

Report of Committee on Citrus Fruits.

By G. M. Wakelin, Lane Park.

Mr. President, Ladies and Gentlemen:

After conferring together the committee decided that every member should present an individual report on whatever of interest had come to his attention. There appeared to be no particular phase of the topic for discussion and besides it was doubtful whether more than one member could be present.

The past eight or nine months have tried the soul of the orange grower. The usual fall drought spread over the whole winter and then, merged with the expected spring drought, has given many sections of the state the driest time known for years. The wonderful vitality of the orange trees has brought them through and will enable them, when properly helped by judicious care and fertilizing, soon to repair the damage. The effects however will be only too evident in a shortage of the coming crop and, where groves have suffered very severely, will reduce their blooming next February.

Well, the lesson is—irrigate. Pipe is high and advancing all the time but it is not nearly so expensive as buying fertilizer at \$30 to \$40 a ton to make bloom and fruit only to have it all fall off. The harrow is a wonderful irrigator and mulching is also very helpful but both are limited and the grower finds he must add water to the soil or else stand by and see the bloom and

fruit he worked so hard to get cover the ground. Especially is watering necessary in old groves where the trees are large and often too close together. Many of the trees of which I have charge are in this category and had they not been watered they surely would have died. I hope the committee on irrigation has some new suggestions as to methods of irrigation.

In addition to the long continued drought the poor orange groves had a freeze to contend with last December. It seemed as if Jack Frost had a particular grievance against those who had tried to escape him by migrating from the old orange belt to the southern counties. But in the eastern half of Lake county where I am located there was slight damage done. The temperature with us did not fall below 27 degrees and fruit was uninjured. In many parts of the state however oranges were badly frozen and alas! shipped to market as sound fruit. A suspicion was thus cast upon sound fruit even when under a guarantee, and buyers generally took advantage of the situation to keep prices down to a frozen level. I am informed that up to a few days ago grape fruit that had been damaged by frost was still going into the Philadelphia market. Unless a grower has a particular trade to supply through some commission man it certainly will not pay him to consign fruit, however

sound it may be, after there has been a freeze in the state.

We need to give more attention to hardy varieties. Trifoliata stock is not a success in light soils so its cold resistant qualities are not always available. But there is a variety of orange that is cold resistant and thrifty above the ordinary. This is the Jaffa. Its heavy, thick, vigorous foliage protects its branches admirably, it bears, even while young, good crops of heavy, fine flavored fruit that is sweet early in the fall and will hang on until late in the spring. The Jaffa has not had the recognition of its value to which it is entitled. It is unfortunate that so many of the trees planted years ago are of no particular variety but just orange, like the man's hound that was mostly "just dog." Such trees not infrequently are characterized by second grade fruit and not much of that.

In uniformity of quality of product California is away ahead of us despite the fact that a good Florida orange is without a peer, here or abroad. In California the growers are effectively organized, and the various citrus unions exercise a strict supervision over the fruit marketed. Fruit in any way inferior is not shipped. We need to campaign toward this end and a higher sense of honor among shippers. There is too much green and frosted fruit shipped from Florida. The state is getting the name of shipping inferior oranges.

Have any members had experience with what has been called tuberosé blooming? Sometimes trees young or old will put on, on a few branches, close packed bloom enough to cover the whole tree if properly distributed.

Such bloom always sheds off leaving the tree bare of oranges. It is a serious matter for trees to so expend their energy to no purpose. What is the cause of this and what can we do to make a tree properly distribute its bloom?

As a mere curiosity I am going to place on the table a freak orange of some good qualities. It was discovered among some tardiff trees. While it has the navel feature it is quite seedy. But the skin is thin and silky and the flavor of the pulp really excellent. In form it is very flat so that the secondary orange within extends well above the median line. This report is well established as there are a number of trees which bear this kind and no other. If the seeds could be educated out of it we would have a new navel of superior quality.

DISCUSSION.

Mr. Penny—I would like to ask Mr. Wakelin more about that bloom he spoke of. We had last year on our tangerine trees a good deal of bloom that appeared to be very short—the bloom buds. Is that the way yours were?

Mr. Wakelin—No, I never knew tangerine trees to do that. The bloom has been distributed over them. Other trees would put on sometimes fifty blooms all on the terminal shoots, but they would not amount to anything because they all fell off. For all the good such blooming does us, the tree might just as well be dead. The blooms this spring resembled bridal wreath more than an orange tree. There was an exceedingly heavy bloom.

Mr. Thornton—I have noticed that the trees are full of bloom—almost like the bridal wreath as Mr. Wakelin says, and this after the dry weath-

er we have had, too. I think it is the dry weather causes it.

Mr. Hollingsworth—I wish to ask if this is the case this season more than usual.

Mr. Wakelin—Our trees have always done more or less of it, and I have not thought it was on account of the dry weather. We had a drought from the first of February to the first of April. Previous to their bloom they were not suffering for water.

Mr. Hollingsworth—My experience on these lines has been simply and purely practical. I have corns on my hands like a small boy has on his heels because I have got right down and worked with my men. I think the same rules apply to the orange trees in Florida as to the peach and apple trees in Western Missouri, where I was raised. I have found that any abnormal condition such as dry weather, or anything like that will produce an abnormal condition of the tree. If a limb is injured by rubbing or chafing, it tries to reproduce itself and perhaps goes to the other extreme in order to establish its equilibrium. We had an old apple tree back in Missouri that had never borne, and it had a spot on it that I thought made a pretty good target. and I shot at it, and after that, it bore. I think a tree tries to offset the injurious effects and many of them will bloom out fully and never show that it is in an abnormal condition.

Mr. Wilson—I would like to ask if the same thing happened all over the State that happened in my grove this year. An insect appeared, we call it the "thrip" at Gainesville. I noticed it this year for the first time. It is a tiny insect resembling the hen mite.

It looks like what comes in the rose in the spring and makes them blight. I was so very anxious about the grove and bloom on account of the drought that I suppose I noticed the bloom more than usual, and I think it is the same thing we call thrip, which destroyed the strawberry crop around Gainesville about ten years ago so that there have been absolutely none raised on account of it.

I would like to say while I am up that my grove is like the grove the gentleman spoke of; the trees were heavily loaded with bloom, but we had no rain and I devised a scheme to water them. I went down with four teams and stopped at Ocala and got whiskey barrels and put them on the wagons and applied three barrels of water to each tree while the trees were in bloom and thought I had solved the problem of making the fruit stick. Now, the oranges vary in size from one the size of the end of a lead pencil to nearly a full grown orange, and they have never stopped dropping from the time they started. At what period can you tell when the fruit that is on is going to stay on? When can you safely estimate your crop?

Mr. Taber—I think there is one thing we should have settled. Did he thoroughly wash out those whiskey barrels before he began to water the trees.

Prof. Rolfs—And I think we ought to know whether he got them from Ocala or Gainesville.

Mr. Neil—I would like to ask Mr. Wilson if it was after that that the thrip did any harm.

Mr. Wilson—I think it was before. I think there would have been a good

many more if it had not been for the thrip, because they got into the bloom before they cracked open, and I expect in many cases they cracked the bloom. I noticed when the orange began to show itself, it was a very pale yellow, and I believe the thrip destroyed the life of the bloom.

