Sacramento Valley Almond News

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In This Issue

Franz Niederholzer
UCCE Farm Advisor
Sutter, Yuba, Colusa Counties

2016 Advances in Almond Production Short Course

November 8-10, 2016

Modesto, California

To be held in the Modesto Convention Center, this course is designed for new and experienced growers as well as other industry members interested in commercial almond production. For more information or to register for the course, go to http://ucanr.edu/almondshortcourse. This orchard management short course will feature speakers from UC Cooperative Extension, UC campuses, and the USDA's Agricultural Research Service. This 3-day course will cover all aspects of almond culture and production.

Pocket gopher management

Roger A. Baldwin, UCCE Wildlife Specialist, Wildlife, Fish, & Conservation Biology, UC Davis and Joseph Connell, UCCE Farm Advisor Emeritus, Butte County

Pocket gophers (*Thomomys* spp.) may be responsible for more damage to orchards than any other mammal species. It's essential to minimize their presence in orchards and this is particularly important for young trees that are highly susceptible to gopher damage. Since reproduction increases toward late winter through early spring, control is more effective before this reproductive pulse since there are fewer individuals to remove. When soil moisture is high, gophers make mounds frequently, easing identification of active tunnel systems, and thus reducing the time required to treat the orchard. Gopher control programs include trapping, burrow fumigants, and toxic baits.

Trapping is safe and one of the most effective methods for controlling gophers. Recent studies have shown a 90% reduction in gopher density after two trapping sessions separated by 1 to 2 weeks. A third trapping session has resulted in complete removal of pocket gophers from some fields. Trapping is a tool all growers should employ to some extent, even if it is not the preferred primary approach. Trapping can be a good follow-up approach since it allows you to target remaining individuals other tools have missed.

Fumigation with aluminum phosphide is the most effective fumigant for gopher control (around 90% control after two treatment periods) and it has a low material cost, although labor costs can be higher. Find the gopher's main tunnel with a probe and drop the label designated number of tablets into the probe hole.

Seal the opening to keep light from entering and toxic gases from escaping. Treat each active burrow system twice to maximize efficacy. Only apply aluminum phosphide treatments when soil moisture is relatively high; the most effective timing is in late winter and early spring. Aluminum phosphide is a restricted-use material so applicators must be licensed and trained on its proper use.

Acute toxicant baits such as strychnine-treated grain bait kills after a single feeding and is available at a 0.5% concentration in California. Recent investigations have shown 0.5% strychnine is still highly effective, with 100% removal rates observed in trials. When repeatedly used over time, gophers can develop behavioral resistance to strychnine. So, be sure to supplement baiting with other management approaches to reduce this potential. Proper application is essential for effective control.

Hand baiting with an all-in-one probe and bait dispenser can be effective if you have relatively few gophers in a field. Once the tunnel is located, bait is directly deposited via a hand-crank or lever. Treat each burrow system at least twice to maximize efficacy.

A burrow builder pulled behind a tractor that creates an artificial burrow is a more practical method for treating larger areas. Gophers will come across these artificial burrows and consume bait that has been deposited at set intervals within the artificial burrow. Soil moisture must be just right; if too dry, the artificial burrow will cave in, if too wet, the burrow will not seal properly allowing light to filter in thus preventing gophers from travelling down the burrow. Efficacy varies greatly depending on how well you implement the method.

In summary, all techniques require multiple applications to maximize control. Management must be integrated since continued reliance on only one technique results in lower efficacy as gophers adapt to avoid control (e.g., strychnine behavioral resistance). Recognize that re-invasion into orchards will occur. Regular long-term monitoring and removal of invaders before they multiply and re-establish is just part of good orchard management. For additional information on managing gophers, check out the UC IPM Pocket Gopher Pest Note (http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn7433.html).

Fall Zinc and Boron Review

Franz Niederholzer, UCCE Advisor, Colusa and Sutter-Yuba Counties

Bloom is the most important time of the year for adequate boron (B) and zinc (Zn) levels in almonds. Zinc is essential to many processes such as cell division, protein synthesis and auxin synthesis in growing points (flowers and shoots), and bloom is the time of the most growing points in a tree. Boron is essential for cell wall synthesis and division. Boron fertilization has improved fruit or nut set compared to deficient plants in many crops, but only if applied in time to get B into buds at bloom. Both Zn and B can be absorbed into leaves and translocated within almond trees.

