

## **Research on the Avocado**

### **Professor Robert. W. Hodgson**

Mr. President, Ladies and Gentlemen:

I always enjoy meeting with and speaking to this group because my experience, which extends back more than twenty-five years, indicates that this is a most appreciative and intelligent group. With your indulgence, I shall abridge my report somewhat, for I, too, will welcome luncheon in the not too distant future.

This topic, which was stated as the avocado research program of the agricultural experiment station, is not a new topic for me to present to this group and other avocado growers' groups. I have reported on various research programs, or phases of such, on numerous occasions in the past.

Since progress in research is necessarily slow and horticultural research in considerable measure depends upon long-time experiments involving field trials, any report of this nature must of necessity, therefore, contain some repetition. The research program of the agricultural experiment station in the College of Agriculture at the University of California is an experiment program, one involving experiment work, and dates back to 1925. Sometime between 1925 and 1930, experiment work was undertaken upon avocado insect pests and diseases. The horticultural research program was started about 1933 when the Division of Subtropical Horticulture was moved from Berkeley to Los Angeles.

### **Fourteen Persons Devoting Part Time**

The present research program, which I have just had occasion to review a few weeks ago in connection with the annual reports which must be presented each spring, involves seven divisions of the agricultural experiment station—five at Riverside and two at Los Angeles—and not less than fourteen persons have devoted part of their time to work on the avocado and its problems during the past year.

For the purpose of brevity, I will confine my report to those problems of a practical nature, or on those findings that may have a practical application; namely, horticultural problems involved in avocado culture.

As any member of this organization would know, the variety problem is one of the most important questions confronting the industry. We feel that way; and so as an experiment station, we have been working on that for some time. We have two variety plots maintained in cooperation with the Variety Committee of the Society—one on the Los Angeles campus and one on the Riverside campus. In that general connection, reference should be made to the field research which has been conducted by Mr.

Marvin Rounds, serving in the capacity of secretary and member of the Variety Committee for a number of years.

With respect to the variety question, reference was made this morning to the so-called strains. We have been working for about eleven years on strains of the Fuerte variety. As a result of this work, we believe we have evidence of the existence of two so-called strains of the Fuerte. Very fortunately for our research work, in our first test plot located at Oxnard and established in 1934, in a region which is very unfavorable to standard Fuerte, we found within a few years evidence that we had in that trial two Fuerte strains, one of which did much better than the other with the exception of the seasons following extremely mild winters. Then they behaved the same. But at other times, one of the strains behaved more satisfactorily from the bearing point of view than did the other.

There have been planted and are now coming into bearing young orchards propagated from these various strains, and reports concerning the behavior of some of these young orchards are encouraging. They are doing better than the older orchards did in the same locality.

Then there is the indisputable fact that the number of growers is increasing who have obtained better results in top working drone Fuerte trees by top working to some of these strains, or in some cases by top working to high yielding trees in their own plantings. In the latter case we believe that they have had a mixture of two strains; and by using the higher yielding strain, they have sorted out the better one.

### **High and Low Yielding Fuerte Types**

Then we have done some experimental work of a slightly different sort which supports these general conclusions. For example, we were fortunate in some of our selection work, with respect to strains, in finding in one orchard (a full bearing orchard) an extremely low yielding tree which seemed to have just as good opportunity for bearing as any other. We therefore used experimentally that poor strain for propagation purposes and compared it with a very fine bearing tree in that same orchard. **The two have behaved exactly the same in the progeny.** The progeny from the low bearing tree still remains very low, whereas the progeny from the high bearing tree has given a high yield. Evidently we sorted out one tree each of these two strains in that selection, from which we derived the conclusion that by and large there are two strains of Fuerte, more or less inextricably inter-mixed in the older plantings.

The better one has been sorted out both by us and by some growers in their selection, and these better strains which we think probably all amount to the same one are now being used with rather better results.

In that connection we propagated from a very low yielding orchard in the Oxnard section from the better yielding trees in that orchard, which, however, was not satisfactory as to production, and then we propagated from an excellent tree in the La Habra section where the yield was satisfactory. We have grown these trees to fruiting in four or five localities. We find no difference whatever between them as to yield. We got the high yielding strain in a low yielding community; and when we put it together with the same strain as was grown in a region where it was environmentally limited, the two strains

behaved the same.

### **Progress of Root-Stock Investigations**

Reference has been made to the desirability of there being rootstock investigations in the avocados. I had supposed that I made reference to our rootstock work several times in the past, but perhaps that is not the case. At any rate, I do wish to report that rootstock work was started in 1937, at which time approximately eight hundred trees were planted in five different localities, and these trees are all on Mexican rootstock, records of all of which go back to one original parent.

The history is that we received from an avocado grower nurseryman about sixty-five avocado seedlings, all propagated from one superior parent tree located near Anaheim. After these trees were eight or ten years of age and had fruited, we made a selection within that sixty-five. We took the largest and the smallest, and we took the tallest and the shortest, and we selected sixteen. We wanted to get the full range of variation in this group of sisters. Then we used those sixteen as rootstock for Fuerte and Nabal varieties. We have them on sixteen sisters, representing the range within the Mexican race.

The general purpose of this experiment was to determine whether there is a root stock problem, when you use the Mexican avocado with these two varieties, and the nature of that problem.

Well, those plantings are now in bearing. Some of them are much better than others for environmental reasons, climatic primarily, although we haven't analyzed the data which are rather extensive. We are beginning to see some suggestions that there are, perhaps, differences due to the rootstock. However, the plantings were made in 1937; the trees are young, the data are not completely analyzed. The beginnings do appear that there may be some root stock problem with these two varieties grown on the Mexican avocado.

