Field Notes
San Joaquin County
February 2016
University of California
Agriculture and Natural Resources | Cooperative Extension

SJC & Delta Field Crops Blog

As advisors, we strive to work on locally-relevant issues that are important to you. We strive to stay informed of the issues, learn solutions to problems, and then communicate those solutions. One of the ways we communicate is by writing blog articles. A blog, or web log, is a website where people post information in concise entries on a frequent basis. Blogs allow us to communicate information in a timely manner, rather than waiting until our next newsletter or meeting when the information may no longer be relevant.

Last fall, I created the SJC and Delta Field Crops blog (http://ucanr.edu/blogs/sjcfieldcrops/). I will use the blog to post information from research projects, field observations, and meeting announcements. Subscribing to the blog will mean that you get an email notification whenever a new entry is posted. To subscribe, go to the homepage URL listed above, and find the subscribe box in the right, shaded column. Enter your email address, and click the envelope symbol. You will be sent an email asking you to validate the subscription. Once you have clicked the validation link in that email, you're done! When a new post is made to the blog, you will receive an email notification.

Whether you are at a desktop computer or with a mobile device, this is a great way to get information in the office or in the field. Take a look, and let me know what you think.

Michelle Leinfelder-Miles, Delta Crops Advisor

Table of Contents:

Golden State Dairy Management Conference

The Golden State Dairy Management Conference will be held March 8-10 in Seaside, CA.

Dairy producers, nutritionists, veterinarians, and other members of allied industry who are interested in topics related to dairy production in California are invited to attend the inaugural **2016 Golden State Dairy Management Conference**. The conference, hosted by the University of California's Division of Agriculture and Natural Resources, will be held at the Embassy Suites Monterey Bay in Seaside, California (near Monterey).

This conference is designed to have something for everyone! California is a unique dairy state; primarily California based speakers will present opportunities to enhance current California dairy systems with California research results. The two day agenda will cover a variety of topics, including:

- crop production
- forage preservation
- diet management and nutrition
- calf management
- reproduction
- herd health
- industry updates
- enhancing revenue flows
- milk and commodity outlook/projections

The reduced-rate registration of $220 expires on February 22nd. Participants are encouraged to register early to obtain the low rate. We also have a limited number of reduced rate rooms at the conference hotel so please make your arrangements early to take advantage of these prices.

To register and learn more about this exciting conference, visit ucanr.edu/sites/CAdairyconference/

For more information about the program, please contact:
Jennifer Heguy, UC Cooperative Extension Farm Advisor at jmheguy@ucdavis.edu
Deanne Meyer, UC Cooperative Extension Specialist at dmeyer@ucdavis.edu
Betsy Karle, UC Cooperative Extension Farm Advisor at bmkarle@ucanr.edu
Peter Robinson, UC Cooperative Extension Specialist at phrobinson@ucdavis.edu

Brown Marmorated Stink Bug (BMSB) and its spread in California

Brown marmorated stink bug (BMSB), *Halyomorpha halys,* is an invasive stink bug species which was accidently introduced in Allentown, Pennsylvania in the 1990s. It has been a serious agricultural and nuisance problem in the mid-Atlantic and other parts of the eastern United States. BMSB has now spread to 42 states in the US, two Canadian provinces, and a few countries in Europe. BMSB is native to Asia where the damage by this pest is not as serious as it has been in North America. BMSB has a wide host range with more than 170 plant species reported. Besides crops, BMSB is a significant nuisance pest in houses and other dwelling structures. During the winter, adults tend to move inside protected and warm areas such as houses, attics, woodpiles, stacked boxes and other potential aggregation areas for overwintering. Adults migrate back to crops and host plants as soon as the outside temperature becomes warm enough for their biological activities.

Status of BMSB in the Western US

Oregon was the first state to report a BMSB population back in 2004. Now, Oregon and Washington both have established BMSB populations causing agricultural and nuisance problems. In California, a large BMSB population was discovered in downtown Sacramento and its outskirts in fall 2013. Although BMSB has been intercepted in 26 counties, reproductive populations have been reported in urban areas of nine counties (Butte, Sutter, Yolo, Sacramento, San Joaquin, Santa Clara, Los Angeles, and most recently in Siskiyou and Stanislaus counties). No damage and finding of BMSB have been reported on any commercial agriculture crop. In Stanislaus County, a reproductive population of this pest (i.e. several batches of egg masses, different stages of immatures, and adults) was detected for the first time in a group of trees of heaven (*Ailanthus* sp), one of the BMSB favorite hosts, near Highway 99 in Modesto in mid-July 2015 (http://www.modbee.com/news/article30007908.html). To date, we have unofficial reports of finding BMSB adults (live or dead adults) at three or more locations in the urban area of Modesto.

