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University of California
Agriculture and Natural Resources
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UCCE

Kern Citrus and Subtropical Fruit

December 2013

Early Frost-Special

December 9, 2013

This newsletter is being written on December 9 and there are, at least, two more cold nights left in this frost episode. While low temperatures in this most recent frost event are in no way equal to those experienced in our last major event in January 2007, temperatures were cold enough and will be cold enough in some areas to damage fruit, despite frost control measures taken. As usual in many recent frost events, citrus planted in the true citrus belt were manageable, but in areas planted lower into the valley and in cold spots, temperatures were probably too low for conventional frost-fighting tactics of running water and wind-machines to counter. Temperatures as low as 17 °F were reported from an area around McFarland, California.

The degree of freeze damage to citrus fruit can take time and mild damage may not be detectable for a week or more. In general, the more mature fruit, the greater the frost tolerance due to a greater concentration of soluble solutes. High concentrations of soluble solutes act as a natural antifreeze. For example, because Valencia oranges are much less mature than navels in December and January, they freeze at a higher temperature than do navels (as much as 2 °F). Severely frozen fruit of some varieties will often fall from the tree, while some mildly frozen Valencia oranges can hang on the tree until the following summer getting a little drier every day. Lemons and thin-skinned mandarins will freeze at a higher temperature than navel oranges. Lemons will probably freeze when temperatures around the fruit fall below 29 °F and thin-skinned mandarins below 28 °F. This time of year, temperatures to freeze navel oranges, probably, will have to drop below 26 ° for an hour or more.

Packing houses are becoming more sophisticated in separating damaged fruit from unfrozen. Generally, freezing temperatures cause cellular damage to the rind, which causes limonene or similar compounds to leak into juice vesicles from the albedo. These compounds turn the juice bitter. The bitterness may dissipate with time, but its presence means the fruit was damaged to some degree. Water from the juice vesicles, in turn, slowly evaporates through the freeze damaged rind causing the orange to dry. This change in weight can be measured in many modern, automated packing houses that have the ability to weigh individual fruit. A frozen fruit will be “under-weight” for its size, and thus suspect of having freeze damage and a candidate for the cull or juice pile. Often the first way to cull frozen citrus fruit is with a flotation tank, that works on the same principle, but which is not as sensitive. Other methods of detecting frozen fruit have also been investigated using peel fluorescence (see http://naldc.nal.usda.gov/download/12943/PDF).

Removing Frozen Fruit from the Tree

Badly frozen fruit may start dropping from the tree shortly after the freeze, but other fruit may hang on the tree longer than unfrozen fruit. Many growers resist picking or dropping frozen fruit in that it is another expense, at a time of little income. Reasons for dropping the fruit, even if it cannot be sold for juice, include:

- Ensuring that the frozen fruit does not interfere with spring fruit set. Navel oranges, for example, will not set as much fruit if last season's fruit remains on the tree.
- Old frost-damaged fruit may harbor fungal pathogens that may infect the new crop, such as clear rot (*Penicillium* sp.), tear staining (*Colletotrichum* sp), brown rot (*Phytophthora* sps.) or *Septoria* organisms.
- Avoiding having to separate last year's partially frozen fruit from the new crop at harvest next year.
- Preventing partially frozen fruit from providing habitat for insect pests.

The Kern County Ag Commissioner Has Input Into the Disposition of Frozen Fruit

Since frozen fruit may take some time to display symptoms, the danger exists for large quantities of frozen fruit to be sold to consumers. Selling frozen fruit, obviously, is a misrepresentation of a product for sale, and if it occurs often enough will keep all consumers from buying all California citrus, whether frozen or not. Where frozen fruit may become a marketing issue in Kern County, its disposal may come under the auspices of the Kern County Agricultural Commissioner's Office. Currently, employees of the Ag Commissioner's Office are cutting fruit to help determine the degree of freeze damage. In 2007, the then Kern County Agricultural Commissioner, Mr. David Moore, and the Ag Commissioners in Fresno and Tulare County, issued a notice to citrus handlers containing the following points:

- All fruit sent to packinghouses will be placed under a Disposal Order.
- It is requested that packers voluntarily hold fruit harvested on or after January 12, 2007 for five days from the date of harvest. This interval will provide an opportunity to fully assess the level of freeze damage.
- If fruit is packed or shipped prior to the expiration date of the five-day period, an official sample will be taken at the time of packing and held until such time that a full determination of quality can be made. This determination will be made within eight days of taking the sample. If the sample fails to meet the minimum quality standards, a Notice of Violation will be issued and the case forwarded to the District Attorney's Office for appropriate action.
- For example, if fruit is harvested January 15, 2007, an official sample will be taken if it is packed and shipped prior to January 19, 2007.

I want to make it clear, that as of the writing of this newsletter (Monday, 1 p.m., December 9, 2013) no such disposal order has been made and no disposal order may ever be made in relation to this current freeze event.

Evaluating Damage to Baby Trees Requires Patience

Earlier temperatures and forecasted temperatures do not appear to be cold enough to freeze baby trees in the citrus belt. Time will tell. Semi-dormant wood in the winter looks dry even when it is healthy, so any final evaluation should be conducted in the warmth of spring. With warmer temperatures, frozen bark will peel easily from the young trunk and the degree of damage easily estimated. A tree, even those frozen down to the top of the wrap, can make an amazing recovery. Growers, in the summer after the 1990 freeze had some success budding onto the rootstocks that remained after the scions were killed by frost.

It may be better to replace a tree if it is still alive under the trunk wrap but badly damaged. Badly frozen trees regrow fairly slowly, and often are not able to resist pathogens that grow into the wood such as fungal *Fusarium* species causing dry root rot. Slow growing Fusarium in the wood can take up to 10 or 15 years to kill a tree.

Texas Mite a Problem in Many Citrus Orchards in the Arvin-Edison Area this fall

The Texas Citrus Mite caused a lot of defoliation and some fruit drop, starting at the top of trees, in the Arvin-Edison area of Kern County this season. The unusually warm temperatures into November (up to 10 °F. above normal) apparently agreed with this pest, and caught a lot of growers and PCAs off guard. For more on this pest visit the U.C. IPM website at:
http://www.ucipm.ucdavis.edu/PMG/r107401111.html

Lindcove Research and Extension Center Fruit Display and Tasting: Citrus Industry

Date: December 13, 2013
Time: 9:00 AM - 12:00 PM
Contact: Anita Hunt
Sponsor: Lindcove Research & Extension Center
Location: 22963 Carson Ave, Exeter, CA 93221, USA

Citrus growers and other Ag professionals are invited to attend the University of California, Lindcove Research and Extension Center Annual Citrus Fruit Display and Tasting on Friday December 13th starting at 9:00 A.M. During the Citrus Fruit Display day, you can see and taste more than 100 citrus varieties that are grown at Lindcove.

Education Building Activities 9 am - Noon

•Taste fruit at your leisure

Walking tour starts at 10 am

•Tour the Citrus Clonal Protection facilities that produce budwood with Dr. Georgios Vidalakis.
•View the action of the new fruit grading system in the packline that provides researchers with detailed information about fruit size, weight and quality demonstrated by Don Cleek

•Tour the demonstration orchard with Dr. Tracy Kahn who will discuss new citrus varieties

Directions: Take Highway 198 east to Mehrten Drive (approximately 15 miles) and follow the signs to our Event. The University of Lindcove Research and Extension Center is located at 22963 Carson Avenue Exeter, CA. The Education Building is located at the end of Carson Avenue. If you have any questions please contact Anita Hunt at 559-592-2408 Ext 151.

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