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# Pistachio Task List for December, 2019

By Bob Beede, UCCE Farm Advisor, Emeritus

A very dry, warm November has provided additional time to prep land for planting next spring, tune up the herbicide rig for your pre-emergent berm treatments, apply soil amendments for salinity management, and begin pruning and winter sanitation. It is ALSO time to purchase and install a simple temperature recorder in each orchard, so that you have real-time weather data to refer to for chill accumulation and assessment of freeze events. Accurate, local weather data is THE missing item to assist growers in determining their chill portions. **Every grower, large and small, should have at least one in every orchard with a different elevation or micro-climate!** Having your own weather data may also prove to be valuable for support of a crop insurance claim. The CIMIS stations appear to be less reliable in recent years. Several of them have reported erroneous or no data. These stations are also designed for assessment of ET, NOT chill portions. I know of ranches whose chill portions vary by 20 percent, due to elevation. Remember that December and January are the two most important months physiologically for rest satisfaction in deciduous trees. Thus, you need to be planning NOW for chill assessment, since we cannot predict winter temperatures and the need to apply diffusion or reflection materials which partially mitigate warm weather in January. Chill portion accumulation began November 1. As of November 26, we have four to five chill portions. This is less than some past years, but not alarmingly low; the past two good chill years had similar values by this time.

For real time updates on chilling hours by CIMIS station, or snowpack and reservoir conditions, go to my website at: http://cekings.ucanr.edu/Agriculture/Grapes_Tree_Fruits_Nut_Crops/. Select "Management" in the main menu, then "Chilling hours" or "water and weather". The Department of Water Resources has a new site for the snowpack plots, but my webpage link will get you to it.

Also, UC Farm Advisor, Kurt Hembree, has lots of helpful pistachio weed information at this website: https://ucanr.edu/sites/Weed_Management/files/277976.pdf. Those of you with fleabane problems really need to understand that there are TWO germination periods (fall and late winter). The prevention of seed production is a must for successful control. Late fall applications of expensive pre-emergent herbicides effective against fleabane and horseweed (marestail) fail to control plants having emerged in early October, which do not grow vigorously above ground, but develop a very extensive root system. Thus, they appear in mid-February to be newly emerged, but are now very difficult to kill. So, you cannot let fleabane become established, especially in young orchards, because the cost to control it rises with every missed opportunity. Some growers have resorted to hand weeding it out, which could make the cost of the expensive herbicides very reasonable! Kurt has lots of good advice on the internet for management of difficult weeds such as fleabane and horseweed. You ROCK, Kurt!!

**Do "Rest Enhancement" Cover Sprays Pay?** Simple answer; I do not know. There has not been a long-term, replicated trial using kaolin or calcium carbonate-based products to declare their economic value. Field reports indicate some growers have begun treatment of these products in mid-November as a precaution. The use rates of the various kaolin-clay products vary from 25 to 40 pounds per acre. The liquid calcium carbonate is typically applied at four gallons per acre. Re-application is recommended after

significant rainfall. Applications are not presently advised in February, unless one desires to delay bud break and bloom due to the risk of spring frost in your growing area. The cost per application is estimated at $80-90 per acre.

Calcium carbonate-based diffusion materials work differently than kaolin-based clay materials. **Kaolin clays reflect light to reduce the absorption of solar radiation** by plant tissue such as flower buds. It is also marketed as a finely ground powder, which growers report to be more difficult to apply than liquids. In contrast, **liquid calcium carbonate crystals modify the incoming light through a process called double refraction**. This essentially divides the light rays as they intercept the crystals, and thus reduces their energy. Incoming light can also hit the crystals whose size matches the incoming wavelength, resulting in a so-called "sparkler effect" in which light is dispersed in multiple directions. Both light division and the sparkler effect reduce energy absorption by the plant, resulting in lower temperature. My intent in describing the methodology of calcium carbonate is NOT to suggest it is better than kaolin-clay. It is simply to inform the reader that kaolin-clay and calcium carbonate are distinctively different in their mode of action.

