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JUNE 2020 PISTACHIO TASKLIST

By Bob Beede, UC Farm Advisor, Emeritus

What Happened at Leaf Out? First, I want to thank pistachio growers Carl and Ron Fanucchi, and Chris Wylie, for sharing their observations and weather data with me. Thanks also to Craig Kallsen, UC Farm Advisor, Kern County, Kevin Day, UC Farm Advisor Emeritus, Tulare County, and Dr. Louise Ferguson and Dr. Z (Maciej Zwieniecki) for entertaining my questions and offering their thoughts on rest satisfaction, carbohydrate (CHO) assimilation, and field experiences. I think Kevin Day best described the arrested canopy development of many young pistachio orchards by the term, "False Spring". Craig Kallsen's excellent and recent newsletter also provided data and observations supporting the concept that warm temperatures in early March triggered trees to initiate growth, but subsequent cold, rainy weather stalled leaf expansion. Thus, absence of the thermal energy required to drive leaf out greatly limited the tree's capacity for replenishing carbohydrates depleted from bud break and periods of high winter temperatures. Weather data provided by a very professional farming operation in the Huron area also showed a sudden drop in temperature the night of March 17 to a measured 34^0F. This could have added cold injury to the pre-mature leaf out. Most of the delayed leafing symptoms are observed in the 4-8-year-old trees if it can be linked to the False Spring concept. However, I also observed delayed leaf out in older trees which I attribute to inadequate winter chill.

Dr. Z's Citizen Carbohydrate project suggests that young pistachios enter the fall with less CHO than mature trees. The CHO's are also cycling within the tree during the wintertime, and ambient temperatures of 65^0F create bud temperatures of 75^0F, which are not only well above the "threshold" of 45^0F, but most likely cause further depletion of stored CHO. Although dormant pruning of young, vigorous trees reduces the total CHO of the tree, I do not know of any research suggesting the remaining buds on pruned trees are at greater risk of inadequate CHO for bud break. To the contrary, heading cuts remove MORE buds than thinning cuts, and LESS CHO, because less wood mass is removed from a heading cut. The greater CHO per remaining bud on a headed branch is the cause for the rapid spring growth of shoots proximal to the cut. Hopefully more research will be done on the CHO status of young pistachios grown in regions differing in winter temperature patterns.

Unfortunately, most of you still do not have temperature recorders in your orchards, so you really have no way of accurately quantifying what's happening. The pistachio industry has also never developed the "sentinel stations" Carl Fanucchi and I suggested several years ago. These stations were to be positioned in locations we selected for chilling variation. The temperature data collected, along with some simple assessments of bud break and rate of bloom, would prove invaluable to the industry and researchers attempting to explain odd tree behavior. These stations could also prove very useful in refining the chill hour requirement and help us understand how warm winters affect rest satisfaction.

In addition to the False Spring, winter water status appears to have an effect on normal bud break. In late January, I made a farm call on a young salt-affected Golden Hills orchard near Arvin. Given the weak growth of the sodium-compromised trees, I recommended a "kill'm or cure'm" approach to the worst 20 acres. Although late in the winter to be leaching, I suggested we immediately apply two ton of high-quality gypsum, rent gated pipe, and flood the area with at least one acre foot of water. To our surprise and glee, the flooded trees leafed out normally and fully (Fig. 1), in striking contrast to the same trees directly across the drive which were struggling to emerge on April 22 (Fig. 2). Carl and I saw this same water effect back in 2015, when limited water allocations for a westside orchard on Highway 46 resulted in male Peters trees attempting to bloom in June! For that reason, I began recommending assessment of orchard soil moisture after the first of the year. Donnie Rose, long-time manager of Kettleman City Pistachio, always applied a hefty irrigation in January. When I shared my Arvin experience with Kevin Day, he told me he has long recommended shipping fruit growers irrigate heavily in January to insure earlier, more uniform bloom critical to economical thinning and slightly earlier maturity. Kevin also stated irrigation after January does not have the same effect. The physiology of this irrigation and its timing needs to be understood. Is it a function of improved CHO availability? Plant growth regulator synthesis? Notice the amount of suckering between the two photos. These are clonal UCB-1rootstock; the degree of suckering suggests the scion is the growth limiting factor, and not the rootstock. So…. what factor limits scion development? It would not appear to be CHO deficiency, because the flooded trees have leafed out normally! Could dry soil be affecting the CYCLING of the CHO's? By the way, the grower did NOT have a temperature recorder in this orchard, but it is my guess that this low area of Kern County is NOT chill limited. The leaf out of the flooded trees would seem to support this opinion. The delayed trees did finally fully leaf out…. two to three weeks later!

