

Suggestive Evidence of the Existence of Strains in the Fuerte Avocado Variety

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At the urgent insistence of the industry, the Division of Horticulture (then Subtropical Horticulture) in 1933 undertook a study of the bearing behavior of the Fuerte avocado variety. Field observations early brought to light two facts, which have subsequently proved to have considerable importance, namely (1) that this variety is a decidedly poorer bearer in the cool coastal districts than is the case farther inland but (2) there occur in all districts trees outstanding in bearing behavior as compared to the average for the locality. The question, therefore, arose as to whether these superior trees were environmentally favored or inherently of better bearing behavior.

For the purpose of ascertaining the facts in this connection two field trials are now under way—one started in 1934, the other four years later. The imminent necessity for concluding the older trial and the fact that some years must elapse before the younger test can provide data of significant value appear to justify a progress report at this time.

The 1934 Trial

In March of 1934 eleven 13-year old Fuerte trees, part of a lot of 51 trees available for field experiments, were topworked with scionwood from selected parent trees of known superior bearing behavior, all of the Fuerte variety. Prior to the initiation of this trial none of the 51 trees had ever borne more than a few dozen fruits nor did they materially exceed this yield up to the time of the removal, several years later, of those not involved in the trial, only one being left to serve as a control. It has subsequently been shown that the unsatisfactory bearing behavior of these trees is traceable to the low mean temperatures which characterize the blossoming and fruit-setting period in this coastal locality*. Young trees propagated from a low-bearing parent in this block have borne well in an inland district where temperatures are more favorable.

Two methods of topworking were employed—one requiring the use of a dozen or more scions, the other but one. As a consequence the tops of some of the trees were restored more rapidly than with others. For several years past, however, no relation has seemed to exist between size of top and the number of scions used in the topworking; some of the tops derived from a single scion are now as large as those produced from numerous scions. It is to be remarked, however, that the trees vary considerably in size and hence bearing surface.

Several years after the topworking, when the trees came back into bearing, it was discovered that three of them, including the control, were affected with the sunblotch

virus disease, one of the effects of which is reduced growth and bearing. It is of significance to note, however, that the two virus-affected selections, while both dwarfed, have performed very differently with respect to bearing behavior.

The selections included in this trial, together with the localities where the parent trees are located, are as follows:

1. Cole (Ojai)—Inland
2. Carr (Rivera)—Semi-coastal
3. Hansen (La Mesa)—Inland
4. *Newman (Tustin)—Coastal
5. Hoffman (Linda Vista)—Inland
6. Popenoe (Altadena)—Inland
7. Lewis (North Whittier Heights)—Inland
8. Zemke (Glendale)—Inland
9. *Donlan (Oxnard)—Coastal
10. Culbertson (Covina)—Inland
11. Weill (Oxnard)—Coastal

*Became virus-affected from original tree.

The new tops started to bear in 1937 and have now borne eight crops. Three fairly good crops have occurred in which all the selections and the control have participated, namely in 1941, 1942, and 1944. It is to be noted that each of these followed blossoming and fruit-setting seasons of above-average mean temperature, when crops were good generally. Two very light crops have also occurred—in 1943 and 1945. The light 1943 crop affected all the trees alike and was doubtless the result of the comparatively heavy 1941 and 1942 crops in succession. The extremely light crop of 1945, however, followed the coolest blossoming and fruit-setting season in many years. It did not affect all the selections alike, however, three of them bearing significantly better crops than the others.

From the beginning, three of the selections—Newman, Weill, and Carr— have exhibited superior bearing behavior. They were the only ones to bear in the 1937 crop, the first produced by any of the topworked trees. Newman and Carr have borne six fairly good crops and Weill has produced five, as compared to only three for the other selections. The reason for the failure of Weill to produce six good crops appears to be the fact that, although only medium in size, in 1941—a good crop year—it out-bore all the other trees, several of which were much larger. As a consequence it alternated sharply and produced a light crop in 1942—another good crop year. In the 1944 crop —the third good crop year—it came back with another crop larger than that produced by any of the other selections. Moreover, considering bearing surface and size of preceding crop, with only minor exceptions these three selections have regularly out-yielded the others, good seasons or bad. The performance of the Newman tree seems especially notable in view of the fact that it is one of the smallest trees and also sunblotch-affected, yet has ranked with the highest yielding trees in the group.

