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Kern Pistachio Notes

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Poor Nut Set in Pistachio – Where/What is the Problem?

In Kern County, almost regardless of whether the trees were in the cold Lake beds in Buttonwillow and the sloughs west of Wasco, Delano, and Shafter or in the foothills of the citrus belt along Highway 65, the north side of trees bloomed, and leafed out, well ahead of the south sides. Most trees, male and female, also showed the typical, insufficient-chill symptom of long shoots at the top of trees that leafed out late, and only produced leaves near the terminal buds (see Figure 1). Probably, both of these 'low-chill' symptoms can be attributed to differences in the absorption of solar radiation this winter. The north side of the tree is shaded by the south side, so buds on the north side stay cooler during the day, preserving existing chill accumulations. Likewise, shoots at the top of the tree have little shade, and are negatively affected by warming equally across the top of the tree.

Chill accumulations based on accumulating hours less than 45 º F during the fall and winter, appeared, on paper, more than satisfactory to meet chill requirements in the low elevation areas of the state. Even the usually notoriously chill-deficient areas along Highway 65 seemed to be borderline. Nevertheless, high and low elevation areas showed insufficient-chilling symptoms, probably because both were at the mercy of direct solar radiation. Solar warming appears to reduce the effect of nightly accumulation of chill hours. The lack of fog, as a result of near absence of rainfall this winter due to the on-going drought, is probably responsible for the similar poor bloom performance between the low-elevation lake beds, that fill up with cold air during the winter, and the higher-elevation in the citrus belt along Highway 65, that normally remain much warmer during the winter. In both areas, trees received substantial direct solar heating. Normally, when fog is present, it acts as an insulating blanket, especially in the old lake beds where it more commonly forms, reducing the amount of radiant energy absorbed by branches. So in a 'normal' year, or even in a year with borderline chilling but plenty of fog, bloom is usually much more uniform in the lake beds than in the foothills. This normal situation did not appear to be the case this year and in many areas, not last year either. It would appear that calculating chill hours below a certain temperature threshold, without some adjustment for interruptions during the winter of warmer temperatures or solar radiation, is of little value. Since fog can be localized, especially during drought years, a temperature recorder (and once models are developed, perhaps a pyranometer), should be present within the orchard to more accurately assess chilling.

Why are only the males to blame?

During bloom, especially in juvenile orchards, Randy bloomed behind Golden Hills and Lost Hills, and Peters was behind Kerman. I have received many calls asking me whether or not Randy should be grafted into Kerman orchards to ensure a more even bloom in low chill years. This question assumes Peters is the major 'weak' spot in achieving normal pollination. Clearly, this and last year, Peters was well behind Kerman in bloom, and the bloom of Peters appeared weak (low pollen quantity per flower and few flowers). However, in most of the orchards I visited, the females Golden Hills and Kerman

both showed the same symptoms of insufficient chill described above as did the males. Is it logical to assume that low-chill affects only the male flowers?

I have a variety-selection trial that I am actively monitoring in the Buttonwillow area. It has a number of males that bloom at different times to cover the experimental females present. In 2013 and 2014, Peters performed very poorly. It was well behind Kerman, and had few flowers and little pollen. This year, Randy was behind Golden Hills in this trial but its bloom covered the bloom period of Kerman perfectly. There were a lot of flowers and lots of pollen. Yet, recently, as I observed the Kerman trees immediately adjacent to the numerous Randy males in the test plot, I saw no more developing nuts on the Kerman trees, than I saw on Kerman trees a thousand or more feet away at the other side of the orchard were only Peters was present. This clearly suggests that something negative happened to the female flowers as a result of low chill as well. As additional evidence, I have toured a number of orchards where male pollen was collected from early-blooming male trees, and mechanically blown onto some Kerman trees and not others as a test. Again, based on the number of flowers that appear to be producing nuts, I see little difference between where the pollen was blown and where it wasn't (I have, in all fairness and by no means, visited all of the trials that might have taken place). In a previous low-chilling environment, U.C. farm advisor Steve Sibbett and crop consultant Gary Weinberger, also, saw no effect of supplemental pollen on average number of nuts per cluster or blanks per cluster (Sibbett, G.S. and G. Weinberger. 1994. Effect of topically applied supplemental pollen on sound and blank Kerman pistachio nuts. California Pistachio Industry Report-Crop year 1993-94. Pages 81-82).