Identification

Adults are approximately two-thirds of an inch long with a speckled brown-gray body (Fig. 1). In general, BMSB looks similar to other stink bugs. To distinguish it from other stink bugs, look for alternating white and dark bands on the antennae; dark and white bands around the outer edges of the abdomen; and light gray, brown or tan (not green or yellow) on the underside of the body. Details on how to separate BMSB from other similar looking stink bugs can be found at this website: http://www.stopbmsb.org/stink-bug-basics/look-alike-insects/. Eggs are white to pale green (Fig. 2), and are in a cluster of 21 or 28 (multiples of 7 in most cases) attached on the underside of the leaf. First instar nymphs aggregate near the eggs after hatching and do not feed (Fig. 2). Second instars start feeding.

Table 1. Hosts of BMSB by habitat category

Category	No. of species	Category	No. of species
1. Agricultural	23	4. Agricultural/Ornamental	8
2. Ornamental	99	5. Ornamental/Wild plants	9
3. Wild plants	31	6. Wild/Agricultural	2

Modified from the host list table, www.stopBMSB.org.

Host plants

Both adults and nymphs (2-5th instars) feed on plants by inserting their straw-like mouthparts (Fig. 3). Table 1 summarizes host plants by category. The full list of 170 host plants is available at http://www.stopbmsb.org/where-is-bmsb/host-plants/.

Potential risks of BMSB in California agriculture

MSB is not yet an agricultural pest in California. We do not know whether BMSB can establish in California to the extent that it will cause problems in agricultural crops given that climatic conditions and orchard systems are different here than in the eastern US. For example, BMSB has several non-agricultural host plants surrounding apple and peach orchards on the east coast, and this may not be the case for crops in California. So, one research objective will be to study the potential risks of this pest at the landscape level. A second research objective will be to study whether BMSB feeds on major nut crops (almond, walnut, pistachios), since they have not previously been exposed to these crops. Of course, we also have crops such as apples, peaches, apricots, and cherries that are already known to be major hosts of BMSB based on evidence from other states, so we should be watchful for this pest. Grapes are not considered a major host, but BMSB will feed on grapes. On a national level, pest monitoring and management research, including the potential of biological control agents, is underway, and hopefully we will be able to use the information gained from that research.

Jhalendra Rijal, IPM advisor

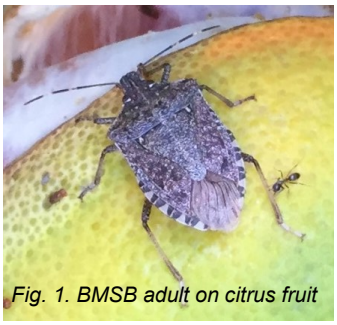

Fig. 1. BMSB adult on citrus fruit

Fig. 2. BMSB eggs and 1st instar nymphs

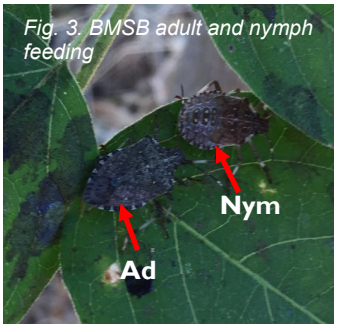

Fig. 3. BMSB adult and nymph feeding

—University of California Cooperative Extension—
Yolo, Solano and Sacramento Counties

EXTENSION MEETING

2016 Organic, Fresh Market Tomato Production

Wednesday, February 24, 2016
8:30 a.m. to 12:30 p.m.

