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(30%) and September - October (20%). Nitrogen use efficiency has increased dramatically (75-85%) in Dr. Brown's studies where nitrogen is applied at the time of peak tree demand and uptake. I know many growers that "spoon feed" their trees with small injections of nitrogen and other liquid fertilizers into their irrigation systems. I would prefer to see you add a little bit of nitrogen with every irrigation from March to July, rather than applying large doses periodically through the season (just as people prefer three meals a day over one big one). Fertigation delivers fertilizer to active roots. It is important that irrigation deliver only needed water because excess water could dilute or leach the nitrogen applied past the root zone. In orchards with flood or solid set sprinkler irrigation systems, the nitrogen should be applied down the tree rows and not broadcast down the row middles. Dormant winter applications of nitrogen should be avoided as well as applications during hull split (July), which can aggravate hull rot and delay harvest. Deciduous almond trees absorb no nitrogen between leaf drop and leaf out.

I have seen many young trees burned by too much nitrogen, especially if liquid fertilizers like UN-32 (urea ammonium nitrate 32%) or CAN 17 (a clear solution of calcium nitrate and ammonium nitrate) are used in single applications. These liquid fertilizers are very effective and easy to use but it doesn't take much to burn young trees. I do not recommend using liquid fertilizers on first leaf trees; I prefer to see triple 15-15-15 (15% Nitrogen - 15% Phosphorous - 15 % Potassium) fertilizers used on first leaf trees. I like to see granular fertilizers placed at least 18 inches from the trunk. With micro-sprinkler and drip irrigation systems, liquid nitrogen fertilizers can be used very efficiently and easily by growers. But be careful; I know several farm managers who will not allow more than 10 gallons of UN-32 per acre per application on mature almond trees. UN-32 contains 3.54 pounds of actual nitrogen per gallon. If you put out 10 gallons of UN-32 per acre, you added 35.4 lbs of nitrogen per acre. If you have 120 trees per acre and do the math, you come up with 4.72 ounces of actual nitrogen per tree – almost 5 ounces! I recommend not applying higher rates than this per application. I have seen nitrogen burn occur more often during hot summer temperatures when trees have elevated transpiration rates and obviously faster nitrogen uptake rates than what would have occurred at a cooler time of the year.

Young almond trees don't require as much nitrogen as older trees. I like Wilbur Reil's (UC Farm Advisor Emeritus) rule of "one ounce of actual nitrogen per year of age of tree for the first five years". That rate can be applied several times per season, but never more than that at any one application. Thus, a first leaf (first year in your orchard) almond tree should not receive more than one ounce of actual nitrogen per any application. A five year old almond tree should not receive more than 5 ounces of actual nitrogen per one single application. The University of California only recommends one ounce of actual nitrogen per one year old tree over the course of the season, but many growers and PCAs feel that this rate is not enough for the growth they desire. So, if you must put out five ounces of actual nitrogen per one year old tree, do so in five applications and not all at once!

Brent Holtz
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Published in 'Field Notes' May issue

Spider Mites in Almonds: Monitoring and Management

May is the month that growers and pest control advisors (PCAs) start focusing on mite sampling in almond orchards. There are three species of spider mites (Pacific spider mites, twospotted spider mites, and strawberry spider mites) that can cause economic damage in almonds during the growing season. Although brown mites and European red mites are often present in the orchard as well, their populations remain below the damaging level in most cases. In fact, these two mite species serve as the food source for mite predators during the time of the year (spring to early summer) when spider mites are not abundant in the orchard.

All three species of spider mites are similar in appearance (adults are green or greenish yellow; females have large and visible black spots on their body), life cycle, feeding habit, and nature of damage to the plants, therefore, the same control measures work for all three species. Early in the season (i.e. late April-May), mites appear on tree leaves that are interior and close to the trunk, and later spread to the entire canopy as the population increases. Mite feeding on leaves results in stippled leaves, which advances to yellow leaves, leading to dropping off leaves in severe cases. The presence of webbing covering leaves and twigs indicates a high degree of infestation. Mite feeding on leaves affects the photosynthetic process, with eventual impact on tree health and productivity. Mite damage in the current year may translate into a reduction in tree growth and yield in the following years. Temperature plays a significant role in mite reproduction. Therefore, the maximum population increase occurs in the summer months (June-September). Spider mites can complete their life cycle within 7-10 days, and can have 8-10 generations per year. We do not know what level of mite population or injury results in significant yield loss in almonds. Not all levels of mite infestation warrant management intervention.

