Pistachio Canopy Management by Moderate Mechanical Hedging and Topping (Fifth Year Report)

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Introduction

Although several major mechanical pruning trials have been conducted over the years, none have compared commercially acceptable levels of hedging and topping with the goal of developing management guidelines. Munger Investments have provided the 30-acre test site planted north-south and located near the southwest border of Kings County. Now 20-years-old, it is one of the first westside orchards planted on *P. integerrima* rootstock. Rich alluvial soil, dense spacing (17 ft. x 17 ft.) and double-line drip irrigation have all contributed to this orchard's uniformly dense canopy which has historically produced very high yields. The low humidity, characteristic of the westside, also prevents confounding of the pruning treatments by foliar and fruit diseases. However, the canopy is now so dense that lower fruit wood is being lost from shading and the increasing tree height makes efficient harvest difficult.

In order to examine multiple combinations of side hedging and topping, the following nine treatments were established in a split-plot experimental design prior to the 1997 bearing year:

1. Hand pruned
2. Hedge one side
3. Hedge one side + top one-year-old wood 50%
4. Hedge one side + top one-year-old wood 100%
5. Hedge two sides
6. Hedge two sides + top 50%
7. Hedge two sides + top 100%
8. Top one-year-old wood 50%
9. Top one-year-old wood 100%

This orchard produced back-to-back heavy crops in 1997 and 1998. It appeared after the 1999 season that the two blocks mechanically pruned over two years had initiated an alternate bearing cycle. Yield data collected in 2000 and 2001 suggests that this orchard is finally becoming more alternate in its bearing habit.

The 2000 season was the first time the severely topped treatments were re-topped during the summer (August 1). This was done to discover a practical method for controlling the vigorous re-growth associated with dormant topping.

Yield data was collected September 26-27 by commercially harvesting each of the 72 plots separately and weighing individual bins from each plot. A 30-pound sample randomly collected from each plot was submitted to the processor for third party evaluation. The results were then used to produce a grower's receipt statement from which the total dry yield, edible split nuts, edible closed shell, shelling stock and blank nuts were determined on a per acre basis.

Results

This is now the fifth year of data collection for the pruning treatments initiated in 1997. Comparing their average edible split nut yield for all nine treatments with the average from the block initiated in 1998 shows an alternating trend in production between the two plots that is well correlated with pruning severity. Average overall yield is consistently lower in the block that is double-side hedged prior to bearing.

The year 2001 was the second off-year experienced during the project. No significant differences in edible split nut production were observed among the side hedging treatments. Also, for the second consecutive year, trees hedged on both sides prior to the current season were not significantly less in edible split nut yield compared to trees hedged on only one side. Although not statistically significant, double-sided hedging prior to an off-year reduced edible split nut production by 15% compared to the single-sided treatment. Review of previous years data indicates that the degree to which two-sided hedging depresses yield is inversely related to potential crop load (the greater the expected crop, the less depression in yield).

The five-year cumulative yield data for the 1997 treatments show hand pruned trees have produced 13,103 edible split pounds compared to 12,825 for trees hedged one side annually and 12,114 for trees hedged on both sides biennially. Although these values do not differ statistically, annual hedging on one side has yielded most similar to hand pruned trees. The results from four years cumulative yield data for the treatments initiated in 1998 are very similar.

The 2001 off-year was the first in which significant differences in edible closed and blank nut production were observed in the side hedging treatments. However, it is more correlated to the amount of total dry nut production than to side hedging.

Review of data suggests that the yield reduction from topping becomes significant when excessive bud numbers are removed relative to the trees cropping potential. During 1999-2001, almost identical flower bud numbers were removed from the 50% topping treatments initiated in 1997. The resulting reduction in yield compared similarly to hand pruned trees. However, in 1999 and 2001, both off-years, the loss represented 21.5% and 28.6% of the hand pruned trees. In contrast, a similar loss in yield in 2000, a heavy on-year, represented only 6.6%.

Shoot growth data indicates greater vigor during the off-year. Following the 1999 season, shoot length from the 50% topping treatments averaged 18 inches. After the 2000 on-year, the average shoot length was only five inches. The amount of growth increased with topping severity prior to the off-year.

Results from topping in-season in an effort to mitigate the vigorous re-growth caused by severe topping in winter appear promising. Trees topped in early August of 2000 just above the fruiting zone produced minimal new growth. Data reported last year also indicated no adverse effects on closed or blank nut production. Due to the lack of re-growth, no winter topping was performed on these treatments. This resulted in an average increase in split nut production of 243 pounds compared to the hand pruned trees. However, the increased yield was not nearly sufficient to compensate for the 1,351 pounds of edible split nuts lost from severe topping in 2000. Trees receiving moderate topping prior to the 2001 off-year averaged 492 pounds less edible split nuts.

After five years, the cumulative yield loss from moderate mechanical topping alone is 892 pounds of split nuts compared to the hand pruned trees. When combined with single or two-sided hedging, the average loss is 1,379 pounds. The same trend is present in the four-year cumulative data from plots initiated in 1998.

After five years, the cumulative yield loss from severe mechanical topping alone is 1,989 pounds.

The loss would actually be greater if severe topping had been performed annually. In 1998, these treatments were re-topped at only 50% to allow observations on yield recovery. They were also not winter-topped before the 2001 season since in-season topping during 2000 prevented sufficient re-growth. When severe topping is combined with single or two-sided hedging, the average loss in edible split nuts relative to hand pruned trees is 1,562 pounds.

Nut size continues to be slightly larger in the mechanically pruned trees than those that are hand pruned. Less difference was observed in 2001 than 2000, suggesting that nut size is more sensitive in years with heavy crops.

Conclusions and Practical Application

This trial and others preceding it strongly suggest pistachios can be mechanically hedged without suffering economic yield loss. Although data collected only during the first year supports it, previous detailed pruning experiments show pistachio compensates for lost fruit buds by increasing the number of nuts set per remaining cluster. Results from this trial indicate there is less yield fluctuation by hedging one side every year compared to hedging both sides every other year. Cumulative yield data also suggests that the fluctuation may lessen with repeated side hedging.

The yield differences between single and double-sided hedging in any given year is also affected by the potential crop. Based on results from this experiment, two-sided hedging should not be performed prior to a low production year. Evidence for this recommendation is found in the last three seasons.

It is still unclear whether pistachio canopy height can be managed by mechanical topping without suffering significant yield loss. Data collected during the past three seasons suggests that the yield loss from topping is more correlated to the potential crop than physiological conditions associated with on- and off-year bearing cycles. This conclusion is based on the absolute versus percent yield loss recorded from trees with almost identical numbers of flower buds removed by topping.

Experimentation with in-season re-topping to control vigorous growth appears promising. Trees re-topped in early August of 2000 grew very little and nut quality was not adversely affected that year.

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