Cover Crops for Citrus Groves

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I have not visited with the Florida State Horticultural Society since 1926. I was with you in 1924 and 1926, and had a very enjoyable time with you. At both of those times it fell to me to discuss Crotalaria. That has already been discussed some this morning, and will be discussed further tomorrow. My topic for discussion this morning is “Cover Crops for Citrus Groves.” I am not going to give you any details in regard to when and how to plant a cover crop. Those who are accustomed to it, know how to do it, anyway. Those who are going to start growing one, can get that from their neighbor, but the purpose of my paper is to just raise a few questions in your mind. There are questions which have been in my mind ever since I have been in Florida. Some of them I have not been able to get satisfied on yet.

Some form of cover cropping has been practiced by some of our Florida growers for many years. Some use a natural cover crop, others use such crops as cowpeas, velvet beans and beggarweed which with the exception of beggarweed have to be planted each year. Of recent years Crotalaria, a plant not unlike beggarweed in general characteristics including reseeding habit, has come into rather extensive use.

WHY USE COVER CROPS

In considering cover crops for citrus groves the following questions quite naturally come up: Why use cover crops at all? What good will a cover crop do? Does a cover crop warrant the expense of growing it? What effect does a cover crop have on tree growth? What effect does a cover crop have on fruit quality and yield? Does a cover crop affect insect control? Does a cover crop have any effect on citrus fruit diseases or their control? Will a cover crop reduce the fertilizer bill?

Some growers evidently must think that cover crops grown and turned under exert a favorable influence on the citrus tree and citrus fruit else there would hardly be as many using cover crops of various kinds. I imagine if a vote were taken by this body this morning the majority of you would vote in favor of a cover crop of some kind for your groves. Therefore, it is taken for granted that a cover crop is a profitable thing to grow in a citrus grove. That being the case we can proceed with our theoretical reasons for the use of cover crops in a citrus grove.

A cover crop is supposed theoretically to do the following things:

1. Prevent washing of land.
2. Prevent leaching of soluble plant food.
3. Add nitrogen to the soil if a legume.
5. Render plant food more available.
6. Add organic matter to the soil.
7. Not to deplete phosphate and potash supply.
8. Increase tree growth.
9. Increase, eventually, fruit production.
10. Decrease fertilizer nitrogen costs (if legume).

The question is quite naturally asked, does a cover crop in the average Florida citrus grove do all of the above things or maybe does it do enough of a part of the above things to make it a profitable practice? I repeat, does a cover crop do enough of the things it is theoretically supposed to do to make the growing of the cover crop profitable?

If we were dealing today with annual plants such as corn or cotton I could tell you that we have some pretty definite answers to the questions asked because it has been demonstrated experimentally and under actual farm practice in a number of southeastern states that a cover crop of vetch or Austrian peas, for instance, will on the average double the yield of corn the first time you grow a crop of corn after turning under a good crop of vetch or Austrian peas. It has also been found that a good crop of vetch or peas turned under will supply all the nitrogen needed by a corn crop and the yield is only limited then by the available moisture at the critical period of growth of the corn. Added amounts of nitrogen to a corn crop under the above conditions has not been found profitable.

But how about the cover crop when it comes to the perennial plant known as citrus? Unfortunately Florida does not have any definite experimental data of long time accumulation to go to.

The only other state in the Union growing citrus on a scale comparable to Florida is California. They use winter cover crops, manure and coarse straws such as from beans, peas and alfalfa. Their soils and their distribution of rainfall is not like ours. Maybe the underlying principles, however, are the same. In 1925 a communication from a member of the California Experiment Station staff to the writer was as follows: "The winter cover crop has a pronounced fertilizer value in the young citrus orchard and in the older orchard, a replacement value of three to five tons of manure."

"So far as the value of the cover crop is concerned, the principal data available have to do with the leguminous winter cover crop. Under favorable conditions the late summer cover crop may have a positive fertilizer value, especially in the young grove, but in the bearing grove the factors entering into its management are so complex that it is doubtful whether they can be satisfactorily controlled. Experience and observation have indicated that, under many conditions at least, the growing of a summer cover crop in the citrus orchard is a practice of doubtful value."

"In the young orchard the fertilizer value of the winter cover crop is unques-
tionably high as has been brought out strikingly in work done at the Citrus Experiment Station and reported on in 1918 in California Experiment Station Bulletin 292. This work indicates conclusively that in the young orchard the cover crop is a means of greatly stimulating growth and production. The pronounced value of cover crops has also been demonstrated in the young orchards at the new Experiment Station site. The trees were set in 1917 and at the present time (1925), seven years later, this orchard is generally regarded as one of the best in both appearance and production for its age in Southern California. No fertilizers whatsoever have been applied and its present condition is altogether the result of winter and summer cover crops grown."

