



July, 2017 Orchard Task List for Pistachios
By Bob Beede, U.C. Farm Advisor, Emeritus

Crop Update: I have burned a lot of gas driving mile after mile of pistachios from Modesto to Buttonwillow, and my general conclusion is that we have a pretty darned good “off-year” crop. I have seen a lot of mature orchards with 2000-2500 pounds, and a lot of six year-old orchards with 600-800 pounds. So, I would not be surprised if the industry talks about how blessed they were in September! However, the plant bugs have been working overtime trying to get their share of it, so as you come up to early July, take a hard look at your overall insect damage to decide if yet another plant bug treatment is needed. Quite a few growers already have two plant bug sprays on due to the extended drying of native vegetation in and around orchards. Last month, I warned you about the possible late arrival of false chinch bug due to the wet winter, and sure enough, it attacked like Seal Team Six in many orchards before the damage was recognized.

Many growers and crop consultants have reported seeing flowering on the current season’s growth of Randy male trees. Figure 1 (Photo by Carla Baker, Weinberger and Associates) illustrates the unusual differentiation of the terminal meristem, and often the lateral buds proximal to it, into a flowering structure more characteristic of a female panicle (rachis). Male pollen sacs develop on the ends of the rachis, which then dehisce (release pollen) when mature. It is not known if the pollen is actually viable. This has been observed by Craig Kallsen, Kern County Farm Advisor for subtropical crops and endowed advisor for the pistachio breeding program. We also saw it last year, but not as widespread as this season. It has been suggested that environmental stress induces this behavior. Craig reports seeing it relatively frequently on Randy buds inserted into older Peters trees for enhancement of pollen overlap. None of the individuals I spoke to thought its occurrence would have any effect on the amount of viable pollen available for next season. However, we are going to attempt to study the morphology of the buds in an effort to learn what we can. So, for now, do not freak out if you see this, and worry that the Randy boy will not perform his duties next spring!

This year’s cool spring suggested to me that harvest was going to be later this year than last, since early season photosynthesis and carbon fixation is not optimized under cool temperatures. Comparison of the degree day accumulation for 2017 between March 10 and June 20 to the 30-year average suggests that 2017 is 180 D⁰ ahead of the average. Last year was 250 D⁰ ahead of the average, and 2014, a very early maturing year, was 300 D⁰ ahead. **The best way to assess the effect of spring weather on crop development is by monitoring the completion of shell hardening, and the beginning of kernel fill.** It would stand to reason that late blooming flowers would be slower to complete both of these important crop development indices than flowers that bloomed early. Noting the date of shell hardening and kernel fill annually provides a reference for comparing previous years, whose harvest date is known. It also tells you when your nitrogen, potassium and water need to be optimized to avoid reductions in kernel growth rate and increased nonsplit nuts.

To assess kernel filling, randomly collect 10 ENTIRE clusters from a selected area of the orchard in a five gallon bucket, making sure that they represent fruit borne from each of the four tree quadrants (north,

south, east, and west). Find a comfortable, shady area to work, because you are going to be there for 45 minutes. Strip the nuts off the rachises, and place the nuts in a container you can easily access. With a pair of hand shears, cut EVERY nut in half. Those preferring to cut them horizontally should hold the base of the nut while they remove the upper, tapered tip. I prefer to cut the nuts lengthwise, because it makes viewing the developing green embryo at the tip of the funiculus easier. However, cutting lengthwise must be done with greater care to avoid catching the flesh of your index finger in the shears (a bloody mess!). Rate the cut nuts for percent of complete kernel fill, and place them under one of five categories labeled 0 to 5 (0=no fill, 5=completely filled) written on a piece of cardboard, or large coffee cups. When you are finished cutting all the nuts, count the number in each category, and do the basic math to determine the percentages of each. **WRITE DOWN** the results! Performing this task at least every two weeks will tell you a great deal about what to expect at harvest relative to maturity and crop load. It will also tell you if the large bugs are having lunch at your expense by the presence of misshaped kernels or tiny dark spots in the kernel or on the funiculus. If the kernel appears to be drying up, look around the base of the nut, which is much softer and easier for the insects to probe.

