Winter Applied Spray Amendment Impact on Winter Chill Accumulation, Carbohydrate Levels, Flowering, Leaf Out and Yield

Mae Culumber, UCCE Nut Crop Advisor for Fresno County
Bruce Lampinen, UCCE Integrated Orchard Management Specialist, UC Davis

INTRODUCTION

Increasingly warm winters in the Central Valley, in recent years, has prompted research to identify methods that mitigate the impacts of decreased chill accumulation. Kaolin clay and calcium carbonate-based products are typically used to guard against sunburn during the summer months. However, preliminary research suggests these materials may have some potential to reduce the adverse impacts of warm winter days. Kaolin treated trees resulted in higher cluster counts, lower blanking, higher yields, and an increase of 1 chill portion when temperature was monitored over a two-week period in 2015 (Doll, unpublished data). A calcium carbonate-based spray applied to pistachio trees in Fresno County the same year, resulted in a 5-6˚C decrease in bud temperature compared to untreated trees (Beede, unpublished data). Bud break responses varied with the timing and frequency of applications, suggesting there may be different critical stages within the dormancy period where chilling plays a more or less important role in bud break timing. This summary describes preliminary bud break data collected during the 2016-2017 winter trial in response to kaolin clay and calcium carbonate spray amendments. Further research needs to be conducted spanning multiple years to better assess what impact these sun-blocking/refracting amendments have during years where winter temperatures fall short of chill requirements.

RESULTS

The intent of the project was to measure the effects of two different commercially available sun-reflecting and refracting amendments on pistachio tree phenological responses and winter chill accumulation. The trial took place from 2016 to 2017 in a commercial pistachio (*P. integerrima,* PG1) orchard located in Kerman, CA. (36.699772, -120.171268) on coarse-loamy, mixed, superactive, thermic soils. The rootstocks were planted and budded with Kerman (*Pistacia vera* L. cv. Kerman*)* in 2006. Male pollinizers (*Pistacia vera x P. integerrima* L. v. Peters) were budded to every fifth tree in every fifth row. Harvest production began in 2013. The experiment included three treatments arranged in a random complete block design with five treatment replicates. Each treatment plot was five acres in size with five rows per treatment plot. The tested treatments include: 1) a kaolin clay-based product (Surround®) applied at a 25 lb/ac rate 2) (Microcal®) applied at a rate of 2 gal or 28lbs, and 3) an untreated control. Application rates for the two amendments were based on the label recommendation for each product and applied in late December. An abundance of rain and saturated conditions in the orchard persisted throughout the 2016-2017 winter, preventing additional applications. It was intended that one of the data trees in each treatment would be equipped with temperature sensors, as described below, in December of 2016; however, we were unable to secure the equipment and install them before the first treatment application.

Tree phenological responses included ratings of the treatments for timing of bud break. Preliminary data was collected in late March 2017 to evaluate any effect of treatment applications from December 2016. Ten buds were evaluated for bud length at bud break for five trees in each five-replicate block for all three treatments for a total of (10 x 5 x 5 x 3 = 750 buds

evaluated). The average bud length in the third week of March 2017 ranged 0.6 to 5 cm with no differences ($p<0.4736$) between treatments in terms of bud emergence.

CONCLUSION AND PRACTICAL APPLICATIONS

Excessive precipitation, favorable chill accumulation temperatures, and difficulties with securing equipment and materials constrained the evaluation of sun-blocking materials to increase chill portion accumulation in pistachio in 2016-2017. According to data from the closest CIMIS weather station at Five Points, approximately 7.9 inches of precipitation fell between November 2016 and March 2017, an inch more than the seasonal norm. An estimated 70 chill portions (Dynamic Model) accumulated, satisfying the minimum threshold for adequate chill portions. There was no difference in the progression of bud break between different materials compared to the control. Although this trial did not yield much empirical data to evaluate the effects of spray amendments on chill and bud break, difficulties applying the materials for purposes of the trial raises questions about the practical application of these products during a wet dormant season.