Figure 1. Fourth–leaf Golden Hills pistachios showing normal leaf out 4/22/20 after being flooded in early February.

Figure 2. Fourth-leaf Golden Hills pistachios not leached directly across the drive showing slow leaf out 4/22/20.

Although the above orchard most likely suffered from the False Spring, I reviewed a series of orchards April 27, at different elevations in Coalinga which strongly suggested inadequate chilling could also cause this season's poor leaf out and fruit set. Figure 3 is a seven-year-old Kerman orchard at 610 feet elevation. This is above the 550-foot level Carl Fanucchi uses to guide growers in new orchard establishment. This orchard is well cared for and quite vigorous. At the upper edge of this orchard, I found a neighboring 23-year-old Kerman orchard at 637 feet with much less vigor but loaded with spurs and developing clusters (Fig. 4). This shows the effect of tree age on rest

satisfaction. Young trees typically have a higher chill requirement than older trees of the same variety. I do not know why this is the case. Figure 5 is another 23-year-old Kerman/Peters orchard at 500 feet. This orchard was not as leafed out as the older orchard in Fig. 4. The tree in the foreground is a Peters male which is much less developed than the Kerman's. This also supports the inadequate chill hypothesis, since the chill studies suggest Peters requires as much as 150 additional hours more than Kerman. The last orchard observed was a 12-year-old Kerman/Peters planting at 411feet (Fig.6). Even at this lower elevation, the Peters male in the foreground was considerably behind the Kerman's in leaf out, but pollen release appeared to overlap with the Kerman bloom due to the numerous well-developed clusters. This is a classic example of how orchard weather stations could assist in determining how much of this delayed leafing is inadequate rest and what role spring temperatures played.

Figure 3. Seven-year-old Kerman/Peters orchard at 610 feet. Coalinga, CA. 4/27/20.

Figure 4. Twenty-three-year-old Kerman/Peters orchard at 637 feet. Coalinga, CA. 4/27/20

Figure 5. Twenty-three-year-old Kerman/Peters orchard at 500 feet. Coalinga, CA. 4/27/20.

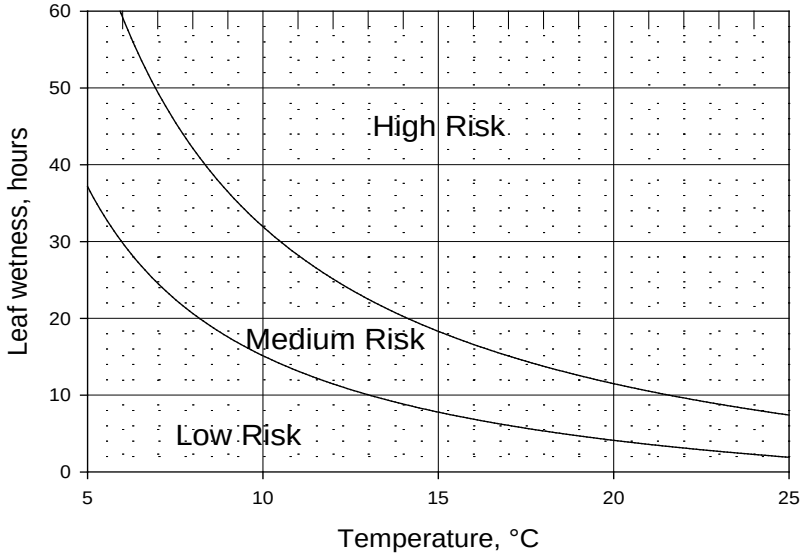
Figure 6. Twelve-year-old Kerman/Peters orchard at 411 feet. Coalinga, CA. 4/2720.

As Craig Kallsen stated, growers should not expect the late bloom to set much, if any, fruit. Many of these inflorescences dry up and dehisce shortly after emergence. Growers with these late leafing orchards can also expect late harvest, and possibly greater navel orangeworm pressure.

Disease Watch:

Themis describes a *Botryosphaeria* "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 7 shows that the risk of infection varies with ambient temperature (5, 10, 15, 20, 25^0C = 41, 50, 59, 68, 77^0F), 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 50^0F 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 (11^0C) 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 7. Relationship between the duration of leaf wetness and temperature in assessing the risk of a *Botryosphaeria* infection event.



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 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 late spring rains. Think of *Botrytis* as an opportunist. This fungus hangs out on the bud scales and surrounding wood during the winter. The spores germinate and splash 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. 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 symptoms depends on how much of a problem you have had in the past, and how much rain and humidity you experience. We have not had *Botrytis* problems for several years, so it tends not to be thought of until we get spring rains. *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 in the 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 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!