****Norton Hall—Yolo County****
70 Cottonwood St. Woodland, California

8:30 – 9:00	**Registration and light refreshments (no charge)**
9:00 – 9:15	Introduction to new small farms advisor program *Margaret Lloyd, UC Cooperative Extension, Yolo, Solano and Sacramento Co.*
9:15 – 9:30	Understanding Verticillium wilt for management *Margaret Lloyd, UC Cooperative Extension, Yolo, Solano and Sacramento Co.*
9:30 – 10:00	Integrated management of thrips and tomato spotted wilt virus in California crops *Ozgur Batuman, Dept of Plant Pathology, University of California at Davis*
10:00 – 10:30	Living with Fusarium wilt *Thomas Gordon, Dept of Plant Pathology, University of California at Davis*
10:30 – 11:00	Break and discussion with Yolo County Certified Organic Inspector *Michelle Lawson, Agricultural Commissioners Office, Yolo County*
11:00 – 11:30	Grafting heirloom tomatoes *Frank Louws, Dept of Plant Pathology, North Carolina State University*
11:30 – 12:00	Principles of nitrogen management in organic fresh market tomatoes *Daniel Geisseler, Cooperative Extension Specialist, Department of Land, Air and Water Resources, University of California at Davis*
12:00 – 12:30	Russet and spider mites on tomatoes *Frank Zalom, Dept of Entomology, University of California at Davis*

Questions, contact Margaret Lloyd, mglloyd@ucanr.edu, 530-564-8642
Continuing education credits are requested. Norton hall and restrooms are handicap accessible.

Almond Bloom Disease Control

Almond trees are susceptible to blossom and foliar diseases when it rains at bloom time. Many of these diseases can be effectively managed with properly timed fungicide applications. We often receive rain during the bloom period that can result in favorable conditions for several diseases of almond. The fungi that cause these diseases are usually present in almond orchards, depending on the previous year's disease incidence and current environmental conditions.

Not all fungicides are equally effective against all diseases. Growers should assess the diseases present in their orchards and select materials carefully. Please read the on-line publication "Fungicide efficacy and timing for deciduous tree fruit and nut crops and grapevines" that can be found at the UC IPM website at http://www.ipm.ucdavis.edu/PDF/PMG/fungicideefficacytiming.pdf. This is the 'Bible' of bloom and foliar disease management. To reduce the risk of the fungi developing resistance to fungicides, fungicides with the same mode of action should not be used repeatedly. The Fungicide Resistance Action Committee (FRAC) has categorized fungicides into groups based on mode of action; those in different groups are suitable rotation partners in a resistance management program. When making fungicide applications, keep track of their FRAC numbers, and if possible, make only one application per season from each of the FRAC numbers 1, 3, 7, 9, 11, and 17. After using one of these fungicides, rotate to another number. Don't use the same number for two consecutive sprays. For fungicides with other FRAC numbers, make no more than two consecutive applications before rotating to a fungicide with a different FRAC number.

In El Niño years, growers have observed late-spring and summer diseases such as scab, rust, and Alternaria leaf spot. If rainfall continues into late spring, additional fungicide applications may be necessary. Growers often concentrate their control measures on brown rot sprays at early bloom and often neglect their scab and Alternaria sprays after bloom. 'Monterey' and 'Carmel' are susceptible to scab and should be sprayed at 2-5 weeks after petal fall. 'Nonpareil' is typically sprayed for brown rot at pink bud, but it is highly disease-resistant, and it is less important to spray at bloom.

Usually two sprays are made for brown rot control. The first is usually done at 5-20% bloom using a systemic fungicide, such as a DMI (FRAC 3) or AP (FRAC 9). The second spray should be done near 80% to full bloom or 7-10 days after the first spray. This is the most effective brown rot spray. Depending on the weather, a third spray may be necessary for protecting against jacket rot and green fruit rot caused by *Monilinia*, *Botrytis* and *Sclerotinia* species, as well as other diseases if rains persist and two weeks of protection have passed. This application can be with a systemic or a contact fungicide. The risk of resistance is reduced by using a multi-site compound (such as ziram or chlorothalonil).