Check leaf symptoms, summer leaf analysis or hull analysis results to see if Zn and/or B fertilization is needed. Zinc deficiency produces “little leaf” symptoms (see Fig.1), with trees showing summer leaf levels of 15 ppm Zn or less considered deficient. Trees with hull B levels below 80 ppm B at harvest are thought to be deficient, but almond yield may benefit from B application if hull levels are below 150 ppm B. Do not fertilizer with B if hull levels are 200 ppm B or greater, as excessive B is toxic to plants.

Figure 1. Zinc deficiency symptoms in almond.

A fall spray is a cost effective way to get Zn or B into buds for the following year's bloom. The return on investment for a fall B spray can be significant. Yield increases of 200-400 kernel pounds per acre have been measured from a foliar application the previous fall at Nickels Soil Lab of 0.6 lbs. of actual B (the equivalent of 3 lbs. Solubor®/acre applied in 400 gallons/acre). Fall Zn sprays should increase leaf Zn the following year and eliminate Zn deficiency symptoms while reducing the consequences of any phytoxicity resulting from zinc applications at this time compared to earlier in the season. The following are tips that may help maximize the benefit from a fall Zn and/or B spray.

- **Materials:** Zinc sulfate is a good, cost effective source of zinc in postharvest applications. Other sources work, but are more expensive. Most B sources, as long as a similar rate of actual B is applied, are effective foliar fertilizers.
- **Zn Rates:** A moderate rate of Zn, for example, 5 lb. zinc sulfate ($ZnSO_4$)/acre, applied in October, is as effective as higher rates applied in November when natural leaf drop begins. The 5 lb. $ZnSO_4$/acre rate in October will not remove leaves, allowing for continued carbohydrate production and storage for use next growing season. To get defoliation plus fertilization, use higher rates – for example, 20 lbs $ZnSO_4$/acre – once natural leaf drop has begun. In my experience, defoliation with zinc sprays requires moisture in the orchard – either from rain or irrigation.
- **B Rates:** Generally 1-2 lbs. Solubor®/acre in 100 gallons per acre is recommended as a fall spray. Excess B can be toxic. Consult with an experienced PCA/CCA when selecting a B rate. If the canopy is healthy and green, B sprays should be absorbed even into November, even when tank mixed with a high rate of ZnS_{O4}.
- **Tank mixing:** When B fertilizer is tank mixed with 20 lbs. $ZnSO_4$, B uptake occurs before defoliation and subsequent flower B levels equal those from a B spray alone. To reduce application costs, Zn and B can be tank-mixed, but certain steps are needed. Acidify the spray solution to pH 5 before adding zinc using an organic acid based material (for example, Mixwell™ or Tri-Fol®) and not a phosphate buffer which will precipitate with zinc. Then add B. If the solution pH climbs above 5, a light brown haze (precipitation) forms in the tank and lower boron levels in the flowers the following spring can result. Add more acid to eliminate the haze.
- **Soil applied B and/or Zn:** Foliar application is more efficient and faster at getting the nutrient into the target tissues (buds); however, both soil applied Zn or B can be effective in increasing the plant level of the applied nutrient. When B is applied to the soil in the fall, flower B is not increased the next bloom, but hull B at the following harvest is increased. Adequate B at bloom is your target, but soil application may be helpful if the orchard is badly deficient. To correct a very B deficient orchard, a combination of foliar and soil applied B fertilizer may be needed. Almonds export 0.4 lb. B in 2000 lbs. per acre of

kernel yield (including kernels, shell and hulls), so 2 lbs. Solubor®/acre will not change hull B levels unless additional B is added. Solubor® is 20.5% B by weight.

- **Canopy Health**: Foliar application in orchards with extensive defoliation is not recommended.

Potted tree irrigation after planting: Getting the first year right

Franz Niederholzer, UCCE Farm Advisor, Colusa and Sutter-Yuba Counties
Dani Lightle, UCCE Farm Advisor, Glenn, Butte, and Tehama Counties

Potted trees may be the nursery stock of the future, but they have challenges and a learning curve for growers accustomed to planting bare root trees. One of the major challenges is irrigating during the orchard's first year. If your orchard is planted by tearing open the root ball of potted trees at planting, spreading the roots, and turning your trees into an almost a bare root condition, then disregard the rest of this column!

Leafed out trees are actively growing and begin using water immediately after planting. The challenge is irrigation water must go directly into the potted soil media. After roughly 30 days, when the tree roots have grown out of the potting media into the surrounding native soil, irrigation water delivery must shift from the original potted root ball to the native soil.

