Colusa Orchard Newsletter

Tree Crops and Nickels Soils Lab

University of California Cooperative Extension

Colusa County

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Farm Advisor

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Another New Almond Disease?

Spring weather hit the central valley hard this year with many frosty nights and endless days of rain during and after almond bloom. Precipitation from March through May totaled 9.8 inches, 300% above normal in Arbuckle. (for each of the three months) Such wet conditions were conducive to most diseases but extra fungicide applications prevented most common fungal problems. However, our spray programs were not active against bacterial diseases and it appears that we have found a new one. In many orchards, unusual leaf symptoms developed early, resembling bacterial blast and shot hole. Lab results did confirm some bacterial blast (*Pseudomonas syringae*) but very little fungal shot hole. But, to many of us, the leaf spotting seemed different than what is normal for blast or any other common almond disease. Additional lab work conducted on almond leaves by Dr.Themis Michailides isolated Xanthomonas sp., **Bacterial Spot**. (see photo) We now suspect this organism caused many of the confusing leaf symptoms up and down the valley. However, further tests must be completed next spring before the identification of Bacterial Spot can be confirmed.

Bacterial spot continued…..

Bacterial Spot, Xanthomonas sp. on Almonds - March 2006

Bacterial spot, *Xanthomonas arboricola pv. pruni*, is a common problem in stone fruit and almonds throughout Europe, the Middle East, Australia and the Southeastern US. This disease can be very damaging, with severity of infection depending on rainfall and dew formation. Fruit and foliage are both susceptible to infection in humid regions or areas with regular late spring and rains. In Australia, many growers have been forced to abandon the two most severely affected varieties, Fritz and Neplus due to extensive crop loss. Infected nuts develop corky lesions that ooze orange colored gum that either drop prematurely or remain on trees after harvest as stick-tights. Circular or angular reddish lesions develop on leaf blades. Leaf spots may be discrete or may coalesce along margins and result in a tattered appearance. (These symptoms are easily confused with shot hole) Defoliation follows and persists throughout the rainy period in Australia.

Mission and Monterey are also very susceptible while Nonpareil and Price intermediate. Intensive spray programs with copper and Mancozeb have not controlled Bacterial Spot "down under" while in the South Eastern US, peach growers have applied Copper + oxytetracycline as preventative fall sprays with some success. In all affected areas, selecting less susceptible varieties has been the best protection from bacterial spot.

The threat from Bacterial Spot to almonds in California is probably small unless we have a shift in spring rainfall patterns as we experienced this season.

Blistered Almond Leaves

Another confusing leaf symptom found widely this spring is shown in the following photo. Nothing too complicated here, this is simply another form of **frost damage**, on almond leaves. I received many inquiries on this, so I will include a picture here FYI.

Frost damage to almond leaves.

Leaffooted Plant Bug

This bug is rarely seen in Colusa County but was attacking almonds this season throughout the Sacramento Valley. The following article was written by Mario Viveros and David Haviland, UCCE Farm Advisors from Kern County where this insect has been a problem for many years. At this time, we don't know if local outbreaks represent an emerging new problem for our area or simply a result of unusual weather this season.

Leaffooted Plant Bug adult **Feeding damage hull** **Kernel damage**

Introduction

Leaffooted bug has a history of being an infrequent pest in Almond orchards throughout the San Joaquin Valley. In Kern County it was first found causing damage to the Sonora variety in the Delano area in 1986. After that it went relatively unnoticed until 2000 when it caused yield reductions in several isolated locations in the San Joaquin Valley. This year there have been widespread reports of damage to almonds and pistachios from Fresno down through Kern County. Reports on damage range from insignificant to severe, with leaffooted bug densities ranging from non-existent to high, even sometimes among different orchards within the same general vicinity.

Identification

Adult leaffooted bugs are relatively large brown insects, up to one inch in length, that have a long proboscis extending nearly the length of the body. They also have a white stripe across the abdomen and flattened leaf-like structures on their hind legs for which they are named.

