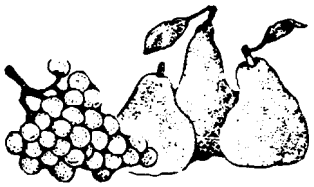
COOPERATIVE EXTENSION • UNIVERSITY OF CALIFORNIA
SACRAMENTO COUNTY

Tree and Vine Newsletter



Chuck Ingels, Pomology/Viticulture Farm Advisor

4145 BRANCH CENTER ROAD, SACRAMENTO, CA 95827-3898 *OFFICE (916) 875-6913 FAX (916) 875-6233*
E-MAIL caingels@ucdavis.edu *Web Site:http://cesacramento.ucdavis.edu*

January 2010

Dormancy, Chill Accumulation, Rest-Breaking and Freeze Damage: What Are the Risks?

by Kitren Glozer, UC Davis Dept. of Plant Sciences

Once a tree's winter chill requirement has been met, continued cold temperatures maintain the buds in a resting state, but the buds are 'ready' to begin growing because internal metabolic inhibitors are no longer present to prevent growth. These inhibitors decrease over time as the chill requirement has been satisfied. Bud growth will resume once temperatures become favorable and as the buds become less dormant (more metabolically active), cold-hardiness diminishes. Hardiness is lost very rapidly once buds begin growth. At full bloom, no cold-hardiness exists and killing temperatures do not have to be as low as when some or all cold-hardiness was present.

Often there can be a warming period in January or early February that tends to increase flower bud respiration and reduce the depth of the dormant state, reducing winter hardiness. Thus, even without swollen buds or open flowers, temperatures can be low enough to reach the 'critical temperature' that will kill buds, and temperatures don't have to be as cold or cold for as long as when buds are fully dormant for freeze damage to occur. Critical temperatures for the various tree fruits have been established in other areas, such as Michigan and Washington, however, California's growing conditions are different enough that we can't depend on the critical temperatures established elsewhere, and we do not have equivalents for California that are exact or published.

Damage to the Tree Canopy

The tree's canopy (not just buds, flowers and fruits) may also be damaged by freezes, particularly during the transition into dormancy or out of dormancy when tissues are more active and less cold-hardy. Freeze damage to the vegetative parts of the tree can result in dead twigs, shoots, and spurs, and can predispose the living tissues to diseases such as bacterial canker and fungal diseases. When this occurs the current year's crop may not be the only loss, but productivity for the tree, or some trees in the orhard, may be reduced for some time. Different trees may be affected within the orchard, or only parts of the trees due to micro-climactic differences within the orchard or within the tree, or due to the kind of freeze that occurs. Sometimes a single variety may be more susceptible, or different rootstocks may predispose the scion (the cropping portion of the tree) to greater or lesser cold-hardiness, hence, susceptibility. There are no hard-and-fast rules as there are too many variables and each occurrence must be evaluated case-by-case.

How Does Application of Rest-Breaking Agents Affect the Risk for Frost Damage? What about Dormant Oil at Pest Control Rates?

Even in a 'good' chill year, application of rest-breaking materials (RBAs), such as CAN17, Dormex or dormant oil, can advance bud development, so that buds become metabolically active and may break early once warm temperatures allow bud-break. If rest-breaking agents are applied and there is a warm period either before or after the application, followed by freeze events, the buds are much more susceptible to freeze damage. This is a risk even with application of label rates of dormant oil for those species that respond to it as an RBA (like pear and prune).

So what choices are there for growers?

- Determine if you really need to apply RBAs. If the amount of chilling received appears to be 'normal' to 'good' by early January, compared to historic data, then it might be a good idea to leave well enough alone and don't apply RBAs. Of course, oil is routinely sprayed on pears in mid-winter for pest management.
- If you do apply RBAs, consider a lower concentration than you would use in a 'low' chill year. If chilling is good, you may not need as much product or any RBA at all, and reducing the risk of either phytotoxicity or freeze damage is more important than that extra 'boost'.
- In 2006, 'Bartlett' pear trial in the Sacramento Delta, freeze damage in the form of crop loss was assessed. 4% Dormant Oil Plus (emulsifiable, UAP) applied in different plots from December 23 (30 chill portions) to January 25 (54 chill portions) did not increase inflorescence bud death, but dormant oil reduced crop load with the earliest (23 Dec, 30 CP) treatment, which also reduced the proportion of #1 fruit significantly. All treatments occurred before the big warming trend that preceded the freeze. Bud death was observed after the freeze (see photo), but percent bud death was not evaluated.