The 1938 Trial

In the spring of 1938 seven Puerte selections were planted in the Horticulture Orchard on the Los Angeles campus of the University and Mexican seedlings planted to permit of the addition, by topworking, of four more selections, which have subsequently been added. In this planting each selection is represented by a pair of trees.

The original planting included the following selections:

1. Newman (Tustin)—Coastal
2. Williams (Montebello)—Semi-coastal
3. Popenoe (Altadena)—Inland
4. McDonald No. 1 (Fallbrook)—Inland
5. Burgess (Brea)—Inland
6. Weisel High Yield (La Habra Heights)—Semi-inland
7. Weisel Low Yield (La Habra Heights)—Semi-inland

There were later added by topworking the following:

8. Cole (Ojai)—Inland
9. Carr (Rivera)—Semi-coastal
10. McDougall (Carpinteria)—Coastal
11. Weill (Oxnard)—Coastal

The trees in the original planting started to bear in 1942 and have now borne three crops, far too few to afford data of significant value. Only one good crop has been produced, that of 1944, which followed a blossoming and fruit-setting period of much above-average mean temperature.

Of the seven selections in the original planting thus far only one—Weisel Low Yield—has differed significantly in bearing behavior. To date, it has borne much less fruit than the other six. On the other hand, Popenoe, which did not stand out in the 1934 trial, is at present leading in yield in this trial. The reason for this difference, as between the two trials, is not known. It is known, however, that until very recently at least there were two remaining Fuerte trees on the Popenoe place at Altadena, both of which have been extensively used as sources of propagation wood. Unfortunately our records do not show that the scionwood used in the two trials came from the same parent tree. The possibility, therefore, exists that the Popenoe selections in these two trials go back to different parent trees and consequently may actually be different.

Tentative Conclusions

The data obtained in these trials, admittedly many too few to be conclusive, together with field experience and observations, strongly suggest the possibility that there are two (and probably only two) strains of the Fuerte variety, one of which bears more consistently in coastal localities and may be considered to be more resistant to unfavorable temperature conditions during the blossoming and fruit-setting period.

There is reasonably good evidence that both strains occurred in the original lot of Fuerte

budwood introduced in 1911 or 1912 and propagated in Altadena by the West India Gardens. Of the seventeen selections in our trials five have been traced back to sister trees resulting from the original propagation. Four of these—Newman, Weill, Burgess, and Popenoe (1938 trial)—appear to have demonstrated superior bearing behavior in coastal localities.

If the results of these trials, and the fairly extensive field experience which supports them, have significance and application to the industry, the latter would seem to include the following:

1. For the coastal or near-coastal districts nursery trees should be propagated from and orchard trees topworked to selections or strains **of demonstrated superior bearing behavior under coastal conditions.**

There is as yet no experimental evidence that such selections or strains will exhibit superior bearing behavior in inland localities, but likewise there is no reason to justify the belief that in such localities they will not bear as well as any other selections.

2. For inland localities the safest practice will involve the use of parent trees of demonstrated high yield capacity.

In conclusion, it should be emphasized that thus far no **visible differences** have been found between the superior strain (numerous selections) and other Fuertes. The difference, if any, appears to be **physiological**, or **functional**. Moreover, all are characterized by the alternate bearing tendency. It merely seems to be less pronounced **under coastal conditions** in the so-called superior strain or selections.

*Hodgson, R.. W. and S. H. Cameron. Temperature in relation to the alternate bearing behavior of the Fuerte avocado variety. Proc. Amer. Soc. Hort. Sci. 33: 56-60, 1936.