

Spotted Wing Drosophila in California Cherries

What is Spotted Wing Drosophila (SWD)?

Spotted wing drosophila (SWD), *Drosophila suzukii*, is an invasive pest with a broad host range, including crops and ornamental plants. Native to Japan, this fly was first introduced in California in 2008 and has become a major threat for several soft, thin-skinned berries and some stone fruits, including cherry. Adult flies look similar to other flies belonging to the genus *Drosophila*, including the common vinegar fly.



Fig. 1. Spotted wing drosophila adults

SWD adults (size ~3 mm; Fig. 1) have red eyes, a pale brown thorax and abdomen, and black bands on the abdomen. Male flies have two distinguishing characteristics: 1) a black spot on the tip of each wing, and 2) a dark band encircling the forelegs. Female flies have a heavily serrated ovipositor, or egg laying apparatus (Fig. 2). Tiny white larvae (3.5-4 mm) feed inside the fruit and pupate. Most of the pupae remain inside the fruit with their respiratory tubes extending out until they emerge as adults.



Fig. 2. Detail view of SWD ovipositor

Why is SWD a big deal?

Of approximately 1500 *Drosophila* species worldwide, SWD is one of the two species capable of depositing eggs on healthy and ripening fruits because the female SWD is equipped with a serrated ovipositor for depositing eggs inside fruits. One female is capable of laying more than 300 eggs during her lifetime, and in most instances, one fruit is infested with multiple larvae. The ovipositor is capable of incising the intact fruit skin rendering the fruit with typical oviposition scars (Fig. 3). Direct damage on fruits by internal-feeding larvae leads to fruit tissue damage, and ultimately the fruit collapse. Fruit injured by oviposition and feeding become an easy target for several other pests such as vinegar flies and other secondary infections (Fig. 4), which are otherwise

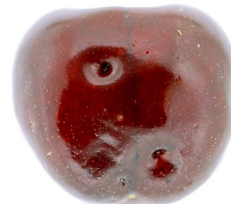


Fig. 3. Oviposition scars on Cherry fruit caused by SWD

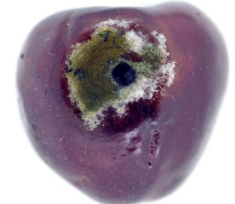


Fig. 4. Secondary infection by mold on cherry fruit

not a threat to intact fruit. In addition to indirect damage associated with secondary pest and disease incidence, there is a high risk of fruit being rejected during the processing and/or exporting of fruit if SWD infestation is found; thus, the economic threshold for this pest in cherry is 'zero' in practical terms.

Why, how, and when to monitor SWD

Because of its wide host range, unique egg laying behavior, high fecundity, and large number of generations per season, damage by SWD in soft and susceptible fruit, such as cherry, becomes severe very quickly. Therefore, it is very important to pay attention to adult activities as well as any other signs of fruit damage in cherry orchards on a regular basis. There are traps that capture SWD but the relationships of trap captures to population or crop damage have not been worked out. Monitor adult fly activities using traps, beginning just before fruit ripening (i.e. changing fruit color from green to red) and continue through the harvest. Traps can be constructed locally. Some local trap designs are described here (http://www.fruit.cornell.edu/spottedwing/pdfs/SWDTraps_CornellFruit.pdf). Traps designed by using plastic cups with screened holes on the sides and apple cider vinegar as the attractant are effective in catching high numbers of adults. Currently, there are many studies going on across the United States focusing on improving effectiveness and specificity of several attractants to SWD, and we are hopeful that even more effective traps will be available in the near future. Traps

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developed so far for this pest catch both male and female flies, along with other *Drosophila* species. Although some traps are more specific than others in catching SWD, none of the traps to date have shown complete specificity to SWD. In this context, identification of SWD from other flies (mostly vinegar flies) is very important. Here is an excellent ID-kit for SWD (<http://www.ipm.msu.edu/uploads/files/MSU-SWD-ID.pdf>). For cherry, it is recommended that traps are hung on the shady side of the tree since SWD prefers relatively shady areas. The height of traps should be within easy reach or at eye-level. In addition to placing traps, it is highly advisable to be vigilant about any signs of SWD damage on the fruit still in trees as well as those dropped onto the orchard floor. Here is information related to recognizing fruit damage caused by SWD (<http://ir.library.oregonstate.edu/xmlui/bitstream/handle/1957/19525/em9021.pdf>).

What are the options for SWD management?

Current management practices for SWD in California cherry production mostly rely on a limited number of insecticides, particularly pyrethroid and spinosad products (http://www.ipm.ucdavis.edu/PDF/MISC/2014_Cherry_Spotted_Wing_Drosophila.pdf). Although frequent use of these insecticides may lead to pest resistance, adverse effects on natural enemies, secondary pest outbreaks, and more importantly, unacceptable levels of residue on fruit, growers do not have many options available at this time. In this context, exploring new pest management options is needed. Recently, the United States Department of Agriculture (USDA) has granted \$6.7 million research funding to University and USDA scientists across the nation for conducting applied research and extension activities that are intended to explore ways to manage SWD in sustainable ways under several cropping systems.

