Field Evaluations of Varietal Susceptibility to Damage by Leaffooted Bug

Project No.: 06-ENTO4(b)-Haviland

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Interpretive Summary:

Leaffooted bug is an established pest of California's Central Valley that periodically reaches sufficient population levels to cause economic damage to almonds. During 2006, growers reported damage throughout most of the lower San Joaquin Valley, with sporadic damage occurring in the northern San Joaquin and Sacramento Valleys. The most common damage reported was nut abortion during the month of May, with some of the more susceptible varieties in hard-hit areas having a crop loss in excess of 50%. Additional economic expenses occurred due to the widespread use of chlorpyrifos to prevent further damage to orchards. In response to the damage during 2006, this project focused on documenting what occurred during this season in hopes of helping growers and pest control advisors be more prepared should it happen again

Objective:

Evaluate varietal differences in the susceptibility of 15 almond varieties to leaffootedbug damage:

1. Evaluate differences in bug-induced nut abortion prior to June
2. Evaluate differences in the percentage of damaged kernels at harvest

Materials and Methods:

Leaffooted bug damage was documented during 2006 at the Kern County Regional Almond Variety Trial. This trial was planted in 1993 near Shafter, Kern Coounty, CA with a tree density of 86 per acre. The trial includes a total of 33 varieties that are each planted in one, unreplicated, orchard row.

In the spring of 2006, natural populations of leaffooted bug entered the variety trial and caused significant damage to many varieties. Quick observations noted that this damage

was similar to what was being reported from orchards throughout much of the San Joaquin Valley.

In an effort to document 2006 damage, and differences among varieties to that damage, we collected data on 15 almond varieties that represented early, middle, and late season varieties, as well as those with both soft and hard-shelled nuts. For each variety, we collected from the ground and counted all nuts that had been aborted by the middle of June from five randomly selected trees of each variety. In these counts, we excluded any nut that aborted due to lack of pollination. We also made general observations that nearly all nuts that were aborted were due to leaffooted bug damage, as was evidenced by external gummosis associated with a puncture wound through the hull and into the kernel. A very low amount of natural drop in 2006 allowed us to attribute nearly all nut abortion to damage by the pest. Numbers of nuts aborted per tree in each variety were compared to the total number of nuts per tree at harvest. Additionally, at harvest we collected one 500-nut sample from each of the 15 varieties in the trial and evaluated the kernels for leaffooted bug damage.

Table 1 shows the effects of leaffooted bug damage to 15 almond varieties. The average number of nuts aborted per tree ranged from 20 to 2179, which was the equivalent of 0 to 33% of the total crop. At harvest, the percentage of nuts that would be considered rejects from leaffooted bug damage ranged from 0 to 30%. When combined, Fritz was the most susceptible variety, with 63% of the total crop lost due to leaffooted bug, followed by Sonora, Aldrich, Livingston, Monterey, and Carmel. Other varieties had 2% or less total damage from leaffooted bug in the trial.

Results and Discussion:

Mechanisms for varietal differences in leaffooted bug damage are still a mystery, though the data do demonstrate some interesting trends. The first is that time of harvest appears to have no correlation with varietal susceptibility (Fig. 1). While it is true that Nonpareil and Price (the earliest harvested varieties) had some of the lowest damage, late varieties such as Mission, Ruby, and Winters also had equally low levels of damage. Likewise, the highest damage was in the latest harvested variety, Fritz; however, the second most susceptible variety was one of the earliest harvested, Sonora.

There was also no correlation between shell hardness and levels of damage. While it is true that both hard-shelled varieties in the trial, Mission and Padre, had very low levels of damage, so did two of the softest, Nonpareil and Winters; yet another soft-shelled variety, Sonora, was the second most susceptible.

Based on these data, it appears that varietal susceptibility to leaffooted bug damage is much more complex than being simply a matter of harvest date or shell hardness. It is likely that other factors such as plant volatiles, hull thickness, or shell hardness (as defined in April and May when bugs are present, and not as defined in the standard method at harvest), also play a role in varietal susceptibility. It should also be noted that susceptibilities of varieties are relative. For example, in our trials we noted that Wood Colony is relatively unsusceptible to leaffooted bug damage. Growers and pest control advisors (PCAs) we interviewed reported this to be true when more susceptible varieties

such as Fritz and Sonora were mixed in the same field. However, if Wood Colony was in a field in combination with varieties like Nonpareil and Carmel, which are both not highly preferred, then damage did occur to Wood Colony. This is to say that leaffooted bug prefers certain varieties; however, in the absence of a more preferred variety, leaffooted bug will remain in the orchard and feed on the most preferable of the relatively unpreferred varieties present.

Data suggest that the best way to monitor for leaffooted bug is to focus our attention on the most susceptible variety in the field. Gummosis and nut drop in that variety will serve as an indicator of what is going on in the field. Data also suggest that growers with Fritz, Sonora, Aldrich, and Livingston should be extra vigilant in scouting for this pest each year. If leaffooted bugs become present, pesticide applications should be considered quickly. On the other hand, much less concern is needed in an orchard where all of the varieties are relatively unsusceptible.

These data also dispelled a myth of many growers and PCAs that all nuts damaged by leaffooted bug abort in June, such that leaffooted bug damage is primarily an issue of yields and not of quality of nuts at harvest. Our data showed that a portion of damaged nuts can still remain on the tree and result in rejected kernels at harvest. The next step will be to determine when the damage to those kernels occurred, and what factors cause a kernel to abort versus remaining on the tree until harvest. Addressing issues such as these will be the focus of the second year of this research project.

Table 1. Comparison of damage from leaffooted bug to 15 different almond varieties.

Variety	Harvest season	Shell Character-istics	Nuts per tree	Number aborted due to leaffooted bug	Percentage aborted	Percentage offgraded	Total percentage loss
2-19E	Early/Mid	Semi	12092	73	1	0	1
Aldrich	Mid	Semi	19544	1279	7	2	8
Butte	Mid	Semi	19209	341	2	0	2
Carmel	Mid	Semi	1566	36	2	1	3
Fritz	Late	Semi	6689	2176	33	30	63
Livingston	Mid	Semi	10547	537	5	1	6
Mission[1]	Late	Hard	9277	30	0	0	1
Mission[1]	Late	Hard	4873	36	1	0	1
Monterey	Late	Semi	5856	156	3	1	4
Nonpareil[1]	Early	Soft	17373	118	1	1	1
Nonpareil[1]	Early	Soft	13866	94	1	0	1
Padre	Mid	Hard	14217	35	0	0	1
Price	Early	Semi	6723	52	1	1	2
Ruby	Late	Semi	7321	20	0	0	0
Sonora	Early/Mid	Soft	10699	509	5	7	12
Winters(13/1)	Late	Soft	6377	38	1	0	1
WoodColony	Mid	Semi	8341	59	1	0	1

[1]Evaluations were made on two independent rows of Mission and Nonpareil (on opposite sides of the orchard) as a way to evaluate the consistency of leaffooted bug pressure across the orchard, as well as consistency of the data. Data from all other varieties are from 5 random trees in a single, unreplicated row of trees of that variety.