- In 2006, cherry trees treated just before the freeze with CAN17, Dormex or Dormant oil (during the warm period) was not adversely affected by the freeze. Buds probably did not have enough time to advance development before the freeze, so they didn't experience damage.
- In 2008-2009, an application was made to 'Bing' cherry with CAN17 (16.7%) + RNA Activator 85 (0.5%) in 150 gallons per acre, applied at 50-53 chill portions (Jan 20) pushed bloom by 2 weeks and those trees that were advanced in bloom lost 25-40% of the crop due to the freeze that followed a warm period, substantiated by observed damage to buds (cut buds showed black tissue in about 25% of those collected).
- How about this year? Many sites are ahead of chill accumulation for the previous year – by 3 to 5 chill portions most places, a little less or more depending on where you are. This looks to be a high chill year with current cold conditions persisting for a while. Warming periods are not unusual in January and February, and the current El Niño (warm Pacific currents) is expected to persist at least through March. Typical lows in the Sacramento-Stockton area for January are about 37ºF. Frosts can occur at any time in January and early-mid February. With good chill accumulation, RBAs provide less benefit than in low chill years and may increase risk for subsequent frost damage.
- Risk for phytotoxicity for any RBA is increased when tissues are more metabolically active.

Chill Hours vs. Chill Portions and Yearly Comparisons

For decades, the chilling requirement of fruit trees has been defined as the number of hours below 45° F during the dormant season – generally between Nov. 1 and Feb. 15. However, simple chill hours (**CH**) do not account for warm days, which can cancel out the previous night's chilling experienced by trees. Also, some chill hours accumulate in October, which help satisfy the chill requirement of dormant buds.

The Dynamic Model was developed in Israel in the 1980s and 1990s and has been tested on cherries and pears by UC researchers in the last several years. The model calculates chilling accumulation

as 'chill portions' (**CP)**, using a range of temperatures from 35-55°F (some temperatures are more effective than others), and it also accounts for chill cancellation by fluctuating warm temperatures. **CH** vary much more widely from place to place in any single year and also from year to year than do **CP**. Also, using a **CP** range has provided the best response in the application of rest-breaking chemicals.

You can download the Dynamic Model (an Excel spreadsheet) and the manual (a PowerPoint file) from our web site – see top of page 1 in this newsletter; click on Agriculture and Horticulture, see links on left. The manual describes **CP** and how to calculate them based on hourly temperatures from a nearby weather station or data logger. Several weather stations in Sacramento and other counties that record hourly temperature values are accessible online using (see www.ipm.ucdavis.edu, http://fruitsandnuts.ucdavis.edu, and www.cimis.water.ca.gov).

Table 1. Chill portions (CP) from the Russell Rd. weather station.

Date	2007-08	2008-09	2009-10
Nov. 1	4	1	5
Dec. 1	14	14	19
Jan. 1	35	39	43
Feb. 1	59	59	

Kocide 3000 for Fire Blight Control: Effective and Doesn't Russet Fruit, But Consider Copper Resistance

Kocide 3000 + Manzate Pro Stick has been used by several pear growers and it has given good blight control with no additional russetting (Kocide 3000 + Dithane was used until 2008). Kocide 3000 has reduced Metallic Copper Equivalent (30% MCE) compared to Kocide 2000 at 35% MCE and Kocide 101 at 50% MCE. Manzate Pro Stick has some efficacy on blight and is also thought to reduce russetting.