Jhalendra Rijal, IPM Advisor, UCCE Merced, Stanislaus, and San Joaquin Counties

CA Rangeland Conservation Coalition's 11th Annual Summit—"Wildlife & Rangeland Management—Mediating Impacts to Conservation & Ranching"

The Rangeland Coalition's annual summit will be held on January 22nd at the Stockton Ag Center, with field tours on January 21st. This year's theme will focus on wildfires. Regardless of whether it is a drought year or an El Niño year, wildfires have become a reality on an annual basis in California's mountains and foothills. Lack of management, in some cases, an increase in

population, and access have created the perfect situation for an increase in fire frequency. There are success stories even in the Butte Fire where ranchers had managed well ahead of time and stayed to create fire breaks during the fire, and that saved larger areas than just their ranches. Three separate tours are being planned for the Rim Fire, the Butte Fire, and the Tesla Fire areas. Each will cover similar topics and will highlight success stories in each area. Registration and more information will be available shortly.

Drought Management

With four years of drought behind us, I am sure everyone is hoping that El Niño predictions all come true this year. We have already had our germinating rain for most of the area. Hopefully this year will break the drought, but just in case, or even for future reference, there are many resources within the University for drought information. The California Rangeland Watershed Laboratory website is one source (<http://rangelandwatersheds.ucdavis.edu/main/drought.html>). There you will find links to past presentations related to drought. In addition, Leslie Roche, Ph.D, the new Rangeland Management Specialist based at UC Davis, has information from a survey she conducted in which many of you may have participated. She has some summaries of both proactive management and reactive management that ranchers in the state have used during the past four years to survive the drought.

Another source of information comes from the UC Sierra Foothill Research and Extension Center's Drought Workshop, where all of the presentations were recorded and posted on YouTube (<http://sfrec.ucanr.edu/Outreach/Workshops/>). Halfway down the page you will find the links for each presentation.

There has also been an effort to capture people's stories about the drought and how they are managing. Titled "Voices from the Drought", people have recorded their stories so others can listen and learn. This is something that can be used now, but also archived and saved for the future. There is also a Facebook page with the same title that Dan Macon maintains. Dan will post different things from Sierra or his own operation and try to get a discussion going. If you have not yet seen the Voices from the Drought, please take a minute and do so. If you would like to add your family's story, please let me know. <http://www.caes.ucdavis.edu/news/multimedia/2014/voices-from-the-drought>

Drought and Poisonous Plants

As many of you already know, poisonous plants are more of a concern during a drought. With less of the desirable forage available for grazing, animals may try to graze on what would normally be avoided. Whether it is milkweed or jimsonweed, now is the time to be familiar with any weeds in your pastures that may be poisonous.

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If possible, try to remove any poisonous plants. If an infestation is too large to remove, consider not grazing that pasture until there is adequate desirable forage so livestock have other forages to select. Most poisonous plants will need to be consumed in a large enough percent of the diet before you see side effects. This is why in drought years, when there is nothing else to choose, you see more animals affected by poisonous plants. Also be careful of well-meaning neighbors who may want to toss their lawn clippings into your pasture. There may very well be poisonous plants mixed into what many think of as just grass. We have seen situations exactly like this in the area – where the gardener felt sorry for the cows on the neighboring ranch that had nothing but dry grass to eat, so he tossed the lawn clippings into the pasture, without realizing that they included some oleander leaves. The result was six dead cows.

UC has a beautiful color publication that is a free download detailing all of the poisonous plants commonly found in California. It can be downloaded at http://www.ucanr.edu/poisonous_plants, or you can purchase a spiral bound, color copy from my office for \$5.00. If you are not familiar with poisonous plants, it is a great publication to have as a reference.

Theresa Becchetti, Livestock and Natural Resource Advisor

Pruning First Season Dormant Almond Trees

First season dormant pruning is the most important pruning your almond orchard will ever have, determining the tree's shape and performance for its lifetime! At this time you should select three (or four) permanent primary scaffolds that will form the framework of the tree. I have observed the consequence of first year trees pruned improperly: premature loss of tree vigor and failure or breaking of primary limbs, resulting in increased susceptibility to diseases and in some extreme cases the early removal of orchards. The primary goal of the first dormant pruning is to select three primary branches with as much space as possible between them. Wide spacing ensures the best chance of strong branch attachments that will not split or break as the tree matures. Try to have 3-6 inches of space vertically between primary limbs (Figure 20.1-A, UC Almond Production Manual, ANR # 3364). The three primary scaffolds should be oriented 120 degrees apart when viewed from above (Figure 20.1-B). Such an arrangement reduces the chance of splitting branches, leaning trunks, and crossing limbs. If possible, one of the three primary scaffolds, preferably the strongest, should grow into the prevailing wind, usually to the northwest. A strong, vigorous limb

on the north side helps keep the tree from being dominated by growth on the 'sunny' south side of the tree. Pruners should also pay attention to the angle of the primary limbs when selecting them because the scaffold angle determines whether bark will become embedded between the limb and trunk. The ideal primary scaffold grows 45 degrees from the vertical and the horizontal (Figure 20.1-C). If the ideal limb is not present, try to find limbs at least 30 degrees from the vertical or at least 30 degrees from the horizontal. Limbs that grow at too flat of an angle tend to lose their vigor and upright orientation. Limbs where the bark becomes embedded will be weak and prone to split with heavy crops.

