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PGR Strategies to Increase Yield of 'Hass' Avocado

Continuing Project: Year 1 of 4

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Benefit to the Industry

This research project supports the industry objectives, expectations and vision of the California avocado industry of increasing grower profitability. Limited research has been conducted on the use of foliar-applied plant growth regulators in avocado production. This is especially true in California. Over the past five years, we have gained experience regarding the response of the 'Hass' avocado to several key commercial PGRs applied at specific stages of tree phenology. Jaime Salvo's and Lauren Garner's dissertation research provided additional basic information to guide our choice of PGR and timing of their application to improve their efficacy. We now have data to successfully demonstrate the efficacy of GA_3 and that the cauliflower stage is the best phenological stage for GA_3 application. The next step is to demonstrate that yield or fruit size responds incrementally to increases in GA_3 dose (per Don Koehler, Department of Pesticide Regulation). Note that Don Koehler just retired recently. Joe Vandepeut has replaced Don. I had the opportunity to meet Mr. Vandepeut briefly. He agreed to meet with me this fall to discuss a number of PGR issues in greater depth.

Objectives

Specific goals of the research project are to increase the productivity of 'Hass' avocado orchards by increasing yield of commerically valuable large size fruit to increase grower income. The project objectives are: (1) to increase yield by annually increasing the number of sylleptic shoots; (2) to increase yield by increasing fruit retention during June drop; (3) to increase fruit size; and (4) to collect dose response data as the next step toward adding avocado to the label for GA_3.

Experimental Plan and Design

All objectives are being met using bearing 'Hass' avocado trees in a commercial orchard. Yield (kg/tree), fruit size distribution (pack out) and fruit quality of 100 randomly selected fruit, including seed size and fruit length to width ratio, will be determined at harvest. Leaves will be collected in September for nutrient analysis (Albion Laboratories). The experimental design is a randomized complete block with 20 individual tree replicates per treatment. There are buffer trees between treated trees and buffer rows between treated rows.

To meet objective 1, Typy® (Nufarm, USA; 6-BA; 1.8% + GA_{4+7}; 1.8%) will be applied at 0.05% (500 pm) and at 0.005% (50 ppm): i) at the initiation of the summer vegetative shoot flush, and ii) in winter at stage 5 of inflorescence development when perianth formation is

initiated on the secondary and tertiary axes. Sylleptic and proleptic shoot growth and return bloom (number of indeterminate and determinate floral shoots) will be determined. To meet objective 2, AVG will be applied at 250 ppm i) at the cauliflower stage of bloom, ii) at full bloom, iii) just before June drop starts; and iv) at full bloom and again just before June drop starts. To meet objectives 2 and 3, i) 2,4-D will be applied at 45 g acid equivalents/acre when fruit are 16-20 mm in diameter and ii) 3,5,6-TPA will be applied at 15 ppm when fruit are 24 mm in diameter. To meet objective 4, GA_3 will be applied at 10, 25, 60 and 120 ppm at the cauliflower stage of inflorescence development. Untreated trees will serve as the control. All data are statistically analyzed by analysis of variance using SAS at $P \leq 0.05$.

Summary

To meet objective 1 (to increase yield by annually increasing the number of sylleptic shoots), we are conducting this research in the orchard that we are using for the alternate bearing research, so that we can treat trees with known cropping histories. Both the high and low concentrations of Typy® (6-BA; 1.8% + GA_{4+7}; 1.8%) were applied at the initiation of the summer vegetative shoot flush. The high and low concentrations of Typy® will be applied again in winter at stage 5 of inflorescence development to two additional sets of trees. An untreated control was included. The experimental design for all treatments is a randomized complete block design with 20 individual tree replications per treatment.

Research to meet objectives 2 and 3 (to increase yield by increasing fruit retention during June drop and to increase fruit size, respectively) is being conducted in Irvine in another orchard owned by the Irvine Company. This experiment is a crop destruct, so we feel very fortunate to have the cooperation of Jess Ruiz. The AVG treatments were applied at the cauliflower stage of bloom, at full bloom, just before the start of June drop (dates were based on the results of Dr. Lauren Garner's research on flower and fruit abscission), and at full bloom and again just before June drop starts. To properly time the applications of 2,4-D and 3,5,6-TPA, fruit diameters were measured during early fruit development. The 2,4-D was applied when fruit diameters were between 16-20 mm, which was May 23, 2005, and the 3,5,6-TPA was applied when then the diameter of the fruit averaged 24 mm, which was on May 27, 2005.

To meet objective 4, we have obtained an orchard in Santa Paula from the Limoneira Company. Due to the persistent rain this spring, I was unable to apply the treatments at the proper stage of inflorescence development. I received permission from G. Witney to hold my funds and begin this experiment next spring. All other research for this project is on schedule.

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