Immature leaffooted plant bugs have the same general shape as the adults, but can look quite different. Small immatures have an orange body, brown legs, a brown head, and brown wingpads. They can easily be mistaken for assassin bugs, but differ in that they have a long, backwards-facing proboscis compared to a relatively short downward or forward-facing proboscis on an assassin bug. As leaffooted bugs mature the body gradually becomes browner and the wingpads enlarge. Generally speaking, the last larval stage and the adult look the same except for the presence or absence of fully developed wings.

Life Cycle

In general, leaffooted bugs are considered to have two generations per year. They overwinter as adult females both within and outside the orchard. Some preferred sites are under brush, inside wood piles, and in other concealed locations. During the spring in late April and May the adult females, which are good flyers, migrate into orchards such as almonds and pistachios. Once in the orchard they begin to

feed and reproduce. Adult females lay eggs in chains of about 8 to 10 rectangular brown eggs. Adult females are thought to live anywhere from four to six months, and will continue to lay chains of eggs during that period. Immature leaffooted bugs that emerge from eggs by the overwintering females feed and become adults anywhere from July through fall. As temperatures cool and day length shortens the leaffooted bugs, which are now all in the adult stage, migrate to a site to overwinter. Details about overwintering sites and how they are selected are still relatively unknown.

Damage

Nymphs and adults feed by inserting their proboscis into plant tissues and sucking out fluids. During late April through May, feeding on the nut hull can be 'superficial' or it can be deep into the endosperm (kernel). If the feeding takes place in the endosperm, the embryo dies, the nut turns yellow and drops to the ground.

The first evidence of nut damage by the leaffooted bugs is clear gumming oozing from the nut surface. A cut underneath the gumming area will reveal a sting that may stop at the endocarp where a gum pocket may form. In some nuts the sting may continue all the way to the seed cavity where lesions can be found in the endocarp (shell) and seed coat (pellicle).

The damage is not uniform throughout the orchard or even within a tree. Some areas and some trees will be more affected than others. Oftentimes the damage occurs in clusters such that if one nut is affected, three or more nearby nuts will also be affected. This is likely caused by the same bug feeding on multiple nuts.

Leaffooted bugs can cause significant nut loss within an orchard. A cage study conducted by Daane et al (2002 report to Almond Board of California) showed that one adult female during a 7-day period on 10-12 caged nuts was able to cause 20% nut drop and 20% nut damage at harvest. That is a total of 40% loss of 10-12 nuts during one week of feeding.

Leaffooted bugs also have varietal feeding preferences. In Kern County on June 10, 2000, Mario Viveros collected data on the damage of leaffooted bugs in Nonpareil, Sonora and Fritz trees. Ten 30-nut samples were taken from each of these varieties. Data were collected on gumming of the hull (surface and inside) and endosperm or kernel lesions. The results (Table 1) show that Sonora was the most damaged and Nonpareil the least with Fritz in the middle. They also show that gumming on the outside of the kernel does not necessarily mean that the kernel has lesions.

Table 1. Evaluation of leaffooted bug damage on three almond varieties, Kern Co., 2000

Variety	Gumming of Hulls (%)		Kernel with Lesions (%)
	Outside	Inside	
Nonpareil	2.3	0.0	0.0
Sonora	22.5	20.0	13.3
Fritz	8.0	14.0	2.5

Daane et al (2002 Almond Board of California Report) showed similar results by using cage studies. Whereas the Viveros data showed that bugs prefer to feed on one variety over another (i.e., one possibly tastes better than the other), the Daane data (Table 2) shows that there are actual differences in the susceptibilities of the varieties to damage. Differences occurred even when the same number of bugs was caged on the same number of nuts of different varieties. As was previously noted, Nonpareil appears to be less susceptible than other varieties such as Fritz, Carmel, and Butte.