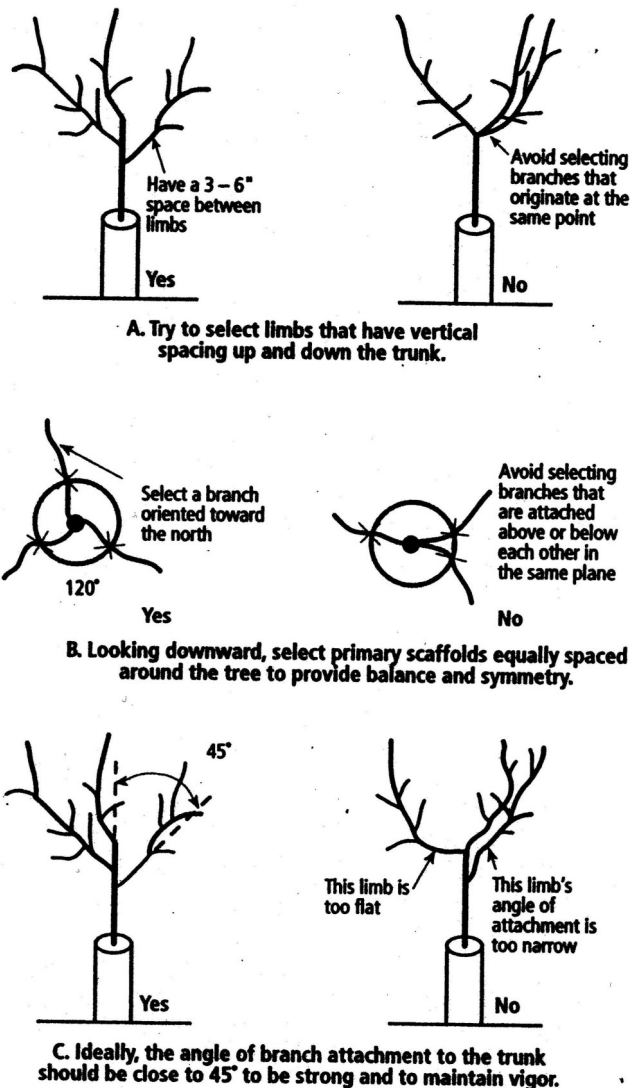


Figure 20.1 The three considerations in selecting primary scaffolds are limb spacing (A), orientation (B), and angle of attachment (C).

We used to recommend three primary scaffolds because if you had more than three you would not be able to limb-shake, but with higher density orchards, tree size is suppressed and primary limb shaking is only rarely performed. Roger Duncan, UCCE Advisor in Stanislaus County, has found in his tree density and pruning trials

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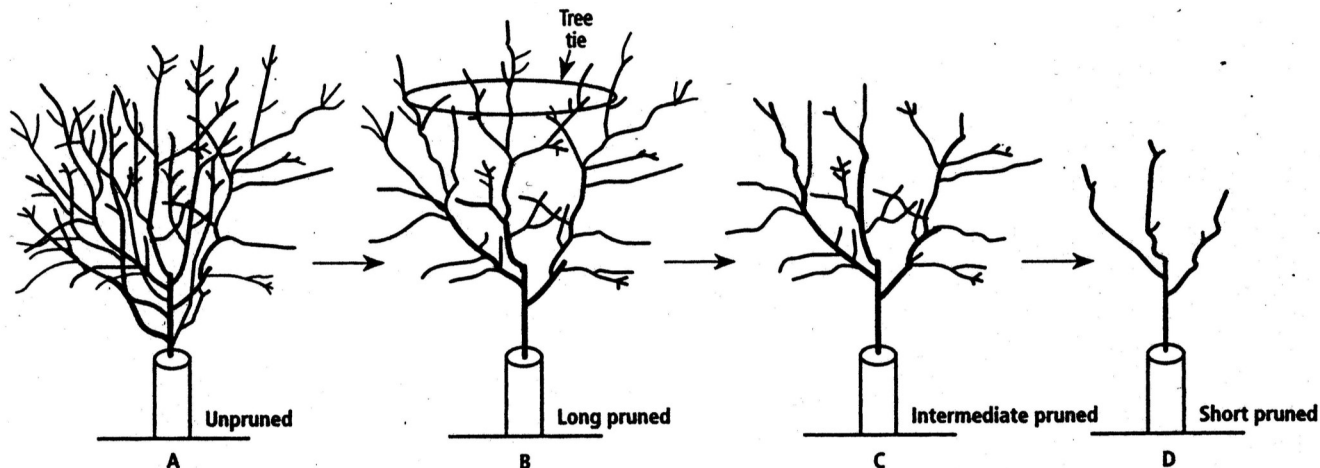


Figure 20.2 The same tree (A) before pruning and after first dormant pruning according to different training systems: (B) long pruning, (C) intermediate pruning, and (D) short pruning.

that the number of primary limbs is less important if they have proper scaffold angles and spacing, especially in higher density plantings where trees will most likely never get so big that they need to be limb shaken.

What if you can't find three acceptable primary scaffolds? Selecting two sound scaffolds is better than keeping four poor ones according to Warren Micke (Emeritus Almond Specialist, UC Davis). After the primary scaffolds have been selected, the next step is to remove all other major limbs that originate from the trunk, and all growth below the lowest primary limb. Pruners should leave small lateral branches on the primaries; this growth promotes scaffold caliper growth and is the first to develop spurs and produce nuts. Growers can prune their primary scaffolds differently using three different pruning practices (Figure 20.2); short pruning, long pruning, and intermediate pruning. These practices generally do not affect trunk diameter or limb caliper, but production differences related to tree pruning occur with the first few harvests and gradually disappear after trees mature. In choosing the pruning method, a grower must decide which is more important, high early production or ease of training during the early growing years. The grower must also consider the growth habit of the variety they are pruning and the wind conditions present in their orchard. I usually prefer the 'happy medium'—intermediate pruning.