Mr. Neil—He asked when he might estimate his crop. I have had some experience in that line, and I would say that the best time to estimate your crop is the day before you go to sell. There are so many circumstances that may affect your crop at any time, that it is difficult to say just when you can estimate with any degree of certainty. Now, about that dropping he speaks of. I have my very serious doubts whether a tree ever drops any more fruit than it ought to. We used to have these annual droughts; it was exceptional to go through a season without one and we used to fret a great deal about them. I used to water a great deal, but never saw that I had any more fruit than my neighbors who did not water at all. I don't believe that a tree ever throws off any more than it should.

Mr. Longley—I have had a little experience with thrip. Year before last, I had considerable thrip in my bloom, but I had a good crop notwithstanding. Last year I saw a lot of it, and sent for some thrip juice. I sprayed my trees in the bloom and it cut off about half my crop. The thrip punctures the little orange when the bloom opens and you will often notice that the bloom before it opens is punctured as though you had stuck a needle through it. You will find in one bloom a hundred of these little punctures. I believe we

will have a pretty good crop of fruit this year, however.

Mr. Wakelin—We notice our oranges sometimes fall off after they are pretty well grown, and of a bright green color and glossy. They fall off and leave their stems on the tree. It looks as though something had gotten between the stem and the calyx and pried it off. You cannot see anything the matter with the orange, and the tree has not suffered for water, either.

Mr. Penny—I would like to ask the gentleman if he had a good crop of fruit after these fell off.

Mr. Wakelin—No, I don't think so. They robbed the tree. I notice often times where these oranges fell off, they would be the only ones on the ends of twigs and should not have fallen off, for they had no neighbors to crowd them.

Mr. Hubbard—The thrip has always been present with us more or less since I began orange culture some twenty-five years ago. Most seasons it has very little effect on the fruit. The thrip seems to get at and feed on the honey that is secreted at the base of the orange. In some cases, the thrip may be a benefit in mixing the pollen. I do not think it does much damage except to mar some specimens of fruit. They sometimes gnaw snaky, little tracks that run around on the peel.

As to the abnormal growth. I think it is caused by shock to the tree. The bloom and the foliage start from the same class of embryo and it depends on the condition of the tree at the time when that embryo is formed whether it will produce leaves or bloom. It depends largely on the climatic conditions. If the shock by cold is great,

it may go to an excess of bloom, and if a drought comes on, it may make more foliage than bloom. An excessive crop is usually caused by some shock, disease or starvation.

Mr. Hume—I do not believe that anything done at the time of bloom has much effect. I am inclined to believe that shock is caused to the tree by cold, drought or some such climatic condition. As far as Mr. Wilson's plan of watering is concerned, I think he should have started watering long before he did, and done it about twice a week. I think his labor was all wasted. I think to get a good crop of fruit to hold on the tree, you should begin back a long time previous to the time that the bloom comes on.

Mr. Hollingsworth—I experimented on the watering question this year for the first time. We had a rain nine weeks ago that caused the bloom to come out in just a few days. Certain parts of my grove were in full bloom and then we had nine weeks drought, and the trees were going to cast their bloom. I took a coal oil barrel, and excavated around each tree in a circle some six or eight feet. We designated six tangerine trees that were heavy in bloom. I gave three barrels of water to them as rapidly as it would soak down and then filled the excavation up with dry dirt so as to hold the moisture. Those trees have set a very good crop of fruit. I have the nucleus of an old grove of about forty-five trees that are about forty-five years old. They have had foot rot, die back, etc. (let me remark in passing that a neighbor of mine said his grove was of no use until the foot rot got into it) but still bearing very heavily. I watered a few of

these trees at the same time we experimented with the younger stock and find the same holds good in both cases. Through the middle of this grove is a ridge, and on the slope of this ridge I had put out about a hundred sweet seedlings some six years ago. This drought overtook these seedlings. They shed their leaves in the tops two-thirds of the way down and directly after the rain, within a week, they put on a bloom. We had watered the trees in the middle of the first drought, and when the rain came, they were so vigorous they reacted again. The second drought caused them to cast that bloom, and then about ten or fifteen days ago they put out a right good bloom, which set the second time on the same limb. That is a freak I cannot explain. They have shed off their bloom and formed oranges about the size of peas and we believe they are going to stick.

Dr. Richardson—I have been much interested in the discussion, and I am particularly interested in the talk of Mr. Hollingsworth. I am inclined to think from his talk that the thinking he has been doing has made corns on his brains as much as hard work has made them on his hands.

An eminent physiologist, when asked what time he would begin treatment of a child to make it a healthy, well developed human being said he would go back one or two generations before the child was born. I think that applies to orange trees as well. It has been argued that the injury which the trees have received has been the cause of excessive bloom. It has also been intimated that shooting into a tree or doing anything to bring

about an abnormal condition will cause bloom. I think our present difficulty can be traced back to the cold of last December. I am of the opinion that it was this that produced the abnormal bloom, and is more to blame than the drought from which we are all suffering. I think that this cold left the trees in an improvident condition, but that when they recover from the shock they received last winter, they will again attend to business. I don't think there is anything to worry about.

Mr. Neil—I presume this will not end the discussion or get off the subject of irrigation. I am afraid that if it took as much as three barrels of water to a tree once a week and we had to apply that three months before the bloom and four months after, it would not be a practical proposition. I have always been opposed to irrigation because I do not believe that orange trees throw off any more fruit than they ought to throw off. I think an orange tree knows how much fruit it can bear and bring to maturity, and if you force it to maintain and ripen more fruit than it is able to, it is an irreparable injury to the tree. We are supposed to have two of the best groves in the eastern part of the county and I do not apply exceeding over one barrel of water, and that only once a week or ten days. Rain water is the best to use, lake water is the next and artesian water is the last. I have some trees pretty well loaded with fruit, but our watering them did not save their fruit, but kept the trees in fine condition. I did not begin to water until the bloom had appeared. We are in hopes of having the second bloom, and

I think we will have two-thirds of a crop in the State this year.

Mr. Skinner—I would like to know how much of a crop we have, from the orange growers' standpoint and the sellers' standpoint. We ought to be able to get at a pretty accurate idea of how much of a crop we will have. I would like to have the men from the different sections get up and say what percentage of a crop they think they will get.

I have tried the kerosene barrel method—not the whiskey barrel—and have abandoned it. If Mr. Neil will go back to the season of 1897-98, he will remember that the drought at that time, was fully as bad as the one we have just had. Around Sutherland and Dunedin whole regions of pine woods and oak woods died. I tried to save my crop with barrels, and worked hard. I poured water under my trees, and my neighbor across the fence did not do anything, and when the time came to bear, his bloomed and mine didn't. If you don't water at the right time, don't do it at all. My experience is that an irrigating plant nearly pays for itself every year you put it in.

Mr. Stevens—I have tried a little watering, and I find that it keeps the wilt off the leaves and keeps the trees in growing condition, but some of the fruit is on the trees, and some on the ground. I don't think they have dropped more than is necessary for them to drop.

