Determining the Effect of Acadian LSC Seaweed Extract on Pistachio Inflorescence Bud Abscission

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INTRODUCTION

This trial examined the potential for biostimulants produced by Acadian Seaplants LLC, the currently registered growth regulator, MaxCel®, and low-biuret (LB) urea, to mitigate the visible mechanism of alternate bearing in pistachios. Specifically, the trial examined the ability of these products to prevent the abscission of the lateral fruiting buds produced on current year's shoot growth distal to the one-year-old bearing shoots. Buds on current year's growth produce the following year's crop. In addition to monitoring bud drop, this trial examined production the following year to determine if the treatments increased productivity of treated trees. The trial was conducted in 2016 and 2017 at the Strain Ranch in Arbuckle, Colusa County, California (Latitude 39.012868, Longitude -122.035319). The orchard is 9-year-old Kerman scion on PG1 rootstocks planted at 17 feet in-row and 19 feet between rows, with a Peters pollinizer planted at a 1:25 male to female ratio. Eight trees were selected from 8 replicate rows to receive the 8 spray applications both seasons. A matching set of 8 replications was also sprayed in 2017 only. Treatments were applied at 1085 and 1380 accumulated temperature units to correlate with the initiation and midpoint of embryo growth respectively. The objective was to apply treatments before and at the time of bud abscission initiation. Yield and grading data from the 2017 season was completed on the 64 trees sprayed with the same treatments over consecutive years. Bud abscission data was collected for all 128 trees in both blocks.

The 8 treatments being compared were Acadian A LSC®, Acadian B (an unregistered Acadian product), MaxCel® (6-benzyladenine (6BA) 1.9% AI, currently registered for pistachio to increase yield and decrease alternate bearing); and an untreated water control. Each of these four treatments was also sprayed in combination with LB urea (Total Nitrogen Analysis 46.0 minimum). The Acadian treatment is a biostiumulant, and MaxCel® is a growth regulator, both formulated to alleviate alternate bearing by decreasing the visible mechanism, fruit bud abscission, on the current year's shoot growth of bearing branches. The Acadian treatments are seaweed extracts derived from *Ascophyllum nodosum*. The suggested mechanism of the product is an increase in shoot nitrogen levels that, in turn, promote chlorophyll development to enhance photosynthesis and carbohydrate status of the shoot. This would allow the leaves on the current year's shoot growth to better support both nut fill and developing buds simultaneously. These biostimulants also possess a cytokinin-like action that protects chlorophyll. The growth regulator, MaxCel®, is suggested to cause a shift in the relationship

between competition for carbohydrates between the developing embryos on one-year-old wood and vegetative growth on current-year wood. In combination with LB urea, the growth regulator spray changes the sink-and-source interaction between carbohydrate demand for reproductive and vegetative growth, allowing for increased bud retention.

RESULTS

All the experimental trees in the 2016 season had equal crop loads ranging from 20-25 pounds of edible yield per tree, or 2300-2800 pounds per acre. The bud drop percentage from the 2016 growing season demonstrated that none of the eight foliar sprays had any consistent significant effect on the percentage of abscised buds on bearing or nonbearing shoots. In 2016 abscission ranged from 57-87 percent, with the control treatments exhibiting the lowest percent loss. These preliminary results indicated that the biostimulants were ineffective at reducing bud abscission on shoots with clusters. The mean percent bud drop compared across all treatments of branches without clusters was statistically insignificant, ranging from 10-18 percent across treatments. These results supported the conclusion that bud abscission is a within-shoot phenomenon related to the cropping load of an individual branch.

The 2017 growing season crop loads were higher than the previous year. Average yields across the 8 treatments ranged from 31-36 pounds dry weight per tree versus 20-25 pounds dry weight in 2016. The yields across treatments were not significantly different from one another, again suggesting that the within-branch crop load is the primary factor in bud abscission. The 2017 season average percent bud drop was far greater and more consistent than in 2016, indicating that the trees are reaching full production potential, and that the alternate bearing tendency of the tree will manifest even more sharply in 2018 and beyond. The average percent bud drop ranged from 86-95 percent in trees that were selected during the first year of the trial and sprayed with the biostimulant and growth regulator + LB urea treatments for two growing seasons. The average percent bud drop ranged from 86-92 percent in trees that were selected only for the second year of the trial. The averages between the two blocks were not significantly different, suggesting that the biostimulant or growth regulator + LB urea sprays will not impact crop load in subsequent growing seasons.

CONCLUSION AND APPLICATIONS

Improving the photosynthetic capacity of individual branches through the use of biostimulants does not appear to target the visible mechanism of alternate bearing in pistachio. Nor were the growth regulator + LB urea treatments, tested during this trial, successful in decreasing the rate of bud abscission. Growth regulator and biostimulant treatments are purportedly useful for increasing the photosynthetic capacity resulting in increased carbohydrates available to the branch and altering the sink/source relationship between embryo development and vegetative growth. The results did not show that an increase in potential photosynthetic capacity translated into an increase in carbohydrates available for current season’s developing nut clusters and inflorescence buds, or a reduction in bud abscission rates.

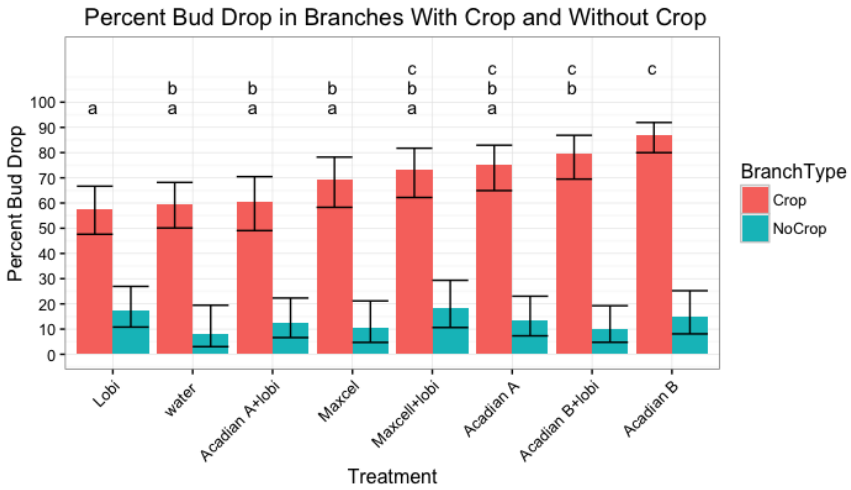

Figure 1: 2016 results of means comparison at p<.05 showing significant difference in the percent bud drop between branches with and without crop.