

August, 2019 Orchard Task List for Pistachios
By Bob Beede, U.C. Farm Advisor, Emeritus

Crop Update: Like I said last month, the crop is good, but not a monster. It varies a lot between orchards. I think I have seen only one 5000 pound or greater crop. It is my guess that many of the orchards I have visited are around 2000-2500 pounds. What is most important now is for you to be out MONITORING your crop for early splits, navel orangeworm, stink and leaf footed bug damage, citrus flat mite, Pacific mite, and WATER STRESS! You also need to be in regular discussions with your crop consultant about what YOU are seeing, so that between the TWO of you, a clean crop can be harvested, and the fruits of your labor enjoyed! Yeah, yeah...I know...same old advice, just a different year, right? Well, if it is so simple, then how come so many of you get it WRONG? In the past two weeks, I have augered the soil of several orchards and found the soil so dry at 18 inches that it runs through my hand! That happens because farmers are not out making sure the basics are being tended to. The SIMPLE stuff! If you change the oil in your pickup every 5000 miles, the seat will probably wear out before the engine does! So, the August task list is about paying attention to the basics, so you can do the happy dance at harvest after the processor called to tell you how clean your crop was!

Monitor Kernel Filling: In 2016, the onset of kernel filling was as early as June 15. In 2017, kernel filling started closer to July 1. In 2018, kernel fill began around June 25. I estimate the onset of kernel fill in Kerman this year to be July 2-6. Obviously, it varies by orchard and location. This is why it is so important to monitor the occurrence of this critical crop development event in your own orchard. On July 9, I rated one orchard with 24% blank or yet-to-start filling, 30% just beginning to fill, 20% with kernels the size of a BB, and 18% almost the size of a pea. That is a lot of variation; you also will not know if the range in kernel development compresses with time if you do not continue to monitor nut fill. This is a SIMPLE task that does NOT get done in most orchards, because no one wants to take the time to do it. This is just like not taking time to check soil moisture with an auger, or check to see how many early splits there are, and when they begin to appear. I rarely talk to growers who are actually monitoring kernel fill. BUT, I talk to LOTS of growers who complain about poor removal at harvest, and the cost of a second shake! The rate of kernel fill will prove very valuable in estimating what percentage of your crop might be harvestable on the first shake. Cutting nuts closer to harvest will also help you decide how long you might have to wait to perform the second shake. Monitoring kernel filling also tells you if the blank nut percentages are unusually high, which could be a nutrition or pollination problem. One also is alerted to insect problems and high early split nut levels which contribute to navel orangeworm pressure at harvest.

For those of you who did not read last month's task list, I am repeating the instructions for the assessment of 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, more 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. Rate the cut nuts for 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 every two weeks will tell you a great deal about what to expect at harvest relative to maturity and crop load. That means you only have to do this about three times. **SIMPLE!**

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 to the heat and your tree spacing. If you do not have any soil moisture monitoring equipment in the orchard, be sure to auger occasionally 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. Calcium thiosulfate (CATS) can be readily applied through the drip system, therefore **reducing the time and equipment needed** to respond to reduced infiltration rates. However, one pays for this convenience, considering the fact that 95% ag-grade gypsum is presently about \$163 per ton, and the price I was quoted for a ton of calcium thiosulfate was \$370. There is about 120 pounds of actual calcium per ton of thiosulfate, compared to about 450 pounds per ton of 95% gypsum. Although ads claim CATS is a more efficient amendment than gypsum for saline or saline-sodic soils, the fact is that solution-grade gypsum has excellent solubility in water, and can be readily injected into drip systems. I will certainly agree that CATS is **EASIER** to use, since you do not have to concern yourself with the bicarbonate concentration of your well water, but ease of use has nothing to do with soil reclamation chemistry. No, I do not hate CATS! I am simply pointing out the **CHEMICAL FACTS** regarding the difference in available calcium between the two products. You are welcome to apply CATS if you feel it works better to you, but please do not try to convince me that you are getting more free calcium for your dollar than you do with high-grade gypsum. 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.

Navel Orangeworm Management: Are you as sick as I am of our constant yakking about **NOW**? Well, the processors aren't! They send me a freshly baked fruit cake every time I bang on you guys about worm management, because clean pistachios are so much easier to sell than wormy ones. Simple, right? **WRONG!** In my 40 years as a farm advisor and consultant, I have never experienced a pest as difficult to control as **NOW**. The vast almond and pistachio acreage, the difficulty in winter sanitation, the challenge in treating thousands of acres in five to seven days, the poor spray coverage, and migration of moths from one orchard to another make this a **VERY** difficult pest to control. Navel orangeworm and cockroaches will be the two survivors of a nuclear holocaust!