Application of these products is intended to reduce the flower bud temperature. Carl Fanucchi and I worked with Tim Baker, co-owner of the Diffusion product, three years ago to measure what effect calcium carbonate crystals had. Tim inserted tiny thermocouples into the flower buds without injuring them; the data showed a $10^0$F decrease in bud temperature. Any reduction in winter bud temperature theoretically benefits the tree by decreasing plant respiration rate, and thus, stored carbohydrate consumption. However, a $10^0$F reduction in temperature would theoretically only improve rest satisfaction if lowered bud temperatures to $45^0$F or below; this is the recognized threshold for chill accumulation. This is possibly why Dr. Gurreet Brar found that whitewashing pistachio trees in 2015 lowered bud temperatures, but did not effect chill accumulation significantly.

It is unfortunate that another UCCE farm advisor was unable to continue the "rest enhancement" research started by David Doll, former Farm Advisor, Merced County. Teamed with Valley Orchard Management, they began a kaolin-clay (Surround) trial during the 2014-15 winter. Kaolin-clay showed a 200 to 250 pound increase in APC yield over untreated trees when applied prior to the 2015 season. In 2016, trees treated with dormant oil yielded more than either the untreated or Surround treated trees. In 2017, the untreated, Surround, and Surround plus oil treatments yielded more than oil alone. The Surround plus oil treatment has yielded the most over two years. However, this is insufficient data to recommend any of the treatments. David believed the test results were partly associated with differences in rest satisfaction, since Surround application provided approximately 10 percent greater chill portion accumulation from lower flower bud temperatures. The 2014 winter was well below the chill portions required for adequate pistachio rest; hence the kaolin treatment was more valuable. High chilling during the 2015 winter rendered the kaolin treatment less valuable in 2016, and the reduced yield in 2017 from the winter oil treatment could simply be an alternate bearing effect. Our lack of understanding the physiological effects of oil, reflective, and diffusion materials makes this research very difficult. It is going to take a more organized, multi-disciplined effort to better define the causes and effects.

If you do decide to apply kaolin clay or calcium carbonate crystals, leave some untreated areas for comparison. Also, re-treatment after an estimated half inch of rain is necessary to maintain the temperature-depressing effect. That could easily mean three treatments over the winter.

**Winter Sanitation and Navel orangeworm (NOW)**: Everyone still agrees that sanitation is the cornerstone of a good NOW management program. Destruction of residual nuts remaining in the trees and on the ground is critical to breaking the NOW life cycle. If navel orangeworm is a problem in your orchard, I would begin knocking the mummy nuts onto the ground **as soon as possible**, since you want them exposed to rainfall for decomposition. It is well known that pistachios are NOT easy to clean up. We

leave lots in the trees, in the crotches, and on the ground after harvest. The difficulty is largely related to the small size of pistachios, compared to almonds or walnuts. One pound of pistachios contains about 375 in-shell nuts compared to about 184 in-shell almonds and 50 walnuts. Pistachios are also harder to destroy; due to their lighter weight, they resist being sucked up and broken by the flail mower. The high air velocity of some equipment used to blow the tree berms free of trash and overwintering nuts can also deposit some mummies into the adjacent tree row just cleaned. They also get imbedded into the soil around the base of the tree where the ground cracks loose from shaking. Depending upon how worn the rubber guards are on the shaker frame, the amount of nuts left during harvest at the base of every tree can range from a few to as much as a couple handfuls. In spite of all these challenges, growers with NOW problems have to do what they can to destroy as many mummies as possible. As you grumble during this arduous task, just remember that every successfully overwintered NOW female produces up to 85-100 eggs in the spring. So, it does not take very many pistachios left per acre to generate a lot of moths for next year. Sanitation is also a COMMUNITY EFFORT! This may be one reason why some areas are more prone to high damage. NOW pressure is also most likely increasing in the southern San Joaquin Valley due to more acres of almonds, pistachios, walnuts and pomegranates.

Growers need to realize that sanitation is supported by both past and current research! During his tenure at Wonderful Farms, Brad Higbee concluded after 100's of hours of detailed research, that winter sanitation remains the cornerstone of effective NOW control. His data from large trials supports this long-standing UC IPM position. Dr. Siegel also has extensive data to support this practice. So, if you do not want NOW problems, you had best do the sanitation thing to the best of your ability! Dr. Kent Daane, research associate Glenn Yokota, and I found from a three year study that there was greater and earlier NOW emergence on bare berms and in cover crops. Discing in the mummies greatly reduced the percent survival. Deep incorporation was no better than regular disking. Brad has data to show NOW larva can even crawl out from beneath the soil.