Mr. Sampson—I want to speak about a particular kind of dropping. Even where the growth appears perfectly vigorous and healthy, the fruit will drop off, but the stem and calyx will remain green and will draw nour-

ishment from the tree all through the season. It is not a natural drop, but something is the matter with the tree. No insect work as far as can be seen, but a sap disease apparently.

Mr. Waite—In speaking of this dropping. Last year, I think we had as normal conditions as we ever had in Florida; a warm winter, plenty of rain, and one of the heaviest blooms I have ever seen. The trees were white, we had a good crop of fruit set, but about the first of May we had for about ten days a cold wind from the east. The nights were very cold. Immediately after, we found that our trees were shedding their fruit and the same conditions existed as mentioned by the gentleman. The stems were green and kept green during the entire season. I was speaking to one of the oldest growers in that section, and he stated that in 1898 the same conditions existed. Our crops were heavily damaged by the fruit shedding after that cold east wind. I find in some secluded places in our groves (where they had protection) we had a good crop of fruit, while where the wind had a good sweep the trees had only about one-third of a crop. Where we expected 75,000 boxes we had only 25,000.

Mr. Willis—I am not old in the orange industry; only about four years. We put in a twenty-horse power engine and ran pipes all over the grove. We irrigate about every ten days. The trees are in fine condition and holding their crop very well. We began irrigating early in March, and our trees look as good as they would if conditions had been favorable, and growing all the time.

Mr. Skinner—I would like to hear

from Mr. Hume and Mr. Rolfs about that calyx dropping. I don't believe that the east wind does it. I am losing thousands of dollars right now.

Prof. Rolfs—So far as I have worked upon it, I find that there is an irritating agent there that gets in between the orange and the calyx. Under climatic conditions, such as drought, cold, etc., it would shed off below the peduncle so that there would be no calyx left on the tree. My scientific work has been limited to the small fruit, not larger than a hazel-nut and at that time I could not get the fungi that caused the fruit to drop to infect the fruit. After the fruit arrives at about the size of a hazel-nut, from this time until the fruit is colored, there seems to be a period of immunity. It is possible that this east wind or other cold wind has a depressing effect upon the plant and allows these fungi to infect and knock them off.

Mr. Hart—I would like to air my views on these subjects, too. According to my little experience, I think that the distance between the trees in a grove has a great deal to do in deciding whether it needs irrigation in a dry time, or not. My trees are mostly set twenty feet apart, some of them thirty. One of the groves has the trees set eighteen feet apart; that is on a piece of ground that has some oyster shells in it. At times, a few of these trees have the dieback, and I think for the past two years, to correct this, I have hardly put a cultivator in it. We had a dry spell as you all know covering six months, and it was not broken until lately. On that grove, some of the oranges got soft, so that they began to drop from the trees in

February, so I started to pick them. Perhaps I got two hundred boxes of soft fruit and I threw out what we could not ship and sold the rest at \$2.00 a box. That, no doubt, was the result of the drought, and I am convinced that non-cultivation and close planting had a great deal to do with it. The trees are large ones, interlocking their limbs and roots so as to occupy all available space. In my other groves, the trees have come through in fine shape; they show little curling of their leaves and have a good setting of fruit today. If there is a drought on, I would cultivate often and keep the surface very fine where this does not interfere with treatment of diseased conditions. You know it has been said that two cultivations are equal to a rain.

The planting of trees according to the new horticultural method, which I suppose you all understand as the Stringfellow method, is also a matter I would like to speak about. Quite a number of years ago, our former president, Mr. Adams, and myself met Prof. Budd, who was one of Mr. Stringfellow's first converts, at an American Pomological Society Convention in Washington, and we went over the ground thoroughly. Soon after, we planted according to this new method experimentally. On uncultivated ground, it is claimed to work finer than where the ground has been thoroughly cultivated beforehand. The roots put down and go deep and do not suffer from drought; the fruit is finely and highly colored, and will stand shipping better, according to the claims of its advocates. I planted some of them by the Stringfellow method and some

of them by the old method in alternate rows, and during this drought those trees planted by the Stringfellow method have come through and show but very little harm from the drought, while the alternate trees set by the old method have suffered some. I think the conditions have been exactly the same except the difference in the method of planting. Those trees have been planted at least eight years, long enough to have them show definite results.

Mr. ————What is the size of the tree? How do they compare? He (Mr. Stringfellow) claims a larger growth.

Mr. Hart—It is rather in favor of the "new horticulture" style of setting trees. I went over them just a short time before coming here to note that particularly, and it is in favor of those set out by the Stringfellow method, though not very marked. The ground in both styles of planting was thoroughly cultivated.

Mr. Longley—I set out a grove that way some twenty years ago. I did not know that it was anybody's method in particular. I had not found out that the roots went down straight, but that may be the cause my grove did not suffer. I know of a neighbor who was setting out some lemon trees some seventeen years ago and he tried the experiment. He set one of them according to my suggestion. For the first year, the tree that had the roots spread out made the best growth, but the next year the other one came up with it, and the two are very much alike. I do not know that the roots have anything to do with it.

Mr. Kerr—I was about to ask to have

the roll called of those present, so that we might comply with Mr. Skinner's suggestion as to how much of a crop of oranges we can expect this year.

Mr. Rolfs—Suppose you conduct this, Mr. Skinner, as you were the one who suggested same.

Mr. Hollingsworth (DeSoto)—For the last two or three years I have been trying to estimate the orange crop, and have missed it so far, and I have said I would never make another prediction. I think, however, that DeSoto county will not have as much as last year. The immediate neighborhood of Arcadia will grow nearer to last year's crop. Our county had between 700,000 and 800,000 boxes. The county has shipped since 1898 about 25 or 30 per cent. of the state's entire crop. I think, however, this year DeSoto will not have more than half a million boxes, if that much. We hope the condition for the remainder of the season will improve very much, but even in that case we will not have much more than half a crop.

I don't think our grapefruit bloom was up to the average. We see now occasional bloom. The bloom is scattered over a long period. My estimate would be that if the conditions until the time of gathering are favorable, there will be 450,000 boxes.

Dr. Phillips—I am not a member of this association, but for the last two years have made a specialty of oranges. There has always been a haphazard way to estimate the orange crop. Nine farmers out of ten will decide what they are going to have, and their expectations are always colored by their desires, and they will say, "Oh, yes sir; we are going to have a magnificent crop." I know there is a

long-felt want in this state for definite statistics. I know it is of interest to me, and I think to everyone else in the state that is engaged in the orange industry.

Mr. Waits (Manatee county)—We will have about 10,000 boxes. If it had not been for the freeze we expected about 60,000 or 70,000 boxes. I have not been over the whole county. Outside of our own groves the trees seem to be setting a very good crop. From what I can hear, there will be one-half or two-thirds of a crop. The grapefruit crop is shy.

Mr. Brown (Manatee county)—I can not speak for the county, but in our own groves we will not have ten per cent. of a crop; less than ten per cent. due to the freeze and the drought.

Mr. Hampton—I have been traveling around in a good many different sections of the state, and I don't believe there will be on an average twenty-five per cent. of a crop. That is a very conservative estimate, for in many places there will not be ten per cent.

