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JUNE 2019 PISTACHIO TASKLIST

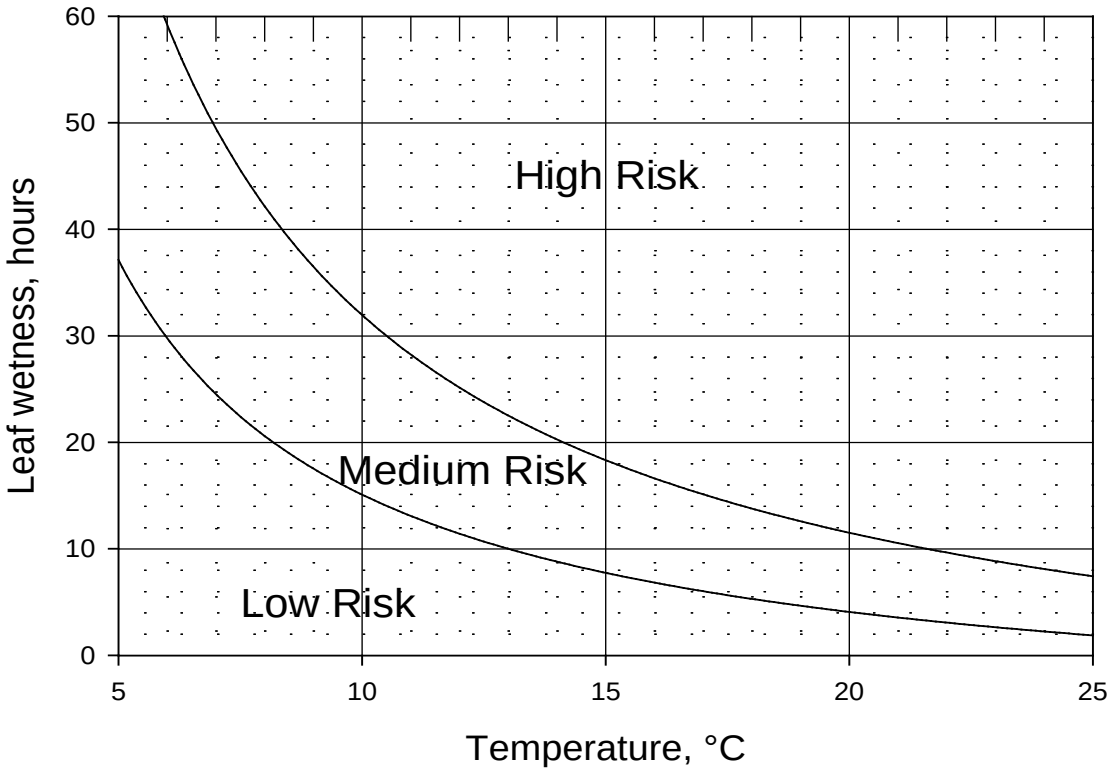
By Bob Beede, UC Farm Advisor, Emeritus

Disease Watch: The weather people finally got it right this past week; it REALLY rained! However, my heart was hardened about their predicting a good storm, since many of the previous predictions proved false. Since we are only two or three weeks away from our first *Botryosphaeria /Alternaria* treatment, I was inclined to let this "non-event" pass like refried bean gas, and stay the course on Dr. Themis Michailides' two-spray program in June and July. This inclination was further supported by the fact that many of you are now applying a fungicide during bloom for these diseases and *Botrytis.* Although justified in Northern California, where the BOT inoculum is routinely high, the BOT inoculum levels and rain events are not typically high enough in the Southern San Joaquin Valley to warrant the bloom fungicide spray. This is especially true on the Westside of the Valley, where BOT is not a problem. Obviously, there are exceptions, such as old orchards with minimal care or ones which are historically prone to Botrytis and/or BOT infection. Justification for a bloom fungicide treatment of these "at risk" orchards can be obtained from surveying the 1-6 year-old wood for sunken cankers, examining the persistent fruit rachises for necrotic tissue extending from their base, and performing the BUDMON test to determine how many flower buds are blackened during the winter. Of course, very few growers wish to do this, and PCA's are paid so little per acre that they cannot afford the time to do it; thus, the easy solution is to just apply a fungicide at bloom time. That approach will work, until we run the course of the powerful fungicide classes we presently have. It's a good thing we do not have the sexual stage of BOT in pistachio, or these prophylactic treatments would be accelerating the rate of resistance development.

