

STEM-ROOTING VARIETAL CLONES BY MEANS OF "JUVENILE GROWTH PHASE" LEAFY-STEM NURSE CUTTINGS

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Nurseryman, carrying on experimental activities.

The following report is the second in a series of experiments (ref. 3) with the avocado concerning the phenomena of the juvenile phase of growth. Simple leafy—stem propagation of the avocado, by means of stem cuttings, has not yet proven economically feasible. A method is discussed that has produced a satisfactory ratio of own-rooted plants of the variety Fuerte, and that conceivably could be developed to economically produce such own-rooted plants of the avocado.

Because present varieties of the avocado, with few exceptions (ref. 2, 4) have all come to our attention as individual seedling trees; growing and fruiting upon their own original roots, there remains to be discounted the supposition that these same varieties might have better production performance if grown as own-rooted trees.

It has been known for some time that leafy—stem cuttings taken from very young avocado seedlings root easily. However, the number of cuttings that can be obtained—and rooted—from any one seedling appears to be limited by at least two factors: The amount of cutting material available, and the limited time during which the plant remains in the "juvenile" condition of its growth.

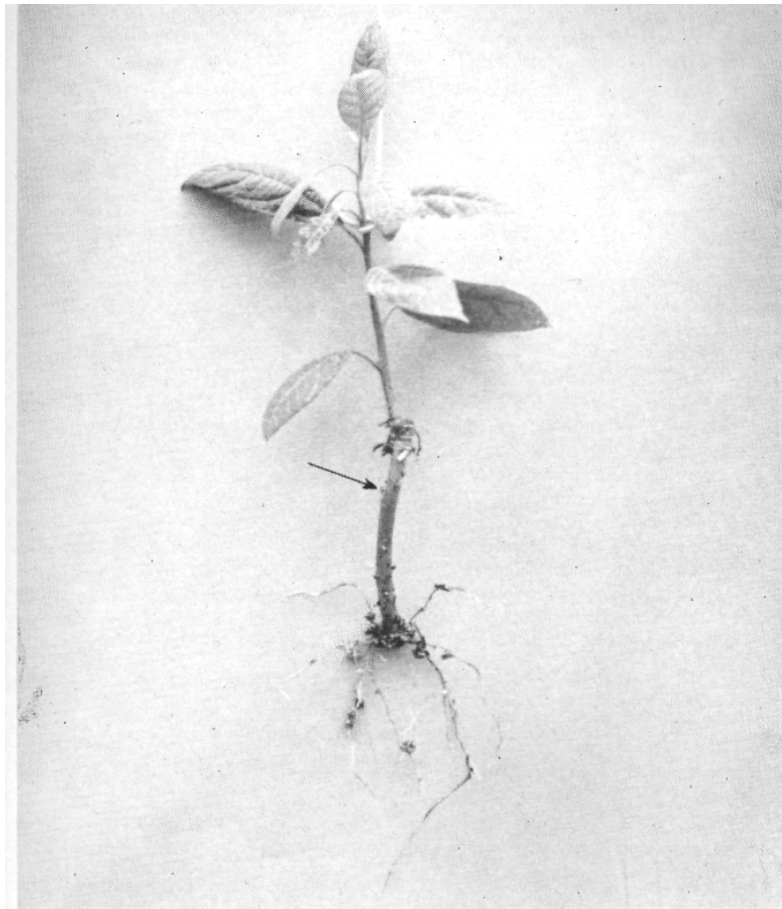
A recent hypothesis (ref. 1) has been developed, which indicates leaf retention or abscission is mediated by the auxin (*Auxin: Any of a group of substances which promote plant growth by cell elongation, bring about root formation, and cause bud inhibition and other effects.*) gradient across the petiole of the leaf. If auxin production by the leaf drops below the auxin level in the stem, it results in activation of the cells of the abscission layer at the base of the petiole—and the leaf is lost. As maximum auxin production occurs in developing buds and the new leaves it becomes apparent that each flush of growth, as it extends beyond the prior flush of leaves, has an effect on this auxin gradient in the older leaves, and eventually, in timing of their drop.