Mr.——(Polk county)—I think there will be about ten per cent. of a crop. I don't think I have seen a grove that has even ten per cent. Only one or two groves have a crop worth mentioning.

Mr.——Our grove has been very late and the fruit is so small it is hard to make an estimate. I would say that the crop at the end of our grove will amount to half a crop; in other words, about 12,000 boxes.

Mr.——(Hillsboro county)—I don't think our crop will be a heavy one, and I doubt if the grapefruit will come to half a crop. I do not know whether the eastern part will have much of a crop or not. I have heard that it would be short.

Mr. Hoard (Orange county)—I think

individually we will have twice the crop we had last year, and I think it is due entirely to our irrigation. Our irrigation plant has more than paid for itself this year.

Mr. Wakelin (Lake county)—Down in Lake county the trees bloomed in the regular time. They continue blooming until about now. The younger trees bloomed at the regular time, and they have done pretty well. There was about two-thirds of a bloom until the latter end of March.

Mr.——(Orange county)—Some trees bloomed pretty well early in the season, but most of it fell. After the rains, many bloomed again, and now a part of the trees are white with bloom. I think in our neighborhood the orange crop will not be more than a third of a crop.

Mr.——(Marion county)—Not over one-fourth of a crop, or less.

Mr. Hart (Volusia county)—I will say that on the east coast where protected there is a reasonably good crop, and more have protected their groves this winter than ever before; but I think that on the west side of Volusia county in groves not protected, there is a short crop.

Mr. Kerr (Volusia county)—In the northern part of Volusia county the groves are showing up well, the trees are looking fine, and we will probably have half a crop. I attribute this greatly to the excellent location of the county, etc.

Mr.——(Lee county)—I do not think there will be more than half a crop.

Prof. Rolfs (Dade county)—I know it is shy in Dade.

Member—How much was the entire crop in the state last year?

Mr. Skinner—It was somewhere around 4,000,000.

Mr. Tilton—How do you regard the June bloom fruit? We have a little of it in our grove.

Mr. Hubbard—The scattering June bloom is usually thick skinned and dry and pulpy and of poor shipping quality.

Mr. Hart—If you have nothing else on the tree it is pretty fair. If mixed up with the regular season fruit, it is poor. It is always thicker skinned. I had much rather it would stay off than come on, although when there is no other fruit on the tree it does very well.

Dr. Phillips—I want to bring up the question again of getting up reliable estimates. I have heard various estimates gotten out by parties in the month of May, and perhaps they will get out another the next month that is entirely different, and when the crop is gathered, it is entirely different from either estimate. I think this society should adopt a method to get the correct statistics, say, in the month of July, when experienced orange men can estimate a crop with a degree of accuracy. Then, I think, each county should be represented, this society appointing a person or persons to go out and send in an estimate to headquarters. Then let the society force the railroad companies to prepare to handle the crop which we will give them. If we have a big crop, the transportation should be prepared beforehand to take care of it. Suppose it is necessary to pay a man for his services; it will be worth much more to the orange grower to have information he can rely upon. If it is rumored that we have a larger crop than we really have, it has a depressing influence upon the price and we lose a great deal more money than these statistics will cost us.

Mr. Hart—I would say that this could

easily be done if we had an appropriation from the state, or some income more than we have at present; but we have had to economize in every direction.

Mr. Longley—As far as my experience is concerned, I believe that all of the orange growers here and elsewhere would be willing to pay a bonus for just such information. The information is sent out all over the country that we will have an enormous crop of fruit by parties bent on depressing the price of our fruit. I have no doubt but that every orange grower has lost hundreds of dollars every year. If we assess every member five dollars it would pay big to get just that information.

Mr. McLane—This is a very important question, and I move that the president appoint a committee of five gentlemen whose duty it shall be to formulate a plan to present to this body tomorrow by which statistics can be secured. I think that everybody will agree that it is a matter of vital importance; not only the men who produce the fruit, but the men who buy it should have some intelligent idea. We know that every other crop produced in the United States is estimated. I make that motion and hope somebody will second it.

Motion seconded.

Mr. Painter—While on this subject I wish to state that I undertook last year to get up information just like what you are talking about now. I sent out over 12,000 letters, addressed to growers all over the state, asking them for the very information that you are seeking for. How many replies do you think I got out of that 12,000? Just 1,200. The trouble is to get the information from the grower. They seem to be afraid to give the in-

formation out, and seem to want to make you think they have a big crop, whether they have or not.

Mr. Phillips—I can readily appreciate that very few people will answer questions like those, and realize how very hard it is to get this information. My suggestion is to get conservative business men, pay them for their time and let them go over the counties and get this information from an unprejudiced standpoint. Not one man in a hundred would refuse to let him estimate his crop. Not to have this estimate costs the state of Florida hundreds of thousands of dollars.

Mr. McLain—The motion is already before the meeting that a committee of five be appointed to formulate and present to this body a plan whereby this information can be secured. I call for the question.

Motion put and carried.

Mr. Cribb—There is a doubt in my mind if this information would be worth anything to us. I never saw an orange grower who could estimate his crop within ten or fifteen per cent.

Prof. Rolfs—The following committee is appointed: P. Phillips, A. H. Brown and Wm. C. Richardson.

WEDNESDAY AFTERNOON SESSION.

Prof. Rolfs—The matter of citrus diseases being up for discussion, I wish to make a few remarks in connection with this subject. The most serious disease and the most peculiar one that we have had anything to do with recently is the one which causes withertip in citrus. The causative agent here is *colletorichum gloeosporiodes*. This species of fungus is probably the same as the one that occurs on the mango and the avocado; a

fact which is of considerable interest to us, especially since the avocado and mango occur in the same region, and often in the same orchards, with the citrus. Mr. Neeld will remember that in 1893 the mango bloom blight occurred pretty severely on the sub-peninsula. Up to that time the trees had fruited heavily. In 1894 the bloom blight was so bad that only a small crop matured, and investigations were started at once with a view of establishing what caused the diseases. Some information was gotten as to the identity of the fungus, but in the winter of 1894-95 the trees froze to the ground, leaving us without an opportunity of carrying on the work already started. Since 1901 investigations on the same disease were begun in the mango orchards of Miami. The mango bloom, when attacked by this fungus, soon turns black and falls off.

During the period of bloom, various species of insects visit the mango blossoms for pollen and for honey. These crawl about over the blooms, passing from diseased blooms to healthy ones. As the insects pass over the diseased bloom, they come in contact with the spores of the fungus. These adhere to their body or to their appendages, and the spores are then carried to the healthy bloom. In addition to the insects, the winds also help in disseminating the fungus spores. It therefore seems almost impossible for a single bloom to pass through this trying ordeal without becoming infected. As a rule, a small quantity of fruit sets in spite of all these adverse conditions. As soon as the calyx and corolla have fallen away from the flower, the young fruit is not in immediate danger of being infected. The recently set fruit stands in a perpen-

dicular position, consequently the danger of fungus spores coming in contact with it is greatly reduced. When, however, the fruit has reached about the size of a pecan nut, the weight becomes too heavy and the fruit causes the peduncle to turn over and bend downward. This gives the fungus a chance again to attack it, since the spores from other portions of the tree may be carried, by moisture, down on to the fruit and infected. On some trees, where the fungus did not affect the bloom, or those which are not affected by bloom blight, the disease gets started sometimes on the young fruit. In such cases the young fruit falls from the trees literally by thousands. While the fruit is quite small it turns entirely black before falling off. As it advances in size to that of a hen's egg, this blackening becomes less apparent. After the fruit has arrived at about the size of a hen's egg the epidermis becomes too hard for ready infection. The fungus spores, however, are washed from the epidermis just as before. The fungus, however, in place of causing infection, merely causes irregular streaks over the fruit, or what might be called tear streaks.

