



UNIVERSITY of CALIFORNIA

# Agriculture & Natural Resources

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COOPERATIVE EXTENSION **C** MADERA COUNTY

328 Madera Avenue **C** Madera, CA 93637-5465

TEL (559) 675-7879 FAX (559) 675-0639

To: Readers of *The Pomology Post*

From: Ron Vargas  
UCCE County Director, Madera County

Re: Inaccuracy in Article on Controlling Ground Squirrels

Date: August 20, 2003

In the August 2003 issue of *The Pomology Post*, Volume 41, published by the University of California Cooperative Extension (UCCE), UCCE Farm Advisor Brent Holtz wrote an article on controlling ground squirrels in almond and pistachio orchards. In the article, tractor exhaust, and d-Con (warfarin) were included in a list of suggested practical methods for controlling ground squirrels. Tractor exhaust was listed as a toxic fumigant and d-Con (warfarin) was cited as an anticoagulant bait. These substances should not have been listed in the article because they are not registered for use in the control of ground squirrels or other rodents in California in either almond or pistachio orchards. D-Con is currently registered in California for the control of rats and mice in and around structures (residential, industrial, commercial, agricultural and public buildings). D-Con, or any other anticoagulant, insecticide, herbicide, or fungicide should be used only in a manner consistent with the label.

Advisor Holtz realizes his mistake and the University shares in this responsibility. It is the University's policy to comply strictly with the use restrictions prescribed by the U.S. Environmental Protection Agency and the California Department of Pesticide Regulation. We regret the errors and are taking this opportunity to set the record straight.

C: Lanny Lund, Assistant Vice President Programs  
Linda Manton, Director Central Valley Region  
Brent Holtz, Farm Advisor, Madera County  
Rick Melnicoe, Statewide Pesticide Coordinator  
Robert Rolan, Madera Agricultural Commissioner  
Scott Paulsen, Branch Chief, Enforcement Division, Dept. Pesticide Regulation





# The Pomology Post

## REVISED EDITION (See letter of correction)

### Survey your almond orchards for almond leaf scorch

by Brent Holtz, Ph.D., UCCE Madera



Almond Leaf Scorch (ALS) or golden death was observed last year to be increasing in incidence in almond orchards up and down the San Joaquin Valley. Growers need to be able to recognize the symptoms of ALS in their orchards early so that they can take precautionary measures against its spread. The bacterium that is responsible for almond leaf scorch, *Xyella fastidiosa*, also causes Pierce's Disease in grapes, alfalfa

dwarf, phony peach disease, periwinkle wilt, citrus variegated chlorosis, and leaf scorch of coffee, plum, pear, mulberry, elm, oak, sycamore, maple, oleander, and pecan. The occurrence of the disease has been sporadic in the San Joaquin Valley, but in the 1950's it wiped out almonds growing in Lancaster, and in the 1970's it destroyed almonds growing in the Brentwood area.

The bacterium lives in the xylem tissues of the tree and is spread from plant to plant by spittlebugs and sharpshooter leafhoppers that feed in the xylem. The spittlebugs can vector the bacterium from infected weeds and trees to healthy trees. The most common vectors have probably been the red headed and green sharpshooters. The glassy-winged sharpshooter, if established in the San Joaquin Valley, could prove an even more deadly vector of ALS. Common weeds and riparian plants living along rivers are common reservoirs of the bacteria. Bermuda grass, rye, fescue grasses, water grass, blackberry, elderberry,

cocklebur, and nettle are common hosts for the almond leaf scorch bacteria.

Grass-feeding sharpshooters require year-round access to plants on which they can feed and reproduce. Most of the severe cases of almond leaf scorch that I have observed have been in orchards near alfalfa fields with host weeds. Clean cultivation of almond orchards for a six-week period, usually during harvest, should help in preventing the establishment of in-orchard vector populations.

Leaves of infected trees appear normal in spring, but develop symptoms in early to mid-July. Tips and margins of leaves turn yellow, then brown, and a golden yellow band forms between the green and brown leaf areas. Symptoms are often confused with salt burn, but often leaves with salt burn will not have a gold band between the brown leaf tip and the green base of the leaf. Leaf analysis on leaves showing burn is one sure way to determine if symptoms are caused by salt. If the leaf analysis is

negative for salt (Sodium or Chloride), then the leaves should be tested for the bacterium.

Newly infected trees typically have one terminal branch that is infected first. As time goes by more and more of the canopy will become infected and show symptoms. Several developing infections on the same or nearby scaffolds may be apparent. As the disease progresses from year to year, trees have reduced terminal growth, large numbers of dead spurs and small branches, and terminal shoots die back. Within 3-8 years the disease can spread over the entire tree, yields are greatly reduced, and the tree will eventually die. Infected trees will also bloom and leaf out later than healthy trees. Cultivars such as Padre, Carmel, Butte, Mission, and Fritz, have shown resistance. Susceptible cultivars include Nonpareil, Ne Plus Ultra, Jordanolo, and Peerless.

