. Bordeaux has had the most marked effect. We spray the ground under the trees every year in the section of the grove where the fruit has been affected.

I know the experts will smile at this idea of spraying the ground, but I think that the spores may propagate in the soil, or may be on the prunings that drop there. We have had very little loss from scaly bark since we have done this.

I am frequently asked to look at groves for people who desire to purchase them. Not long ago I was asked to look over a grove for a purchaser, and I looked at it. It was just about eaten up with scaly bark, but we could not find a bit of fruit that showed damage from the disease. I felt sure there must have been a lot of the fruit affected, and finally we found it. Wagon load after wagon load of scaly bark fruit was hidden out in the palmettos.

Mr. ——: Groves near Frostproof had a severe infection of scaly bark, and under the direct supervision of the Plant Board representative, every vestige of it was burned out by fire. The result was that none has been found since. The quarantine has long since been lifted. The growers in all parts of the State should assist and co-operate with the Plant Board. They know more about it than we do.