In 2009, we conducted a spray trial in a mature Bartlett orchard at the McCormack Hansen Ranch near Walnut Grove. We compared three bactericidal programs: 1) Season-long use of Mycoshield, 2) Season-long use of Kocide 3000 + Manzate Pro Stick, and 3) Kocide 3000 + Manzate Pro Stick up to April 8 and Mycoshield April 14 through April 21. Each plot was four rows wide by approx. 100 trees long and each was replicated four times. Blight incidence was evaluated on May 7 and July 13. On May 7, relatively little blight was found and there were no significant differences between treatments. In the July 13 evaluation, mostly older shoot strikes were present, and the season-long Kocide 3000 + Manzate Pro Stick treatment had significantly fewer strikes (less than half) than the other treatments, although the mean differences were not large. Over an inch of rain fell in early May, so the presence of residual copper on the foliage likely enhanced control of the shoot strikes. No significant differences in russetting were found.

Although copper resistance has not been found in pears, it is widespread in walnuts in California and the Pacific Northwest from overuse of copper products. A blight program that integrates Kocide 3000 with antibiotics would be a better strategy for reducing resistance. Furthermore, recent US EPA re-registration and risk assessments may mean that fewer copper fungicide applications can be used per year, likely starting in 2010.

In a different block of the same orchard, we also compared a standard air blast sprayer (100 gal./acre) with a tower sprayer (80 gal./acre) for coverage of spray cards placed at 5 and 10 ft. in tree canopies of this hedged orchard. The mean coverage by the tower sprayer was significantly greater than that by the standard sprayer at several points, especially on the upwind adjacent row. Reduced drift is likely with the tower sprayer since the spray is directed laterally and less ends up above the tree canopy.

Funding for this trial was provided by the Calif. Pear Advisory Board.

2010 SACRAMENTO RIVER DISTRICT PEAR RESEARCH MEETING

Thursday, February 4, 2010

Walnut Grove Library Meeting Room, 14177 N. Market St., Walnut Grove, CA 95690

(Same building as Ag. Commissioner Office in Walnut Grove)

(a wheelchair accessible facility)

3.0 hours PCA / Private Applicator C.E. credit approved
4.0 hours Certified Crop Advisor C.E. credit applied for

Sponsored by:
UC Cooperative Extension, Calif. Pear Advisory Board, and the Pear Pest Management Research Fund

Agenda

8:00 Refreshments
8:25 Welcome and announcements

Entomology

8:30 1) Large block testing of meso-emitters for control of codling moth
2) Why puffers work: Determining the effects of residual releases on control of codling moth
Steve Welter – UC Berkeley
9:05 Toxicity and longevity of new reduced risk insecticides
Bob Van Steenwyk – UC Berkeley
9:25 Control of codling moth by postharvest application of Ethephon 2SL and insecticide
Chuck Ingels – UCCE Sacramento County

9:40 Update on the pear pest management strategic plan
Lori Berger – Calif. Specialty Crops Council
10:00 Sustainable practices program: 2009 grower self-assessment process & results
Andrew Arnold – SureHarvest

10:20 -- *Break* --

Plant Pathology

10:40 Evaluation of new bactericides for control of fire blight
Jim Adaskaveg – UC Riverside
11:00 Use of Kocide 3000 and a tower sprayer in a fire blight management program
Chuck Ingels – UCCE Sacramento County

Horticulture

11:20 Evaluation of potential new size controlling rootstocks
Rachel Elkins – UCCE Lake & Mendocino Counties
11:40 1) Inducing precocity in European pears
2) Use of plant growth regulators for freeze protection & increased fruit set
3) Efficient nitrogen fertilization for control of vegetative growth
Kitren Glozer – UC Davis
12:20 1) Finding cost-effective weed and nutrient management practices in organic pear orchards
2) Darwin blossom thinner effects
Chuck Ingels – UCCE Sacramento County
12:45 Adjourn

Spotted Wing Drosophila Update

The spotted wing Drosophila is a new pest of many fruit crops, especially cherry. The tiny flies feed on ripening fruit just before harvest. Information on the pest and on monitoring and treatment guidelines is available on two UC IPM web pages (www.ipm.ucdavis.edu). Click on "Agriculture and Floriculture", then "Cherry". For more information on this and other new pests, on the UC IPM home page click on "Exotic and Invasive Pests".

Several collaborative research and extension projects are currently being developed throughout the West Coast, both for commercial and home garden situations. New monitoring and treatment recommendations are also being developed and will be available soon, although it will take a season before the best control methods will be identified. More information will be provided in this newsletter as it becomes available.