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On the Bearing Behavior of the Fuerte Avocado Variety in Southern California

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INTRODUCTORY

Fuerte,[1] the principal avocado variety grown in southern California, is satisfactory in all respects except bearing behavior. During the past 15 years it has exhibited a decidedly erratic bearing habit and the conclusion is now general that unless practicable means can be devised for regulating its production this variety will have to be discarded. As an indication of its behavior may' be cited the sequence of crops harvested during the past 7 years, 1928-29 to 1934-35, namely, medium, small, large, medium, small, small, and large respectively. It will be observed that this period included three small crops, two medium crops, and two large crops, and that 4 years elapsed between the latter. This paper comprises the first report on a study of the bearing behavior of this variety.

The orchard used in this study is situated in the La Habra Heights district of Los Angeles County, which is an important center of avocado production. It has received good care and is above average for the locality. Frost protection has not been considered necessary and no tree injury has occurred during the past decade. In January, 1932, the temperature in an adjoining orange orchard dropped to 25 degrees F for a short period one night, which caused injury to young trees. The avocado trees showed little evidence of injury, however, though the succeeding crop was produced mainly in the tops of the trees, with the exception of those at the upper end of the orchard which rises rather abruptly. In this area, the trees are much smaller than in the lower and relatively flat bottom which comprises the bulk of the planting. The orchard was originally a double planting of the Fuerte and Puebla varieties but in recent years many trees of the latter, and a few of the former, have been removed because of crowding which resulted from too close planting. The trees were planted as seedlings in the spring of 1921 and were budded or topworked during the growing seasons of 1922 and 1923.

DATA AND DISCUSSION

The data here summarized and discussed consist of the annual yield records, in number of fruits, of each of 128 trees for the 6-year period, 1928-29 to 1933-34 inclusive. The yields for each tree were plotted and a study of the graphs indicated that with the exception of seven trees, six of which fail to correspond only in the first or last year of the 6-year period, they fall into four groups of similar behavior. Since it is not practicable to reproduce all the graphs here the average yields in each of the four

[1]For the history and characteristics of this variety see the following references:
POPENOE, W. Manual of tropical and subtropical fruits. 9-78. The Macmillan Company, New York. 1920.
RYERSON, K. A. Avocado culture in California. Part I, History, Culture, Varieties, and Marketing. Calif. Agr. Exp. Sta. Bul. 365. 1923.

groups, including the exceptions noted, have been determined and are shown graphically in Fig. 2. The mean temperatures for certain months during the 7-year period, 1927-28 to 1933-34, at the nearest official Weather Bureau station, Yorba Linda, about 10 miles distant, are shown, in Fig. 1, In the following paragraphs the crop sequences and relationships for each of the four groups are summarized and briefly discussed.

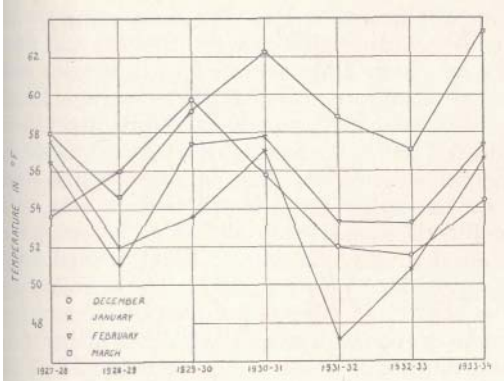

FIG. 1. Mean monthly temperatures at Yorba Linda, Orange County, Calif.

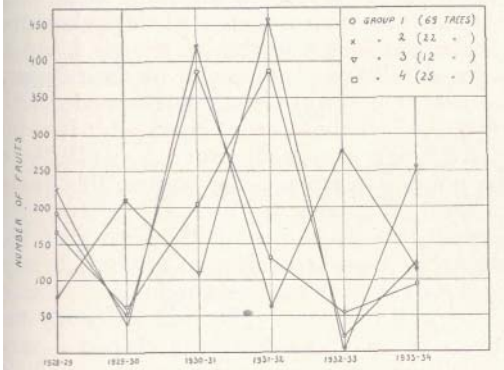

FIG. 2. Average yields of Fuerte avocado trees, plotted by groups of similar bearing behavior.

Group 1 (69 trees):—Crop sequence—medium, small, large, medium, small, and small. The general similarity between the graph portraying the bearing behavior of this group representing more than half of the trees, and those depicting the mean temperatures of the preceding February and March suggests a causal relationship, particularly in view of the fact that these months normally represent the peak of the blooming period of the Fuerte variety. It will be observed that the correspondence is perfect with two exceptions, 1931—32 and 1933-34. In the former a medium crop followed a large crop even though temperature conditions were favorable during the blooming period; this suggests that the large crop of 1930-31 was the dominant factor determining the amount of crop in 1931-32. In the latter (1933-34) the situation was reversed. Some crop increase followed a small crop although temperature conditions were even less favorable; this suggests that the small crop of 1932-33 permitted an increase in the succeeding crop in spite of unfavorable weather during the blooming period.