As part of the on-going U.C. breeding program, viability tests were conducted on pollen collected from Peters, Randy and two other numbered selections at a trial located near Famoso in Kern County. Germination percentages were high (>50% 16 hours after collection of the flowers) indicating that low chill did not appear to affect pollen viability.

In the past, during low-chill years, the effect on yield is usually much worst on juvenile trees just coming into bearing, and older trees going into an off year of the alternate bearing cycle. An off year can be really off when preceded by a low-chill winter. In a related matter, in my last newsletter I stated that female flowers will wait to be pollinized. I need to revise (i.e. correct) that statement somewhat as follows: Female flowers will wait to be pollinized, assuming that they have enough chilling." Otherwise, apparently, all bets are off.

I think we as an industry are too quick to place the blame on the males. It takes two to tango as the saying goes. Since the male does not appear to be the only, or, perhaps, not even principal reason of reduced nut set in low-chill years, replacing existing males (i.e. those that are usually well-timed with their female counterparts in years of sufficient chill) with early blooming males, may actually reduce optimal yields when chilling is sufficient.

Putting Randy in an orchard for pollinating Kerman may have some problems. When we were initially evaluating Randy, for possible release to the industry, when we had hot summers and high-chill years with fog, Randy was often through dehiscing pollen before Kerman even flowered. Dr. Dan Parfitt and I, evaluating the germination percentage of various pistachio males, have noted that pollen collected late in the bloom period, usually has a poorer germination percentage. Thus Randy has a couple of strikes against it in a normal year, since, in some years it might be too early to pollinate Kerman, and we would be depending on it to pollinate Kerman, with pollen produced later in its bloom period.

As part of the on-going U.C. breeding program (with funding from the Pistachio Research Board), we have found a number of very precocious males that appear to bloom similarly to Kerman, have pollen with a high germination percentage, high pollen production, and came through the low-chill years as juvenile trees in pretty good shape. We hope to begin testing some of these in commercial

plantings this year. Again, however, in a low-chill year, a perfect bloom synchrony between male and female, will not ensure a satisfactory nut set.

Figure 1. Damghan, experimental selection in trial, showing late foliation, compared to Kerman trees in background, and flagging of long shoots. Damghan is a selection from Iran, where much of the production is accomplished at higher elevations where chilling is not usually a problem. (Photo by Craig Kallsen)

Don't Spray Poor Pollination or Crop-Load Adjustment

One result of poor chilling is a failure of the tree to set fruit. Flowers that fail to set fruit may swell, but shortly thereafter, or sometimes not so shortly thereafter, will turn black and fall from the tree. This is normal and is called poor pollination early in the season or crop load adjustment as the season progresses. Frequently, the little black nuts falling from the tree will have a single gummy spot. That does not necessarily mean it was stung by a small or large plant bug, it just means pistachios tend to gum, especially when senescing. Over the years, small plant bugs, such as lygus, calocoris, and phytocoris, have gotten quite a reputation for attacking pistachio nuts suddenly in the spring and then disappearing before a single one could be spotted. The obvious question, of course, is if they were really there to begin with. A lot of poor pollination and crop load adjustment has been sprayed with pesticides. Unless small plant bugs are very numerous, U.C. farm advisor emeritus, Bob Beede and others, have demonstrated that the pistachio tree can tolerate a lot of small-plant-bug damage before shell hardening in early June, and compensate for it in the process of adjusting crop load, without a decrease in yield. As U.C. entomology farm advisor David Haviland has pointed out, prophylactically spraying pyrethroids, although cheap when combined with a nutrition spray, will only hasten the day that insects such as mealybugs, navel orangeworm and other members of the true bugs become resistant to them. From my early observations in the field, this is going to be a big year for crop load adjustment, especially if it gets hot suddenly early in May.

Of course, a note to PCA's. Don't get too complacent. Some of this drop might really be bug damage, especially if it is on the first few rows of trees directly across from a recently disced weedy field or a semi-abandoned vineyard.

Figure 2- Small nuts looking good but destined to drop. (Photo by Craig Kallsen)

Figure 3- Nuts failing to set. Is this due to insufficient male pollen, an unreceptive female flower, or early crop load adjustment? (Photo by Craig Kallsen)

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