Long pruning: Growers who use long pruning make no major heading cuts on primary scaffolds and retain small lateral branches that will provide leaf surface and early fruiting. This type of pruning allows the tree to develop a natural branching habit. Scaffolds, canopy, and fruit wood develop quickly. Long-pruned trees usually need roping or tying (Figure 20.2-B). If ropes are used, they must be placed as high on the primary scaffolds as possible so that the scaffolds do not bend over them and break. In this system, secondary and tertiary branches are selected from the natural branching of the tree. The main advantage of long pruning is heavy early production. Disadvantages include the need for more work and care the second growing season.

Short Pruning: This type of pruning involves heading each of the three primaries back to 18-24 inches. Unfortunately, I have seen some pruners even head their primaries back to 12 inches or less, which is much too severe and will lead to "elbow" growths and sharp secondary angle branching. Short pruning (18-24 inches) stimulates vigorous secondary growth that is largely removed later with thinning cuts. This type of pruning allows growers a large role in shaping trees, because the vigorous re-growth provides many choices for secondary limb selection where you want it. Short-pruned trees are usually shorter in stature and require less roping or tying in their third leaf (Figure 20.2-D). Keeping trees shorter may be advantageous in their second growing season in areas with strong wind. Although short pruning is easy to teach, growers should consider the trade-offs. Heading cuts on vigorous trees can encourage vegetative growth at the expense of early nut production and increased pruning expenses. Developing a primary scaffold on short-pruned trees long enough to limb-shake can be difficult.

Intermediate pruning (my favorite): This type of pruning is a compromise between short and long pruning. Growers make heading cuts high on the primary scaffolds. These cuts are at 42-48 inches from the trunk, usually at a point just below the closely spaced buds that are common in the last 6 to 12 inches of shoot growth (Figure 20.2-C). Heading at this distance greatly reduces the number of new shoots that originate near the end of the branch in the second leaf. This reduces the shoot weight at the end of the primary scaffold and makes it less likely to bend in spring winds. As with long pruning, intermediate pruning will keep small lateral branches to increase leaf surface and promote early fruiting. Intermediate pruning generates fewer undesirable water sprouts than short pruning. If intermediately pruned trees are especially vigorous or if the variety is willowy, branches

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may require roping prior to the second leaf. Overall, this is a successful training system that avoids the worst problems of long pruning but offers advantages in terms of early production.

Pruning potted trees: The first dormant pruning of potted trees can present some difficulties when selecting primary scaffolds. Potted trees are often planted throughout the year because growers are no longer limited to planting bare root trees while they are dormant. I have observed many successful orchards planted from potted trees in July and August - usually with drip or micro-sprinklers to keep them irrigated - but these potted trees often have produced branches that have unsuitable angles, placement, or girth to develop into suitable primary scaffolds. In these cases, I have recommended to growers that they treat their six-month in the ground potted trees as if they were recently planted dormant trees, and prune off all of their branches the first dormant season. By doing so, these trees will push new growth the following spring that should have enough branches from which to choose primary scaffolds that are spaced properly around the tree with appropriate vertical angles (45°).

Minimal pruning: Interest in minimal pruning has increased greatly and deservedly. I believe my family severely over pruned our first almond orchard, resulting in lost production, because we were ex-Cling Peach growers converting to almond production, and pruning had been one of our main methods of crop thinning for size. With almond, however, thinning for crop size is not necessary, and minimal pruning should start with the second growing season, after primary limbs have been properly selected. At this point, growers can back off on pruning and concentrate on early production. Usually by the second dormant season the secondary branches do not need to be headed unless excessively long, since most almond trees branch sufficiently without heading cuts. Other than pruning out limbs that compete with our selected primary scaffolds, and removing badly crossing branches or limbs that interfere with mechanical cultivation, additional limb removal is usually unnecessary. For young trees between 3-7 years old it is generally a good idea to tie the canopy in order to support limbs and prevent breakage. With some varieties, like 'Monterey,' it is critical to tie or primary limbs could be lost. It is difficult to judge next year's crop load when pruning and circle tying in the dormant season. Better safe than sorry!

Good Luck!

Brent Holtz, County Director and Almond Farm Advisor



Announcements / Calendar of Events

Western Alfalfa and Forage Symposium

December 2-4, 2015; Reno, NV

To register visit: calhay.org/symposium/schedule-of-events/.

The Almond Conference

December 8-10, 2015; Sacramento, CA

To register visit: almondconference.com.

SJC and Delta Field Crops Meeting

January 8, 2016; 8:00am–12:00pm

Robert J. Cabral Agricultural Center, 2101 E. Earhart Ave., Stockton

Contact: Michelle Leinfelder-Miles, (209) 953-6120
mmleinfeldermiles@ucanr.edu

Proven Solutions to Drought Stress: Water Management Strategies for Perennial Crops with Limited and Impaired Water Supplies

January 12-13, 2016; Modesto, CA

To see the agenda and register, please visit: <http://www.droughtmgt.com/>

Northern San Joaquin Valley Almond Day

January 20, 2016

Modesto Junior College Ag Pavilion (West Campus)
2201 Blue Gum Avenue, Modesto

Contact: Brent Holtz, (209) 953-6100, baholtz@ucanr.edu

California Rangeland Conservation Coalition Summit

January 22, 2016 with field tours January 21; 9:00am–4:00pm

Robert J. Cabral Agricultural Center, 2101 E. Earhart Ave., Stockton

Contact: Theresa Becchetti, (209) 525-6800
tabecchetti@ucanr.edu

California Cherry Research Review

Tuesday, January 26, 2016

Robert J. Cabral Agricultural Center, 2101 E. Earhart Ave., Stockton

Contact: Joe Grant, (209) 953-6100, jagrnt@ucanr.edu

N. San Joaquin Valley Processing Tomato Production Meeting

Wednesday, January 27, 2016; 8:00am–11:00am

Doubletree Hotel, 1150 9th Street, Modesto

In conjunction with the California Tomato Growers Association (CTGA) 68th Annual Meeting

For info on the educational portion, contact Brenna Aegerter, (209) 953-6114, bjaegerter@ucanr.edu.

