UCCE Capitol Corridor, Sacramento County

University of California
Agriculture and Natural Resources | Cooperative Extension

Tree and Vine Newsletter

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Winter Chilling and Rest Breaking

In years with low winter chilling, flowering may be delayed, light, and prolonged, and yields may be lower. Lack of chilling reduces carbohydrate mobilization in fruit trees, reducing the capacity for sugar synthesis in wood tissues and the ability of the floral buds to import it. Insufficient chilling may increase fire blight of pears because of the lengthened main bloom period, although rattail blooms in Bartlett trees already provide this extended bloom.

Most pear and cherry varieties have a high chilling requirement, but grapes have a very low requirement so they always receive adequate chilling. For cherries, the low chill in 2013-14 may have extended bloom and caused pollinizer bloom timing to be out of sync with main varieties, both of which could affect fruit set. But the main culprit in the very low cherry crop statewide was likely the high temperatures during bloom – upper 70s for an extended period and 80°F+ on two days in March.

Winter chilling was off to a slow start in late 2014. But how slow?

Chill Hours. By the old method of simply counting the number of hours below 45°F ('chill hours'), November and December were very low. Table 1 shows cumulative chill hours from 2010-11 through Jan. 1, 2014 for the Lambert Road weather station.

Most pear and cherry varieties require about 1,000-1,200 chill hours to break bud dormancy and allow for normal flowering. The chilling requirement for Bartlett pear is considered to be 1,000 hours, but normal crops have been observed with only 800 hours.

Chill hours are usually recorded from Nov. 1 through Feb. 28, but species that begin growth early, like almonds, have an earlier cutoff, and even pears begin bud swell well before Feb. 28. Also, chilling in October can likely also add to chilling accumulation.

Chill Portions. But research has shown that deciduous fruit and nut trees also benefit from temperatures somewhat higher than 45°F and receive little or no benefit below 32°F. The Dynamic Chill Model converts temperature into units of 'chill portions' for deciduous fruit trees. The model describes the following key elements:

1) The optimum bell-shaped curve of rest breaking dependence on temperature, with maximum efficiency at about 43°F and zero effect below 28°F or above 57°F
2) Negation of the chilling effect by warm periods depending on temperature, duration and cycle length when alternating with lower temperatures
3) The enhancing effect of moderate temperatures on chilling when they alternate with colder temps

Table 2 shows the accumulated chill portions (CP) from 2010-11 through Jan. 1, 2015 for the same Lambert Road weather station. Note that chill hours appeared to be adequate (although marginally in 2010-11), but CP in 2013-14 were lower because of the large number of sub-freezing temperatures in Dec. 2013 and the many warm days experienced during that winter. Interestingly, few or no chill hours accumulated from Nov. 29 – Dec. 11, but 7 CP accumulated during that time.

Table 1. Cumulative chill hours (number of hours below 45°F), Nov. 1-Feb. 28 from Lambert Rd. weather station data. Chill hours officially begin Nov. 1; Oct. hours are provided to show that chill hours can actually accumulate – and may affect chilling – before Nov. 1. Values for October are not included in the cumulative chill hours. Be aware that substantial differences among weather stations may exist – even just a few miles away.

Date	2010-11	2011-12	2012-13	2013-14	2014-15
(Oct.)	(9)	(40)	(5)	(93)	(23)
Dec. 1	231	240	168	227	158
Jan. 1	367	696	522	695	295
Feb. 1	755	1037	974	1038	--
Feb. 28	1048	1418	1292	1112	--

Table 2. Cumulative chill portions (CP) from the Lambert Rd. weather station (Sacramento County).

Date	2010-11	2011-12	2012-13	2013-14	2014-15
Nov. 1	4	1	3	2	2
Dec. 1	19	19	16	14	16
Jan. 1	38	41	38	34	33
Feb. 1	62	61	59	52	--
Feb. 28	78	78	75	66	--

Rest Breaking and Frost Danger. Past research has shown that for pears, applying dormant oil at about 40 CP has led to the best effects on yield and fruit size. No other products are available for breaking rest in pears. In low-chill areas of some countries thiourea has improved pear flowering, but it will not be registered in the U.S. because of toxicity problems. For cherries, applications of CAN-17 made at 49-60 CP should advance bloom by 5-7 days and harvest by 3-5 days.