Application techniques are important. Ground applications are better than air, but care must be taken that both are applied correctly. Use properly calibrated and directed nozzles while spraying, and maintain a slow ground speed (<2.5 mph). The brown rot fungus (*Monilinia laxa*) attacks the tree by invading the stamens and pistils of the flower when it is open. From there, the fungus can move into and kill the spur or shoot. Young fruit are also susceptible in early spring, and infection of fruit may extend to spurs and shoots. Although all cultivars of almond are susceptible to brown rot, they vary in their degree of susceptibility. 'Nonpareil, 'Peerless,' and 'Aldrich' are the least susceptible. 'Sonora', 'Fritz', 'Monterey', and 'Carmel' are less susceptible than 'Butte', 'Wood Colony', 'Mission', and 'Livingston' which are some of the most susceptible varieties. Varieties that are susceptible to green fruit rot or jacket rot are 'Butte', 'NePlus Ultra', 'Merced', 'Carmel', 'Price', and 'Wood Colony', or any variety with tight clusters. If bloom is extended and the weather is wet and rainy, no more than ten days should elapse between treatments.

The shot hole fungus (*Wilsonomyces carpophilus*) is notoriously more prevalent in wet years. This fungus requires water for all of its activities, so periods of extended rainfall create a situation that favors shot hole disease epidemics. The fungus can cause lesions on leaves and fruit, but most of the time it infects the leaves as they emerge from the leaf bud. Leaf infections lead to defoliation, which usually occurs in early spring. Shot hole infections of young fruit, shortly after they emerge from the jacket, can cause the fruit to drop. As fruit enlarges, shot hole infection results in a lesion, but the fruit no longer fall. About the first of May, when the embryo of the nut begins to grow, the hull becomes resistant to infection and no further lesions develop. Shot hole is usually controlled by fungicide applications after bloom (when leaves emerge after bloom), usually from petal fall to two weeks after petal fall. An IPM strategy for shot hole control is to monitor orchards in the fall and spring for shot hole lesions and fruiting structures. Fruiting structures appear in the center of leaf lesions as small black spots (sporodochia) and can be seen with a hand lens. If fruiting structures are present in leaf lesions in fall, then a treatment the following spring should be applied at leaf emergence. (Sometimes this can be concurrent with bloom.) If fruiting structures are not present, you can hold off the petal fall spray and monitor leaves in the spring for lesions. As soon as fruiting structures are evident, however, apply a fungicide as long as conditions are wet. If fruiting structures are not present, delay treatment until they are. Zinc sulfate (10-20 lb/acre) applied in late October to early November will hasten leaf fall and prevent shot hole inoculum from increasing.

Scab (*Cladosporium carpophilum* or *Fusicladium carpophilum*, Figure 1) was initially controlled with the stro bilurin or QoI fungicides (Group 11), but resistance to these fungicides has developed and we now recom-

(Continued on page 5)

(Continued from page 4)

Figure 1. Scab on almond hulls

Figure 2. Bacterial spot gumming on hulls

mend not using group 11 fungicides unless in pre-mixtures or tank mixtures and in orchards without known resistance. Dr. Jim Adaskaveg has developed a three-spray strategy for scab control that includes a delayed dormant application of copper-oil, a two-week after petal fall spray that includes chlorothalonil (Echo, Bravo, Equus; group M5), and a five-week after petal fall spray that includes Captan (group M4), Ziram (group M3), or pre-mixtures of DMI (group 3), SDHI (group 7), or QoI (group 11) fungicides. Ph-D (FRAC 19) can also be used in tank mixtures (Table 1). Mixtures and pre-mixtures include, for example, 3+9, 3+11, 3+19, or 7+11 fungicides. Other fungicides such as maneb (recently cancelled) can be used until supplies are exhausted. The mancozeb product (FRAC M3) was registered as Manzate in 2012. All of these multi-site mode of action fungicides will have little chance of resistance developing to them.

Recent work by Dr. Adaskaveg also has shown that delayed dormant applications of chlorothalonil and oil are even better than copper and oil at reducing scab inoculum. *Cladosporium (Fusicladium)* causes greasy black spots on fruit, leaves, and green shoots. The shoot lesions are the overwintering sites for the fungus and the source of new spores in the spring. No apparent damage is done to the fruit, but leaves may fall prematurely. Scab can completely defoliate a tree in a short time. All cultivars appear susceptible, but 'Carmel', 'Peerless', and 'Monterey' are especially vulnerable. One of the more complicated aspects for managing this disease is that it is slow to develop, and symptoms apparently develop all at once. When this happens, most growers and PCAs want to start treating; however, it is very difficult to manage the disease at this stage, and use of single-site mode of action fungicides may lead to resistance due to high inoculum levels. Under these conditions only multi-site mode of action materials like sulfur or captan should be used.

