California Agriculture. 1954. 8(3):12-14.

2,4-D Treated Avocado Plants

Plant growth regulator improved the vegetative growth in greenhouse tests with sand cultures

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In avocado tree culture, one of the important problems is to maintain a healthy root and top growth at all times.

A step in this direction was taken when studies—involving organic chemicals—were conducted with avocado seedlings to each of which a large seed was attached.

Low concentrations of 2,4-D in the nutrient solution added to the soil cultures greatly stimulated the growth of the tops and the roots. In these tests, it was possible that the action of the 2,4-D plant growth regulator was chiefly on the plant food stored in the seed and not a direct action on the root itself.

Leafy-twig cuttings of the Zutano—Mexican—avocado variety were rooted in the propagation chambers and when hardened, a rooted cutting was planted on April 14, 1953, in each of five two gallon-capacity earthenware jars filled with soil and provided with suitable drainage.

The five cultures were grown in the glasshouse and were similarly treated as regards distilled water or nutrient applications. The composition of the nutrient solution in parts per million—ppm— was calcium, 239; magnesium, 81; potassium, 276; sodium, 11; chlorine, 15; nitrate, 1,078; sulfate, 324; phosphate, 158; zinc, 0.2; manganese, 0.2; boron, 0.2; iron, 0.2; aluminum, 3; copper, 0.25; and molybdenum, .05. On the 20th day of April, of May, and of June, various concentrations of the acid form of 2,4-D—0, .005, .010, .015, and .020— were added to the nutrient solution that was applied to the soil of the various cultures. In this test, 2,4-D was not applied to the leaves and the possible effects on fruit to be produced later were not given consideration.

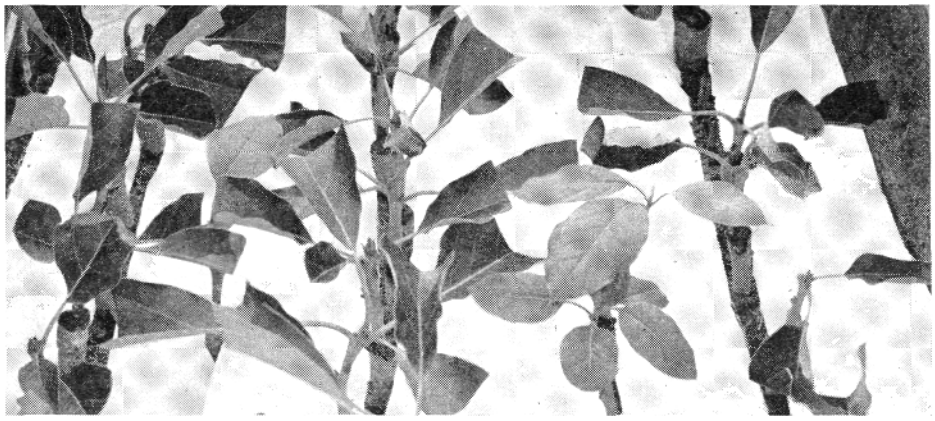
On November 16, 1953, the cultures appeared as shown in the illustration at the bottom of this page. Culture No. 1 never received any 2,4-D and served as a control. On three occasions culture No. 2 received 0.005 ppm of 2,4-D and No. 3, 0.010 ppm of 2,4-D in their nutrient solution, but their growth was not unlike that of the control culture No. *1.* The growth stimulation in culture No. 4 was very pronounced as was also the slightly less striking growth made by culture No. 5. Three soil applications of 2,4-D concentrations—0.015 ppm to No. *4* and 0.020 ppm to No. 5—apparently were responsible for the unmistakable growth improvement.

The somewhat more diminished stimulation in culture No. 5 than in No. 4 indicates the extreme caution that should be exercised in not raising unduly the very low concentrations of 2,4-D used.

Growth of rooted leaf-twig avocado cuttings of the Zutano (Mex.) variety in well-drained cultures of sandy loam soil that received similar nutrient solutions except that on three occasions the nutrient solutions contained various concentrations of the acid form of 2,4-D (0, .005, .010, .015, and .020 ppm, respectively). Cultures were grown from April 14, 1953, until photographed on November 16, 1953.

With such intense vigor as shown in culture No. 4, it may be informative to test the susceptibility of such roots to root rot and other attacks. The increased leaf development should better facilitate the removal of excess soil moisture which is associated with certain types of root injury.

The addition of a plant growth regulator to the soil has proven beneficial to the growth of a plant, because the concentration of auxins—growth substances— in soils bears a relation to the fertility of the soil. The decomposition of the organic matter in the fallen avocado leaves possibly assists in the formation of auxins.

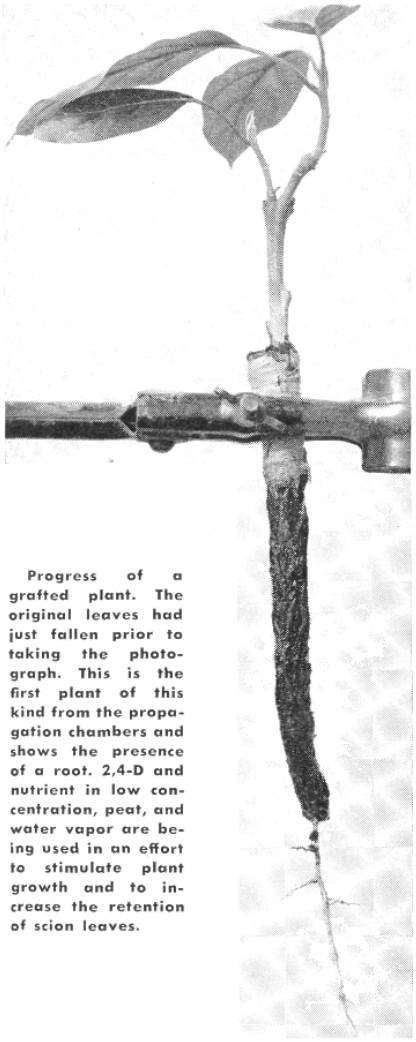


Shows efforts being made to reconstitute productive avocado trees. The propagation chamber has its cloth-covered glass frame removed to show the leafy-twig Fuerte avocado cuttings that are cleft-grafted into pieces of avocado root grown in a well-drained half plaster sand-half peat mixture maintained at 65° F in the glasshouse with bottom heat.

