

Evaluation of Mechanical and Chemical Strategies to Enhance Winter Chill Accumulation in Pistachios

Gurreet Brar, Assistant Professor, Department of Plant Science, CSU Fresno

INTRODUCTION

Lack of chill accumulation in pistachios has been a growing production issue in California for the past several years. Growers have been facing crop losses as a consequence of these changes, and there is a dire need to address this very important issue. The current study is being conducted with the following objectives for this project:

1. Evaluate the effect of various chemical and mechanical strategies like netting, kaolin clay and horticultural oils on bud temperatures and bloom of pistachios.
2. Study the effect of these strategies on nut development and yield.

This report presents summary of results from year one of two. This study hypothesized that some mechanical and chemical methods could be beneficial to compensate for lack of chill or to induce physiological changes in the trees so as to have a normal bloom and crop load. Fifteen-year-old pistachio trees of Kerman variety on UCB-1 rootstock were selected for this study at the California State University Campus in Fresno. The treatments included covering the trees with two types of shade netting (Black and Gray), spraying horticultural oils and kaolin clay dust. These treatments were compared with an unsprayed control over two years. Trees were covered by November 1 and the shade nets removed in late February both years. In the kaolin clay treatments, trees were sprayed with clay material throughout the winter months, when needed, depending on rain events. The idea was to keep the trees covered throughout the chill accumulation period. Temperature and light intensity data were collected both inside and outside the shade netting using dataloggers. Chill accumulation was calculated using a dynamic chill accumulation model as described by Glozer (2009). Data on bloom progression, nut growth, nut weight and volume, shell strength progression, yield and number of blanks were collected.

RESULTS

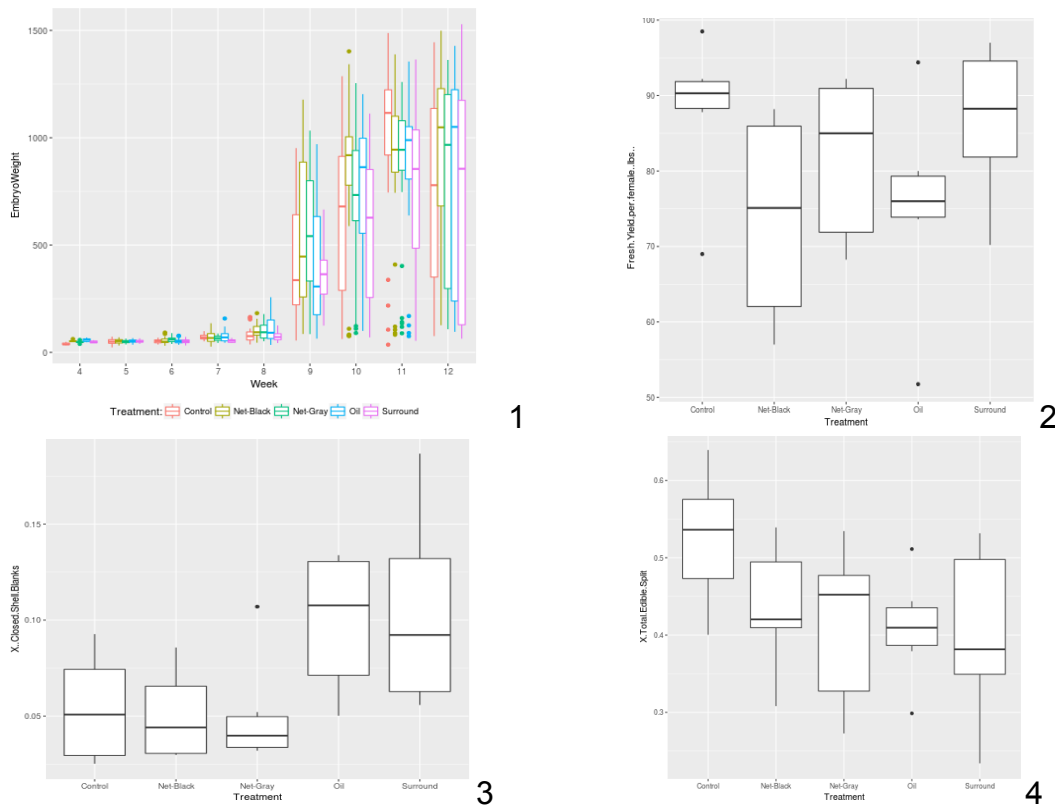
The experiment included 4 test treatments plus an unsprayed control. Four treatments were: Oil spray, kaolin clay (Surround) spray, Black Net and Gray Net. The experiment was designed as a Randomized Complete Block Design with 6 blocks. There were 5 replications in each treatment unit. Horticultural oil was applied in late January 2017, while Surround spray was first applied during the first week of December, after leaf fall, and then reapplied at intervals depending on rains, to cover the trees throughout dormant season. The experimental block accumulated 65 chill portions as of March 1, which denotes that it was a good chill year. Bloom progression evaluation data showed that oil sprayed trees were ahead in blooming as compared to other treatments and control. The Netting—both Black and Gray—were not significantly different from the control but were significantly different from oil treatment in terms of progression of bloom. The oiled trees were earliest to bloom (full bloom around March 27). Surround treatment was next to bloom, while most of the Netting and control trees were the last among treatments. The nut phenology data showed that during initial weeks, oil treatment trees were ahead in nut size and shell strength progression. However, when all season data were pooled at the end of the season, no significant effect of treatment was observed in terms of nut

development (Fig. 1) or shell strength. Although yield was not significantly different among treatments, control trees had the least variability in yield and, on an average, yielded higher (Fig. 2). Both Black and Gray shade netting trees had large variability in yield. Surprisingly, oil and Surround treatments had a higher number of blanks as compared to both Black and Gray netting as well as control trees. In case of split inshell percentage, treatment differences were not statistically significant. However, control treatment had the higher percentage of split inshell nuts.

The results from year one suggest that there were no significant differences between treatments in terms of yield, nut development or percent split inshell nuts at harvest. The oil spray and Surround treatments had significantly higher number of blanks as compared to Black and Gray netting treatments and control trees. This suggests that in a good chill accumulation year, any chemical or mechanical strategies do not play any significant role in altering the production or yield characteristics in pistachios. This work will be repeated in 2018 growing season as well.

CONCLUSION

Since the 2016-17 winter had sufficient chill accumulation, the control trees did not have any physiological issues related to lack of chill. The year one results from the current study show that in a good chill year, any oil or kaolin spray or shade netting does not have a significant effect in improving nut growth and development, yield or quality in pistachios.



Figures 1-4. Plots showing 1. Development of nut weight during season, 2. Yield data, 3. Percent of blank nuts and 4. Percent of split inshell nuts, among different treatments in pistachios.