An extremely damaging fungal disease, anthracnose (*Colletotrichum acutatum*), can be severe in warm, wet springs, with average daily temperatures above 63°F. We saw a lot of anthracnose in the 2011 El Niño. On fruit, anthracnose can cause deep crater-like lesions; the affected area turns a rusty-reddish brown. Older fruit often gum profusely, and the nut meat is usually destroyed. The fungus is reported to invade the wood, and the branches upon which infected fruit reside weaken and die. In addition to destroying the crop, long-term damage and weakening of the tree may occur. A good scab control program will usually control or reduce anthracnose. Orchards that have a history of anthracnose should be treated during bloom, starting at pink bud (with your brown rot spray to protect blossoms), to help reduce inoculum build-up. Ideal conditions for disease are warm rains, and protecting trees before every rain is necessary for ideal control. All cultivars appear to be susceptible to anthracnose. 'Thompson', 'Merced', 'Price', 'Peerless', 'Winters', 'Monterey', 'NePlus Ultra', 'Fritz', and 'Butte' appear quite susceptible; while 'Harvey', 'Carmel', 'Padre', and 'Mission' are moderately susceptible. 'Nonpareil' is considered to be less susceptible. In orchards that have a history of anthracnose, apply fungicide sprays every 10 to 14 days if rains persist after bloom. Late spring rains may necessitate additional applications into May. Alternate fungicides as previously discussed using FRAC numbers (3, 7/11, 11, M3, M4, M5). Rotating materials starting at pink bud using azoxystrobin (Abound) or DMI fungicide , followed by a pyraclostrobin/boscalid (Pristine) or propiconazole/azoxystrobin (Quilt Xcel), azoxystrobin/difenoconazole (Quadris Top), followed by a tank mix of chlorothalonil, captan or mancozeb with thiophanate-methyl (Topsin) a DMI, or a QoI fungicide. Pruning out dead, infected wood reduces inoculum. If sprinkler irrigation is practiced, use low-angle nozzles to prevent the tree canopy from being wetted by sprinklers. Fortunately, Luna Sensation and Merivon were recently registered and have built-in resistance mechanisms.

Bacterial spot (Figure 2) is a new bacterial disease of almond in California that is caused by *Xanthomonas arboricola* pv. *pruni*. The disease mainly occurs on cultivar 'Fritz' in the mid- to northern almond production areas and commonly develops on fruit. The pathogen primarily overwinters on diseased mummified fruit, and infection periods are during warm, wet conditions during the spring as fruit and leaves develop. Initial results indicate that the most effective management program for bacterial spot includes a delayed dormant bactericide (copper-mancozeb) application to reduce inoculum and at least one in-season application around rain-

(Continued from page 5)

fall events and rising temperatures (e.g., mid- to late March) to prevent new infections. In a wet spring, additional in-season applications may be needed to protect developing fruit. Most fixed-copper products and copper-mancozeb treatments are highly effective.