Dormant buds that have received chilling are 'ready' to begin growing because metabolic inhibitors are no longer present to prevent growth. These inhibitors decrease over time as the chill requirement becomes 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.

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. Therefore, 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.

For weekly CP updates from the Lambert Rd. station, visit http://cesacramento.ucanr.edu. For current and historical weather data and forecasts from local weather stations, visit http://www.westernwx.com/LWWC/index.htm. For more information, see past Sacramento Tree & Vine Newsletter issues: Chill Portions and Dormant Spray Timing (Jan. 2009) and Dormancy, Chill Accumulation, Rest-Breaking and Freeze Damage (Jan. 2010).

Tracking Brown Marmorated Stink Bugs in 2014

In 2014, we monitored the spread of brown marmorated stink bugs (BMSB) in Sacramento County. BMSB were first found in midtown in early Sept. 2013, and monitoring by Charlie Pickett of CDFA found that the infestation covered an area between about 11th and 18th Streets and between P and V Streets. Reports by individuals and my confirmation showed that they were scattered in lower numbers throughout downtown, midtown, and Old Sacramento, and individual finds have now been made from Citrus Heights to Elk Grove. No BMSB have yet been reported on any farm in California.

The Pear Pest Management Research Fund and the Lodi Winegrape Commission provided funding to study the BMSB population in Sacramento. After intensive searching in April and early May, we found the first eggs on May 5. Using that date to start the BMSB development model, based on average temperatures two complete generations should occur in Sacramento, which is consistent with the warmer areas of the mid-Atlantic states. Interestingly, the model predicts three generations in Kern County.

Ten 4-ft. tall pyramid traps were placed in midtown Sacramento, with two lures per trap (aggregation pheromone + the synergist MDT), along with an insecticide strip. Only the traps in the initial infestation area caught substantial numbers of adults and nymphs (circled in Fig. 1), with few or none caught only blocks away. Few adults were caught until a spike in September, reflecting the 2nd generation buildup (Fig. 2). Far more nymphs were trapped. Several predators were seen feeding on BMSB nymphs, including assassin bug, jumping spider, praying mantis, and birds. However, their effects on the BMSB population may not be substantial.

BMSB has over 170 host species, including crops and ornamental plants. In the initial infestation area, BMSB were consistently found on tree of heaven from late spring through early summer, and large numbers were found feeding on the fruits of trident maple and waxleaf privet in August and September. Chinese pistache trees also had moderate numbers in summer. Relatively large numbers were also found on apple, Asian pear, cherry, and peach and nectarine, and all fruits on these trees were severely damaged and inedible, but plums did not appear to be injured. Few BMSB and no damage were seen on persimmons, citrus, or grapes. Tomatoes and beans were also damaged, and many adults and nymphs were found on sunflowers.

Fifteen traps were also placed from South Sacramento to Walnut Grove, but no BMSB were found. BMSB has risen to the nuisance pest level in neighborhood areas of Citrus Heights and River Park. This fall in midtown and downtown Sacramento, the stink bugs became a serious nuisance in apartments, restaurants, offices, and government buildings. According to Tracy Leskey, USDA researcher in W. Virginia, it takes about 4-5 years from the first BMSB introduction until it becomes a large nuisance/pest problem in that area. Unfortunately, the time of first introduction in an area is never known.

To view the full report, photos, and more information, see the BMSB section of our web site (http://cesacramento.ucanr.edu).