TREATMENT.—As soon as bloom blight makes its appearance on the mango, it is necessary to begin a vigorous campaign of spraying, using the ordinary form of Bordeaux, going against all recommendations heretofore in regard to its application. Direct the spray here against the bloom and right into the open blossom. Spray every third day, and continue this until a crop of fruit is set that is vastly heavier than the tree can bear. As soon as a very heavy crop of fruit is set, spraying may be discontinued until a large proportion of the fruit has become large

enough to bend the peduncles over, and the fruit hanging in a pendant condition. Then spraying should be again resorted to. An application of once in two or three weeks will be sufficient at this time. After the fruit has arrived at the size of a hen's egg no further spraying need be done.

WITHERTIP OF CITRUS.

For the last six or seven years, work has been carried forward actively on the study of withertip of the citrus. As said before, this disease and the mango blight are caused probably by what is the same species, *Colletotrichum gloeosporioides*. Similar to the bloom blight of the mango we have a bloom blight of the citrus, including grapefruit and lemons. Citrus bloom, when attacked by this fungus, sheds off in great quantities, leaving scarcely any fruit set. As soon as the grove owner discovers a condition of this kind, he should give careful attention to the blooms. If withertip fungus is present in this stage of the citrus bloom, a considerable number of the petals in place of being pure white, as they should be, or withering a brown, will have turned a brownish red. By means of the hand lens, one will be able to learn to distinguish fungus infested petals from petals that are merely dropping and withering.

TREATMENT.—Here again, as in the case of the bloom blight of the mango, our recommendations are contrary to the usual practice of spraying, in that we advise spraying directly into the bloom, using Bordeaux mixture of the ordinary strength. While this operation will destroy a quantity of the bloom, it will be comparatively insignificant when compared with the amount that it saves. As new blooms open constantly, the spraying should be repeated at short intervals, prob-

ably not more than three or four days apart. This, of course, will depend upon the severity of the disease in the grove, and the possibility of doing the work with the spraying machine.

After the bloom has shed and a considerable quantity of the fruit has set, there is still considerable danger from withertip fungus. If a large quantity of young fruit is shed off free from the calyx, one should regard it as a very suspicious condition and make careful examination for the withertip fungus. If the fungus occurs, the young fruit should be sprayed as promptly and thoroughly as possible. From the time the fruit is set until it reaches about the size of a large hazel-nut it is very apt to be attacked by this fungus. After the fruit has reached the size of a large hazel nut there appears to be little danger of its being attacked by this fungus. From this time until the fruit reaches the coloring stage, it seems to enjoy comparative immunity.

During this period, when the fruit appears to enjoy immunity from fungus attack, the tree itself seems to be vulnerable to its injuries. For controlling the disease in the tree we would not advise spraying, but would advise pruning. Prune out all dead and diseased wood, and do it as thoroughly as your time and pocketbook will permit. This pruning out should be done preferably before the middle of July in the summer time, and before the middle of February in the winter time.

In the fall of the year, after the fruit has begun to color, it is again vulnerable to the attack of this fungus. The marking on the fruit, whether it is grapefruit or oranges, is rather characteristic in that it makes a large brown *sunken* area, beginning usually with small size spots and

increasing in size. In groves where one notices considerable dropping of fruit, this disease should be suspected at once and a careful examination made for it. If the fruit is dropping from this cause, spray with an ammonical solution copper carbonate (ammonical copper carbonate). In using this fungicide, the spray should be directed toward the fruit as much as possible, keeping it away from the leaves and branches of the tree. We know from experience that an application of fungicide is pretty certain to be followed by an attack of scale insects, since the fungicide kills off the fungus which attacks the scale insects, as well as the fungi which attacks the fruit.

Mr. Gibbs—Did I understand you to say that you threw a good, strong spray upwards right into the bloom?

Prof. Rolfs—Yes, we did. But the rains and dew carry the spores downward, and by spraying downward the fungicides follow the paths of the rain and dew drops.

Mr. Skinner—I want to ask a question, too. We are all interested in the buying of nursery stock. We don't want to get any more insects than we can possibly help, and I want to bring up a point that has been in my mind for some time. When the state inspector signs a certificate, saying that there is no white fly or other insects in a nursery, I think we ought to be able to place dependence on that certificate. I understand that last year some nurseries got certificates saying that they were free from white flies when I knew positively that they did have white flies, and I think we should insist that if certificates are given they should be honestly given. If the nursery that has white fly will clean their trees and promise to do

the best they can to get them out, they should have a certificate to that effect, but they should not have a certificate saying that they are *free* from white flies. I think the experiment station, or whoever gives the certificates, should give them honestly. I would like to make a motion that this society, as a body and as a society, shall request whoever is in authority to give these certificates that they give them strictly in accordance with the law, and not give certificates that are no good.

Dr. Berger—I wish to say that these certificates were given to the best of my knowledge, honestly and honorably. If there were any white flies I certainly did not know it. I know that so far as I am concerned I did not give a single certificate where I had any doubt that the certificates would not be telling the truth.

Mr. Skinner—How do your certificates read? Do they all read one way?

Dr. Berger—Yes, sir.

Mr. Skinner—That this nursery is *free* from white fly?

Dr. Berger—Yes, sir.

Mr. Skinner—I will not mention any names, but I know of certificates being given when it was a patent fact known to everybody that the certificates were given when they did have white flies. I think the growers should have some protection.

Mr. Bell—I move that a committee be appointed by the president to examine into this matter and report at some future meeting the course they think this society should take in relation to it.

Prof. Rolfs—In regard to the matter of giving these certificates that are given to the nurseries in Florida. The other states in the Union require that stock shall be certified before it can be shipped. The

state of Florida makes no provision for the inspection of nurseries; consequently our nurserymen are placed in the position of not being able to ship their nursery stock into another state. Is Mr. Skinner going to sit down on the nurserymen and say they cannot ship their stock out on account of having no inspection? The other states, as a kind of waiver on the delinquency of this state, have said, "We will allow the stock to come into our state upon the certificate of the entomologist of the experiment station." Dr. Berger, or one of his assistants, has made the inspection, has granted certificates, and if there were any white flies in there, they did not know it. You could do more about it if you had a state entomologist.

Mr. Skinner—Well, I know there are certain nurseries in this state that have the white fly, but still have a certificate saying they have not got the white fly. I think a certificate ought not to be given saying that it is free from white fly when it really has them.

Prof. Rolfs—The state has made no appropriation for a State Entomologist.