It is interesting to note that during the 7-year period covered by the temperature graphs there were three winters, namely, 1929-30, 1930-31, and 1933—34, too warm to properly break the rest of certain temperate-zone fruit trees, and each was followed by the occurrence of the phenomenon known as delayed foliation (1). Two of these winters, both in odd-numbered years, preceded large crops of the Fuerte avocado; in each case the large crop followed a small crop. The third (1930-31), as noted above, preceded a medium crop which in turn followed a large crop.

Group 2 (22 trees):—Crop sequence—medium, small, large, small, good, and small. The trees in this group alternated regularly in bearing behavior throughout the period in question, starting like those in group 1 but ending in exactly the opposite phase. It will be observed that they started higher than any other group and were likewise higher in 1930—31, following the first of the two successive mild winters; also that they dropped considerably lower in 1931—32 than group 1. Most of the trees in group 2 are situated in the upper end of the orchard where, as previously mentioned, they average much smaller in size. It seems reasonable to assume, therefore, that their first large crop, which followed the mild winter of 1929-30, actually represented a much heavier production per unit of tree volume than occurred the same season on the larger trees in the bottom area, and that this was responsible for the small crop the next season even though it followed another mild winter. Having produced a small crop that season, 1931-32, they were able to bear a good crop the following season, 1932-33, and did so because of their favorable hillside location in spite of the generally unfavorable winter of 1931-32. Further evidence supporting this conclusion is afforded by the fact that 18 of 20 younger trees of the same variety located higher up on a nearby hillside behaved similarly during the period, 1930-31 to 1933-34 inclusive.

Group 3 (12 trees):—Crop sequence—small, medium, small, very large, very small, and good. This group also alternated throughout the full period but started in a phase opposite to that of groups 1 and 2. The one large crop it produced followed the second of the two successive mild winters; its two other on-crop phases corresponded with unfavorable winters which depressed these crops markedly. It is interesting to observe that following the medium crop of 1929—30, which was the result of the unfavorable preceding winter, this group did not drop so low in 1930-31, following the first of the two successive mild winters. Apparently this permitted it the next year, the mildest of the period, to reach the highest maximum attained by any group. It should be noted, however, that this maximum was in turn followed by the smallest crop of any group. This was evidently the result of the combined effects of an unusually large crop and very unfavorable temperature conditions during the blooming period. It will also be observed that following this lowest minimum the succeeding crop was good notwithstanding the fact that temperature conditions in 1932-33 were even less favorable than in 1931-32. One of the 20 younger trees above-mentioned has followed the behavior of this group.

Group 4 (25 trees):—Crop sequence—medium, small, medium, large, very small, and small. During the first 2 years the behavior of this group was similar to that of groups 1 and 2 excepting that in 1928-29 the average yield was somewhat lower and in 1929-30 somewhat higher than for the other two groups. This may explain the fact that in 1930-31 a medium crop was produced whereas groups 1 and 2 yielded large crops. Having borne only a medium crop following the first of the two successive mild winters this

group was able to produce a large crop in the second and more favorable season. In this connection attention is directed to the contrasting behavior in these 2 years, 1930-31 and 1931-32, between groups 3 and 4. In the first year, group 3 produced a considerably smaller crop than group 4; this apparently enabled it to bear a correspondingly larger crop the second year. Study of the graphs shows that this relation obtains for all the groups. From 1931—32 on, group 4 behaved like group 3 except that because of the somewhat smaller crop that season the yield the following year did not drop quite so low nor did it rise so high in 1933-34.

A study of the graphs of these four groups shows that large, crops were produced only in seasons which followed mild winters and that they invariably succeeded small or medium crops. It also indicates that large crops were followed by small or medium crops even though temperature conditions during the blooming period were apparently favorable.

CONCLUSIONS

It is believed that these data support the following conclusions: (1) In southern California the Fuerte avocado variety exhibits a pronounced tendency to the alternate bearing habit, the causal factor for which is the amount of crop produced the previous season; (2) temperature conditions during the blooming period comprise an important factor in the bearing behavior of this variety; and (3) the crop produced in any given season is determined by the percentage of trees in the on-crop phase and temperature conditions during the period of bloom.

ACKNOWLEDGMENTS

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LITERATURE CITED

1. WELUON, G. P. Fifteen years study of delayed foliation of deciduous fruit trees in southern California. Monthly Bul. Calif. Dept. Agr. XXIII: 160-181. 1934.