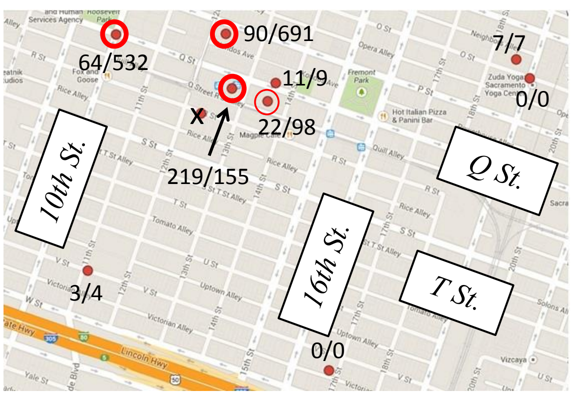

Figure 1. Cumulative trap counts (adults/nymphs) in Midtown Sacramento in 2014. The four circled traps were used for data and analysis.

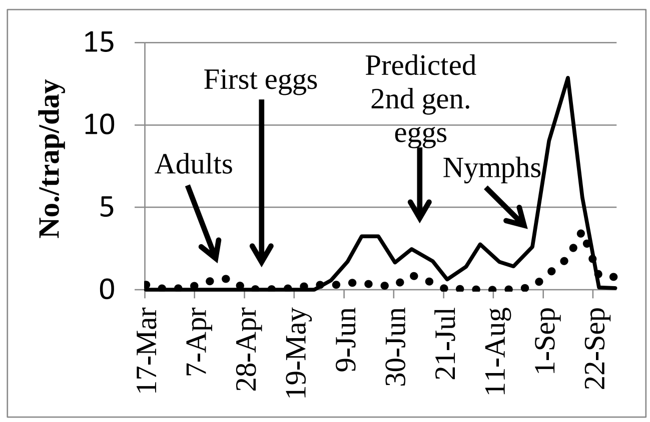

Figure 2. Average number of adults and nymphs per trap per day found in the four midtown traps that caught substantial numbers. First eggs were found May 5 and second generation eggs were predicted for July 11, based on the Rutgers model (low 57°F, high 97°F) using 2014 Sacramento temperatures.

Upcoming Meetings

Calif. Cherry Research Review. Tues., Jan. 27, 10-3:15. UCCE Stockton. http://cesanjoaquin.ucanr.edu

Pear Research Meeting. Wed., Feb. 4, 2015. Walnut Grove Library. (see attached agenda).

Clarksburg District Wine Grower Meeting (Grape Day). Tues., Mar. 3, 2015, 9 AM to 12 PM. Old Sugar Mill, Clarksburg. More details in the February newsletter.

Grapevine Red Blotch Disease (GRBaV)

by Rhonda Smith, UCCE Sonoma County

(*This disease occurs in some vineyards in the northern San Joaquin Valley. The article below was excerpted from Rhonda's full article on her Viticulture web page: http://cesonoma.ucanr.edu/viticulture717/, which also has references and the link to testing labs, some of which include testing for diseases. Rhonda will be speaking on the subject at the Clarksburg's Grape Day on March 3, 2015. According to Dr. Mysore (Sudhi) Sudarshana, Research Biologist, USDA-ARS, whether or not to remove infected vines depends on the quality of the wine made, because affected grapes will reduce wine quality. Red blotch would lower the revenue of high-value wine but not of low-value wines. He noted that some growers in Napa are removing infected vines and sometimes whole blocks.*)

In 2011, a new grapevine virus was discovered in vines showing symptoms that occasionally had been confused with grapevine leafroll disease. Grapevine red blotch associated virus (GRBaV) has been confirmed in both red and white varieties within California and in other states. Disease symptoms in red varieties include reddening of regions within leaf blades, along with red veins and petioles and delayed fruit maturity. Disease symptoms in white varieties include subtle-to-obvious chlorotic regions within leaf blades.

The virus name applies to all varieties including whites. Currently, it is not known what factors affect symptom onset and development in diseased vines; variety, rootstock and vine age may play a role. In red varieties, the first signs of red coloration in basal leaf blades in 2013 occurred in June and July. Based on experience from past years, by the end of this season, foliar disease symptoms will occur in most or all leaves in the canopy. However, in white varieties, timing of symptom onset and severity of symptom expression has not been tracked as well.

