

Steps in the Solution of Avocado Problems

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Ladies and Gentlemen, I have been asked to discuss the Agricultural Extension Service program of work with Avocados in Santa Barbara County. Many of you may wonder why I have been chosen to speak on this topic since the avocado acreage in Santa Barbara is very small. It is small, but expanding, and I believe Santa Barbara County can become one of the major avocado producing counties in the State if a practical answer can be found to some of the industry problems. Some progress is being made with these problems through exhaustive research and test plot work under way through cooperation of the growers with the University of California, College of Agriculture and Agricultural Extension Service.

The number of problems has not been reduced because of the total plantings being small. About the only manner in which they differ from problems elsewhere in the industry is perhaps in their relative importance.

In addition to being small, the avocado industry in Santa Barbara County is relatively young. It is just old enough to give some idea of the relative importance of future problems, such as:

1. Varieties for the area.
2. Control of root rot disease.
3. Irrigation and fertilization.
4. Replanting in established orchards.
5. Management of crowded orchards.
6. Tree spacing in new plantings.
7. Selection of best root stocks.

All of these problems are receiving attention in rather large scale test plots in the County. Comprehensive field plots on these problems were possible only because growers have provided facilities that enable them to use to the fullest extent agencies working in agriculture such as the Agricultural Extension Service and Research Staffs of the University of California.

Avocado plantings, as well as lemon plantings, are on the whole small. They are owned by men with many interests. This type of farming makes it practically impossible for any individual farmer to carry on comprehensive test plots regardless of how interested he is in the work. The leaders in the avocado and lemon industries of the county realizing the need for local test plot work, formed an organization called "Citrus Field Research, Inc."

to give financial support to a program whereby the findings of research could be tested locally in the field. Following the formation of the Citrus Field Research, Inc., which provides a field assistant, transportation, and funds for test plot material, the Board of Supervisors have provided six acres of land for variety gardens and propagation work, a work room, a green house and a full-time county employed field assistant to work with the Agricultural Extension Service, in establishing field test plots. Also they have provided transportation for a Senior Superintendent of Cultivation, assigned to the County by the State office of the Agricultural Extension Service.

The avocado program calls for a permanent variety garden of about three acres, and a site for seed bed and nursery where test plot materials are being propagated. In addition to the variety garden located on county grounds, plants will be propagated for distribution in small test plots of about 10 trees each and located on ranches wherever avocados might be commercially grown. Another part of this program is to grow seedlings which hold promise of developing into desirable varieties. Any of the seedlings that bear promising fruit will be propagated in the variety garden and in local field test plots. Those that are undesirable for commercial varieties will be used as rootstocks for testing varieties from other areas that hold some promise locally. In all plantings, only seeds from known varieties will be used for rootstocks. This will be practiced for the purpose of furthering the work being done by Dr. F.F. Halma, of U.C.L.A. on avocado research.

That is our approach to problem number one, e.g., varieties.

In addition to our search for new varieties, we have test plots on many other problems. But to describe all these in detail at this time would mean very little, for many of them are not old enough to furnish conclusive information. It might be well, however, to give a progress report on some of the older plots.

Perhaps the most important of these having general interest is the work on avocado root rot. The first field test on this disease in the county dealt with drainage. In 1942, Calvin Delphy, then Assistant Farm Advisor in Santa Barbara County, cooperating with Dr. Maurice Donnelly of the Soil Conservation Service at Riverside made the plans for installing four terraces through the middle of an area on Mr. C. W. Bradbury's property that had gone out with root rot in 1938 to 1940. The terraces were constructed so that the water drained both ways from the crest of the terrace. The construction succeeded in draining the soil but by 1945 about 50 % of the avocados planted on the land had died and the growth of the remainder was far below normal.

From these results, it was evident that drainage, alone, would not solve the replanting problem on that property. In the early part of 1945, Sespe Ranch in Ventura County reported some encouraging results from replanting lemons after fumigating the soil. Using this as a lead, the Agricultural Extension Service and County Commissioner's Office, cooperating with Mr. Bradbury and the McCrae Seed Co., started the first soil fumigation plots in the County. The fumigants used were chloropicrin, carbon bisulfide, DD, and two concentrations of EDB. Injections were made with a Mack weed gun. The plots were laid out up and down the hill, across the four terraces and extended two rows above into un-terraced soil where avocados had died and the land cropped to beans for three years before replanting. Eight weeks after treatment, the whole plot was

alternately planted with avocados and lemons. There were six trees in each plot, and each treatment was repeated three times for lemons and three times for avocados. Twelve lemon and twelve avocado trees were planted as checks in non-treated soil. The reason for planting lemons was to check the effect of terracing on the growth of tree crops other than avocados and to gather information on how lemons would perform when planted in soil that had gone out with avocado root rot.

The results with the avocados after three years are rather confusing. While there are more good trees in some of the treated plots than in the checks, there were individual trees in all plots and all checks that looked good. Even in the best plot there were enough bad trees to prevent us from recommending on the basis of this, test plot, that growers can replant land with avocados where they have died with root rot.

