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## PGR II - Strategies to Increase Fruit Size of 'Hass' Avocado

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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. Given that avocado orchards alternate bear, the California Department of Pesticide Regulation (DPR) will accept yield benefits that are significant only in an on- or an off-crop year, as cumulative yield or when averaged across the on- and off-crop year.

*'Hass' Avocado Orchard – Fillmore.* This was an off-crop year in this orchard with an average of only 47 fruit per tree for the untreated control. Fruit size peaked on packing carton size 48. Trees treated with 6-benzyladenine (25 mg/L, MaxCel<sup>®</sup> Valent BioSciences) when fruit were 17-20 mm in diameter produced significantly more fruit as lbs per tree than the untreated control trees at the 10% confidence level, resulting in a net increase in yield of 1,360 lbs/110 trees/acre over that of the untreated control. This treatment also increased the lbs of commercially valuable large size fruit ( $\geq$  packing carton size 60) by 1,277 lbs/110 trees/acre compared to the untreated control at the 10% confidence level. Over 60% of the increase in yield was fruit  $\geq$  packing carton size 60. This 6-benzyladenine treatment also increased the yield of fruit of packing carton sizes 48+40+32 by 1,048 lbs/110 trees/acre over the untreated control at the 10% confidence level. Application of 2,4-D (38 g/acre) when fruit were 17-20 mm in diameter also produced a numerical but non-significant increase in total number and lbs of fruit per tree compared to the untreated control trees at the 5% confidence level.

At harvest, two fruit were selected randomly from each data tree and allowed to ripen. The number of days from harvest that it takes for each fruit to ripen was determined. When ripe, external and internal fruit quality was evaluated for decay and discoloration. Vascularization (presence of vascular bundles and associated fibers) of the flesh and germination of the seed were also determined. No PGR treatment had any negative effects on fruit quality.

The effect of 6-benzyladenine and 2,4-D on yield in Santa Paula 1 and in additional orchards is presented in the report for CAC project #65306.

*'Hass' Avocado Orchards – Somis and Santa Paula 2.* Comparison of the effects of (i) GA<sub>3</sub> (25 mg/L, ProGibb<sup>®</sup> Valent BioSciences) applied at the cauliflower stage of inflorescence development and again when fruit were 17-20 mm in diameter, (ii) GA<sub>3</sub> (25 mg/L) applied when fruit were 17-20 mm in diameter; and (iii) GA<sub>3</sub> (25 mg/L) applied when fruit were 17-20 mm in diameter followed by prohexadione-Ca (125 mg/L) 30 days later (mid-August) demonstrated that treatment (iii) significantly increased total yield, resulting in a net increase of 5,871 lbs/110 trees/acre over the untreated control

( $P = 0.0357$ ). In addition, GA<sub>3</sub> (25 mg/L) applied when fruit were 17-20 mm in diameter followed by prohexadione-Ca (125 mg/L) 30 days later (mid-August) significantly increased the yield of commercially valuable large size fruit (packing carton sizes 60+48+ 40), resulting in a net increase of 6,691 lbs/110 trees/acre more large size fruit than the untreated control ( $P = 0.0220$ ). This treatment also resulted in a net increase in fruit of packing carton size 48 of 4,920 lbs/110 trees/acre above the yield of untreated control trees ( $P = 0.0165$ ). In contrast, in the Santa Paula 2 orchard, these three GA<sub>3</sub> treatments had no effect on yield. Treatment effects on 2-year cumulative total yield and yield of commercially valuable large size fruit will be determined when the spring 2010 crop is harvested in 2011.

The effect of increasing GA<sub>3</sub> concentrations applied at the cauliflower stage of inflorescence development on total fruit number and number of fruit of packing carton sizes 60+48+40 is presented in the report for CAC project #65306.

### **Benefits of the research to the industry**

Application of 6-BA (25 mg/L) when fruit were 17-20 mm in diameter resulted in significant net increases in total yield and yield of fruit of packing carton sizes 60+48+40 as both lbs and number of fruit per tree over that of the untreated control at the 10% confidence level. GA<sub>3</sub> (25 mg/L) applied when fruit were 17-20 mm in diameter followed by prohexadione-Ca (125 mg/L) 30 days later (mid-August) resulted in significant net increases in total yield, yield of fruit of packing carton sizes 60+48+40, and yield of fruit of packing carton size 48 over that of the untreated control at the 5% confidence level.

The results confirm that application of treatments when fruit average transverse diameter is between 17-20 mm to approximate the application time just prior to the period of exponential increase in fruit size is efficacious. Use of this easily determined biomarker ensures that a PGR application is properly timed, which will improve reproducibility from year to year.