**A Word About Mating Disruption**: **Do it!** Navel orangeworm biology continues to challenge the minds of the world's best entomologists. The population of all living things on earth is reduced from less successful sex! We still do not have a method for assessing the NOW population within individual orchards. Thus, we cannot tailor the pest management programs. Orchards with past NOW damage benefit from mating disruption. Area-wide mating disruption further suppresses the chances of successful mating, and damaging populations at harvest. Use all the tools available to you! The past two seasons have given us a reprieve from this complex pest. We may not be so fortunate in 2020! Also, I STILL believe that not allowing researchers access to ALL the grade sheets for the industry to assess hot and cold spots annually using population statistics is a BIG MISTAKE! If we knew of locations which were consistently high and low in NOW damage, we might find another big piece to the puzzle.

**Pruning**: The goal of a good pruning program is to manage the canopy over the life of the orchard in such a manner as to achieve the maximum possible yield of clean open split-nuts from an efficient harvest. In our quest for this goal, we must couple our knowledge of how pistachios grow and fruit with the research data developed over the past 30 years. One thing to remember about pruning is that we must think in terms of **TWO** years, rather than just **NEXT** year if we want to better manage alternate bearing. Pruning harder prior to an on-year improves the yield during an off-year, in my opinion. Dr. Ferguson and I have begun a project to test this hypothesis.

Let's first briefly review what we know about the growth and fruiting habit of pistachio. This tree is very apical dominant, meaning that it does not branch readily and grows mostly from the terminal bud and one or two lateral buds behind it. Therefore, branching must be forced by removing the end portion of a limb, known as a heading cut. Heading cuts are performed regularly during the training years to develop the desired branching. Because of pistachio's apically dominant nature, it also does not develop girth (enlargement of

trunk and limb diameter) rapidly. Consequently, main structural limbs have to be headed shorter than desired in order to keep them upright.

The fruiting characteristics of pistachio also greatly influence pruning. Flower buds are born on one-year-old wood, typically towards the base of medium to long shoots and adjacent to the terminal vegetative bud on short shoots (spurs). The lack of lateral branching causes the fruit-bearing wood to become increasingly distant from the central axis of the tree. Failure to contain the tree canopy to a diameter of about 17 feet results in crop falling onto the ground at harvest due to the limited size of the harvest equipment.

Eventually, the main structural limbs bend downward during the on-bearing seasons from the weight of the crop. Without corrective pruning, the pistachio tree canopy begins to take on the appearance of an umbrella. This combination of less upright fruiting limbs and their greater distance from the tree's center creates major problems for effective harvest. The high energy imparted to the trunk by the shaker can no longer be sufficiently transmitted to the fruiting zone for its removal. Some growers attempt to solve this by simply shaking the tree harder. The result is more frequent equipment breakage, rapid sling wear ( the thick rubber sheets draped around the shaker pads for protection), excessive removal of next year's fruiting wood (spurs) and possibly greater tree stress from disruption of roots at the tree's crown. Harder shaking also flings the crop past the catch frame of the harvester.

The solution to the above problem is to prune the pistachio with the objective of "pushing back" the canopy perimeter (reduce its diameter) and directing growth upward. This is accomplished principally by "thinning cuts", which is the complete removal of a limb at its point of origin. To achieve a more compact and upright tree, thinning cuts are made to flat limbs around the outside of the tree and within the canopy where excessive fruitwood exits. Care should be taken to not perform too many cuts in any given sector of the canopy unless the fruitwood is unusually abundant. In addition to distributing the thinning cuts over the entire tree, avoid removing all of the lateral limbs on a specific structural branch in order to make room for adjacent branches. Rather than creating these so-called "snakes", it is better to leave the best structural branch minimally pruned and remove the competing branch entirely. Also avoid opening the center of pistachios. We do NOT want them to look like peach trees at the completion of pruning. Because of the growth and fruiting habits described, pistachios will naturally open up and allow sufficient light into the canopy center for fruitwood production. Loss of fruitwood in the middle of the tree over time is, in my opinion, more a function of apical dominance than insufficient light penetration. So, remember, prune to keep the pistachio canopy compact and upright for productivity and harvestability.

Above all, remember that we DO NOT want **mature** trees to be pruned to the point that they produce lots of long whips! Although this looks good, it most likely means that the tree has been over pruned. Work by Tim Spann, shows that pistachio has "preformed shoots". These are shoots with 7-9 bud positions set **BEFORE** the season begins. Providing the tree is not excessively vigorous, these preformed shoots grow into spurs and set lots of crop. If mature trees are over pruned, these preformed shoots are "pushed" into continued growth. I believe the most productive pistachio tree is one that has hundreds of these short, preformed shoots, rather than lots of long whips.

