Effects of Almond Leaf Scorch Disease on Yield and Tree Vitality

Project No.: 07-PATH9-Sisterson

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Objectives:

1. Compare yields of almond leaf scorch affected trees to those of unaffected trees.
2. Determine if yields of unaffected trees adjacent to almond leaf scorch affected trees compensate for yield losses due to almond leaf scorch disease.
3. Develop an economic model to use as a decision tool.

Interpretive Summary:

Almond leaf scorch disease (ALS) has been present in California for more than 60 years (ABC 2004). This disease is caused by the bacterium *Xylella fastidiosa* (Xf), which also causes several other important plant diseases, most notably Pierce's disease of grapes (Hopkins 1989). The bacterium is vectored by xylem feeding insects, including sharpshooters and spittlebugs (Purcell 1980). The disease is present in orchards throughout the state, but usually affects only a small proportion of trees and large increases in the number of infected trees within orchards between years is typically not observed (Groves et al. 2005). Consequently, almond growers are faced with managing a sporadic problem. Due to its sporadic nature, management tactics which prevent trees from becoming infected may not be successful. Thus, a major question for growers is whether or not to replace infected trees. As tree-to-tree spread of ALS appears to be rare (Groves et al. 2005), the decision to replace infected trees should focus on productivity.

To address this issue, we compared the yields of ALS-affected and unaffected trees for the cultivars Sonora and Nonpareil. Comparisons for the cultivar Sonora were made at two sites in Fresno County and one site in Kern County over the past four years. Averaged across sites and years, ALS-affected Sonora trees produced 40% fewer kg of kernel relative to unaffected Sonora trees (Fig. 1A). Comparisons for the cultivar Nonpareil were made at one site in Kern County over the past four years, although data was not collected in 2006. Averaged over years, ALS-affected Nonpareil trees produced 20% fewer kg of kernel relative to unaffected trees. (Fig. 1B).

Due to the reduced productivity of ALS-affected trees, it has been hypothesized that healthy trees which are next to infected trees may produce greater yields than healthy trees which are next to other healthy trees. If true, such yield compensation could negate losses due to ALS. We tested this hypothesis for the cultivars Sonora and Nonpareil in the fall of 2007. Averaged over three sites, healthy Sonora trees which were next to ALS-affected Sonora trees produced 10% more kg's of kernel than healthy trees which were next to other healthy trees, although this effect was not significant

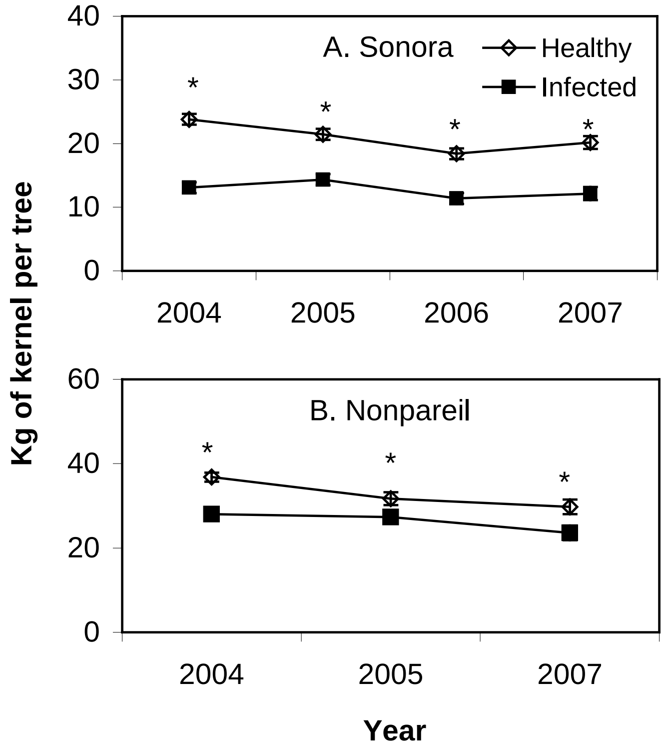

Fig. 1. Least square mean (± SE) yield of ALS affected and unaffected trees. A) Yields of Sonora trees averaged over three sites. B) Yields of Nonpareil trees at one site. Yields of Nonpareil were not measured in 2006. Comparisons with asterixes above them were signficantly different.

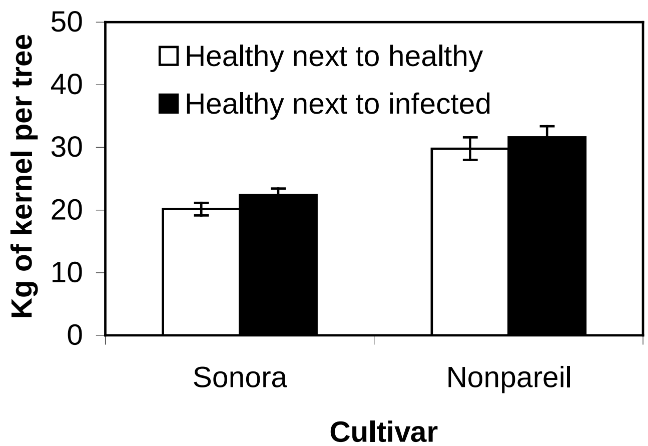

Fig. 2. Least square mean (± SE) yield of healthy trees located next to other healthy trees compared to healthy trees located next to infected trees . A) Yields of Sonora trees averaged over three sites. B) Yields of Nonpareil trees at one site.

(Fig. 2). For the cultivar Nonpareil, we found that healthy trees next to ALS-affected trees produced 8% more kg's of kernel than healthy trees next to other healthy trees, although this effect was also not significant (Fig. 2). Thus, after one year of testing it appears that the compensatory effects are minimal.

The information collected in this study will be used to parameterize a model that will aid in determining when the economic benefits of replacing an infected tree exceed that of leaving the infected tree in place.

References

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