Use of GA_3 to Reduce Alternate Bearing and Increase Annual Yield, Fruit Size and Quality

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Benefit to the Industry

The research takes advantage of recent advances made by my lab in understanding the basic physiology of flowering, fruit set and alternate bearing of the 'Hass' avocado. The results of that research has enabled us to develop field strategies using foliar GA_3 sprays to provide a practical solution for improving yield of the 'Hass' avocado, including fruit size and quality, and fir evening out alternate bearing. The product of this project will be a set of directions stating when to apply GA_3 during an "on" year and when to apply GA_3 during an "off" year to even out alternate bearing and directions about how to use GA_3 to maintain a higher yield thereafter. In addition, we will be able to provide instruction on the use of GA_3 to increase fruit size and improve quality of late-harvested fruit.

Objectives

The objectives are (1) to use foliar-applied GA_3 (25 mg/l) to even out alternate bearing and to increase yield such that the combined yield for the "on" and "off" crop years is greater for the GA_3 treated trees than the control trees; and (2) to demonstrate that a higher annual yield can be maintained through the use of properly timed foliar applications of GA_3.

Summary

In our preliminary study, GA_3 sprays to commercially-bearing 'Hass' avocado trees in September reduced flowering intensity the two years of the study. November sprays reduced the number of inflorescences produced in the spring when the tree was bearing an "off" crop year with a concomitant increase in production of vegetative shoots; there was no effect in the "on" crop year. January and March applications had no effect on the

number of flowering or vegetative shoots produced either year. GA_3 treatment did not affect flower parts. GA_3 had no effect on the start of anthesis (days to presence of 50 inflorescences at anthesis per tree). Application of GA_3 (25 mg/l) in November or January stimulated the precocious development of the vegetative shoot of indeterminate inflorescences, The only effect on fruit set was that the November application of GA_3 (25 mg/l) increased fruit set in the "on" year and decreased it in the "off" year. GA_3 was applied during the "on" crop year; thus, the yield data for the first year are for an "off' crop: 18 kg/control tree. GA_3 (25 mg/l) applied in November, January, or March increased yield to 35, 27, and 34 kg/tree, respectively, but no treatment was significantly better than the control. The November GA_3 application resulted in approximately a 3fold increase in fruit weighing 135177 g compared to the control. The March application resulted in a 2fold increase in fruit weighing 213269 g. Application of GA_3 (25 mg/l) during the following "off crop year had no statistically significant effect on kg fruit/tree or fruit size of the "on" crop: 80 kg fruit /control free. Application of GA_3 (25 mg/l) in March of both years resulted in the highest cumulative yield (25 kg more fruit/tree than the control) and the lowest index of alternate bearing, e.g. the more similar yields for the "off" and "on" crops. Applications GA_3 (25 mg/l) in November, January or March increased the number of late-harvested fruit (May) with green skin, i.e., reduced the number with black skin, with no negative effects on internal fruit quality or maturity.

Depending on the time of application, GA_3, showed the potential to reduce flowering intensity, make leaves in indeterminate inflorescences sources rather than sinks during fruit set, and to increase yield and fruit size. The larger leaves of GA_3treated frees protected fruit from sunburn earlier in their development and GA_3 kept the peel of late-harvested fruit green. The results of our preliminary two year study provide evidence that strategies using foliar applied GA_3 to manipulate flowering can be developed at the commercial level to increase yield and fruit size and/or even out alternate bearing for the benefit of the avocado industry.