Dr. Richardson—There is a motion before the house, which, I think, covers the ground fully. I do not think that Mr. Skinner meant to insinuate that there is anything maliciously wrong; at the same time it is possible that there is an inspection that does not inspect, and if this is so, a very great wrong is being done. We do not want to send the white fly out of our state as the white cotton cushion scale was sent in. We have no means of inspecting except in the method that has been put before you, because there is no provision for it. Now, suppose a proper committee be appointed to look in-

to it and settle this matter at this point without any further discussion.

Question called; motion put and carried.

Mr. Bell—I move that the first vice-president be empowered to appoint this committee.

Motion seconded and carried.

Dr. Berger—I would like to have the floor for a few minutes. I would like to ask Mr. Skinner if he ever saw any nursery stock sent out from a nursery with my certificate, when it had white fly?

Mr. Skinner—No, sir.

Dr. Berger—I wish to state that all certificates were given in good faith to cover shipments out of Florida, as there is no law in the state of Florida compelling any inspection of stock not going out of the state. Inspection is made for other states, and whatever the state of Florida gets out of it, it gets under the inspection laws of those states.

Mr. Bell—It has been the practice of some nurserymen to defoliate everything, and I think we should require that. In shipping stuff through the states something may get on it. Some nurserymen make it a practice to defoliate everything; others do not defoliate at all.

Member—A short time ago, trees were sent out of a certain part of the state to another place, and it was understood that there were white flies in that section, and when they came they were defoliated; but when trees came from another part of the state where there was no white fly, the foliage was on.

Mr. Taber—The first vice-president has announced that the following committee is appointed to report on the question of certificates of inspection: W. C.

Richardson, chairman; H. B. Stevens and J. D. Bell.

Prof. Rolfs—We have with us the State Entomologist from Georgia, Prof. Smith. We would be glad if he will give us a short talk.

Mr. Taber—Can't you tell us about the operation of your law, etc.?

Prof. Smith—I am glad to tell you about the inspection law in Georgia. In the first place, we have there a State Board of Entomology, supported by the state appropriation, and their work is laid down in the law which created the department. One branch of the work is the inspection of the nurseries in the state. The State Entomologist, or duly authorized assistant, is required to visit every nursery in the state each year and make a careful inspection of the nursery and surrounding conditions, and if the nursery is found apparently free from the San Jose scale and other insects and diseases, the nurseryman is given a certificate under which he can ship stock to any part of the state, and that certificate is usually accepted by any entomologist in any other state where they require a certificate.

I have been in Georgia only four years, but know somewhat about the working of inspection in other states, and I think that perhaps we make a more thorough inspection than the majority of the states. I want you to notice this point, that the *law* requires us to inspect the nurseries, and if we can do so consistently, we give a certificate saying that the stock is apparently free from San Jose scale. There is no entomologist in the world who can say that a plant is absolutely free from San Jose scale. You cannot say that a nursery is absolutely free; but after it has been carefully inspected by a com-

petent inspector who has had considerable experience, he can tell you pretty well whether it is infected or not, and if he finds no sign of that pest, we feel safe in giving the certificate.

Mr. Skinner—You spoke of the San Jose scale. It seems to me a couple of years ago a lady-bird was imported from China. What has become of them?

Prof. Smith—Most of them have died out. Of all the colonies started in several states the one in Marshallville, Ga., was the most successful. In the summer of 1903 we found that they were destroying some of the scale, but not enough to make any appreciable decrease. Next spring it was impossible to find many there, probably on account of the spraying that had been given the previous winter. In the summer of 1905 I sent one of my assistants to every place in Georgia where a colony had been established, and also sent him to DeLand, Florida, where we had sent some of those lady-birds, and he found almost none whatever. The general concensus of opinion is that the lady-bird will probably never become acclimated in the United States.

I might state further, with regard to the nursery inspection, that there is a need, I think, in Georgia and other states of some change in the nursery inspection laws. It is getting to the point where it is almost impossible for all the nurseries in the state to be free from the San Jose scale, and I feel that the time is coming when the scale will get in such a great number of the nurseries that it will be necessary to issue a different kind of a certificate than what we have been issuing. If the nurserymen are prevented from selling their stock by reason of finding a little of the scale in a small block,

perhaps only in a little corner, of the nursery, it will be an unjust law.

Mr. Griffing—I understand there is a movement among the entomologists to get a uniform law about inspection.

Prof. Smith—Yes, sir; the entomologists of the United States at their last meeting advocated that, and the nurserymen have also taken it up and tried to get them to work together. They should work together, with the idea of getting some uniformity in the laws, or some one law that would be adopted by all the states.

Prof. Rolfs—Tell us how much is appropriated annually by the legislature for this entomological commission in Georgia.

Prof. Smith—\$10,000. Of course, only a portion of that has to be used for nursery inspection. If we did nothing but keep with the nurseries, we would not need that much. Our work covers a larger field now.

Mr. Waite—I would like to ask Mr. Rolfs in regard to this scab or scaly bark that I have noticed in a few groves in this section; that is, on the Gulf Coast, some time ago. I presume Prof. Rolfs can give you a better description of it than I can.

Prof. Rolfs—Last year, immediately upon the experiment station being separated from the university, Mr. Fawcett took charge of that work on the scaly bark and has been working upon it since that time.

Mr. Fawcett—I was in hopes that the subject of scaly bark would not come up, but I will try to tell you all I can about it. This disease became known to the experiment station only about two years ago, when a specimen was first sent in to

us from this vicinity for our examination. In investigating the distribution of this disease I found it was confined to a limited area including this peninsula from just above St. Petersburg to a few miles above Tarpon Springs.

The first infection covers only a small spot, and this enlarges until finally the whole limb becomes scaly and scabby and reminds one of the progress of leprosy. Almost nothing is known of a remedy for scaly bark, but we are beginning some investigations with a view toward preventing the spread of this disease.

Mr. Longley—Does it appear only on the orange tree, or does it also attack other citrus fruits?

Mr. Fawcett—It is confined almost entirely to the sweet seedlings variety. Grapefruit seems to be free. We have begun experiments with the Bordeaux mixture.

Mr. Skinner—I think it was from my grove that the specimen you speak of came. I have experimented a little with this disease myself and inoculated the trees and the roots with a little bit of sulphite of copper with beneficial results. The scaly bark is almost identical, I think, with the "brown spot" that occurs through this section and makes the fruit rot. (The specimen referred to was sent in by the Secretary and taken from Mr. Skinner's grove.)

Mr. Fawcett—I might say that along in the fall about August, the fruit becomes covered with these spots, and there is every indication that the fruit has become infected from these scabs. The disease is a serious one and needs to be looked into.

Mr. Waite—I would also like to ask if, in treating the disease called "Mela-

nose," blue stone under the trees would be beneficial.

Prof. Rolfs—In connection with this subject I would like to say it is what some people call physiological disease. That does not express anything, but it is due to malnutrition. It is very closely related to dieback. You can cure a tree by spraying it with Bordeaux mixture. Melanose and dieback do not usually occur on the same tree, although I have seen the two diseases on one tree. It is what you might call "citrus tree indigestion."