Soil and Water Management: Kernel filling requires **lots** of water, nitrogen, potassium, and boron. Average water use in July is 9.8 inches (55 gal/tree/day, 150 trees/ac). August water use is 8.2 inches (50 gal/tree/day). Keep an eye on the temperatures and adjust your schedule accordingly. If you do not have any soil moisture monitoring equipment in the orchard, be sure to auger weekly to check for moisture below two feet. The surface can look mossy and wet, but the lower depths can be dry as chalk. Believe me, deficit irrigation sneaks up on you, and before you know it, your trees are stressed and limited in kernel filling rate! The amount of water applied must be greater than the tree's water requirement because of application inefficiency (70-80% efficient in basin or furrow systems, 85-90% in low volume). **Deficit irrigation, zinc or boron deficiency, and cool weather during kernel filling will dramatically reduce split nut percentages.**

Spread gypsum at one to two ton per acre if infiltration is becoming a problem. Standing water increases your foliar disease risk due to greater humidity. Irrigate every other middle rather than stretching irrigations out to reduce standing water and tree stress. This is especially critical if you are on shallow soil with limited root mass. **Remember: no water = no splits = no money!** In the WORST cases, rip down the middle of the row with a single 24" shank to get water into the root zone. The stress caused from in-season root pruning is small compared to dry trees. Irrigate IMMEDIATELY after you rip! A professional soils and water adviser can assist you in assessing the need for such drastic action.

Pest and Disease Management: Dr. Siegel's research suggests that 1700, 2200, and 2700 Degree Days from January 1 are key times for **evaluation** of your NOW population, since they mark rises in NOW activity. **EVALUATION does NOT mean BLANKET SPRAYING!** Dr. Siegel's research confirms that NOW cycles MUCH faster on new pistachios, so much so that they can complete a generation in 500-600 D⁰! Dr. Martin Barnes (Dr. NOW of the 1970's at UC Riverside) also reported this back in the 1970's. Hence, Dr. Siegel suggests orchards under **HIGH** NOW pressure may require re-treatment at 2200 **and** 2700 D⁰ from January 1. The need to do this in YOUR orchard is a decision between you and your crop consultant, SO you need to get together with your crop consultant NOW to discuss what they are seeing and what THEY recommend you do. The overwintering NOW flight ended about June 12. We have begun what we call the "second flight". The impact of the second flight greatly increases when pea split pistachios are present. At the time this was written (June 21) early pea split nuts were not present in the orchards I have been in. However, that does not mean they will NOT occur later, so be on the lookout for WHEN they occur, and HOW EASILY you find them. Pea split nuts allow the overwintering generation of NOW to transition onto the "new crop", and thus develop at a faster rate, due to the improved food source.

Between the difficulty in thoroughly winter sanitizing pistachios, and the thousands of acres of nut crops now present in the southern San Joaquin Valley with varying degrees of NOW management, it is no

surprise to me that attempts to apply IPM principles prove very difficult. This is especially true with our excessive reliance on fourth and fifth generation pyrethroid insecticides, which are very hard on the predator and parasitic insects. There are no praying mantises in the orchards these days! It is for this reason that I hope to see mass Mating Disruption in pistachio and almond before I take my last breath!

We have several excellent materials now registered for navel orangeworm control. Your selection and preparation for treatment should be made in conjunction with an experienced pest consultant. You should also **CHECK WITH YOUR PROCESSOR**, to insure that your plans do not conflict with maximum residue levels set by other countries. It is also **CRITICAL** that you keep excellent records of what you have done. This is a major component of the good agricultural practices program established by the industry

Continue to watch for leaffooted plant bug and stink bugs, which are difficult to detect after shell hardening. This is because the hull and shell **do not** develop the brown lesion characteristic of bug damage when the shells are soft. Nuts observed now with external lesion symptoms are old damage. New feeding will often show a tiny, clear bead of sap on the hull from where the stylet penetrated. Do not forget to look for new damage **at the base of the nut** where it attaches to the stem. This is the “Achilles’ heel” of pistachio since it remains softer and the insects somehow know this! Feeding at this site can cause loss of the developing kernel. Big bug feeding elsewhere on developing kernels causes distortion, sunken areas and black lesions in the meat (kernel necrosis). Carry a pair of hand shears during orchard monitoring. Select nuts randomly and cut them open to examine evidence of recent kernel damage. *Stigmatomycosis*, a fungal yeast infection resulting in wet, slimy kernels is also transmitted by the big bug mouthparts penetrating the kernel. Keep your UC/Pistachio industry insect guide handy for reference in the field.

