Chemical inhibition of AVOCADO TOP REGROWTH

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Two new growth-retardants—NIA-10637 and NIA-10656—sprayed on regrowth of topped Bacon avocado trees in Ventura County resulted in significant growth inhibition.

AVOCADO VARIETIES such as Bacon and Zutano have an upright growth habit. To facilitate harvesting and reduce picking cost, some growers limit tree height by mechanical top-pruning. The high cost of topping and hauling away or shredding the brush, suggests that growth inhibitors might offer economic advantages.

Maleic hydrazide (MH) is a chemical growth inhibitor that has been found to reduce or inhibit growth on a number of plants including lemons. However, MH in earlier trials on Bacon and Zutano avocado trees did not inhibit regrowth. Growth inhibitors such as succinic acid, 2,2-dimethylhydrazide (Alar) and a new formulation of maleic hydrazide, potassium salt of 6-hydroxy-3-(2H)-pyridacinone (KMH), have been tested as growth inhibitors for lemon top regrowth. Eight months after application, KMH-sprayed lemons showed a significant reduction in top growth and shoot length. Growth was reduced with Alar sprays but not significantly. Height measurements taken one year after spraying showed no significant inhibition of top regrowth with either KMH or Alar.

Recently, a new experimental plant-growth retardant, ethyl hydrogen 1-propylphosphonate (NIA-10637), successfully inhibited lemon top regrowth. This same formulation has been shown to retard shoot growth of wild cherry, ash, beech and poplar trees, and also eucalyptus seedlings.

In the trial reported here, NIA-10637 and 1-propylphosphonic acid (NIA-10656) were sprayed on top regrowth of Bacon avocado trees. The avocado trees were topped in April of 1970 and sprays were applied June 26, 1970, when regrowth was from 4 to 8 inches long. Top growth was sprayed with a mist to minimize runoff, using 1,250 and 2,500 ppm of two chemical formulations—NIA-10637 and NIA-10656—in water with 0.02% X-77 as the wetting agent. The growth retardants were sprayed with a 3 gallon sprayer, using a self-propelled man positioner to reach the top of the trees. A randomized block experimental design was used with five single tree replications. Before spraying, the base of new growth was marked with yellow surveyor's flagging tape as a reference point for subsequent growth measurements. Growth measurements were taken on August 4, 1970, six weeks after spraying; March 1, 1971, eight months after treatment; and on June 29, 1971, twelve months after treatment (see photo). Treatment effectiveness was evaluated by the amount of inhibition of top growth in comparison with the control trees.

Two weeks after application, both concentrations of each chemical showed some degree of leaf distortion in the area of new growth (see photo). Six weeks after treatment, growth differences were even more noticeable and a greater percentage of the larger leaves (4 to 8 inches) of new growth that had been treated, shriveled and stopped growing. Unsprayed control trees had normal regrowth (see photo).

Growth measurements are shown in the table. Growth reduction, in comparison with the check, was significant for the 1,250 and 2,500 ppm rates of both

EFFECT OF GROWTH-RETARDANTS NIA-10637 AND NIA-10656 ON REGROWTH OF SHOOTS ON TOP-PRUNED AVOCADO TREES.

Treatments	Rate	Mean regrowth			
		6/26/70	8/4/70	3/1/71	6/29/71
	ppm	inches			
Control	0	0.0	9.20	16.20Z*	28.60Z*
NIA-10637	1250	0.0	2.62	4.36Y	7.00Y
NIA-10656	1250	0.0	2.20	4.50Y	7.00Y
NIA-10637	2500	0.0	2.30	3.90Y	6.40Y
NIA-10656	2500	0.0	1.74	2.86Y	5.00Y

* All ranking is at the 1% level; means are significantly different if they do not have subscript letters in common. Duncan's multiple range test was used to determine the significance of differences in treatment means. Trees were topped April 1970 and sprayed June 26, 1970.

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141

chemicals. NIA-10656 at a concentration of 2,500 ppm produced the most inhibition, or the least amount of new growth (5 inches). The greatest growth was produced on the untreated trees (28.60 inches in twelve months).

Regrowth top shoots of top-pruned Bacon avocado trees were sprayed with 1,250 and 2,500 ppm of both NIA-10637 and NIA-10656 in the spring of 1970. Both these new growth retardants at both concentrations gave significant growth inhibition 8 and 12 months after treatment. However, 12 months after application of both growth retardants, a new growth flush had sprouted on all sprayed treatments. Neither of these chemicals is registered and neither is recommended for use at this time.

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Characteristic growth deformity accompanying the inhibition in regrowth on avocado trees, using NIA-10656 at 2,500 ppm.

Normal regrowth from non-treated avocado tree.

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APPLICATIONS OF TIBA (trüodobenzoic acid) have broken terminal dominance, and caused sprouting and growth of axillary buds in young avocado trees without killing the terminal shoot which continues to grow at a reduced rate. This chemical may offer a way to alter the marked upright growth of varieties such as Zutano and Bacon into a more desirable spreading-scaffold branch structure.

Varieties with predominantly upright growth characteristics are often hand pruned or mechanically topped to lower tree height and facilitate harvesting. Such pruning is expensive and results in delayed fruiting of young trees and reduced yield in mature trees. A secondary benefit associated with an open, spreading scaffold structure may be the successful shake harvesting of varieties which do not carry both young and ripe fruit on the tree at the same time.

Apple trees

TIBA has been used to change the branch structure of young Red Delicious apple trees, by causing an outward bending of young shoots which allows a greater choice of limbs for the permanent scaffold structure. The increased crotch angle also produces a stronger union between the branch and the wood from which it arises. Trials on several varieties of citrus with TIBA caused a spreading branch pattern; however, the concentrations of TIBA needed to change the branch structure of citrus were so high that considerable foliage damage