Just a little later we started plans for rootstock trees of named varieties of the Mexican avocado, since these and seedlings are the varieties the nurserymen have used. There has been a great difference of opinion concerning their comparative desirability, and we now have five field plantings in which we can compare from six to eight or nine of these Mexican varieties used as rootstocks together with Fuerte.

The first of these plantings was made in 1942 at Fallbrook; in 1943 at Saticoy and Fillmore; in 1944, at Escondido and Azusa. We now have five of them, making a total of ten rootstock field plots, dating back to 1937 for the beginning.

The Program Committee originally suggested that I give a report on the progress of the avocado decline research program, and I pointed out that a rather detailed report on the status of that problem, as of last October, was presented at the avocado institute at La Habra, and again at a meeting of avocado growers in Vista in December, and that there was not much to report in the way of progress since last October.

This report would not be complete without some reference to the general problem of disease. As far as disease control is concerned, it is a pleasure to be able to report that

Dr. George Zentmyer, one of our former students who went to Berkeley for graduate study and who later came back, has been appointed to the staff of the division of plant pathology at the Citrus Experiment Station to fill the vacancy created by the untimely death of our old friend, Professor W. T. Home. Dr. Zentmyer has been on the job for some months and will concentrate insofar as is possible upon diseases of the avocado.

### **Dr. J. M. Wallace to Investigate Sunblotch**

It is also a matter of satisfaction to report that the "sunblotch" disease, which is one of the most mysterious of the lot, has been assigned to Dr. J. M. Wallace, who is a virus specialist. He was added to the staff at Riverside several years ago. With respect to the disease problem in general, we are somewhat better fixed from the point of view of staff, than we were a year ago.

Now with respect to the avocado tree decline problem for which the industry itself provided financial assistance last year in the way of a donation to permit an expanded program of research; it is necessary to report that conditions have arisen which have interfered with our original plan with respect to this program. I should explain the situation to this group. Many of you, perhaps all of you, have heard a good deal in recent months of something called the "quick decline in citrus." Some of you, probably, are reasonably well acquainted with the characteristics of that trouble and its present status. Suffice it to say, that last summer it became evident that in one of the important commercial citrus areas, there was something in the nature of a disorder, or perhaps a disease that appeared to be on the move, which was definitely causing very rapid and serious decline of orange trees. Only a few years ago, a dreaded disease of a mysterious nature broke out in South America. It has destroyed thousands of acres of their industry. Its nature is not yet known. It is also true there is a somewhat similar disease P in South Africa which has prevented the expansion of their industry on the basis of the sour orange rootstock.

One of the first facts discovered on this quick decline was the fact that it is restricted, as far as we now know, to the sour orange rootstock. This, together with the obvious fact that the worst suspicions might be confirmed, presented to the California orange industry a very great threat involving considerable hazard, which made it necessary, in view of the limited manpower in the experiment station, and the impossibility through lack of funds as well as the war situation to increase that manpower, to make the decision to temporarily concentrate on the citrus decline problem. This will be necessary until a new budget goes into effect and it is possible to add to our technical staff. If this threat proves to be less of a problem than present conditions indicate, we can relax. On the other hand, we cannot afford to leave any stone unturned in our effort to unravel the nature of this citrus decline.

### **Advent of Citrus Quick Decline Slows Up Research Work on Avocado Decline**

As a consequence, the pathologists and the horticulturists, beginning with last summer, have not been able to devote as much time to the avocado work, and particularly the avocado tree decline research program, as had been planned. The status of the

program you will find in some detail in the last issue of the Yearbook of this Society.

The Soil Study work has been proceeding uninterruptedly and pretty much according to plan. The soil studies proper and the soil tree studies have gone forward, and additional drainage installations have been made and cooperative field trials have been established in drained and un-drained areas. Some of these experiments are in cooperation with other divisions, such as Pathology and Horticulture. Some work of a pathological nature has been continued. The soil organism survey which was started more than a year ago by Dr. Harvey has been completed and the results of that survey are summarized in the last number of the Calavo News. (See p. 82.) Dr. Zentmyer and Dr. Coates have continued to follow up some of the laboratory and field studies which got under way last fall, and even a few new experiments have been established. The horticultural studies have been continued although not to the extent which had been originally planned. Since a good deal of the work involved propagation of trees for field plantings, there has been no interruption to those plans, and new rootstock plantings and replanting trials involved in this problem have been made in the last several months.

### **Conclusions at to Avocado Decline**

I would say, to summarize the situation, that the results of the studies conducted under this research program to date support the conclusions announced about a year ago that the avocado tree decline is associated with unfavorable moisture conditions in poorly drained soils, largely the result of excessive rainfall; that soil organisms are normally of secondary importance and come into notice only with unfavorable soil conditions.

In conclusion, I wish to emphasize that I have given you by no means a complete report on the work which is under way and the other accomplishments that have been made in the past year. The program is now too large and there are too many persons involved in it for me to keep closely in touch with all the current developments and still do the other things which I have to do, such as other industry research programs and other responsibilities. In presenting this report, I regret that I have not been able to do a more adequate job in summarizing the work done. I regret I am no longer able to follow the program as closely as I would like. My principal regret is that my personal participation in this program is no longer as extensive as it was formerly. I have never enjoyed doing anything more than I have this research work on the avocado. I thank you.