**In Remembrance of Two Great Pistachio Growers**: Ali Orandi, founder of Orandi Farms Management, Ducor, died in his Visalia, California home on October 17, 2019. He, and two of his brothers, Ahmad and Mehdi, were early pioneers in the California pistachio industry, and developed high producing orchards in the Terra Bella area. Although each one of them willingly shared their knowledge of pistachio production, I had the most contact with Ali, who was one of the most gracious individuals I have ever met. In addition to farming his own property, he developed a management company to care for surrounding orchards. He and his loving wife, Fali, also developed their own processing plant and marketing program. In addition to Kerman, the Orandi families specialized in marketing varieties from the "old country", such as Arya and Kalehghouchi. Anyone having had the pleasure of visiting Ali knows of his famous "soup kitchen", in which lunch and

extended conversation were served. There was a lot of great information shared over a sandwich and tea! Like Ahmad, Ali loved to teach, so you could learn a lot if you stuck around and asked questions! Ali was a great supporter of UC Cooperative Extension. In addition to allowing me to test several plant growth regulators on Kalehghouchi to improve fruit removal, he opened his ranches for our 2008 Pistachio Short Course field demonstrations. Ali also spoke on how to do what I called the "Ali Switch", in which 24'x 24" spaced orchards were converted to a denser spacing without removing all the trees. Ali loved soccer. After playing it for many years, he turned to helping develop a youth league in Visalia and Tulare County. Ali's "Visalia Suns Soccer Club" were twice crowned State Cup Champions in 1994 and 1997! Think how many young lives Ali influenced with his kind, loving, wise character! I'll miss talking pistachios and life lessons with you, Ali!

Larry Easterling, Chairman of the Kettleman Pistachio partnership, died October 10, 2019. He was an early leader in the development of the California Pistachio Commission. He was also a tireless advocate for California agriculture, and our rights to adequate water. He was the fellow that allowed Donnie Rose, Senior, to turn the Utica pistachio ranch into an extended UC research center. Armed with Donnie's encouraging comments about its value to the ranch and the industry, Dr. David Goldhamer, myself, Becky Phene, and a host of support staff performed all the early irrigation research here. This included development of the first crop coefficients, the water use requirement (which at the time was thought to only be two acre-foot annually), the effect of regulated deficit irrigation (RDI) on tree growth and development, the effect of sustained drought, and the first buried drip irrigation experiment. Our five year RDI experiment involved nine treatments, each replicated six times over forty acres. EVERY TREE had individual yields taken on it! Donnie ran interference with the commercial harvesters to allow us the extra time to accomplish this! Today's harvesters would have tarred and feathered us! Following the irrigation trials, Larry permitted Donnie and I to continue large, detailed projects. They included the pruning trial which discovered the compensation effect, numerous oil trails, both aerial and ground, to develop dormant applied oil as a rest breaking agent, and the so-called "Phytocoris" trial, in which Donnie Thomas and I, in concert with Dr, Dick Rice, Kent Daane, and Walter Bentley, studied the complex relationships between this tiny mirid insect, navel orangeworm, and lecanium soft scale. This was another huge, detailed project involving yield data from 360 individual trees using hand crews and tarps supplied by Kettleman Pistachio Growers. Try getting approval from the CEO of a 2500 acre pistachio ranch today from a simple phone call by the ranch manager! Larry believed in Donnie and I, and we delivered! Had it not been for Larry Easterling and Donnie Rose, I would have never achieved the pistachio knowledge I have to share with you today! This is the kind of visionary that has made the pistachio industry what it is today! I personally, and we collectively, owe a tremendous amount of thanks to Larry Easterling and the Kettleman Pistachio Growers partnership for their contribution. You let us achieve great discoveries!

Finally, come to STATEWIDE PISTACHIO DAY, Wednesday, JANUARY 22, 2020, at the Visalia Convention Center, to see your buddies and have a great learning day! Please pre-register to prevent more expense and wait at the door! Here is the signup link: http://ucanr.edu/sites/pistachioday/. It is a FULL DAY, so come ready for a learning marathon! Happy Farming!