
PGR Strategies to Increase Fruit Size of 'Hass' Avocado

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Competition from Mexico, Chile and other countries requires that the California avocado industry not only increase production per acre, but also increase fruit size to remain profitable. The goal of this research is to increase net income per acre for growers of the 'Hass' avocado in California by developing plant growth regulator (PGR) strategies that increase yield of commercially valuable large size fruit. The specific objectives of this research are: (1) to demonstrate that the ability of three strategies to increase fruit size is reproducible in a second avocado orchard representing a different avocado-growing area of California and (2) to demonstrate that the yield of large size fruit responds incrementally to increases in PGR dose. The objectives are to satisfy the requirements of the California Department of Pesticide Regulation (DPR) necessary to add a plant growth regulator to an existing label so that the PGR can be legally used in avocado production in California.

Executive Summary.

Previous research identified three PGR strategies that significantly increased yield of commercially valuable large size fruit without reducing total yield and, in one case, significantly increased total yield compared to untreated control trees.

- BA (25 mg/L) (Accel[®] Valent BioSciences) applied at full bloom resulted in a net increase in 3-year cumulative yield of commercially valuable large size fruit (packing carton sizes 40 + 36 + 32) of 6,511 lbs/110 trees/acre, an average of more than 2,000 lbs/acre/year, more than control trees.
- GA₃ (25 mg/L) (ProGibb[®] Valent BioSciences) applied in mid-July followed by the application Prohexadione-Ca (125 mg/L) (Apogee[®] BASF) approximately 30 days later (mid-August) resulted in a net increase in 3-year cumulative yield of commercially valuable large size fruit (packing carton sizes 40 + 36 + 32) of 6,070 lbs/100 trees/acre, an average of approximately 2,000 lbs/acre/year, more than control trees.
- GA₃ (25/mg/L) applied at the end of June–beginning of July resulted in a net increase in 2-year cumulative yield of commercially valuable large size fruit (packing carton sizes 60 + 48 + 40) of 5,665 lbs/110 trees/acre, an average of more than 2, 700 lbs/acre/year, more than control trees. This treatment also resulted in a significant net increase in 2-year cumulative total yield of 6,579 lbs/acre, an average of more than 3,000 lbs/ acre/year, above the yield of control trees.

Per CA DPR requirements, these treatments are now being tested in a second orchard in Santa Paula owned by the Limoneira Company, which is absorbing the loss of revenue due to having to destroy the treated fruit. This project was initiated in spring 2007 and the first harvest will be in 2008. The project is on schedule.

Project 1. Objective 1: To demonstrate that the ability of the three strategies to increase fruit size is reproducible in a second avocado orchard representing a different avocado-growing area of California.

Approach. In a mature, commercially producing 'Hass' avocado orchard in Santa Paula owned by the Limoneira Company, we are testing the ability of (i) 6-benzyladenine (25 mg/L) (MaxCel[®]) applied at full bloom; (ii) GA₃ (25 mg/L) (ProGibb[®]) applied in mid-July followed by prohexadione-Ca (125 mg/L) (Apogee[®]) 30 days later (mid-August); and (iii) GA₃ (25 mg/L) will be applied end of June – beginning of July to increase the yield of commercially valuable large size fruit. This is the first experiment in which the treatments (ii) and (iii) are being tested in the same orchard for comparison. It is important to determine if treatment (iii) is equally effective as treatment (ii), since a strategy requiring a single PGR would be more cost-effective than one requiring a separate application of two PGRs. In addition, we are also testing the efficacy of applying (iv) 6-benzyladenine (25 mg/L) at anthesis and again at the end of July – beginning of August. Treatment (v) is the untreated control. We thank Gus Gunderson of the Limoneira Company, who is absorbing the loss of income resulting from having to destroy the fruit from PGR-treated trees.

Project 2. Objective (2): To demonstrate that the yield of large size fruit responds incrementally to increases in PGR dose.

Approach. Based on 2 years of harvest data, the more cost-effective strategies for increasing fruit size will be included in a new experiment to demonstrate a dose response. The concentrations proposed for this experiment are: BA - 0, 10, 25, 62.5, and 126 mg/L; GA₃ - 0, 10, 25, 62.5, and 126 mg/L; and prohexadione-calcium - 0, 62.5, 125, 250, and 500 mg/L. The highest concentration in each case is to determine a threshold for phytotoxicity as requested by the CA DPR.

Results. The research is on schedule. Project 1 was initiated in spring 2007, all treatments have been applied and the first harvest will be in 2008. The cost per acre for each PGR is: MaxCel[®], \$26; ProGibb[®], \$16; Apogee[®], \$86.