Now that I have the bloom fungicide treatment off my chest, let's return to the most recent rain event. Because most growers are subscribing to the "two spray" fungicide program in June and July for both BOT and *Alternaria,* the inoculum levels of these two diseases should be at low levels. Thus, given the "predicted" rain, I questioned the need to make an extra treatment for them. However, the recent rain did not turn out to be a "splash and go". It rained up to 1.5 inches in some locations from Merced County south over a three day period, and they are predicting more rain during the week of May 20th. The temperatures have also been cool in between the rains, with overcast skies that raise the humidity. This increases the duration of leaf wetness, which is key to increasing the distribution of BOT inoculum from hold-over cankers in the branches. Figure 1 shows this relationship. Themis describes an "infection event" as one with a quarter inch or more of rainfall with ambient temperatures greater than 50^0 F. and a leaf wetness duration of 12 hours. Figure 1 shows that the risk of infection varies with ambient temperature (5,10, 15, 20, 25^{0}C = 41, 50, 59,68, 77^{0}F), and duration of leaf wetness. Leaf wetness is a parameter which is actually measured by some weather stations, but unfortunately the CIMIS stations do not presently have this capacity, and will not in the near future due to budget constraints. Those of you wanting actual leaf wetness data could obtain it through private weather stations which are relatively common in the south valley. The rest of us, for now, must rely on our intuition to estimate how long after a rain event the leaves remain moist. Obviously, if it rains at night, the hours are high, providing the threshold 50^{0}F is met. If it rains early in the morning, and then the sun comes out and the wind blows, leaves may only be wet for an hour or two. You can see from Themis' figure that it takes about 14 hours of accumulated leaf wetness at 55^0 F (11^{0}C) to begin thinking about needing to treat for

BOT. **DO NOT** forget about past disease pressure in making this decision! Also remember that we are presently discussing INFECTION events, NOT SYMPTOM events. In the spring, the BOT pycnidiospores infect the leaves and nut clusters, but the infections do not express themselves until hot weather arrives in the summer. This is why the June-July treatment window has proven to be most effective. Fungicides applied at that time control the development of the infected tissue.

Figure 1. Relationship between the duration of leaf wetness and temperature in assessing the risk of a *Botryosphaeria* infection event.



OK, so enough science! All the above supports the fact that it rained a lot more than I expected, so we certainly had a high infection event in some areas, in terms of the ENVIRONMENTAL conditions conducive to BOT infection, BUT DO YOU HAVE ENOUGH INOCCULUM TO JUSTIFY A SPRAY TWO WEEKS AHEAD OF YOUR NORMAL PROGRAM? Obviously, the only way to estimate that is to do the homework I described earlier in this task list. If you have not been treating for BOT in June and July, and have seen some blighted clusters at harvest, I would say a spray is justified NOW as well as in June and July. Many of the modern fungicides active against BOT have what we call "kickback activity", meaning that their translaminar properties allow them to be effective in disease control for as much as 96 hours after the infection event. Consult with your crop advisor on specific materials.

Botrytis can be another problem caused by these late rains. Think of *Botrytis* as an opportunist. This fungus hangs out on the bud scales and surrounding wood during the winter. During wet springs, the spores germinate ~~germinate~~ and are splashed and germinate onto the emerging green tissue. In persistent wet weather, the fungus infects the tender shoots of male and female trees, forming a tuff of buff-colored spores around the base of the emerging shoot or blighted cluster. The shoots then wilt, become a dark green, and resemble a shepherd's hook. Infected shoots are NOT hard, but flaccid to the touch. *Botrytis* also penetrates the shoots and flowers, and causes a canker to develop in the wood tissue. You can find it by cutting into the wood at the base of the flower or shoot. Rain continuing into the fruit set period can cause

infections to the rachis tissue and subsequent loss of part or all of the cluster. Fruit infection is more common on trees 6-8 years old. The degree to which a given orchard suffers all the above awful symptoms depends on how much of a problem you have had in the past, and how much rain and humidity you have experienced. We have not had *Botrytis* problems for several years, so it tends not to be thought of until we get weird springs like this one. *Botrytis* makes ranch managers and PCAs understandably uncomfortable, since the wilted shoots become focal points for those seeking to find fault.

Alternaria control by fungicidal treatment is becoming difficult. For this reason, it is critical that growers faced with a serious *Alternaria* problem acknowledge the role humidity and prompt harvest plays in escaping serious defoliation and shell staining. It is too late to open up the canopies now for improved air movement, but this is something growers with chronic infection must do this winter. The quick and cost effective way to achieve an open canopy is to perform side hedging. The depression on next year's yield is proportional to how crowded the canopy is. Expect some loss, since you will have to cut every row to improve air movement sufficiently to reduce your dependency on *Alternaria* sprays.

