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Mechanical Hedging to Manage Mature Almond Orchards

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Introduction:

Density of California almond planting has been seeing a linear increase from 1986 to 2012. The average orchard in 2012 has 112 trees per acre which corresponds to a spacing of approximately 15 x 21 feet. However, when you consider that there are still many traditional planted orchards embedded in those statistics, the average new orchard is likely being planted at even higher densities than 15 x 21 feet. Although orchards at this close spacing tend to come into production earlier than those at a more traditional spacing, there are often problems with lower canopy shading and difficulty with getting adequate sunlight to the orchard floor to dry the nuts at harvest as they mature. This likely results in increased food safety risk suggesting there is a tradeoff between maximum production and food safety risk in almond. The authors have suggested that almond orchards should be designed to intercept about 80% of the total incoming photosynthetically active radiation at maturity which should result in a yield potential of about 4000 kernel pounds per acre. This is substantially higher than the statewide average per acre yield of about 2500 kernel pounds per acre in 2012.

The current study is designed to investigation hedging regimes to manage existing orchards that are planted at densities and configurations such that at maturity, the average midday canopy light interception level is higher than desired.

Materials and methods

An almond orchard site was selected for the hedging trial in Kern County. The orchard was planted in 2000 and has 50% Monterey, 25% Nonpareil and 25% Wood Colony. The orchard had been hedged once previously about 3 years earlier.

Midday stem water potential was measured on two trees per replication on all 3 varieties on 8 dates during the summer of 2014.

Mobile platform light bar- Pretreatment conditions were assessed by running the mobile platform light bar in the orchard in July 2013. Following treatment imposition in the Fall of 2013, the mobile platform light bar was run through the orchard four times during the summer of 2014.

Harvest- The plots were harvested to assess pre-treatment and post-treatment yields. Samples will be taken for drying and cracking to assess kernel yield and quality impacts of treatments.

Treatment impacts on quality were investigated by cracking out a 200 nut sample from each replication and weighing and grading individual nuts.

Results and Discussion

There were no significant differences in midday canopy PAR interception, yield, or yield per unit PAR intercepted in 2013 before treatments were imposed.(Table 1).

Due to drought related water limitations, midday stem water potential values on the first measurement date in early April 2014 showed that the trees were quite stressed (Fig. 3). This is more severe stress than we have ever seen this early in the season. Even though water applications were increased as the season progressed and the orchard was not stressed through most of the summer (Fig. 3), this early season stress appeared to impact the canopy development.

During the 2014 season, midday canopy light interception would have been expected to gradually increase over the summer but instead it actually had a slight decline (Fig. 3). This was likely due to the early season stress impacting leaf expansion and shoot development. There was also a leaf drop during late June through July even though the trees were not stressed during this period. This loss of leaves combined with the decreased shoot growth is likely to have a greater impact on the 2015 crop than it did on the 2014 crop. This is because flower and fruiting potential is related to the previous season cropping history as well as the leaf area. In addition, the

Table 1. Midday canopy photosynthetically active radiation (PAR) interception, kernel pounds per acre yield, and yield per unit PAR intercepted for trial before treatments were imposed in 2013 and after one year of treatment imposition in 2014.

Nonpareil

Treatment	2013 PAR interception (%)	2013 yield (kernel lbs/ac)	2013 yield per unit PAR intercepted	2014 PAR interception (%)	2014 yield (kernel lbs/ac)	2014 yield per unit PAR intercepted
No hedge	78.8 a	3226 a	40.9 a	76.7 a	2414 a	31.6 a
28″ hedge	78.9 a	3178 a	40.3 a	74.9 ab	2274 a	30.6 a
38″ hedge	78.1 a	3351 a	42.9 a	73.5 b	2287 a	31.2 a
48″ hedge	77.5 a	3192 a	41.2 a	72.9 b	2337 a	32.1 a

Monterey

No hedge				72.7 a	2277 b	31.3 b
28″ hedge				71.0 ab	2457 ab	34.7 a
38″ hedge				71.2 ab	2408 ab	33.8 ab
48″ hedge				70.5 b	2526 a	35.8 a