Dr. Siegel's research suggests that 1700, 2200, and 2700 Degree Days from January 1 are key times for **evaluation** (**neither** Dr. Siegel nor I are suggesting that these are automatic spray timings) of your **NOW** population, since they mark rises in **NOW** activity. As of July 22, this model suggests the degree day accumulation is around 1900 in the southern San Joaquin Valley. This is a general statement based on public weather data, not the weather data being collected in your orchard. Dr. Siegel's research (and that of Dr. Martin Barnes, UC Riverside in the 1970's) confirms that **NOW** cycles **MUCH** faster on new pistachios, so much so that they can complete a generation in 500-600 D⁰!. Hence, Dr. Siegel **suggests** orchards under **HIGH** **NOW** pressure may require 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. There is NOTHING in this paragraph TELLING you to do anything! As of July21, I have not found an orchard with numerous pea split pistachios. The orchards most recently scouted are on the west and east sides of Kings and Fresno County. The absence or late arrival of early split nuts is GOOD, since it assists us in reducing NOW damage at harvest, because they are the link between the overwintering NOW generation surviving on the mummy nuts and the new crop. The arrival of early split nuts needs to be monitored by the grower, irrigator, and crop consultant to detect NOW egg laying activity. Although these pea-sized nuts typically get consumed by larva feeding on them before harvest, they serve as an excellent indicator of NOW activity, especially in orchards with mating disruption, where the adult traps are shut down. Make note of what stage of NOW development you find (eggs, tiny worms, large worms); this tells you how strung out their development is. Later in the season, NOW generations overlap, and all the stages seem about equal.

We should reach the Siegel 2200 degree-day mark early next week. The following are factors I take into consideration for possible treatment: 1. NOW history, excluding 2018, since we got a pass on worm damage due to great hull integrity. I showed this effect back in 1983 and 1984. Brad Higbee repeated hull integrity tests recently, and got the same results; smooth hulls without splitting, tearing or breakdown are not favored NOW oviposition sites. 2. Sanitation level. 3. Overwintering moth trap counts or egg laying consistency. 4. Presence of Nonpareil almonds within 2 miles of my orchard. 5. Time of occurrence and abundance of early splits. Use the runt trees as indicators. 6. Big bug pressure; pyrethroid insecticides kill NOW as well as stink and leaf footed bugs. 7. How long it will take to treat the orchard at 2700 degree days after the Nonpareil's are harvested, and NOW migration into my pistachios is in progress. If I treat at 2200, I have at least three weeks residual on my smooth pistachios. Thus, if almond harvest impacts my NOW population, I have some protection until I can treat at 2700. Although the FACTORS are supported by good science, the value of treating at 2200 degree-days is still an OPINION. This OPINION should be discussed with YOUR crop consultant! August-only treatments may not provide sufficient NOW control in orchards with high populations. By August, NOW development is strung out and generations are overlapping. Hence, a single treatment is unlikely to provide sufficient residual to reduce damage by much more than 50%. Use of the sprayable pheromone by air is also a possible treatment. It supposedly provides 30 days of mating disruption, and one could cover large acreages quickly.

Finally, it is recommended that your normal pesticide spray program continue for at least two years following the implementation of Mating Disruption (MD), since MD is NOT a stand-alone program. Research in other crops using MD shows a gradual depression in insect pressure, which allows reduced pesticide use in future years. We are still challenged by not being able to assess the NOW population within individual orchards. This makes it difficult to determine when reduced pesticide treatments can be considered.

More Pest Management: Watch out for citrus flat mite, a common pest in July that turns the rachis and hull tissue brown from feeding. Continue to watch for leaf footed 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 (epicarp lesion) earlier in the season when the shells are soft. Hence, nuts observed now with external lesion symptoms are old damage. Feeding **after** shell hardening 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.

Pacific mite infestations 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 russeting 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.

Orchards with a history of *Alternaria* should have received their second spray in mid-July. Waiting until symptoms to appear in August is too late for disease control. It is not too late to apply nitrogen and potassium for kernel filling, providing you get it on by early August. *Botryosphaeria* may appear in August in some orchards. 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. Do not wait to treat for *Alternaria* in August when symptoms appear, because it is then too late. 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.

New Trees: Budding of newly planted orchards got into full swing in mid-July and will continue into mid-August. Trees can be budded in September, and the decision to push the bud or not is up to the grower and the adviser. Buds pushed late are tender and subject to early freezes. Follow the budder's instructions for irrigation and post-budding plant management.

I do **not** advise tipping secondary branches in an attempt to develop tertiaries during the second season. My experience is that it only works on highly vigorous trees. Carl Fanucchi has shown me second-year trees with strong tertiary growth from secondaries tipped as late as early August in Buttonwillow. However, I have seen insufficient, weak growth from the same practice in most orchards. Properly assess

your orchard's vigor with your tree trainer before attempting this. There is always next year! Tying vigorous limbs into the desired upward position now prevents flat scaffolds in the winter. Above all, be careful about too much water. Also, be on the lookout for zinc, boron or copper deficiency, all common in young trees. They will stop new growth! Tissue sampling should also be scheduled soon for all orchards. Happy farming!