Summer 2018

Dispatches from the Orchard

University of California
Agriculture and Natural Resources
Cooperative Extension

UC CE

I'm pleased to announce that I am producing a podcast, Growing the Valley, with Luke Milliron, the Butte County Orchard Systems Advisor. You can find and download episodes through Google Play or iTunes, or listen to episodes on our website, www.growingthevalleypodcast.com. I will be directing the bulk of my 'creative' activities to the podcast (that's been the plan all along!) but I will still be sending out meeting announcements and occasional articles through my newsletter.

Boron Deficiency in Almonds and Pistachios

Boron is a weird nutrient in orchard crops, particularly in California. It's needed in very small amounts, and some crops, like almonds, do not tolerate soil levels much above 1 ppm. To complicate things, boron tends to be deficient in some parts of the valley, such as sandy soils where canal water is the primary water source, and at toxic levels in areas in soils formed by old marine deposits.

Boron is an important nutrient to get right, however, as it is necessary for effective pollination. Mild deficiency symptoms can first manifest themselves as disappointingly low yields or heavier than normal 'June' drop. Boron is also necessary for cell wall development, so more severe deficiency symptoms can include deformed leaves and shoot and tip dieback.

Note the deformed leaves of this pistachio leaf suffering from boron deficiency. Photo: Phoebe Gordon

Boron behaves differently across tree species. Understanding the differences in mobility is important because it determines what tissues you will be monitoring for deficiencies and toxicities, as well as how to rectify deficiencies. In most tree crops, for example pistachios, boron is immobile, which means once the plant has taken up the nutrient and transported it into the growing tissues, it stays there. This means that when evaluating deficiencies and toxicities, you should be monitoring leaves. Deficiency symptoms are cupped and deformed leaves, though they retain their green color. In more severe deficiencies, flower panicles can drop from the tree. Boron toxicity symptoms are necrotic leaf margins, however in pistachios, toxicity symptoms can still be associated with high yielding orchards. In plants where boron is immobile, foliar sprays will only affect the current season's growth, and severe deficiencies are better addressed through soil applications.

In almonds and other *Prunus* species, boron is mobile, since it is involved in the transport of photosynthesized sugars. You should be monitoring deficiencies and toxicities in the location where the season's photosynthate ends up: the fruit (and specifically, the hull). Severe deficiency symptoms manifest as shoot tip dieback, whereas more mild deficiencies can show up as internal gumming in the fruit. Severe toxicities will cause gumming in the trunk as well as tip dieback, though the reason why is

unknown. Since boron is mobile, foliar sprays can affect future year's crops, though the effect is more limited than with soil applications.

In order to first assess your field's boron levels, it's important to have your soil and irrigation water tested. In some areas, groundwater is a significant source of boron. I would never advise embarking on a fertilization regime unless you know that both your water and soil levels are low. If both show low levels of boron, next you'll need to test your plants to assess how deficient they are in boron. As boron is immobile in pistachios, you should be monitoring leaf levels with your July leaf tests. Start thinking about it now – if you're like me, July will be here sooner than you think! In almonds, you should be monitoring boron with hull samples pulled at harvest time. I want to stress that boron deficiencies do not show up in almond leaves, so you can't rely on your spring time or July leaf samples to ensure your plants are adequately fertilized.

Crop	**Leaf critical value**	**Hull critical value**
Almond	N/A	80 ppm
Pistachio	90 ppm	N/A

The table above states the critical values for almond and pistachio; these are values below which you will see deficiency symptoms manifest in the plant. Actual sufficiency values, which are levels where yield is not negatively affected are much higher; in pistachios it is between 150 and 250 ppm, and in almonds between 100 and 160 ppm.

To correct minor boron deficiencies, conduct spring foliar sprays in pistachios, using 2.5 to 5 lbs of Solubor in 100 gallons of spray at the bud swell period (early to mid-March, depending on spring temperatures). Use much lower rates in almonds – 1 to 2 pounds of Solubor in 100 gallons of water. Almond sprays should be timed after harvest before leaves fall for best effects, or at bud swell but before the trees are in bloom. Boron sprays during bloom can damage flowers and interfere with bee pollination.

Major boron deficiencies can be corrected via a soil application (major deficiencies would be far below the critical value). In both almonds and pistachios, broadcast 25 to 50 lbs of Borax per acre (about 2-4 lbs of actual boron). Failure to broadcast applications can result in toxicity symptoms. Make sure to take into account soil texture: lighter textured soils should have lower rates of application. Monitor leaf tissue levels closely to ensure the deficiency has been corrected. In pistachios, which have a greater need for boron and higher tolerance toxic levels, severe deficiencies may need to be treated with both soil and foliar sprays.