Brent Holtz, Almond Advisor and County Director

Table 1. 2015 Almond Scab Fungicide Efficacy Trial

Diseased nuts per tree
Carmel Variety

Treatment	Rates per acre	Diseased nuts[a]	
14	Indar 6 fl oz + DA 0.25%[1], Indar 6 fl oz + Abound 15 fl oz+ DA 0.25%[2,3]	2.75	a
10	Quadris Top[1] 14 fl oz + DA, Bravo[2] 4 pt, Inspire EC[3] 7 fl oz + DA	3.00	a
18	Microthiol Disperse[1,2,3] 20 lbs	3.00	a
12	Quash 3.5 oz + Dyne-Amic 0.25%[1,2,3]	3.25	a
17	Pristine[1], 14.5 oz + DA, Luna Experience[2,3], 8 fl oz + DA	3.50	a
9	Merivon SC[1,2,3] 5.5 fl oz + DA 0.25%	3.75	a
15	Luna Sensation SC[1,2,3], 5 fl oz+ DA 0.25%	4.50	a
1	Fontelis 1.67 SC[1,2,3], 20 fl oz	4.50	a
7	DuPont Experimental + DA[1,2,3], 43.4 fl oz + 0.25%	5.00	a
3	Fontelis + Tebucon 45DF[1,2,3], 20 fl oz + 8 oz	5.50	a
11	Fontelis 1.67 SC[1] 16 fl oz, Inspire EC[2,3] 7 fl oz + DA	5.75	a
4	Fontelis + Abound 2.0 8F[1,2,3], 20 fl oz + 12 fl oz	5.75	a
5	Fontelis + Gem 4.05SC[1,2,3], 20 fl oz + 2.9 fl oz	7.75	ab
13	Rovral + oil[1], 16 fl oz+1%v/v, Luna Sensation SC+ DA[2,3], 7 fl oz + 0.25%	9.50	ab
16	Serenade Optimum 16.0 oz + DA 0.25%[1], Luna Experience[2,3] 6 fl oz + DA	10.50	ab
2	Fontelis + Bumper 3.6EC[1,2,3], 20 fl oz + 8 fl oz	11.00	ab
8	DuPont Experimental + DA[1,2,3], 57.8 fl oz + 0.25%	13.50	ab
19	Regalia[1,2,3] 1.0% v/v dilution	25.75	b
6	DuPont Experimental + DA[1,2,3], 28.9 fl oz + 0.25%	27.00	b
21	Untreated Control	68.50	c
20	Untreated Control	76.25	c

Diseased nuts[a] = number of diseased nuts counted while walking around a single tree in two minutes. The average number of nuts (both healthy and diseased) that could be counted in two minutes was 185. The trial was rated on July 15th. Data was analyzed by ANOVA with means separated by Fisher's Protected LSD (α = 0.05) test. Means followed by the same letter are not significantly different. All treatments significantly reduced the number of diseased scab nuts per tree when compared to our two untreated controls.

The following trial applications are outlined above:
[1]First trial application was performed at 100% full bloom (100 % FB) on February 18th.
[2]Second trial application was performed 1 week after petal fall (1WPF) on March 5th.
[3]Third trial application was performed 5 weeks after petal fall (5WPF) on April 2nd.

Curly Top Virus in Tomatoes

Incidence of curly top of tomatoes, caused by *Beet curly top virus* (BCTV) and vectored by the beet leafhopper (BLH), was not particularly high last 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 here 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 as many of the tomatoes were being transplanted. Although trap catches declined after April, there were occasional high counts, and we continue to catch live hoppers during every month of the year. This year, with support from the California Tomato Research Institute, we will be conducting more intensive monitoring of beet leafhopper populations in San Joaquin and Stanislaus counties, to gain a better understanding of the role of valley floor vegetation in the disease cycle.

Field trials were conducted in 2015 to evaluate the use of the insecticide Verimark for suppression of curly top disease in processing tomatoes. Verimark, sold by DuPont, contains the active ingredient Cyazypyr or cyantraniliprole, the same active ingredient as in the foliar insecticide Exirel. These products are labeled for control of several insects in tomatoes, including both chewing pests (lepidopteran worms) and sucking pests (whiteflies, aphids, psyllids). Interestingly, leafhoppers are not listed on the label. However, it has been shown that Verimark-treated plants are less likely to become infected by tomato spotted wilt virus (TSWV), which is vectored by thrips. TSWV suppression is therefore listed on the label, as is suppression of the whitefly-transmitted tomato yellow leaf curl virus (TYLCV, which thankfully we do not have in the Central Valley!). In 2013 and 2014, it was noticed that curly top incidence was lower in Cyazypyr-treated plots (in trials evaluating efficacy against other insect pests). To follow up on this, in 2015 we conducted a field trial to evaluate transplant tray drenches with Verimark for suppression of curly top transmission.

In this local trial, conducted in the Tracy area, transplants (cv. HM 3887) were drenched at the greenhouse with a rate of Verimark calculated such that one acre worth of transplants (in this case, 7,000 plugs) received 13.5 oz Verimark. The following day, May 6th, these plants were transplanted into a commercial field with a recent history of curly top. Six replicate blocks were established; in each block there were 3 rows of non-treated plants to compare to the treated plants. At regular intervals after planting, the plots were evaluated for incidence of virus, including whether the virus infection appeared early or more recently. From the data (Table 1), we can see that early infections of curly top were reduced by about 80%. The strength of this effect weakened over time, but even on June 22 (~7 weeks after planting), the recent infections were still reduced by 40%. In another trial, conducted by Tom Turini at UC's West Side Research and Extension Center near Five Points, results were similar, with Verimark treatment reducing curly top by 60 to 70% depending on the date (Table 2).