Outdoor Tests

The test with rooted-leafy-twig avocado cuttings in the glasshouse was followed by an experiment with budded trees in several sets, each of four out-of-door soil cultures. In one set, Caliente—Mexican— avocado seedlings were grown in small containers of soil

until of a size suitable for budding. The buds used were of the Carr Fuerte variety and the budded trees were grown—with similar nutrient supplies—under lath for nearly a year.



Progress of a grafted plant. The original leaves had just fallen prior to taking the photograph. This is the first plant of this kind from the propagation chambers and shows the presence of a root. 2,4-D and nutrient in low concentration, peat, and water vapor are being used in an effort to stimulate plant growth and to increase the retention of scion leaves.

On February 16, 1953, the roots of the young trees were washed free of most of the adhering soil. One of the trees was planted in each of four soil cultures that consisted of sandy loam soil in galvanized iron containers—18" in diameter, 25" deep and provided with drainage.

The nutrient solution employed was similar to that used in the experiment for the rooted Zutano leafy-twig cuttings in soil cultures. On three occasions—February 23, April 6, and May 20, 1953, the nutrient solution of nine liters for each culture—except *A,* which served as the check—contained concentrations of the acid form of 2,4-D. On those dates .005 ppm of 2,4-D was added to *B;* .010 ppm to *C* and .015 ppm to *D.*

The picture at the lower right on this page shows the marked improvement in growth of the Fuerte avocado trees on Caliente rootstock when very small additions of 2,4-D were made to the nutrient applied to the soil. It would appear that the concentration of plant growth regulators in soils bears a relation to the fertility of the soil.

Grafting Experiments

Low concentrations of 2,4-D are now being used in a preliminary way in grafting experiments in avocado plants. In avocado orchards, it has been shown by other research workers that certain trees are responsible for the bulk of the fruit production. Therefore, it is desirable that all the trees in an orchard have the same root and top growth as the productive trees. For tests toward that objective, the experimental propagation beds in the glasshouse consist of a mixture of half plaster sand and half peat, maintained at 65°F by bottom heat. The glass-frames for enclosing the chambers were covered with thin cloth to reduce the light intensity.

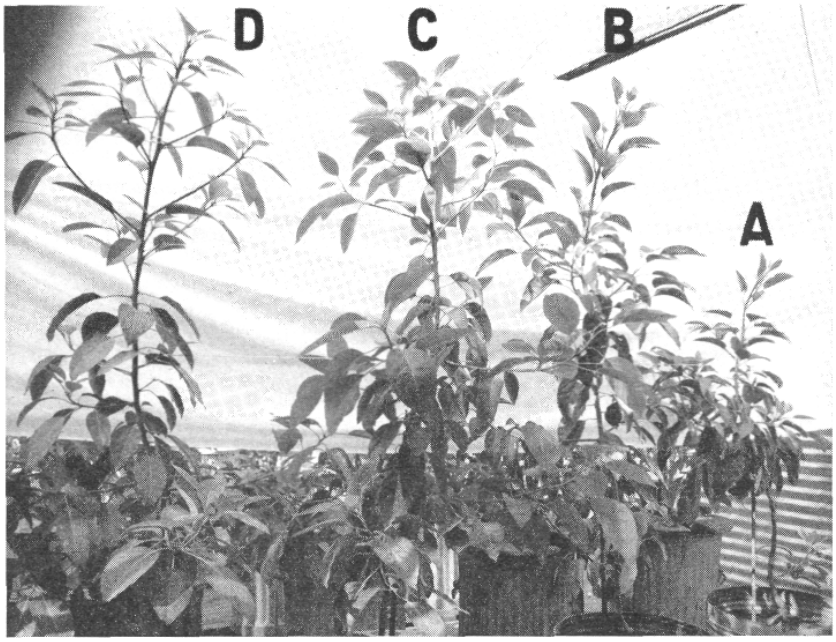
The upper right picture on this page shows leafy-twig cuttings of Fuerte avocado trees wedge-grafted into pieces of avocado root. These grafted plants were occasionally sprinkled with a very dilute nutrient solution containing a low concentration of 2,4-D. Continuous vaporization of distilled water within the propagation chambers is also being tried in an effort aimed at further reducing the loss of scion leaves.

Collections of roots are being made at various times to note whether their condition or state of physiological activity influences their grafting behavior. Other workers have reproduced avocado trees by means of tedious indirect methods and these tests are

designed to explore other means. Varying success has thus far lent encouragement.

The use of low concentrations of nutrient, saturation of the propagation chamber with water vapor, excellent drainage, and the acid and other properties of peat in the plaster sand-peat mixture should prove helpful, whereas the use of low concentrations of 2,4-D should assist in the retention of the leaves and in promoting growth.

Improvement in the growth of Carr Fuerte avocado trees on Caliente (Mex.) rootstock when grown in large out-of-door soil cultures that received in the nine liters of nutrient solution applied to the soil on three occasions: *A*, 0; *B*, .005; *C*, .010; and *D*, .015 parts per million of 2,4-D, respectively. Trees planted in cultures February 16, 1953; photographed November 16, 1953.



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The above progress report is based on Research Project No. 1088.