For info on the CTGA luncheon meeting and exhibition contact (916) 925-0225 or ctga@sbcglobal.net.

Grape Day

February 2, 2016; 8:00am– 2:00pm, Doors open at 7:00am.

Hutchins Street Square, 125 S. Hutchins Street, Lodi

Morning session is free. Lunch is \$25. Lunch speaker TBA.

Contact: Paul Verdegaal, (209) 953-6119
psverdegaal@ucanr.edu

Seed Treatments for Wireworm Control in Field Corn

Wireworms are the soil-dwelling larvae of click beetles. They feed on the seeds and roots of various crops and are a particular pest of field corn in the Sacramento-San Joaquin River Delta region (Figure 1). According to the UC IPM Guidelines, wireworms may live three or more years depending on species, conditions, and food supply. Wireworm management in corn is generally by seed treatment or soil treatment at planting. Cultural practices – like crop rotation, flooding, or cultivation – are generally not effective against wireworms. Studies have shown that neonicotinoid seed treatments are as effective at controlling wireworms as organophosphates, the latter being linked to environmental and wildlife persistence. Neonicotinoids, however, are under increased scrutiny for possible off-target effects on bees.



Figure 1. Wireworm emerging from corn seed.

The objective of this study was to evaluate the efficacy of a new reduced-risk product called Lumivia™ (active ingredient chlorantraniliprole) at different rates, in combination with other products, and in combination with polymers, which are used to help hold seed treatments in place. Lumivia™ was compared to three commercial neonicotinoid products: Cruiser® (a.i. thiamethoxam), Poncho® (a.i. clothianidin), and Poncho® Votivo® (a.i. clothianidin + *Bacillus firmus* I-1582). This was the second year of evaluation. Complete reports from both years are available on my website (<http://ucanr.edu/sites/deltacrops/Corn/>).

Two trials were conducted in 2015 – one on Staten Island and one on Tyler Island. The soil type at both trial sites is a Rindge muck, which characterizes approximately 57,000 acres in the Delta. The Rindge muck is high in organic matter and considered very poorly drained, and thus, it was a good soil for these trials because the soil stays cool and damp into late spring and early summer. Both sites have heavy wireworm pressure, according to the growers, and were planted with corn the previous year. The Staten Island trial was planted on April 15, 2015, and the Tyler Island trial was planted on June 9, 2015, both having four replicate blocks.

We evaluated growth parameters starting at about a week after planting for a period of about six weeks. Growth parameters of interest were emergence, stand count, vigor, damaged plants, dead plants, and height.

Additionally, on the second week of evaluations, ten seedlings were lifted. Dead and live wireworms were counted on the seeds, roots, and surrounding soil, and the seedlings were given a visual health rating. The trials were harvested on September 30th and October 14th (Staten and Tyler Islands, respectively). Harvest parameters included a plant count, yield, grain moisture, and bushel weight. Moreover, at the Staten Island trial, Johnson grass plants were also counted because weed pressure was high.

Growth results are described in the online report. Yields at the Staten Island trial were highly variable, and both wireworm and weed pressure may have contributed to the variability (Table 1). Johnson grass pressure was especially high in treatments where plant stands were compromised by wireworms or birds. High weed pressure can be a consequence of poor wireworm control because stands that are compromised do not provide the consistent shading to out-compete weeds. Yields can suffer as a result. The Lumivia™ + Cruiser® treatment yielded the highest, and Lumivia™ 750 yielded the worst, even lower than the untreated control. The poor result of Lumivia™ 750 may be explained by uncontrollable factors, namely, bird damage and high wireworm pressure. The polymer treatments that were tested at the Tyler Island site showed no yield benefits over the non-polymer treatments and yielded similarly to the commercial standard, Poncho® Votivo® (Table 2).

The trial results illustrate that growers have several options for managing wireworms. Across both trial locations, results suggest that Lumivia™ 250 + Cruiser® 250, Lumivia™ (500 or 750) in combination with bifenthrin 125, and commercial standards Poncho®, Poncho® Votivo®, and Cruiser® provide good control against wireworm in the weeks after planting when corn is in the seedling stages. While we saw few statistical yield differences, the control and resulting better stands have the potential to improve yields over non-treated seeds. The two Poncho® products are commercially available from Bayer CropScience, and Cruiser® is commercially available from Syngenta. Lumivia™, a Dupont product, is not yet commercially available as a corn seed treatment in California, but if it were to become so, it would provide growers with an alternative to the neonicotinoid treatments. When making decisions on products, growers should consider their wireworm pest pressure and other soil-dwelling pests that could limit their production. Growers should also consider which seed treatments they have been using and whether those are still controlling pests. If not, rotating to a different chemistry might be a way to bring pests back under control. Integrated pest management practices recommend rotating chemistries for insect resistance management.