Watch out for citrus flat mite, a common pest in July that turns the rachis and hull tissue brown from feeding. Pacific mite infestations also occasionally occur in pistachios. Unlike citrus flat mite, pacific mite can cause damage at low populations (3-5 per leaflet). Defoliation during kernel filling can greatly reduce crop quality. Research suggests pacific mites do not thrive on pistachio. Six-spotted thrips are very effective predators. My research on various miticides in 2000 indicated oils of all types were as effective as synthetic compounds. Observations also indicate the addition of spreader-stickers to oils is not advised due to possible russetting of the hull tissue which could increase the potential for *Alternaria* infection later. Slight phytotoxicity may occur with oil applications made close to wettable sulfur.

Botryosphaeria may appear early this year, due to the heavy rains and recent hot weather. Orchards with past BOT infections benefit from two sprays; one in mid-June, and another close to mid-July. The strobilurins remain very effective against BOT, because the sexual stage of this disease is not present in pistachios, and its genetics remain very stable. This is NOT the case for *Alternaria*, whose genetic makeup is constantly changing, and thus it develops resistance to new fungicides within a couple of years, depending on the frequency of application. Treatment timing for *Alternaria* is the same as that for BOT. Orchards with a history of *Alternaria* should be on their second spray by mid-July. Waiting until symptoms to appear in August is too late for disease control. High humidity and dense canopies both favor buildup of *Alternaria* inoculum. Look for patches of brown necrotic tissue on the leaves with black sooty material that rubs off on your fingers.

Fertilization: U.C. Davis research shows kernel filling is a period of high nitrogen demand. On-year trees took up 35 percent more nitrogen during kernel filling than off-year trees. The nuts accounted for more than 90 percent of the accumulated nitrogen for the entire season. The total nitrogen requirement for on-year trees was calculated at about 150 pounds. Research by Dr. Siddiqui and Dr. Patrick Brown indicate 28 pounds of N is required per 1000 pounds of ACP weight pistachios. Add 25 pounds of N during the on-year for tree maintenance. These guidelines do not include inefficiencies in application, which can run as high as 50% when applied by the water-run method. Off-year trees accumulate most of their nitrogen in the canopy branches. Yellowing of leaves adjacent to nut clusters is common in heavy bearing trees. This

occurs even when tissue levels are considered adequate (2.5%). Some growers report less yellowing with higher nitrogen applications. This has not yet been researched. .

Potassium (K) uptake is also very high during kernel filling. Research by Drs. David Zeng and Patrick Brown indicate potassium applications up to 200 pounds actual K per acre applied in equal amounts over the months of May through August significantly increased yield, split nut percentages, nut weight and reduced blank and stained nuts. Reductions in staining were associated with less *Alternaria* leaf infections at harvest. Siddiqui and Brown indicate 25 pounds of K are required per 1000 ACP pounds of pistachios. The greatest response to K fertilization was on soil whose potassium availability was limited by either low soil K or high fixation within the soil. Young alluvial soils such as those on the west side of the San Joaquin Valley are very high in exchangeable K, and thus less likely to respond to potassium fertilization, unless confounded by salinity or extremely light texture. Zeng and Brown suggest the August tissue level for K should be about 1.7% for optimum plant performance. No elevation in chloride was observed in the leaf tissue from chloride-containing potassium sources after three continuous years of application. However, consideration of orchard health, soil permeability and stratification should be given prior to performing large-scale KCL applications.

Happy farming!

Figure 1.