There were enough good trees in some of the treated plots to warrant further investigation. So in the latter part of 1948, many of the plots were repeated in cooperation with Dr. George Zentmyer of the Plant Pathology Department, Riverside, and Jack Fisher of the Dow Chemical Company; from a practical standpoint, these plots are too new to furnish conclusive information.

Aside from the pre-planting soil fumigation plots, we have cooperated with Dr. Zentmyer and Jack Fisher in the treatment of trees showing early symptoms of root rot and also installing a chemical barrier which we re-treat each six months in an attempt to stop the spread of the disease from infected to non-infected area. Dr. Zentmyer is making periodic examinations of roots from trees in the non-infected area, and so far as I know, has not found any evidence that the disease has crossed the barrier. Although some trees above the barrier are now showing symptoms of root rot, they are several trees removed from the barrier and may have had the disease prior to the time when the barrier was established.

Dr. Zentmyer reported last year on our irrigation plots. The only thing I can say at this time is that the disease was not stopped in any treatment which dealt with varying the amount of water and the frequency of application. It must be understood, however, that this test was conducted in an area where most of the trees were showing symptoms of root rot damage, and results may have been different if such a test was conducted on trees not showing damage from root rot.

In addition to the test plot work on avocado root rot, we have had three years' experience with fertilizer test plots. The fertilizers used were completes, chemical nitrogen applied in amounts varying from one-half to three pounds actual nitrogen per tree and organics. To date, no difference can be detected in any of the treatments. If avocado trees on this soil type are exacting in their demands for definite amounts of nitrogen, they do not show it at the end of tree years. Correction of deficiencies of minor elements zinc and manganese has been accomplished by spraying trees with a water solution of these elements. Spraying with minor elements has not improved the growth of the trees with root rot.

Another problem which is anticipated for our locality is that of tree crowding. We have one test plot with two approaches to the problem. One approach is to cut back trees in alternate rows, something like that recommended for thinning crowded walnut orchards. The other approach is to stub back the trees in alternate rows and graft them over to

early bearing upright varieties. As we see it now, the two practices are not adaptable to the same orchard. Good results have been realized from the gradual cutting back of trees in orchards that are crowded enough for the trees to fill in rapidly. Grafting over to an upright early-bearing variety looks good in orchards where only moderate crowding is taking place and where fill-in growth is slow.

Tree spacing in new plantings is a tough problem and we do not know the answer. A conscientious study of the problem is being made, and within a few years we should have some fairly reliable leads. Right now we are doing a lot of guessing.

Just how big a problem we may have in rootstocks is anybody's guess. We are cooperating with Dr. F. F. Halma in a very extensive rootstock test plot in Santa Barbara County and if enough growers in other areas will follow his lead of keeping records on origin of rootstock seeds and scion wood, some very valuable information should be forthcoming before too many years.

In closing, I'd like to point to a few things that we can tell the Santa Barbara growers. It may not be the same for your area.

1. To date, from a practical standpoint, we cannot recommend replanting avocados where trees have gone out with root rot. Dr. Zentmyer and others are doing excellent work on this problem and the picture may be different within a few years.

2. After three years, that is as old as our plots go, lemons will make normal growth on soil where avocados have gone out with root rot.

3. Pre-planting soil fumigation has no effect on the growth of lemons when planted in soil where avocados have gone out with root rot. They all look good.

4. Following the soil for seven years following the removal of avocado root rot trees is not long enough to produce a second planting as good as the first. Pre-planting soil fumigation where avocados have gone out with root rot has not improved tree growth of replants sufficiently to warrant recommendation of this practice in Santa Barbara County. Some of the more recent plots, with Dr. Zentmyer and Dow Chemical, are too new to draw conclusions at this time.

5. Where avocados have gone out with root rot, our advice is to plant a crop other than avocados. Leave just enough land so that test plots can be continued and be patient. These problems take a long time to solve.

6. Fertilizer variations within limits of from one-half to three pounds actual nitrogen per tree per year has had no visual effects on mature trees within three years.

7. Avocado trees free of root rot will respond favorably to zinc and manganese water solution sprays when deficiency symptoms show in the leaves.

8. If you want to install some good insurance, start tree and rootstock registration now. A lot of time and money could be saved if some system were devised whereby all scion and rootstock trees could be registered as to origin. It is difficult to certify against disease, but it should be a simple matter to register trees as to origin.

I want to re-emphasize that these are conditions as they exist in Santa Barbara County and they may not be applicable to your own area.

Much similar work is being conducted in San Diego County, and I understand that Mr. Joe Coony, Assistant Farm Advisor, has cooperated with Dr. Zentmyer in getting many of these plots started. Information having the highest practical value to growers is that which comes from local test plots. We recommend that our growers visit the plots established locally, analyze them and make their own decisions as to whether or not they want to invest the money necessary to treat the soil before replanting.