Why this complete shift in irrigating potted trees after the first month in the ground? It's because very little water will move across the large difference in textures between the potted soil media and the surrounding native soil – especially when the local soil is a fine textured soil (loam, clay loam, etc.) common to the Sacramento Valley. Water applied to the native soil after planting will be drawn to the continuous small pores of the dry native soil away from the newly planted tree, and not into the larger pores of the potting media. Water applied directly to the top of the potted soil media will move freely in the potted media, but won't drain out of the potted media until the potting material is saturated, again because the water won't move easily between the two soils. In both situations, water does not move readily across the boundary between the native soil and the potting media due to textural differences.

It takes about 30 days for tree roots to grow out of the pot and into the surrounding soil under good growing conditions. So, water the potting media for the first 30 days, then check to make sure roots have grown out into the surrounding native soil (yes, you will need to dig a hole!). If they have, move the water source [drip hose(s), microsprinkler, etc.] away from the tree. At first, put the water delivery within about a foot of the trunk, then, as the roots extend more, move the water source to its permanent location.

How can water be delivered directly to the potting soil and then shifted away? Here are some ideas (but not all options) offered by experienced nursery representatives:

- Stake a microsprinkler by the trunk and cap it to direct water downwards onto the potting soil. Once the roots have grown out beyond the potting media, take the cap off and move the sprinkler to a permanent location.
- Stagger a double-hose drip system so the emitters are evenly spaced along the tree row – basically making a big single line drip hose with emitters at half the distance apart along the row compared to each single hose. Throw a shovel of soil on top of the hose to keep water from running along the hose away from the tree, especially when trees are planted on cut-out berms ("islands").
- Cut a shallow "V" in the top of the berm or "island" before the trees are planted and lay drip hose in the "V", reducing the risk of water running down the hose away from the tree.

We've had numerous encounters that required troubleshooting irrigation problems with newly-planted potted trees, and we've consistently observed some common errors.

- Short irrigation sets are essential to meet tree water needs while also avoiding saturated conditions in the potting media immediately after planting.
- For the first month after planting, growers should not time irrigation by the use of soil moisture sensors set in the soil outside the potted media area. These measurements don't show the water status of the roots in the potting media. Irrigate by water status of the root ball (dig down and feel it) and/or the estimations of ET use by small trees (http://cesutter.ucanr.edu/files/102712.pdf or ask your local farm advisor for a copy of "Irrigating young trees" by R. Scott Johnson, retired UCCE orchard specialist.
- When calculating water delivery volume, use only the water delivered by the emitters close to the roots, don't include water applied out between the trees. Water delivered by a microsprinkler or drip emitter(s) halfway between two, newly planted potted trees is not being used by either tree.
- Don't continue adding a large amount of water to the potting soil region for an extended period of time. This will saturate the potting soil and encourage crown rot. This is extremely important for rootstocks that require well drained soils (peach/almond hybrids, peach seedlings, etc.), and for orchards on heavier soils.

Adequate root zone moisture is essential to good, sustained tree growth and root health – especially in the first leaf. Excessive soil water will drown the roots or invite *Phytophthora* infection in the crown and/or roots. Dry soil limits tree growth and eventually, survival. The extra effort to get potted tree irrigation right the first year will pay off with the best possible start for the orchard.

Leaf rust of almond

Joseph Connell, UCCE Farm Advisor Emeritus, Butte County

Leaf rust, caused by the fungus *Tranzschelia discolor*, favored by high humidity and leaf wetness, was prevalent in most vigorous young Sacramento Valley orchards this year. The late rains in May and mid-June really got it going in some locations, with additional fungicide treatments needed to minimize defoliation. Vigorous higher density plantings and micro-sprinkler irrigation with longer, more frequent irrigations can contribute to higher humidity and more accumulated leaf wetness hours (dew) resulting in more disease.

Rust appears as small, yellow, angular spots on the upper surface of leaves and rusty red pustules of spores on the lower surface (Fig. 1). The disease is more likely to become serious in two to four-year-old orchards near rivers or streams or other locations where spring and summer humidity is relatively high and where fungicides have not been applied. Excessive levels of nitrogen are also known to increase a tree's susceptibility. Premature defoliation will weaken trees, reducing the following year's bloom. The rust fungus overwinters in infected leaves that remain on the tree, spores contaminating buds and tree bark, and possibly infected twigs.

Figure 1. Almond Leaf Rust

In orchards that struggled with rust this season, treatments next year should be applied before symptoms appear. Use materials effective on rust at 5 weeks after petal fall with a second application 4 to 5 weeks later to control leaf infections.

Monitoring should be done from April through June. Once started, rust can spread explosively; orchards showing only 1% leaf infection are at high risk if favorable environments persist. Two or three applications may be needed in orchards that have had severe rust problems.