"In the bearing citrus orchard the cover crop is unquestionably of considerable value where a reasonable tonnage can be grown without competition with the trees. The data from the tests on older orchards, however, are conflicting, the probable explanation of which is competition with the trees either for nitrogen or water."

"The orchard practice survey previously referred to brings out clearly the fact that in the bearing orchard the cover crop has a definite organic matter replacement value. Where the smallest amounts of manure were used, it was shown that the cover crop gave the most striking results, with an average increase in yield of about twenty per cent. Where the largest amounts of manure were used, the lease effect from the cover crop was noted in an increased yield of six per cent. A good cover crop consisting of twelve to fifteen tons of green material should furnish approximately two tons of dry matter, each of which is equivalent in fertilizer value (nitrogen and organic matter) to two tons of ordinary manure. It is believed that there is justification for estimating the cover crop replacement value at from three to five tons of manure."

So much for California. What does Florida have to offer as a result of citrus cover crop experimental work? In 1925 a citrus cover crop experiment was laid out at the Citrus Experiment Station at Lake Alfred. How many of you have visited the Station and seen this experiment? In brief this experiment shows that where cover crops were used tree growth and fruit production has been a great deal better than where no cover crop was used. The experiment has not progressed far enough to show the exact value of the different cover crops being used, neither has it been run long enough to tell how much if any fertilizer can be dispensed with in connection with the use of cover crops.

The cover crop experiment at Lake Alfred started in a newly set grove, hence what effect cover crop growing in an older grove may have on the grove is not now being answered. Therefore it is our intention to extend the cover crop experimental work to bearing groves in the citrus belt and in order to do this seven bearing groves, two on the East Coast, two on the West Coast and three in the Ridge section will be selected by county agents, citrus specialist and district agents. In these groves the following
cover cropping scheme is going to be tried: One acre to a natural cover crop, one acre to Crotalaria, one acre to Crotalaria plus Crotalaria grown elsewhere and hauled in for mulching and one acre grown to any one of the following cover crops: Cowpeas, velvet beans, beggarweed or Crotalaria sericea. A record is to be kept of the tonnage of cover crops produced, fertilizer used, and fruit produced. The main idea in this work is to find out how valuable a cover crop is.

Mr. Woodson: The chart shows only the amount of nitrogen in the top of the plant. I would like to ask what proportion do the roots supply? Isn’t it greater than the plant itself?

W. E. Stokes: The question is asked what proportion of nitrogen is in the root part compared to the top. Ordinarily about two-thirds of the nitrogen in the use of a legume is supposed to be air nitrogen and about one-third soil nitrogen, if the legume is properly inoculated. Some legumes are very heavily rooted, and compared to the top growth, you might find more under the ground than you would on top. With the cover crops we are working with, we produce more top than root. The top growth on these cover crops represents approximately the air nitrogen, and that below the ground was about what naturally came from the soil. That’s just an approximation, and is a rule usually followed. Your question with reference to the amount of nitrogen in the nodules, I will answer this way, that the nitrogen is not all in those nodules. It is distributed, and in the leaf part it is surely higher than in the actual nodule itself. That makes such a small proportion compared to the whole thing that it does not really amount to so much in the end.

Mr. Smith, Avon Park: What cover crop would you recommend for the ridge section as compared with the flat woods or hammock lands, and what do you think of natal grass as a cover crop?

W. E. Stokes: On the ridge section we have gotten the highest yield from Crotalaria. At Lake Alfred Experiment Station, and other places in the ridge section, the greatest tonnage has been produced by Crotalaria. At Lake Alfred the greatest tree growth has been in those blocks where Crotalaria has been grown. We don’t have any carefully conducted citrus cover crop experiments anywhere in the citrus belt except at Lake Alfred, and that is the reason we want to get this out over the territory. Until you do get some very definite work under way you are going to be guessing right on. That is true with reference to fertilizers or anything else you try to do.

Mr. Smith: Well, what about the natal grass?

W. E. Stokes: So far, natal grass has been second in yield.

E. A. Hartt, Avon Park: I would like to ask if there has been any experiments carried on with the coffee weed. I have a friend from the Imperial Valley who tells me they pay as high as twenty cents a pound for the seed of the coffee
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weed—that little nodule they find in the roots. I was wondering whether any experiment had been carried on by our Experiment Station.