Cultural practices which can be performed immediately to reduce humidity include the application of gypsum for improved water infiltration, basin irrigating every other row during kernel filling (late June to harvest), and applying less water more frequently. After 30 years, I have seen many growers whose standing water problem is associated with their "stacking" the water into the furrows or basins by making irrigation set times of 24 hours or more. If you are doing this, I wish to remind you that you are spending a lot of money on electricity or diesel to donate almost **one-third of an inch of water per day** back to the environment due to evaporative losses! That means one inch of water every three days! So, get those flood set times down to 12 hours if your system and water availability allow it, improve your irrigation uniformity, and avoid applying more water than your soil can infiltrate.

If you anticipate an *Alternaria* problem, **prompt harvest is a must**, if you do not want to lose a lot of your clean open splits to dark staining. This is especially true if harvest weather turns hot, since the hulls will break down even faster.

Crop Status:
The cool spring has also contributed to slower crop development. I have mentioned in many past Task Lists that spring temperatures have a greater effect on date of maturity than summer heat, because cool spring weather does not optimize carbon fixation. The lower rate of carbon accumulation cannot be "made up for" by hot summer temperatures, because the plant has to limit its water loss for survival. Thus, the rate of photosynthesis does not continue to increase with temperature. In fact, it is possible that super hot days in the summer may burn extra fixed carbon from higher respiration rates. This may all seem like science Mumbo Jumbo to you, but it is actually VERY important that you understand how heat affects your ability to produce a big crop! Spring temperatures could collectively result in some pistachio orchards not being ready to harvest until mid September. We will know more about maturity when we determine the shell hardening date.

Water: Average pistachio water use (ETc) for June 1-15 is 4.00 inches and June 16-30 is 4.6 inches. As you know, it has been cool this spring, thus reducing water use by as much as ten percent. Research by Dr. Goldhamer indicates regulated deficit irrigation (RDI) during growth stage 2 (late-May to late- June) can be safely implemented at 50% of full ETc **on deeply rooted trees** with no adverse crop effect. This would mean one rather than two, four to five inch irrigations in June. Be sure to meet full ETc by the beginning of nut filling. Do not consider RDI if you are on shallow soil and are already struggling to adequately irrigate during kernel filling.

Nutrition: Nitrogen fertilization was covered extensively last month. Research now suggests that 1000 pounds of dry, in-shell pistachios requires 28 pounds of actual N. About 25 pounds of N is needed for tree development. Kernel filling begins in late June, and is THE most demanding sink for N. For that reason, I

suggest that 75% of your total nitrogen management program be applied from late June to early August, when demand is greatest. Your nitrogen management program should include tissue, soil AND water analysis to quantify all sources of N and insure that excessive nitrates are not accumulating in the soil from over fertilization.

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 splits over the months of May through August significantly increased yield, split nut percentages, nut weight and reduced blank and stained nuts. Reduced staining was associated with less *Alternaria* leaf infections at harvest. This research was conducted on San Joaquin, Yolo and Arbuckle soil series. The greatest response to K fertilization was on the San Joaquin soil series which is lower in total K and less likely to bind the applied K to the clay types in that soil. Young, alluvial soils such as those on the Westside are typically very high in available potassium and less likely to require as much supplementation. Zeng and Brown suggest the August tissue level for K should be about 1.7% for optimum plant performance. The high fixation capacity of some soils requires large K applications to saturate the soil exchange sites and increase K tissue levels. Growers using surface irrigation should therefore band the application. This saturates the exchange complex of the clay and provides more K in soil solution for uptake. Three continuous years of potassium chloride application did not elevate chloride in the leaf tissue. However, consider orchard health, soil permeability, salinity, stratification and deficit irrigation before performing large-scale KCL applications. Siddiqui and Brown calculate the annual K requirement at 25 pounds per 1000 pounds in-shell ACP weight.

Insects: Gills mealybug crawler emergence has been slowed by cool spring weather in many locations this year. Check with your crop consultant. Early to mid-June is typically when most of the crawlers have moved out from under the adult females. This treatment is important in orchards with significant pistachio Gills mealybug, since control programs for the second generation have been less effective. The next opportunity for control should be in late July. **Be sure to discuss your choice of insecticide with your processor BEFORE treating, to insure there are no concerns about acceptable residues.** In addition to birds, pistachio mealybug is readily spread by harvesting equipment, so growers are advised to inspect the harvesters upon arrival to minimize the need for this expensive treatment. David Haviland, UCCE Kern County Entomology Farm Advisor, is an excellent resource for additional control information.

Also watch for light browning of the nut rachis and fruit from citrus flat mite. This often goes undetected until economic injury has occurred. Control is easily achieved from 30-40 pounds of dusting sulfur per acre or 15-25 pounds of wettable sulfur. Finally, keep your eyes and ears pealed for stinkbugs and leaffooted bugs, which could become significant in June, prior to kernel development.

Happy Farming!