A zinc nutritional spray (zinc sulfate 20-40 lbs./acre) applied in early to mid-November resulting in defoliation may reduce overwintering rust inoculum. For tips on using zinc in the fall, see the Zinc and Boron Review article elsewhere in this issue.

Next year, start your early rust fungicide program with a multi-site mode of action material (eg. Chlorothalonil) keeping in mind pre-harvest intervals. Sulfur, Abound, Gem, or Sulfur in combination with single-site mode of action fungicides such as QoI and DMI fungicides is an effective program in late spring or early summer.

Fungicides effective on rust can be found at http://ipm.ucanr.edu/PMG/r3100711.html.
Another resource is the 2015 Efficacy and Timing of Fungicides Publication at:
http://ipm.ucdavis.edu/PDF/PMG/fungicideefficacytiming.pdf

Post-Harvest Considerations

Katherine Pope, UCCE Orchard Advisor Yolo, Solano, & Sacramento Cos.

OCTOBER

- ✓ *Survey for stick-tights/mummy nuts.* Nuts stuck to the tree well after harvest may indicate hull rot. In certain areas, this could also be a result of high boron. If hull rot is indicated, consider revising irrigation and nitrogen management practices that may encourage hull rot next year. For more on hull rot, see http://ipm.ucanr.edu/PMG/r3101811.html. If more than 2 nuts per tree remain, plan to knock off and destroy mummies by February 1st to reduce navel orangeworm and brown rot.
- ✓ If *rust infection* was heavy this year, consider a foliar zinc sulfate spray to hasten leaf fall to ensure infected leaves don't carry over into next season. Wait until late October or early November to allow leaves time to continue making photosynthate and build up energy storage in the trees after harvest. See the article on rust in this newsletter for more details.
- ✓ *Watch for shot hole fruiting structures in leaf lesions* after fall rains begin. If fruiting structures producing spores are present in leaf lesions in the fall, there is a greater risk of shot hole development the following spring. Foliar zinc sulfate applied in late October or early November can also hasten leaf fall and reduce shot hole inoculum. For more, see http://ipm.ucanr.edu/PMG/r3100211.html.
- ✓ *Scout for weeds after the first fall rains.* Look for late summer weeds that escaped this year's control and winter annual weeds that are just emerging. UC IPM has a late fall weed survey form that can help: http://ipm.ucanr.edu/PMG/C003/almond-fallweed.pdf. The UC Weed ID Tool may also help: http://weedid.wisc.edu/ca/weedid.php.
- ✓ *Consider a fall nutrient spray.* Check hull boron and leaf zinc analyses results to help determine if a foliar spray of either or both nutrients is needed. See article in this newsletter for details.
- ✓ *Planting a cover crop to improve soil, provide pollen to bees, and/or reduce runoff?* Get it in the ground by the end of October for best stand establishment.

NOVEMBER

- ✓ *Apply banded potassium to the soil* if that is part of your fertility management plan. Granular potassium chloride or potassium sulfate is most commonly applied in late November after leaf drop progresses and a few inches of rainfall have re-moistened the soil. If potassium chloride is used, make sure there are no soil restrictive layers and that application is followed by 8-10 inches of rain or irrigation prior to bloom to leach chloride from the root zone. Every 1,000 lbs of almond kernels harvested remove 70-80- lbs of potassium. For more, see https://apps1.cdfa.ca.gov/FertilizerResearch/docs/Guidelines.html**.**
- ✓ *If planning early pruning, watch the weather forecast.* Especially in young orchards, avoid pruning ahead of forecast rain. Disease spores are spread in rain events, so pruning would increase the risk of infection. Grower experience suggests the worst timing for infection may be November. UC researchers are investigating pruning timing relative to rain and infection risk.
- ✓ *Sample dormant spurs* for scale, mite eggs and scab sometime between mid-November and mid-January. Collect a total of 100 spurs from 35-50 trees, randomly selected from each orchard. Details for examining spurs and making treatment decisions can be found at http://ipm.ucanr.edu/PMG/r3900211.html.

DECEMBER

- ✓ Look for Sac Valley farm advisors at the Almond Industry Conference, December 6th through 8th at the Sacramento Convention Center! For more, see https://www.almondconference.com/events.aspx.

Visit the Sacramento Valley Orchard Source!

This website provides our wealth of information in one location. As this fall's meeting season begins, look for meetings you'd like to attend on our **"Calendar of area Cooperative Extension meetings & events"**. If you hold your own meetings, check this out to avoid conflicts! Visit us at http://www.sacvalleyorchards.com/.