Monitoring orchards for spider mites, along with predator activities, is critical for making management decisions. A high predator-mite ratio does not require treatment intervention in almond. Spider mites do well under high temperature and low humidity conditions. Thus, water-stressed trees and trees adjacent to dirt roads are often at risk of infestation, so early sampling should fo-

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cus on those areas of the orchard. Sample at least once every two weeks during the early portion of the growing season (May-June) and weekly after that until August. If the orchard has a history of heavy mite infestation and the orchard is water-stressed, monitoring every few days may be necessary.

Mite monitoring:
UC IPM Guidelines provide a protocol for mite monitoring in almonds.

1. Dividing orchards into sampling areas is helpful to determine whether spot treatment is sufficient. Within each sampling area, sample 15 random leaves from each of a minimum of 5 trees. Sample leaves should represent both the inside and outside of the canopy. Examine both sides of the leaves with a hand lens, looking for spider mites and eggs, western predatory mites and eggs, six spotted thrips, and other predators. A picture guide of mites and mite predators is available from: http://www.ipm.ucdavis.edu/PMG/C003/m003bpmites.html
2. Count the number of leaves from each tree with pest mites or their eggs, and the number of leaves with predators, then note this on the form (There is no need to count individual mites or predators). Download the sampling form here: http://www.ipm.ucdavis.edu/PMG/C003/almonds-mites.pdf.
3. Once you have sampled at least 5 trees (total of 75 leaves), compare your total to the numbers in the "Don't Treat" and "Treat" columns on the sampling form and make decisions based on it.

Management:
Maintaining healthy trees. Irrigating orchards properly to reduce water-stress is important to reducing overall mite populations in the orchard. Also, ways to minimize dusty environment (by oiling or watering the dirt roads) and maintaining a good ground cover in the orchard can minimize mite infestations. Properly irrigated orchards may not require treatment for mites in most cases, as almond trees can tolerate low to moderate mite pressure without affecting tree productivity.

Insecticide program and natural enemies. Another important aspect of effective mite control is careful planning of the spray programs targeting other insects. Use of broad-spectrum insecticides such as pyrethroids and organophosphates in “May spray” is highly discouraged because it can disrupt the natural enemies of mites, resulting in increased spider mite populations. There are reduced-risk and growth regulator-based insecticides that are soft on mite predators. These are available for spring and hull-split worm control. Although western predatory mites are an effective predator at reducing mite populations, their presence and abundance in almond orchards have been in decline. Western predatory mites are commercially available for augmentative release. Six spotted thrips is another effective predator, especially in the later part of the season when there are abundant spider mites. Both nymphs and adults prey on spider mites. The spider mite destroyer is a black ladybird beetle predator. Both adults and larvae of the beetle feed on mites. Beetles can fly and thus can effectively concentrate in the area of the orchard with heavy mite pressure.

Use of miticide. If sampling warrants miticide treatment, there are several miticides available to use against spider mites in almonds. UC IPM lists at least 12 miticides and orders them for both efficacy and effect on beneficials. Each of the listed miticides also has comments about the products, regulatory caveats (if any), effects on beneficials, etc. This information is very helpful for making decisions and selecting products.

Jhalendra Rijal, IPM Advisor

Field Crops Observations

It goes without saying that this is a busy time of year. Winter crops are maturing, and summer crops are being planted. Over the last month or so, I’ve received some questions from the field from growers and consultants. A common theme has emerged – while winter and spring rains have been welcomed for improving our water situation, these wet conditions have resulted in some pest problems. I’ve written about these in my blog SJC and Delta Field Crops (http://ucanr.edu/blogs/sjcfieldcrops/). Some excerpts are below.

Scouting in Garbanzo Beans:
Ascochyta blight (*Ascochyta rabiei, Didymella rabiei*) is a particular problem in garbanzo beans in wet years, like what we’ve been having this year. Ascochyta blight can occur at any stage of growth and on any aerial part of the plant. Brown lesions on the stems can cause damping-off symptoms in seedlings or can cause stems to break. At the advanced stage of the disease, concentric circles of spores will form within brown leaf lesions, and these are a good diagnostic characteristic (Figure 1). These concentric circles can also be seen on seed pods (Figure 2), which can result in poor seed set, seed discoloration, and shrinkage. If these beans are used for seed, subsequent crops can get infected. Management of Ascochyta is through the use of tolerant varieties, crop rotations, certified disease-free seed, always using a seed treatment (such as Mertect), and foliar fungicides. Foliar fungicides, such as Headline or Quadris, should be applied at the first sign of the disease and reapplied if rainy weather is forecasted.

Stem Nematode in Alfalfa:
Stem nematodes (*Ditylenchus dipsaci*) can be a perennial problem in California alfalfa. They are a particular problem in the spring when the weather is cool. The alfalfa stem nematode lives and feeds in the stems and crown of the plant. When temperatures warm, they recede to the soil and go dormant until cool weather returns. Symptoms of infection include plant stunting, shortened internodes, and