

January 2021 Task List for Pistachios
By Bob Beede, UCCE Farm Advisor, Emeritus

Chilling and Cold Weather Update: As you know, this winter has been dry and somewhat warm as of December 18. It has allowed for completion of field work, but at the expense of early rainfall and chill accumulation in some regions. The dry, warm November prompted questions about applying Rest enhancement foliar treatments early. This subject was covered in considerable detail in the December Task List, and should answer many of your questions. As of mid-December, we only have about an inch of rainfall; we need that pure water from the heavens badly, for many reasons. One is the woefully deficient storage capacity for an ever-growing population; we simply do not have much wiggle room these days when it comes to water supply. So, stay on your knees, my friends, in hope that this winter will provide an abundance of rain and cold weather for chilling.

Table 1 provides the chill portions for various sites throughout the Valley between September 1 and December 10 for six winters; included is 2013, the winter prior to the disastrous 2014 season with delayed leaf out and poor yields due to only about 59 chill portions accumulated in most growing regions. The 2015 winter, in which 79 chill portions were recorded, is also included to allow you to gauge this winter's progress. Although pistachio very likely benefits from chill portions accumulated between February 15 and March 1, I use February 15 as the "cut-off" because it allows us to reference historical data, and it is also the date shown in my UC research as the optimal application timing for dormant oil. Several UC research projects and field experience suggests that 65 chill portions satisfy the rest requirement of the Kerman cultivar. The Peters male may have a chill portion requirement as great as 70. The values in parentheses in Table 1 are the **total chill portions** accumulated by station and year, **up to February 15**. My study of the chill accumulation patterns the past few years suggests there have been MORE cold weather events after the traditional cut-off date than usual. These "late" chill portions may be the reason why we have observed good leaf out and bloom overlap in winters with marginal chill accumulation by the traditional February 15 cut-off date. **As of December 17, we have accumulated 22-25 chill portions in many areas, including the Westside Field Station. This is surprising, given the warm, fog-less days we have been having thus far, but that is what the CIMIS stations are saying.**

In the recent past, I declared my personal sense of ignorance about the physiology of deciduous tree rest. I have read several papers on the subject since then, and must admit that my comprehension has not improved much; the papers address lots of hypotheses and results of monitoring concentrations of growth substances, but we still really don't know the exact mechanism of chilling, and to what degree it can be manipulated. So, if I were going to write the book, "Pistachios for Dummies", I would simply state the obvious; deciduous fruit trees not receiving "Adequate Rest" struggle to leaf out and bloom, and produce less crop presumably because they are depleted in carbohydrates, and do not have the energy to "put out"! They also develop leaf area for carbohydrate replenishment slowly, and have weak or poorly overlapping bloom which does not set enough fruit. There are scientists who can wax on eloquently about the physiology, but it will not change the fact that adequate chill portions are needed to prevent pistachio trees from waking up like grumpy bears!

Over the years, Rest researchers generally agree on the following: (1) It is the BUD temperature that concerns us. Light, wind, fog, and shade all affect bud temperature. Clear, sunny days can elevate bud temperatures 10°F above the air temperature. Wind also warms buds slightly above ambient temperature. Fog and shade make the bud temperature equal to ambient. (2) Rest satisfaction begins in the fall when the terminal buds are

no longer active, and the leaves no longer functional. (3) December and January are believed to be the two most important months for Rest satisfaction. (4) Deciduous trees with high vigor and nitrogen status in the fall have a higher Rest requirement than trees with moderate vigor and nitrogen level. (5) Researchers report in the literature that periods of “non-chilling” temperatures interspersed through the winter increases the plant’s chilling requirement. The increase depends on the magnitude of the elevated temperatures, and their duration.

I have gone back and reviewed the chilling observations of Dr. Julian Crane, as well as the research Dr. Louise Ferguson and I performed individually and collectively. It all clearly states that Kerman and Peters do not grow normally when winter Rest is inadequate. Our research efforts suggest Kerman requires 750 hours below 45⁰ F, and Peters 850 hours in order to leaf out and bloom promptly in the spring. One experiment suggested that Peters continued to benefit from cold temperatures up to 1200 hours below 45⁰F. It was also reported in these studies that a minimum of 500 hours below 45⁰ F was needed to initiate much bud break from Peters. University of California Circular 179, “Deciduous Orchards in California Winters”, by W.H. Chandler and D.S. Brown (1936), states that December and January are the two most critical months in California to satisfy the rest requirement. It was their belief that optimal Rest conditions occurred when EACH of these months received 400 hours below 45⁰F. In recent years, we have been fortunate to get 200! During the 2013 and 2014 winters, the unusually warm temperatures in January did not provide its complement of chill hours.

Craig Kallsen, UC Farm Advisor for Pistachios and Subtropicals, Kern County, recently published a refereed journal paper summarizing thirty years of pistachio yield data from three Kerman/Peters orchards in Kern County. Armed with CIMIS weather data proximal to each orchard, Craig studied the relationships between yield the previous year and a number of calendar periods including fall and winter temperatures preceding the next crop year. This data set showed a positive correlation between yield and hourly air temperatures greater than or equal to 45⁰F and less than 60⁰F. The accumulation of chill portions or hours **did not** correlate as well with yield as the hours accumulated at temperatures between 45-60⁰F. Modeling fall and winter air temperatures above 65 and bloom temperatures above 80⁰F both resulted in negative correlations (reduced) with yield. This data makes me think there is a LOT of pistachio physiology that I do not know, and hence my earlier statement that I question my knowledge about Rest! Those interested in fully understanding Craig’s study and entering your own data for yield prediction can do so at: <http://cekern.ucanr.edu/files/260681.pdf>.