Verimark can be applied as a transplant drench, an in-furrow spray at planting, or as a transplant water treatment (where approved), it can also be injected into the soil or applied via drip chemigation after planting. If transplants are treated at the greenhouse, this must be done no more than 72 hours prior to planting. DuPont has detailed guidelines developed for greenhouse applications; for more information please contact them. Applications of Verimark are limited to two (e.g. one at planting and then one via drip or soil injection). Total applications of Cyazypyr (Verimark or foliar Exirel) are limited as well. See the label for all the details on use restrictions.

Resistance management guidelines

Both Verimark and Exirel contain the same active ingredient, which is in the anthranilic diamide class, IRAC group 28. Other products in the same class include Coragen (chlorantraniprole) and Belt (flubendiamide). Because of the potential for repeated applications of group 28 insecticides to lead to a buildup of resistant pests, there are specific guidelines on the label which address how to best deploy this chemistry while avoiding the development of resistance.

Verimark is quite safe; the pre-harvest interval (PHI) is 1 day, while the re-entry interval (REI) is 4 hours. One downside of this product is its high cost. One would need to increase marketable fruit yield by a couple tons per acre to recoup the cost of the transplant drench (assuming the maximum label rate). This goal was met at the Five Points location (yield was over 9 tons higher in the treated plots), but no difference was detected at the Tracy trial, despite the good level of disease control. This could be due to the capacity of tomato vines to compensate for missing plants, or may be due to the variability in yield between rows that can make it hard to detect treatment differences. So is the cost justified? Most likely, the answer is going to depend on the level of curly top pressure in the field and the timing of infections (early infection leaves time for adjacent plants to compensate; later infections can be more detrimental in some respects). The effectiveness of lower rates (below 13.5 oz) is not documented and is an area for potential future research.

In other research, several different research groups at UC Davis are looking at various repellants or management practices to prevent leafhoppers from ever landing on or "tasting" tomatoes in the first place. There are some very interesting findings, but it is too soon to share management recommendations based on their preliminary results. However, I do feel that there is some hope of gaining some understanding of why leafhoppers are attracted to certain fields and that perhaps we will one day soon be able to do something to decrease attractiveness of tomato fields to hoppers.

Brenna Aegerter, Vegetable Crops Farm Advisor

Table 1. Curly top incidence in 2015 trial, Tracy area.

	CURLY TOP INCIDENCE (%)					
Evaluation date	4-Jun	----------12-Jun----------				22-Jun
Days post-transplanting	*(29 DPT)*	*(37 DPT)*				*(47 DPT)*
	total	early infections	mid infections	recent infections	total	recent infections
Verimark 13.5 oz/A tray drench	1.5	0.8	1.3	1.1	3.2	1.9
Non-treated control	5.8	4.4	4.2	2.0	10.5	3.0

Table 2. Curly top incidence in 2015 trial conducted by Tom Turini, UCCE Fresno, Fresno Co., Five Points area.

	CURLY TOP INCIDENCE (%)				
Evaluation date	22-Jun	1-Jul	12-Jul	28-Jul	12-Aug
Days post-transplanting	*(31 DPT)*	*(40DPT)*	*(53 DPT)*	*(67 DPT)*	*(82 DPT)*
	total	early infections	mid infections	recent infections	total
Verimark 13.5 oz/A tray drench	2.8	3.7	5.7	4.3	4.8
Admire Pro 10.5 oz/A transplant water	5.3	6.8	8.0	8.4	6.9
Non-treated control	9.9	12.1	13.9	11.5	12.3

Announcements / Calendar of Events

Conservation Agriculture and Wildlife Friendly Farming Meeting
February 25, 2016
9:00 -11:00 am
San Joaquin County Robert J. Cabral Agricultural Center
2101 E. Earhart Ave., Stockton, CA
For agenda, see http://ucanr.edu/sites/deltacrops/files/232610.pdf.
Contact: Michelle Leinfelder-Miles, 209-953-6100 or mmleinfeldermiles@ucanr.edu