Annually inspect your orchards in mid-to late July. Prune out all infected limbs in newly infected trees, 2 to 3 feet below symptoms. Do this as soon as infected shoots are detected. The disease spreads relatively slowly and the disease may not be noticed for several years, but if growers are aware of the disease and its symptoms, early infections can be removed by pruning. If a tree is completely infected I would remove it. Pruning has been used to remove infected branches of citrus trees in Brazil, and researchers at UC Riverside have evaluated pruning as a method to reduce the spread of the same bacterium in Oleanders infected with *Xylella*.

Their results showed that pruning out infected branches with oleander leaf scorch symptoms showed a 50% reduction in observed disease the following year. Bruce Kirkpatrick at UC Davis is performing a similar experiment on almonds in the San Joaquin Valley.

Because bacteria plugs the xylem or water conducting tissues of plants infected, symptoms are often confused with water stress or salt burn. Care should be taken in orchards with ALS not to stress the trees for water. Other scientist working at the University of Maryland have shown water stress on grapevine can enhance symptoms and the development of Pierce's Disease of grape (Plant Dis. 85:1160-1164). More information can be obtained on University of California Statewide Integrated Pest Management Program web site ([www.ipm.ucdavis.edu](http://www.ipm.ucdavis.edu)).

### Controlling Ground Squirrels

By Brent Holtz



There are several control methods you may want to use to control those forever reproducing and nut eating ground squirrels. Controlling ground squirrels is a battle that you never really win, but hopefully you will reduce their numbers enough so that they will not economically effect your production.

In the spring, after ground squirrels emerge from hibernation, they eat primarily small grasses. During this time they will not eat poison baits; thus, late February, March, and April are good months to try fumigation. It is more effective and selective in the spring when the soil contains enough moisture to retain the toxic gas in higher concentrations. Fumigants are not effective during the coldest months of the year (December/January) because the squirrels use a soil plug to seal themselves inside their nest chambers.

What fumigants can you use? Gas cartridges are effective against squirrels in the spring, especially against young squirrels that have not emerged yet from their holes. Gas cartridges are available at most agricultural commissioner's offices. Aluminum phosphide tablets can also be used as a slow release fumigant against squirrels; these tablets are available at local farm supply stores. Aluminum phosphide tablets are my favorite fumigant, they react with atmospheric and soil moisture to produce phosphine gas that is lethal to all mammals. Place the label-recommended number of tables into the burrow entrance, and place crumpled newspapers or thick weeds over the hole to prevent soil from covering the tablets, and then firmly seal off the entrance with soil tamped firmly. Aluminum phosphide is a restricted-use material and should be handled according to label specifications.

Acrolein (Magnacide "H") is an aquatic herbicide with vapors in high concentrations can kill ground squirrels. This volatile liquid can be

applied to squirrel holes through a hose with a calibrated wand delivery system in low yet lethal doses. The entrances are again sealed off.

Acrolein, is a restricted use material that can only be used by a licensed pest control operator.

Many growers have tried the Rodex 4000 (800-750-4553) or similar device where propane and oxygen are pumped into the burrow and then ignited. But be sure to wear protective eye and ear equipment and be sure to obtain the necessary permits to be able to use this lethal devise.

When using fumigants, I prefer to fill in as many holes as I can with dirt and then come back in 2 days to place tablets or cartridges only in the active entrances where the soil was pushed out. With all fumigates you should examine the treated area a few days after treatment to determine how many squirrels survived by looking for recently dug out holes. Then you can again re-apply fumigates into just the active burrows. Shooting squirrels with a .22 rifle can also kill them if you can hit them?

Ground squirrels switch from eating small grasses and green vegetation to eating seeds, grains, and nuts the latter part of May. Therefore, May and June are the best months for baiting. Zinc phosphide is the only acute rodenticide registered by EPA for ground squirrel control in California. Zinc phosphide baits are most often hand applied with a tablespoon (4g) of bait scattered on bare ground over about 3 or 4 square feet (0.3 meters squared) next to the burrow entrance. Squirrels will become shy

to zinc phosphide baits if they do not die after their first feeding. Thus, zinc phosphide should only be used once per season.

Anticoagulant baits can also be hand applied like zinc phosphide but they require more bait as well as repeated applications. These baits include diphacinone and chlorophacinone, and they are placed in bait boxes or stations where they can be continuously supplied. These stations should be placed out in the orchard a few days or weeks before the bait is added so that squirrels will become accustomed to them.

Diphacinone is also available at the County Ag Commissioner's Office.