The effect of high winter temperatures is **thought** to elevate the bud respiration rate which consumes the limited amount of stored carbohydrates critical for spring growth. UC Davis Plant Sciences Associate Professor Maciej Zwieniecki (Dr. Z), and his Reseach Associate, Anna Davidson, have joined our pistachio industry research team to study this important aspect of tree biology. Dr. Z suggests there may be a critical amount of carbohydrates and other growth substances needed to produce normal growth in the spring. This may explain why oiled trees performed so poorly in 2015. Oil is **thought** to enhance rest breaking by causing a slight stress to the tree which is not phytotoxic. In the process of metabolizing the oil, the tree **may** increase its respiration rate, which renders it more responsive to favorable spring temperatures for growth. Thus, high January temperatures and oil treatment possibly have a compound effect on carbohydrate depletion from elevated respiration. When the time comes for bud break, the deficiencies in both chilling and available sugars create the perfect storm for poor leaf out and fruit set. There could also be detrimental effects to male and female flower development and receptivity.

To check on your local chilling, go to the “Weather-Related Models and Services” section of the UC Fruits and Nuts Center. Select “chilling accumulation models” from the menu, and then “Cumulative Chilling Portions”. This site allows you to see the chill portion accumulation for every CIMIS station in the state. You can also click on a given station to get historical data. I find this helpful in estimating where we are relative to other years. You can also compare chill portions to chill hours at this webpage. Keep in mind that these stations were designed to accurately estimate water use, NOT chill accumulation. The data is collected in an open grass-covered area which may influence the temperatures compared to those within the orchard environment. The absence of fog also causes temperature differences up to 20⁰F between ambient (air) and the buds. Obviously, we are concerned with the bud temperatures, so it would be helpful to make note of those

warm, fog-less winter days. Lest I miss yet another opportunity to stress the importance of **having your own weather station**, I want to point out that relying upon CIMIS stations can be very misleading, especially if you are farming in an area with lots of rolling terrain, such as Coalinga. Make it your New Year's resolution!

Table 1. Chill portion accumulation for various CIMIS stations statewide from 9/1-12/10 for selected years. Numbers in parentheses are the total chill portions accumulated at each station by year from 9/1- 2/15.

Year	2020-21	2019-20	2018-19	2016-17	2015-16	2014-15	2013-14
Durham	19	16(61)	27(69)	23(64)	25 (66)	22 (55)	20 (54)
Patterson	na	na	na	16(54)	20 (59)	23 (63)	22 (63)
Madera II	na	na	na	22(68)	25 (66)	25 (52)	15 (57)
Parlier	19	16(61)	21(61)	14(56)	26 (67)	27 (64)	22 (53)
Five Points	17	15(60)	21(59)	15(56)	24 (65)	15 (52)	20 (55)
Coalinga	18	13(56)	21(59)	16(60)	25 (62)	13 (48)	20 (53)
Shafter	17	14(56)	22(56)	12(49)	24 (59)	25 (61)	24 (63)
Delano	21	16(61)	20(55)	15(56)	25 (65)	16 (58)	22 (56)
Blackwell's	19	18(63)	21(62)	18(60)	24 (67)	15 (52)	21 (50)
Arvin/Edison	21	13(56)	19(54)	15(54)	23 (61)	10 (44)	21 (55)
Porterville	21	18(65)	24(68)	14(49)	30 (76)	20 (63)	22 (59)

Field reports indicate some growers began rest enhancement treatments in early December 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. Tim Baker, researcher for the Diffusion product sold under several proprietary names, recently told me that their liquid calcium product is **STILL EFFECTIVE** after **SIX INCHES** of rainfall. That level of rain fastness certainly makes it more economical to use! 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.

Snow? What's That? Growers wishing to periodically check on reservoir and snowpack status can do so my website: http://cekings.ucanr.edu/Agriculture/Grapes_Tree_Fruits_Nut_Crops/. Select "Management" in the main menu, then "Water and Weather". Select "Snowpack Status" from the menu, which will link you to the state water resources webpage. This page converts snowpack into water content and plots it for three major sections of the state. It also compares this year to wet and dry seasons and the 30-year average. These plots really provide a visual picture of where we stand in water availability. Statewide reservoir conditions can be accessed by selecting "Reservoirs Status" from my webpage menu. This takes you to a DWR web site that lets you click on the reservoir of interest. It then brings up information about current and historic water status, and allows you to select what years you would like to compare in graphic form. It is pretty neat, and gives you lots of sound data to spread around at the coffee shop! I'm afraid to look at these, given the few storms so far.

Happy New Year, Farming, and see you "Virtually" at Pistachio Day, Tuesday and Wednesday, January 12-13, 2021! It costs \$30 to attend the two-day course. After January 4, it costs \$40, and after the 11th, it will cost \$50 to attend! Each day's session will be from 8am-Noon. Hold your own mini Pistachio Day at your office for your staff and clients! The agenda is online for your review.