With this in mind, attempts were made to delay drop of leaves from cuttings of the Fuerte variety by means of foliar sprays of synthetic auxins (2,4-D and 2,4,5-T). However, no conclusive information was obtained, at the concentrations used (5 and 10 ppm.), and dip treatment of the stems (basal portion immersed in the solution for 24 hrs.), if anything, appeared to accelerate leaf drop.

Aside from rooting behavior, cuttings of the juvenile phase of growth display exceptional retention of the leaf. This under identical conditions and in comparison with cuttings of the mature growth phase. Juvenile leafy-stem cuttings rarely drop any of their leaves, while in cuttings of the mature growth phase leaf drop starts in the third to fourth week, and once initiated usually continues until the cutting is lost.

The leaf, in the rooting of the avocado, would appear to be of prime importance. To further test out this supposition, the following experiment was initiated.

Deleafed cuttings of the Fuerte variety, averaging 3/8 in. in diam. and 6 in. in length, were bark grafted with leafy-stem cuttings taken from very young seedlings of the Mexican family of the avocado. Each of the "juvenile" cuttings being the entire growing point or Primary meristem of the young avocado plant. These "combinations" were then placed in a cable heated hotbed with the graft unions one inch above the vermiculite-peat moss growing media. Bottom temperature for the bed was adjusted to and automatically held between 70-75°F. Top heat or temperature was provided when the bed fell below 58°F., and the over temperature control was set to prevent temperature above 85°F. Humidity, provided by fogging sprays, was automatically controlled so as to prevent relative humidity below 80%. Mean air temperature for the 120 days of the experiment was 64°F.; an inversion of 8° below the temperature for the bottom of the bed.



Stem cutting of the Fuerte variety rooted by means of the "juvenile" nurse cutting grafted upon it. Note remains of aerial roots at the union between the two woods. Of interest is the negative (initial) geotropism displayed by two of the roots (Fuerte roots). A latent bud (arrow) is shown on the Fuerte stem, and which can be used to form the vegetative top of the new tree when the nurse is no longer needed.

First indication of rooting activity was the formation of aerial roots from the seedling cuttings at the juncture with the Fuerte sticks, this in the ninth week (see photo). Callus formations appeared at the bases of the Fuerte sticks, but it was not until the 17th week that roots began to appear from the Fuerte cuttings.

Elapsed time, in the matter of rooting the Fuerte variety, using this approach, appears to be little shortened in comparison to the "time" required to root clones of the Fuerte using their own leaves. However, due to the excellent leaf retention of the juvenile cuttings superimposed on the leafless Fuerte sticks, the succeed-to-fail ratio is roughly 50-to-1 in favor of the juvenile nurse-topped material.

In regard to the manner of combining the seedling tops and the Fuerte leafless cuttings, bark grafts were used, but only because the Fuerte bark had not yet "set." Any of a number of methods would probably work as well. One detail of importance was observed. It is advisable to locate the juncture of the two woods approximately one inch above and directly in line with a well-developed but latent Fuerte bud. As a result of such positioning, auxin (growth regulator) can, as soon as a union is established, be delivered to and hold this bud in a latent condition. Graft positioning without regard to bud position, in many of the cuttings, resulted in premature growth of the Fuerte leaves, and it is believed this contributed to the loss of many of the juvenile-topped combinations that might otherwise have produced roots on the Fuerte section.

A few "do and don't" items became apparent as the experiment progressed. Don't use juvenile cuttings with incompletely expanded leaves. Best results were obtained from juvenile cuttings taken from a bed of seedlings that were outside without any top cover, although furnished with bottom heat (October through January). This environment produced seedling top-growth having close internode spacing of the leaves as well as abnormally small leaves. In the selection of the Fuerte material: Don't make cuttings extra long or of diameter more than ½ inch. Make sure that the buds are well developed, but that they are in a latent condition.

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