Michelle Leinfelder-Miles, Delta Crops Advisor

Table 1. Harvest results of the Staten Island seed treatment trial.

Date: Treatment*	September 30th								
	Total Plants		Moisture (%)	Bushel Weight (lbs/bu)		Yield at 15% Moisture		Johnson Grass Pressure	
	(#plants/40 feet)					(tons/acre)		(#plants/20 feet)	
Cruiser® 250	48	abc	11.7	60.13	a	3.82	ab	16	ab
Lumivia™ 250 + Cruiser® 250	61	a	11.6	59.35	ab	5.04	a	8	b
Lumivia™ 250	29	abc	11.5	57.28	ab	2.30	ab	23	ab
Lumivia™ 500	32	abc	11.5	57.78	ab	2.24	ab	20	ab
Lumivia™ 750	9	c	11.1	55.44	b	0.36	b	38	a
Lumivia™ 250 + bifenthrin 125	42	abc	11.8	58.73	ab	3.30	ab	14	ab
Lumivia™ 500 + bifenthrin 125	50	abc	11.8	59.83	a	4.66	ab	12	b
Lumiva™ 750 + bifenthrin 125	42	ab	11.8	59.88	a	3.55	ab	7	b
Poncho® Votivo® 1250	55	ab	11.8	59.43	ab	4.21	ab	10	b
Poncho® 500	58	a	11.6	59.35	ab	3.89	ab	14	b
Untreated control	15	bc	11.5	58.2	ab	1.10	ab	27	ab
Treatment P value	0.0012		0.0728	0.0147		0.0205		0.0015	
Standard Error	8.78		0.12	0.67		0.98		4.95	

* Numbers following product names indicate the micrograms of active ingredient per seed (μ a.i./seed).

Table 2. Harvest results of the Tyler Island seed treatment trial.

Date: Treatment**†			Moisture (%)	October 14th		Yield at 15% Moisture (tons/acre)
	Total Plants (#plants/40 feet)			Bushel Weight (lbs/bu)		
Cruiser® 250 + Disco™	79	a	22.1	54.15		4.15
Lumivia™ 250 + Cruiser® 250 + Disco™	81	a	21.5	54.95		5.18
Lumivia™ 250 + Cruiser® 250 + PSF 1006	80	a	22.4	53.95		4.40
Lumivia™ 250 + Cruiser® 250 + FR1197	82	a	22.2	54.53		5.09
Lumivia™ 750 + FR1197	75	ab	21.3	54.83		4.85
Poncho® Votivo® 1250	80	a	22.0	54.58		4.59
Lumivia™ 250 + Cruiser® 250 (no polymer)	81	a	22.2	54.33		4.47
Lumivia™ 750 (no polymer)	78	a	21.7	54.05		5.03
Untreated control (w/ fungicide)	66	bc	22.8	53.65		4.41
Untreated control (w/o fungicide)	63	c	21.8	54.15		4.40
Treatment P value	<0.0001		0.6134	0.9397		0.1231
Standard Error	2.67		0.54	0.66		0.29

* Numbers following product names indicate the micrograms of active ingredient per seed (μ a.i./seed).

† Disco, PSF 1006, and FR1197 are polymers used with the seed treatments.