In the case of the dieback we made very careful experiments to see whether an application of blue stone to the soil would be of advantage. We found no advantage in treating the dieback in this manner. We also applied it to the leaves and found it of no advantage. We tried the lime on the leaves of the dieback tree and saw no advantage. In these experiments we had untreated plots that we used as checks. In three plots that were treated with Bordeaux mixture they at once responded and showed beneficial results. Now, I will say that, not having made the experiment of applying blue stone to the soil, we are a little inclined to doubt if it would be advantageous in treating this disease.

Mr. Waite—In one section of our grove last year we had a good deal of fruit affected by melanose, and a gentleman living up the river who had quite a large grove, told me it was so badly infested that nearly all the fruit dropped off before it was matured, and he said he used about one or two pounds of blue stone around the trees, and the next year very little fruit was affected, and the second year there was none at all. I applied

some, but did not know whether it was the right thing to do or not.

Mr. Hoard—I have used blue stone as a remedy for dieback for several years, and always with good results. Have cured small trees that were almost dead and put them in fine condition. Have also used it on large seedling trees which were so badly affected with dieback that nearly all of the fruit would split and drop off early in the fall. I commenced using it on these large trees the year before last, with the result that the fruit was much improved last year; so I gave them another dose last year and am using it again this year. In using it on small trees, care must be taken not to use too much, as an overdose would be fatal. Large seedling trees will stand from three to five pounds twice a year, broadcast.

Member—What else do you do besides that?

Mr. Hoard—Nothing at all. Whenever I see a tree with symptoms of dieback I get some pulverized blue stone and apply it just as I would fertilizer. I have used it in the liquid form and have also put small pieces under the bark, but have come to the conclusion that it makes very little difference how it is applied so the tree gets it, and have adopted the easier method of throwing it broadcast.

Mr. Penny—I use blue stone under the trees. I put it on the crown roots and cover it over. I have thought possibly that is where they get the most benefit from the Bordeaux.

Prof. Rolfs—Where we applied it to the soil there was no benefit from the Bordeaux.

Mr. Donovan—I tried the same experiment last summer with blue stone in spreading in a circle around the tree to

the outer edge of the branches. It seems to do my trees good. They are dieback stock, and the trees this year do not seem to show any dieback. I didn't do any thing else, so I think it must be due to that treatment. I have also sprayed with Bordeaux and killed the dieback.

Mr. Waite—Prof. Rolfs, did I understand you to say that lime applied to the soil would not correct the conditions there?

Prof. Rolfs—In our experiments we wanted to find out what element in the Bordeaux corrected the disease, so we applied slaked lime to the soil in the plot, and in another plot we used lime on the leaves to find out whether the application to the leaves was necessary, or whether it was necessary to put it on the ground where it would be taken up by the roots. In the place where we used the lime on the leaves or on the ground, it gave us negative results; in other words, were no better than our checks. But in those cases where we used Bordeaux mixture on the leaves we got decidedly better results. We had the lots laid off with about thirty trees in the plot and went through one set and then took another set. Our conclusion was that, from the test we made, Bordeaux mixture must be applied to the leaves to be of advantage in curing the dieback. Mr. Waite has spoken more of the melanose than of the dieback, but it is very analogous to it in its behavior.

Mr. Waite—I have suggested that you use lime. I applied lime to the amount of 1,000 pounds to the acre and only this past winter, and I thought of applying it again this summer.

Prof. Rolfs—There are a good many things that may cause this dieback, and you want to make sure just what is caus-

ing it when it makes its appearance. Top pruning may cause it; carbonate in the soil may cause it; or if there is too much acid in the soil—humic acid—that may cause it. If it is the latter, lime would correct the conditions.

Member—Is blue stone an antidote for humic acid?

Prof. Rolfs—I think not. I think it would have no effect.

Mr. Waite—I would like to know if anyone has cured by inserting blue stone under the bark and kept check, so that he could tell if it had any effect.

Mr. Cooper—I had some trees on our place that had the dieback, and I tried the experiment. I took every other tree down the row and put blue stone under the bark, and it set up a terrible "spew," but it straightened them right out. Last year I applied it just as you would fertilizer.

Member—What quantity?

Mr. Cooper—A piece about the size of a grain of wheat.

Member—How large were your trees?

Mr. Cooper—We tried it on trees six inches through. I had one tree on a little five-acre place that certainly was a forlorn object, and it was astonishing how it picked up. Last year we tried some by casting it broadcast and with as good results. I mean to keep the experiment up.

Mr. Hampton—I had some experience with this blue stone inoculation and find where it is used carefully it is very satisfactory. I have taken trees and inoculated them in three different places, but I never used more than a piece the size of a small grain of wheat. Where you use more it splits the tree until it looks as though it had been frozen.

Member—Does this add to the growth of the tree?

Mr. Hampton—The tree shows a big, thrifty green leaf, and I never found any bad effects if used carefully.

Member—What is the chemical action of the blue stone that causes the beneficial action?

Prof. Rolfs—I don't believe that has ever been worked by the chemist. I do not think that we know just what the chemical reaction is.

Mr. Hampton—For the past two or three seasons I find that the kumquat, where budded on the rough lemon, especially, has the sap oozing out right at the connection of the bud and the stock. I would like to know the cause.

Prof. Rolfs—We have not succeeded in getting any cure or any definite information as to the cause.

Mr. Skinner—Isn't that identical with the same disease that is in Cuba?

Prof. Rolfs—I think not. As near as I can tell from observation without investigation, it is not a genuine disease. It almost invariably occurs where it is budded on the rough lemon.

Mr. Hampton—I am of the opinion that the stock of the rough lemon outgrows the bud, and I think it throws out too much sap for the bud to absorb, and it throws it out in the form of gum.

Mr. Griffing—Regarding the fungus asked about. Prof. Rolfs discovered this red fungus (*Sphaerostible coccophila*) about ten years ago. We have had it in mind since that time, but we didn't have the courage to try it. In the meantime it cost us anywhere from a few hundred up to about four thousand dollars a year to keep the scale under control. That does not mean that the orchard was badly

infested; you probably wouldn't find one tree in a hundred that had any scale on it. We used the spray as a preventive to keep it down. At the Horticultural meeting last spring, in Jacksonville, F. P. Henderson reported that owing to his inability to spray he got this fungus into his orchard and it practically cleaned up the scale. We went to Mr. Henderson's orchard and found the conditions exactly as he had reported them. You could see that ninety per cent. of the trees had been infested and the wood was pitted with the marks of the scale, but you could not find a live scale in the orchard. We immediately went to work to introduce the fungus in our 650 acres of peach orchards. Although it was the last of July, we tried to inoculate all the infested trees by taking a piece of limb infested with either the red fungus (*Sphaerostible Coccophila*) or the black fungus (*Myrangium durii*), and binding on the limbs of the infested peach trees. Last fall we thought that the fungus was not going to do the work, but, much to our surprise, this spring the orchard is coming out with practically no live scale showing. It took a lot of nerve to do it, but I believed that if you have got the nerve to keep your spraying machines out and encourage the natural enemy, it will help you out.

Prof. Rolfs—Mr. Griffing left off the most important part, and that is the cost of applying the fungus.