Alternaria Late Blight of Pistachios – start monitoring for it soon

Alternaria Late Blight (ALB) of pistachios is a fungal infection caused by several *Alternaria* species, *Alternaria alternate* being the most common. These species can also cause Alternaria leaf spot in almonds, which tends to show up around this time of the year. Severe infections will result in leaf loss, and the fungus will move into the fruit, causing staining and molding and thus lower nut quality. This is unlike almonds, where Alternaria infections only damage the leaves, though defoliation can be severe if the disease is unchecked.

Alternaria infections have differing symptoms depending on whether infections happen on the leaves or fruit. Leaf infections can be angular or circular and start out small with either dark brown or black coloration. As they grow, they will merge together and form light brown spots that can be as large as an inch. When humidity levels increase the fungus produces spores on the surface of the lesions which results in them blackening. You can differentiate ALB from Botryosphaeria panicle and shoot blight by rubbing your fingers on leaf or fruit spots: the spores from ALB will coat your fingers. Alternaria infections on pistachio fruit and panicles remain small – no more than a few millimeters in diameter, and these spots stay black. Red haloes will surround the lesions on immature fruit, some of which will grow and

Like most foliar fungal diseases in orchard crops, ALB thrives in high humidity conditions generated in dense canopies, flood or sprinkler irrigation, or from nearby bodies of water. Sodium affected soils, which reduce the rate of water infiltration and can result in water being ponded on the soil surface for longer periods of time, can also increase humidity levels in the orchard. To combat a severe ALB problem, you must address orchard humidity levels in addition to your spray program. Alternaria evolves resistance to fungicides readily, so any attempt to reduce the need for fungicide applications ensures that existing fungicides can remain effective.

Lowering orchard humidity can be achieved by pruning to open the orchard canopy, which in turn increases air flow. More effective measures are to address irrigation delivery and management. While shifting irrigation systems can be a pain, ALB is a problem that can absolutely linger in orchards if humidity levels are not addressed. Severe ALB infestations can result in losses of up to $1000 per acre, so fixing a problem block can repay itself quickly.

If the orchard is irrigated with flood or sprinklers, conversion to microsprinklers or drip decreases the surface wetted area, which reduces orchard humidity. Ensure you are not overirrigating by monitoring evapotranspiration, and only applying what the trees lose. If possible, decrease the frequency of irrigation and irrigate more deeply, though do not irrigate for longer than 24 hours in an irrigation set to reduce the danger of Phytophthora infections. In past studies, subsurface drip irrigation managed in such a way that surface wetting was minimized reduced ALB in a severely affected orchard (Goldhamer et al., 2002).

Severely affected orchards will need sprays in addition to lowering orchard humidity; getting the problem under control cannot rely on one method alone. Early June is the time to start treatments, and three applications are recommended. There are a wide variety of available fungicides, so if you decide you need to conduct multiple sprays, ensure you rotate chemistries, and do not bring a mode of action back into the orchard in a growing season once it has already been sprayed. For instance, if you spray with a group 11 fungicide, conduct your second spray with a group 3 fungicide. Changing the formulation is not enough. An example (and not a fungicide recommendation!) is conducting your first spray with Luna Sensation (groups 7 and 11) with Quash (group 3). An example of changing formulations, which is not effective, is conducting a first spray with Abound (Group 11) with Gem 500SC (Also group 11) or Quadris Top (Groups 3 and 11). For a more complete list of fungicides and their FRAC groups, visit http://ipm.ucanr.edu. As always, check with your PCA or pesticide manufacturer so that you are up to date on which fungicides are registered for use in pistachios.

Cited open source article:

Goldhamer, D.A., T.J. Michailides, and D.P. Morgan. 2002. Buried drip irrigation reduces fungal disease in pistachio orchards. California Agriculture. 56(4): 133-138

Walnut Short Course

November 5-7, 2016

Plan to join us for this integrated orchard management short course featuring UC faculty, Cooperative Extension specialists and farm advisors, and USDA researchers who will provide an in-depth, comprehensive study of all phases of walnut culture and production.

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Register to learn about:

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- Evaluation and modification of water and soils
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- Mineral nutrition and fertilization
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For more information visit
http://ucanr.edu/sites/WalnutShortCourse/

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UC Cooperative Extension
550 E. Shaw Avenue, Suite 210-B
Fresno, CA 93710

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