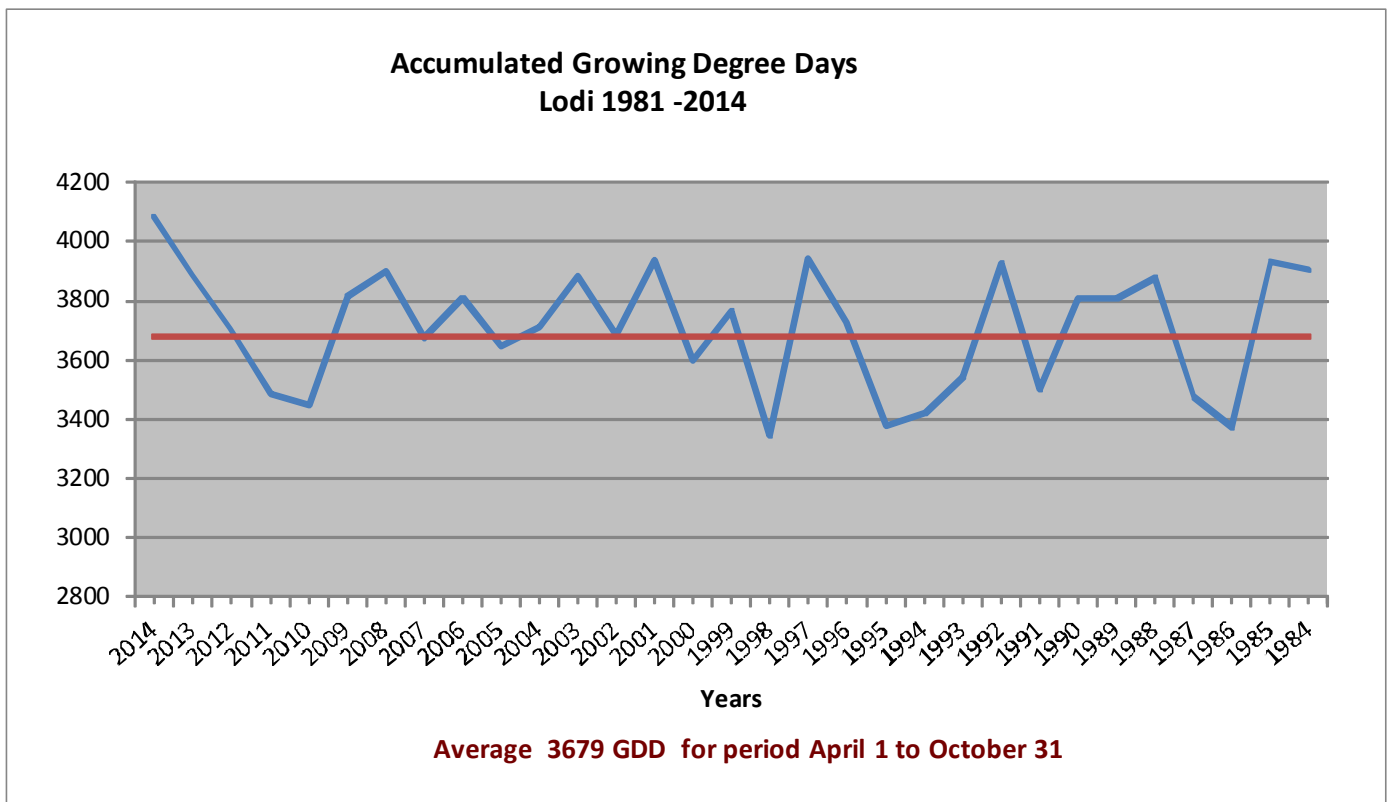
In the Vineyard

The 2015 harvest came to a close by the second week of October. Harvest began on the earliest date that most anyone can remember. It was an interesting year to say the least, but there have been previous harvest starts in July. Let's look back on some local observations from the recent past to see how this year compares. Checking some of my notes, Zinfandel for red was picked in August in 2001, 2004 and 2007, at 24° to 26° Brix, compared to usual harvest dates around mid to late September for red programs. A Chardonnay clone trial was harvested on August 17th in 1994.

The 2015 season did start out with budbreak a full three weeks ahead of average on February 28th, but the previous early record start was on March 1st in 1997. The

temperature at or above 100°F, versus an average of about 17 days. On October 31st, the Growing Degree Day (GDD) accumulation ended up slightly above the 27 year average for the season, with about 3835 GDD accumulated. The past season total rainfall was 13.2 inches in the North County, which at 80% of average, is better than initially expected. The majority of this total (9.2 inches) came early in the fall and winter months from October through December. Currently, we are about 7% of seasonal total, when we should be about 15 to 20% of total. Keep your figures crossed.

Chardonnay was ready for harvest in the third week of July. Some small plantings of German varieties in the Victor area were also harvested by August 1st. Harvest got fully under way about July 24th with Pinot grigio, some Sauvignon blanc, some Muscat selections, and



cool April and May slowed crop development enough to put the harvest about 10 to 12 days earlier than the long term average. A surprise hailstorm caused some scattered but severe damage in the area west of downtown Lodi between Highway 12 and just north of Turner Road. A few small areas of damage also occurred to the north and south of Lockeford.

June tended to be warmer than average, but July was average or slightly below average for temperatures. Some color in Zinfandel occurred as early as June 23rd compared to a more average date around the 4th of July (for Zinfandel). After veraison the weather heated up with a few 100°F days (38°C in Australia), but returned to more average maximums as harvest ramped up. The season ended with a total of 14 days with a maximum

some Pinot noir for sparkling wine. The first Zinfandel berries with color began to show on June 23rd and some vineyards for red programs were at 28° Brix by August 20th. Other mid-season reds were also ready to go early, with some Pinot noir approaching 24° Brix in late August! The crop was about average across varieties, but ranged from about 20% below long term performance to well above average for young vines.

Cluster counts were mostly average, but cluster size and set varied by variety and location. Some of this variability possibly depends on the erratic temperatures during a rapid bloom period but mostly from four years of drought and two of the three previous seasons with record crops. Overall, berry and cluster size may be smaller this year, as extremely dry conditions prevailed during

early spring development of berries. Little to no berry shrivel was apparent this year, but some sunburn has been reported. Fortunately, Sour (Summer Bunch) rot was much less than last year and almost nonexistent.

Similar to last year, conditions were good for powdery mildew (PM). Although problems were scattered and not as bad as feared, it was relatively easy to find PM as disease pressure was severe from April on. Mite problems flared somewhat in the last part of the summer, but still occurred rather scattered and were inconsistent, and light considering the dry soil conditions. A new concern is the Grape Red Blotch associated Virus (GRBaV). It doesn't seem to be as severe as some of the traditional problem viruses but in some varieties and some sites it does seem to inhibit sugar accumulation. The frustrating part of GRBaV is that we don't know if there are pest vectors, where it comes from, how long it has been around or if there are different strains. See <http://ucanr.edu/sites/NCPNGrapes/files/161782.pdf> or http://iv.ucdavis.edu/Viticultural_Information/?uid=284&ds=351 for more information.

Vine Mealy bug (VMB) is still spreading through the county. Be aware of any new infestations, often indicated by sooty (black) mold and honeydew staining on the bark of the trunk or cordons, or as excessive honeydew and waxy secretions in clusters, on spurs, or along cordons. A high degree of ant activity in and around vines can also indicate problem spots. Good places to focus on a first look are where birds tend to perch or roost. It may be the mild and dry winter, along with the early bud-break that increased VMB movement. It appears the materials available for control are working but have taken longer to fully suppress active populations. At this point, there doesn't appear to be control problems, but be on the lookout.