Investigations to learn how the virus is spread

Cornell researchers have identified the virus as a very unique member of the Geminiviridae family. Some geminiviruses are spread by leafhoppers and whiteflies. At this time, it is not known if leafhoppers or other insects can vector GRBaV in the field. A research group in Washington State University has determined the virus can be moved by insects to potted vines.

The virus is known to be spread by propagation. UC Foundation Plant Services virologists successfully graft inoculated healthy potted vines with the virus by using chip buds taken from vines known to be infected with GRBaV. What is not known is the pattern of distribution of the virus inside the plant after it is grafted and how long it takes symptoms to develop following inoculation.

Identifying red blotch diseased vines

The diagnostic test (a PCR assay) to detect GRBaV developed by the USDA-ARS group at Davis became available in October 2012, and since that time commercial laboratories have processed thousands of samples submitted by growers. The virus has been confirmed in several varieties in California and in several California counties and other states. At this time, all scion varieties and rootstock plants regardless of parentage are thought to be susceptible.

In 2011 and 2012, samples were collected from individual symptomatic vines of red varieties in Napa, Sonoma and San Luis Obispo counties. GRBaV was detected in ~95% of symptomatic grapevines and in ~2.7% of asymptomatic grapevines. This is a very high correlation between disease symptoms and the virus – higher than the correlation between grapevine leafroll disease symptoms and leafroll associated viruses. Although symptoms are highly correlated with GRBaV, it does not mean the virus causes the symptoms. However, it does mean that symptomatic vines are likely to be infected with GRBaV.

To verify the presence of the virus, samples must be collected and submitted to a commercial diagnostic lab for testing by PCR assay. Fall and winter are ideal for detecting many grapevine viruses and the basal portion of current year canes are submitted for testing. If you plan to submit samples from vines to confirm the presence or absence of GRBaV, contact the lab of your choice or visit their website for sample collection protocol. For a list of commercial labs in north and central California, see this article on Rhonda's web site.

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2015 SACRAMENTO RIVER DISTRICT PEAR RESEARCH MEETING

Wednesday, February 4, 2015

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)

Units applied for

1.5 hours Calif. Department of Pesticide Regulation (DPR) units and

3.5 hours Calif. Certified Crop Advisor (CCA)

Sponsor: Sacramento County UC Cooperative Extension, Calif. Pear Advisory Board, and Pear Pest Management Research Fund

There is no charge or registration for this meeting. A set number of lunches will be available for attendees.

Agenda

8:00 Refreshments

8:25 Welcome and announcements

8:30 Marker-based breeding technologies for pear improvement and related outreach activities
    David Neale, UC Davis and Rachel Elkins, UCCE Lake & Mendocino Counties

8:50 Evaluation of new bactericides for control of fire blight
    Jim Adaskaveg, UC Riverside

9:10 Detection of fungicide resistance in populations of *Venturia pirina* in California pear orchards
    Doug Gubler, UC Davis

9:30 A rapid prototyping design tool for pear harvest-aid platforms utilizing 3D fruit reachability and kinematic modeling
    Stavros Vougioukas, UC Davis Biological & Agricultural Engineering

9:50 Break

10:10 Phenology and distribution of brown marmorated stink bugs in California pear orchards
    Chuck Ingels, UCCE Sacramento County

10:30 Monitoring orchards for consperse stink bug
Evaluation of potential components of a fire blight IPM program
Rootstocks and orchard systems for European pears
    Rachel Elkins, UCCE Lake & Mendocino Counties

11:20 Effects of calcium sprays and AVG on fruit quality at harvest and after storage
Evaluation of pear tissue sampling protocols for improving nutrient management
Pear variety evaluation
    Chuck Ingels, UCCE Sacramento County

12:10 Lunch (Provided by Calif. Pear Advisory Board and Pear Pest Management Research Fund)