W. E. Stokes: There is a common coffee weed, and there is another kind that does have that nodule. We have not done any definite experiment work with either of those plants. I am well aware of the fact that they use it in California with very good results. We have tried, in an experimental way at Gainesville, and at the station in the Everglades several of the Sesbanias gotten from the California people, without getting anything like as satisfactory growth as we do with the commonly used cover crops. Since we did not get a satisfactory growth we thought it hardly worth while to include them in this experiment I have just outlined to you. We maintain a plant introduction garden at Gainesville in co-operation with the Bureau of Plant Industry, and we are testing out hundreds of plants from anywhere we can hear of a plant that might be worth trying. So far our work has been to see what kind of growth it would make, and it did not make a growth sufficient to warrant us in including this particular experiment.

Mr. Ward: My only reason for asking was because he went wild to see how careless we were in not making use of this plant.

W. E. Stokes: It does not, under Florida conditions, produce anything like the tonnage some of our cover crops produce.

Mr. Smith, Avon Park: Would it be proper to mow down natal grass and Crotalaria in August?

W. E. Stokes: Ask some of these men who know more about citrus than I do. I am a farm crops man, general field crops, and only interested in this from the standpoint of soil fertility. I am not a citrus man at all. Ask Mr. DeBusk.

E. F. DeBusk: We recommend generally that Crotalaria be mowed in August. It is a matter of controlling the pumpkin bug. It is purely a matter of the pumpkin bug.

Mr. Smith: What about the natal grass? Do we mow that in August or September?

E. F. DeBusk: I think you get the best results if you mow it two or three times as a cover crop. I think it should be mowed every time it begins to bloom. I think Dr. Barnett's work will back that up. It is best for production of organic matter.

W. E. Stokes: I think I can tell you what will happen to Crotalaria if you mow. We have mowed as high as three or four times during the growing season, and if you don't mow too close to the ground it will come back several times. Keep the blade up six or eight inches if you can. The growth does not come back from the ground part but from the butts along the stem, as in the case of sweet clover. Where we have mowed several times the total amount of dry matter produced has not been as great as where we let it grow a full season.

C. I. Brooks, Miami: I would like to ask this. I notice he speaks of sections to try out cover crops. In view of the fact of the new station at Homestead, I am wondering if you are not going to
plant your cover crops down there, and see what it will do on those soils?

W. E. Stokes: Our plan was to try to have one of those co-operative experiments in Dade County area.

Mr. Ward: We have heard something of a cover crop that is being tried out in the Lakeland district—Alice Clover. Does it look very promising for any particular types?

W. E. Stokes: We have had that plant, and a number of different ones under observation at the Experiment Station for a number of years. They make a pretty good growth. The big trouble so far with every one we have had under observation has been that they are susceptible to root rot injury. If you have land free from that, there is a possibility that you can grow it very well. Mr. Stephen Chase of Dunedin tried some, for some time, but I don’t believe he is growing it at present.

Mr. Parker: On this matter of cover crops, in the vicinity of canning plants, a number of growers have been hauling out the refuse and putting it on their groves. Is there any value to that compared with other cover crops?

W. E. Stokes: No sir—do you mean chemical analysis?

Mr. Parker: No. as a soil builder?

W. E. Stokes: So far as I know, it has none. There has not been any work done at the main station or the citrus experiment station, that I know about, on this.

Mr. Ward: About three years ago, a grower at Haines City hauled out the culls from the packing house and put them on the grove at about six to eight inches in depth. Shortly after that the grove turned up deep green; and a little later the trees shed their leaves. Since then he has used hardwood ashes, and lime, to overcome the effect. He said a year ago that he was having trouble with the soil taking water. Is there a danger of putting too much on the soil?

W. E. Stokes: I refer you to Dr. Ruprecht or Barnette. They have charge of this work at the Experiment Station, and when anything of this nature comes up in our investigation work, we immediately go to those boys.

Mr. Barnette: In our experience, the burying of large quantities of green material in the soil and piling it there, is very bad practice. It causes an undesirable fermentation process. In cowpeas, it runs into that. As soon as it is mixed up with the soil this condition will not exist.

L. B. Skinner: How can you overcome the tendency of the soil to shed water?

Mr. Barnette: We do not know any more about that than you do. Do not let the soil get that dry is the only way I know to overcome it.

L. B. Skinner: That is a condition that we find in a good many of our groves. Some have tried to overcome it by raw phosphate. I don’t know whether it is good practice or not.

Mr. Barnette: Personally, I would not venture to say. The only suggestion I have to make is not to let it get so dry. If you keep it to about one per cent, it will not get that way.