To assure good bait acceptance prior to an extensive control program, acceptance should be tested by scattering tablespoons of bait next to a few burrows. If all of the bait is gone the next day, good bait acceptance is indicated. Bait acceptance is especially important with zinc phosphide or cholecalciferol, both of which require a single feeding to produce death. Good acceptance avoids poor control and possible bait or toxin shyness, which will adversely affect repeat control efforts. If acceptance of cereal baits is less than adequate, then zinc phosphide application should be delayed until bait acceptance is improved, or not applied at all in favor of other control options. Squirrels may learn to take the anticoagulant bait (diphacinone or chlorophacinone) over time, since they are accumulatively poisoned with no bait shyness, and control will not be jeopardized by marginal feeding as long as feeding continues over a number of days.

During July and August the adult squirrels go into estivation, during the hottest time of the year, and will not take up bait. You can fumigate at this time but it is not as effective as spring fumigation. You can continue baiting again between September 15-October 31. In November the squirrels will go into winter hibernation and baiting should be discontinued. During this time though you may want to make sure that brush piles and debris are removed to make an area less desirable for ground squirrels, and also allow detection and access to their burrow entrances.

There are also a variety of traps that you can use to control squirrels. The CONIBEAR trap can be set at the entrance of the squirrel hole to trap the squirrel as it exits the hole. With care, the traps can be placed so that there is little danger of injury to children or domestic animals. Frequent monitoring is necessary to dispose of trapped squirrels and to reset traps. These traps are not expensive \$ 4-7 each, but you must order them from states other than California. They can be very effective if used properly. Where squirrels are a severe problem, all available methods of control are needed to keep the population within limits that minimize their impact on your nut crop. Female squirrels have one litter of 6-8 in the spring, and squirrels can live for five or more years. A little problem can become a big problem very fast! Good luck in your battle against those hungry rodents from the underworld.

### Pruning Almond Trees After Harvest

A pruning trial was conducted by Wilbur Reil (UCCE Yolo and Solano Counties) at Harry Dewey's almond orchard which compared pruning mature Nonpareil trees each year in October, November, and December. Yield, trunk growth and leaf analysis were taken each year. The trial was designed to examine if there were any deleterious effects to trees from pruning before leaf fall. The fall is a good time to prune out many growers believe they need to wait until January or February before they can start pruning.

In Wilbur's study, pruning mature almond trees in October and November, before leaf fall, had no effect on yield, growth or nutritional levels when compared to dormant pruning. Removing limbs after harvest should therefore have no adverse effect on the yield or nutrients levels the following year. Pruning in the fall can provide work at a time when few other activities occur in almond orchards. Wilbur's paper can be found in California Agriculture May-June 1991-Vol.45, No.3.

Also, I have seen what I believe are *Phytophthora* pruning infections, where the fungus entered

the tree at the site of a pruning wound. In order for this to occur I believe moisture must have been present at the time of pruning, most likely either rain or fog. Also, there is a new disease in the San Joaquin Valley called Silverleaf, caused by the fungus *Chondrostereum purpureum*, which forms leathery fruiting bodies (mushrooms) in clusters on tree trunks and scaffolds. This fungus releases its spores during wet weather and can infect pruning wounds. Thus, I prefer that growers prune right after harvest when the weather is still nice and the wounds will dry quickly.

**Brent A. Holtz, Farm Advisor**  
**University of California Cooperative Extension**  
**328 Madera Avenue**  
**Madera, CA 93637-5465**  
**559-675-7879 Extension 209**  
**559-675-0639 FAX**  
**Email: baholtz@ucdavis.edu**

*Visit us on the Web at [www.cemadera.ucdavis.edu](http://www.cemadera.ucdavis.edu)*

## **NEW PUBLICATIONS:**

**Tree Fruit Pest Identification and Monitoring Cards** - carry these pocket-sized laminated cards in the field as handy references for identifying and monitoring major insect and mite pests and several important diseases in California deciduous tree fruits and nuts. Each pest is identified by a description and close-up photographs of important life stages. Cards identifying important natural enemies are also included. The information on these 32 cards will help pest control advisors and growers know how and when to look for these pests - both in growing and dormant seasons. References are provided to the appropriate UC IPM Pest Management Guidelines and IPM Manuals for management information. Everyone involved in pest management in tree crops will want a set of these handy cards. \$15.00

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## **OTHER PUBLICATIONS OF INTEREST:**

IPM for Stone Fruits, #3389 - \$35.00

IPM for Apples and Pears, 2<sup>nd</sup> Edition, #3340 - \$30.00

IPM for Walnuts, #3270 - \$22.00

IPM for Almonds, #3308 - \$22.00

Almond Production Manual, #3364 - \$30.00

Pests of the Garden & Small Farm, 2<sup>nd</sup> Edition \$35.00

Natural Enemies Handbook \$35.00

**These publications are available in the Madera University of California Cooperative Extension Office.**



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Reprint freely with credit to: **Brent A. Holtz, Ph.D., Pomology Farm Advisor, University of California Cooperative Extension, Madera, CA.**

Sincerely,

Brent A. Holtz, Ph.D.  
Pomology Farm Advisor

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