Mr. Griffing—We didn't know where to find a supply of the fungi, so arranged with Mr. Henderson to furnish the limbs infested with the fungus and carry it to the orchard in sufficient quantity for five hundred acres for \$200.00. I do not suppose it cost us to put it on the trees

over \$250.00 or \$300.00. Since then we find that we could get quantities of the fungus by hunting up live oak trees that were infested with obscure scale. You can find it almost anywhere if you look carefully. You will find where the oaks are infested with the scale, the fungus will be growing out over the scale. I think the one that has done the best work is the black one, which seems to work equally well during either the wet or the dry weather. I don't think the cost of applying the fungus will be over \$1.00 per acre. Mr. Berger, please tell them what per cent. of the scale you found had been killed.

Prof. Berger—We estimated something like 99 per cent.

Mr. Griffing—Prof. Smith from Georgia has just been in the orchard. He came to see what the results were, and he might tell you.

Prof. Smith—I came from Georgia principally for the purpose of investigating the red fungus on the scale, because if it will do the work in Georgia, it is of great importance to our fruit growers. I visited that orchard last Monday and found that the scale was practically dead, as has been reported. In fact, a larger per cent. was dead than Mr. Berger has reported in the majority of the orchard. We could not find much red fungus, either, at this season of the year. Of course, I am not well enough acquainted with the work of this fungus to explain the condition, but certainly something has killed the scale in that orchard, and if not the fungus it is something equally valuable. In my own personal opinion, I think, there is very little doubt but that the fungus is doing the work.

Mr. Griffing—I want to say right here,

too, that when we visited the Henderson orchard last June we didn't find any fungus. We simply found that the scale was dead.

Mr. Rowe—Would it not be possible to dissect some of those insects and find out what was working on the inside?

Prof. Rolfs—That is exactly what I did ten years ago and presented the results of my work to this society at the Orlando meeting, and before I got through reading my paper I had the house entirely to myself. I never tried it again.

The red-headed fungus has several stages in its life history, some of which are invisible to the unaided eye. The life history of this fungus being unknown, it proved a serious obstacle in its practical use as an insecticide. We found that the scale was dying off without any apparent cause. After learning the life history of the fungus all of this difficulty disappeared. In my studies I found no difficulty in getting pure cultures of this fungus from insects that showed no signs of disease to the unaided eye. (For a full discussion of this fungus see Bulletin No. 41 of the Florida Agricultural Experiment Station.)

After we have discovered this peculiarity of the fungus we then found that by taking some of the diseased insects we could readily get cultures of this fungus from them, proving quite conclusively that it was the cause of the death of those particular insects. Since that time, however, we have made considerable progress, and have added the black fungus as an ally in killing off the San Jose scale. The red-headed fungus likes a moderately dry season, while the black fungus wants, or prefers, an extremely rainy one, such as we had last year. Con-

sequently, the black fungus flourished better last year than the red-headed. I think it is a good plan to have both of these friends in our peach orchard.

In this connection, I might say that the long scale of the citrus is also severely attacked by these two fungi. In addition to these we have the white-headed fungus which Mr. White has been using for several years with the greatest satisfaction to him and those people who are watching the operation.

Mr. Hudson—Will someone please tell us how much time is required for applying the fungus before the scale is dead?

Mr. Griffing—Until last January or February we were afraid that the experiment was going to be a failure, but when the scale came out this spring it soon disappeared.

Mr. Hart—I have talked so much on this subject that I am a little modest about saying more. It does do me so much good to hear Mr. Griffing get up and talk about the nerve it takes to try the experiment he has been trying and found successful. That very nerve I have been preaching and urging on all my friends for the past twenty years. I am pleased beyond measure to know that so many are adopting the natural and rational method of controlling injurious insect pests, and when Prof. Gossard stated at the Miami meeting that over 50 per cent. had adopted these methods I felt like resting the case and letting it go on. I believe you are on the right track, and will do all I can to encourage it.

Mr. Skinner—How about the natural enemy of the rust mite? Has it got any?

Mr. Hart—I have found quite a number of these and have been careful not to drive them away by spraying. I never

sprayed for the rust mite. I am not thick-headed enough to say that I would never spray under any conditions, for that would be foolish; but I would not spray until I had tried almost everything else, even should dire disaster threaten in some new form.

Mr. Hampton—Let me tell you how I treat my trees for the rust mite. I powder the dry Bordeaux on the trees, and it keeps my fruit nice and bright. I have not given up spraying altogether, but find it injurious in many respects. I had much rather put the dry powder on than to spray it. I have also used the dry sulphur.

Mr. Hart—In my crop this year there was but a small part of one per cent. of rusty fruit. In fact, I did not pack a single box during the season.

Mr. Hampton—As I understand, your grove is in a hammock or in dark hammock soil. I have found that on light, clay soil the oranges will be more inclined to be rusty than on the dark, clear soil. Now, I would like to know how that holds good with the balance of your experience.

Mr. Hart—I think you are right in that. We all know that by covering the ground with mulch it will do away to a great extent with the rust. The rust mite does not like a direct, strong light or reflected light. If you can cover the ground in some way, you can do away with a good portion of the rust mite.

Mr. Hollingsworth—I never see results without looking back in an effort to locate the cause, and I have wondered if the climatic conditions have not had a great deal to do with the disappearance of the scale. I can think of nothing else to lay it to, and I think that the radical seasons

we have had did a great deal towards the destruction of the scale.

Mr. Griffing—Last year we had a very wet, rainy winter and spring and early summer. This year we have had identically the reverse, so I don't see how the dry weather can be accountable for the disappearance of the scale.

Mr. Hudson—I have noticed in setting out young trees, that the scale appears on the body of the tree within about ten months after it has been planted out. I have used a little coal oil and find that it works very well. The older trees can stand the scale better than the younger ones. I have also noticed that the scale takes more readily where there has been much vegetable matter in the way of beggar-weed, etc.

Mr. Waite—Is there any injurious effect to the orange trees by using sulphurous acid as a spray for foot rot?

Prof. Rolfs—There would be no injurious effects by using it in a diluted state. The dilution is about one to ten of sulphurous acid. The sulphurous acid is one of the first remedies recommended for foot rot, and you will find that it does no damage to the sound wood. *Sulphurous* acid is what was recommended first, and by mistake some people have used *sulphuric* acid. This latter will cure the foot rot all right—so will a red hot iron.

I would like to say in connection with the rust mite and the red spider, that in each of these cases I have found that diseases attacked them as well as higher insects. They do not exactly belong to the insects, but to the spider mites. They are attacked by diseases as well as higher life, but when you attempt to inoculate them with disease germs you will see that it is a very difficult thing. The practicability of the scheme falls down when you come to applying it. The difficulty is almost unsurmountable. Dry sulphur, or the sulphur and lime that Mr. Hampton has recommended, is a perfect remedy for it. On my own trees I used this calcium sulphide and had it applied merely to the fruit. I gave the colored man special instructions to apply it to the fruit only. By use of a hand lens, one can tell when the mites are migrating to the fruit and causing it to turn them to a rusty or golden rust. If they are present in sufficient numbers to cause it to turn to a golden rust, the spray should be applied.

Member—How can you spray the fruit without spraying the leaves at the same time?

Prof. Rolfs—The citrus fruits are nearly always on the end of the branch, and are away from the leaves. The fruit that is inside in the dark is not apt to be attacked by the rust mite.