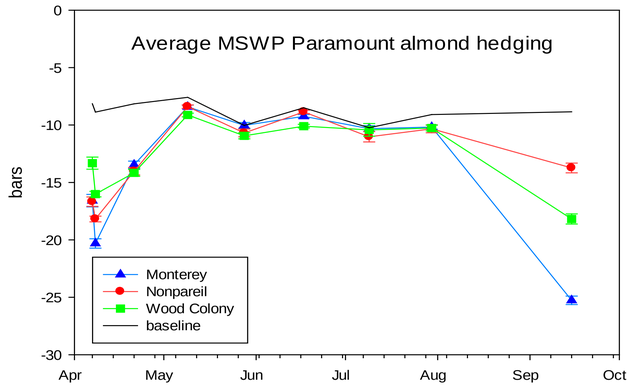

Figure 1. Midday stem water potential by variety over the 2014 season.

Figure 2. Images taken from a GoPro camera mounted on the front of the Mule lightbar in July 2014. Photos show hedging treatments of (a) 0”, (b) 28”, (c) 38” and (d) 48”.

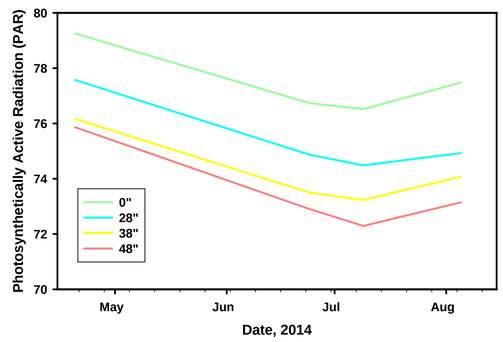

Figure 3. Nonpareil midday canopy PAR interception by hedging treatment over the 2014 season.

Decreased shoot growth will result in lower levels of light interception and lost yield potential as well. Based on the 2013 light bar data, we predicted 2014 interception levels for the 0, 28, 38 and 48 inch hedging treatments 79, 72, 68 and 65% respectively. Actual light interception levels were actually higher than predicted in all of the hedged treatments despite the lack of growth due to the early season stress (Table 1). This may have been due to the crop weighing down the branches into the drive row. The view from the camera mounted on the Mule platform lightbar are shown in Fig. 2. If you look at Fig. 2a versus Fig. 2c, you can see that the difference is really only an occasional branch that has been cut off.

Nonpareil yields tended to decline with increased hedging cut width but differences were not significant (Table 1). For Monterey, the highest yield was in the 48” hedge treatment and this was significantly more than in the no hedge control. This is likely due to the smaller stature of the Monterey leading to less canopy being removed by the hedger and the cut on the Nonpareil tree letting more light fall onto the smaller Monterey tree. Nut size distribution as measured by individual nut weight was similar among the treatments (Fig. 4)

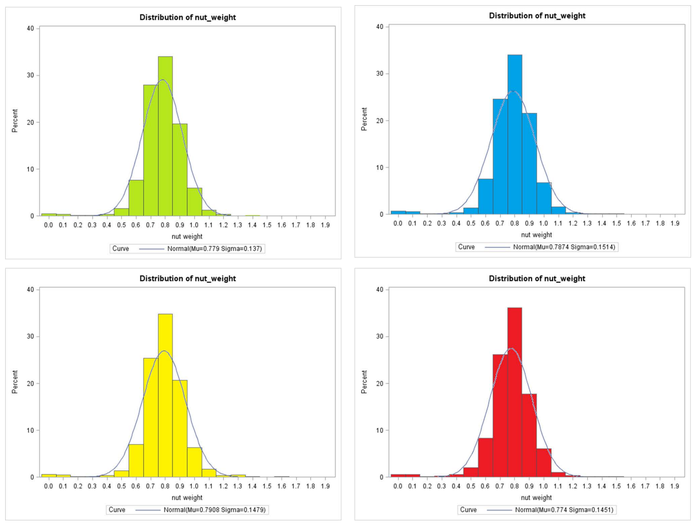

Figure 4. Nut size distribution for 200 nut sample from each replication for the 2014 harvest.

The original plan was to hedge some of the plots in the dormant season but because of the lack of growth response due to the early season stress, there is not a need to do hedging.

Acknowledgements

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