The Light Brown Apple Moth (LBAM) continues to expand its territory in the south part of the county around Manteca. It is very similar to Omnivorous Leaf Roller in appearance, the number of host crops, damage, and in control. In some areas of the state, LBAM is showing some effects of control by native beneficial insects. Learn more about LBAM at <http://www.ipm.ucdavis.edu/EXOTIC/lightbrownapplemoth.html>. A new invasive species of concern for many crops is the Brown Marmorated Stink Bug (BMSB). First spotted in Stockton a couple of years ago, it may have been identified just west of Lodi recently. See <http://www.ipm.ucdavis.edu/PMG/PESTNOTES/pn74169.htm>.

The following are some general observations (no data) that come to mind after four years of drought conditions.

- There is more evidence of trunk canker diseases and vine dieback from Measles/Esca/Vine Decline or as Eutypa Dieback/Botryosphaeria Canker.
- There are fewer weed problems.

- There is more concern for apparent early and increased VMB activity.
- There is more overall vine stress on young and old vines and more potassium "deficiencies."

Fall Checklist

- If the weather stays dry, apply post-harvest irrigation to help maintain soil moisture until rains are steady.
- Little to no nitrogen should be applied now, but potassium now (or early next year) is okay. It won't "move" like nitrogen. To get the full benefit of compost, it needs to be disked in.
- Make a note of any problem weed species that may be increasing.
- Mark any vines with excessive red leaves and/or leaf roll for monitoring of fruit quality next year or for possible removal before then.
- Renew your Irrigated Lands Regulatory Program permit/membership, and stay up to date on the implementation of the Waste Discharge Requirements for 2015.
- Update your air pollution mitigation plan if you have 100 acres or more in a single vineyard.
- Review your pesticide use reports, and get everything up to date.
- Check locations near riparian areas, trees, and other bird roosting sites for VMB. Focus on these areas next spring in any VMB control program.
- Gophers, voles, and squirrel activity are still common and may deserve attention with baits, gas cartridges, fumigant pellets (usually better in the spring), trapping, shooting, or a combination of several of the methods. Remember ground squirrels are fair game, tree squirrels require a depredation permit. Owl boxes can help stabilize rodent populations, but do not control them.

Paul Verdegaa, Viticulture and Pomology Advisor

Powdery Mildew and Curly Top in Tomatoes

This was certainly an “out of the ordinary” season for mildew in tomatoes. The mildew problems started earlier than usual and progressed fairly fast – by the third week of July we were already seeing some tomato fields which were significantly damaged by mildew. Strangely, we noticed mildew sporulation on stems; the mildew we normally see here only grows on the leaves. Based upon these unusual symptoms (sporulation on petioles and stems), as well as evidence from the microscope (spore shape) and genetic fingerprinting, the pathogen has now been confirmed to, indeed, be different from our usual *Leveillula* mildew. This “new” mildew is a species of *Oidium*.

Below are some preliminary thoughts on this *Oidium* mildew based on my limited experience with it from this past season:

- *Oidium* mildew may cause problems earlier in the season than we are accustomed to (e.g. July). Late-season (October) disease pressure was low in 2015.
- Both mildew pathogens (*Leveillula* and *Oidium*) can be present in the same field.
- It may be somewhat more challenging to scout a field for early symptoms of *Oidium* mildew, as it does not seem to exhibit the bright yellow leaf spots that *Leveillula* mildew displays fairly reliably. Inspect older leaves (both top and bottom) for faint white sporulation.
- Based on my experience with *Oidium* in three fungicide trials in San Joaquin County in 2015, it appears the *Oidium* mildew can be controlled with sulfur and other mildew fungicides, provided applications are made sufficiently early.

Incidence of curly top of tomatoes (and other crops), caused by *Beet curly top virus* (BCTV) and vectored by the beet leafhopper (BLH), was not particularly high this season, but did reach levels of 20% in some tomato fields. Unfortunately, it is becoming apparent that this is going to be a reoccurring problem in the northern San Joaquin Valley despite our past history of very low disease levels prior to 2013. From our local monitoring of the BLH vector populations, 2015 trap catches here in the county peaked in April, just when many of the tomatoes were being transplanted. Although trap catches declined after April, there were occasional high counts, and we did catch BLH “on the move” during every month of the year. Note that the vectors are not actually attracted to the traps, so we are intercepting only hoppers that happen to accidentally fly onto the sticky traps. From my informal “windshield” surveys, host plants such as Russian thistle and stinking orach (*Atriplex*/saltbush) are quite abundant despite (or perhaps because of?) the drought. These valley floor hosts may be playing a role



in a BLH life-cycle which may not involve the well-studied winter migration to the coastal foothills. We hope to conduct more intensive monitoring next season. This season, we did evaluate applications of the insecticide Verimark (DuPont) which is registered for use on tomatoes and was applied to the trays as a drench at the greenhouse the day prior to transplanting. In this 20-acre trial, curly top pressure was moderate to low (11% incidence in the non-treated areas), but nonetheless we saw early infections of BCTV reduced by 82%. Later, the infection rate was not reduced to as great an extent; nonetheless, infections during the first seven weeks were reduced by about 65% (from 11% down to 3.7% incidence). However, we were not able to see any differences in yield between treatments, presumably because of the vines' great capacity to compensate for missing plants (the original plant population was a fairly typical one at about 7,400 plugs per acre).

Brenna Aegerter, Vegetable Crops Advisor



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