Table 2. Evaluations of leaffooted bug damage to nuts in cage studies, April 2002

	Percentage of Damaged Nuts				
	Nonpareil	**Fritz**	**Carmel**	**Butte**	**Mission**
Dropped Nuts	2.1	10.7	20.2	10.5	5.6
External Damage at Harvest	8.0	12.3	17.5	6.5	0.0
Internal Damage at Harvest	5.0	6.9	1.2	3.3	0.0

Leaffooted bugs can also damage almonds later in the season. They are capable of drilling all the way through the shell and into the meat. This causes black spots or wrinkled, misshapen nutmeats.

Control

In most years leaffooted bug is controlled by an egg parasitoid, *Gryon pennsylvanicum*. Later in the season it is not uncommon to find over 80% parasitism of leaffooted bug eggs. These parasitoids have been seen this spring, but cannot be relied on for control during this very sensitive period in the crop.

Control is currently based on the use of the Lorsban®, Sevin®, or pyrethroids. The biggest concern with these products is the potential to flare mites later in the season. Growers using these products should watch their mite populations closely and follow treatment guidelines available for mites.

Unfortunately there are no official monitoring programs or treatment thresholds available for leaffooted bug. Each individual grower and PCA will need to make their own decision on whether or not a spray is needed. This decision should be based on the number of bugs seen in the orchard, their known longevity in the field (adults are around for a long time), the amount of gumming seen on the nuts, and the tolerance for damage in the crop. PCAs basing treatments on gummosis and nut drop should also recognize that there is a lag time between when feeding takes place, gummosis occurs, and the nuts drop and that not all nuts with gummosis will end up being damaged.

Safety Note

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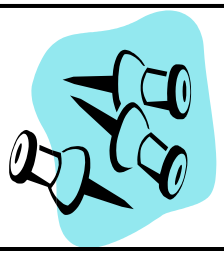

Safety Note #20

HEAT STRESS AWARENESS

Heat Stress Disorders and Symptoms

1. Heat Stroke – sweating stops and the body fails to regulate its temperature. Victims may die if they don't receive immediate medical treatment. Characterized by: mental confusion, fainting, or seizures; hot dry skin usually reddish in color; and high body temperature.
2. Heat Exhaustion – profuse sweating results in dehydration. Characterized by: fatigue, dizziness, and nausea; pale and moist skin; and possibly slightly elevated temperature.
3. Heat Cramps – cramping thought to be due to loss of salt through sweating. Characterized by muscle spasms in arms, legs, and abdomen during or following work activities.
4. Heat Syncope – dehydration while standing still causes blood pooling in lower portions of body. Characterized by fainting while standing still.
5. Heat Rash – occurs under hot and humid conditions where sweat does not evaporate readily. Characterized by irritated/itchy skin with prickly feeling and small red bumps on skin.

Treatments for Heat Stress Disorders

1. Heat Stroke – call 911 immediately, soak victim's clothing with cool water, move victim to shaded and cool area, fan victim to increase cooling of their body.
2. Heat Exhaustion – have victim rest in shaded and cool place and drink fluids. Do not serve caffeinated fluids such as soft drinks, iced tea, or coffee.
3. Heat Cramps – have victim rest and drink non-caffeinated fluids.
4. Heat Syncope – have victim rest in a shaded and cool place, and drink non-caffeinated fluids.

   Heat Rash – wash and dry skin. Wear loose clothing and keep skin dry.

Precautions to Prevent Heat Stress Disorders

1. Acclimatize yourself to the prevailing weather conditions.
2. Always drink plenty of fluids such as water and sports drinks. Avoid caffeinated drinks.
3. Wear summer hat with a brim and loose-fitting, light-colored, and lightweight clothing like cotton. Schedule vigorous work activities during coolest portions of the work day and take frequent breaks on hot days.

If treated victims do not recover from heat exhaustion, heat cramps, or heat syncope in a reasonable amount of time, promptly seek medical help.

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