Quad-County Walnut Institute
March 15, 2016
8:00 am - 12:00 noon
San Joaquin County Fairgrounds
1658 S. Airport Way, Stockton, CA
Contact: Joe Grant, 209-953-6100 or jagrant@ucanr.edu

Golden State Dairy Management Conference
March 8-10, 2016
Embassy Suites Monterey Bay, Seaside, CA
To register and learn more about this exciting conference, visit ucanr.edu/sites/CAdairyconference/
Contact: Jennifer Heguy jmheguy@ucdavis.edu

Organic, Fresh Market Tomato Meeting
Wednesday, February 24, 2016
8:30 am—12:30 pm
Norton Hall, Yolo County
70 Cottonwood St., Woodland, CA
Contact: Margaret Lloyd, 530-654-8642 or mglloyd@ucanr.edu

Rice Variety Trial Results

Tables 1 and 2, respectively, show the results of the 2015 San Joaquin County rice variety trial and a 5-year yield summary of very early maturing commercial varieties. The statewide trials are a cooperative effort of the California Cooperative Rice Research Foundation, Inc., the United States Department of Agriculture, and the University of California. The trials compare advanced breeding lines with commercial varieties. The San Joaquin County test site is located in the Delta. It is a test site for very early maturing varieties because San Joaquin County is cooler than other rice growing regions of the state. The varieties were drill-seeded on April 29th at a rate of 140 lbs/acre and harvested on October 13th.

When interpreting the results, consider the following. The mean represents the average of all varieties. The CV, or coefficient of variation, is a measure of variability of the data in relation to the mean. The LSD (.05), or least significant difference at 95%, is used to compare means of different varieties. When the difference between two varieties exceeds the LSD value, we are 95% certain that the two varieties performed differently; the results are not due to random chance. For example, the LSD of the grain yield at 14 percent moisture is 640. This means that if the yields of two varieties differ by at least 640 lbs/acre, then we can conclude that the two varieties yielded differently. In this case, the top six varieties in Table 1 had statistically similar yields. In Table 2, yield means are averaged across all locations and years and compared to M-104, a standard very early variety. Over the five years, and across the four very early variety locations, M-206 – a common variety in this area – yielded 2.2 percent higher than M-104.

Michelle Leinfelder-Miles, Delta Crops Advisor

Table 1. 2015 San Joaquin very early rice variety test (advanced lines and varieties)

Variety	Grain Type	Grain Yield at 14% Moisture (lbs/acre)		Grain Moisture at Harvest (%)		Seedling Vigor (1-5)		Days to 50% Heading		Lodging (1-99)		Plant Height (in)	
M206	M	9970	(1)	15.1	(7)	5.0	(1)	103	(8)	1	(1)	35	(16)
CM203	SWX	9770	(2)	16.1	(4)	5.0	(1)	100	(3)	13	(17)	36	(17)
M104	M	9650	(3)	14.3	(14)	5.0	(1)	98	(1)	1	(1)	34	(15)
12Y113	MB	9400	(4)	14.5	(13)	5.0	(1)	107	(14)	6	(16)	34	(14)
12Y3097	MB	9390	(5)	14.9	(11)	5.0	(1)	102	(6)	1	(1)	33	(10)
11Y2022	MPQ	9390	(5)	14.6	(12)	5.0	(1)	105	(12)	1	(1)	33	(8)
S102	S	9240	(7)	13.5	(16)	5.0	(1)	99	(2)	3	(15)	33	(7)
M209	M	9210	(8)	16.2	(3)	5.0	(1)	110	(16)	1	(1)	33	(11)
10Y2043	S	9100	(9)	15.0	(9)	4.6	(16)	101	(5)	1	(1)	32	(3)
CM101	SWX	8750	(10)	13.4	(17)	5.0	(1)	100	(4)	1	(1)	34	(12)
CH201	SPQ	8540	(11)	14.9	(10)	5.0	(1)	105	(9)	1	(1)	33	(5)
L206	L	8400	(12)	13.8	(15)	5.0	(1)	103	(7)	1	(1)	31	(1)
12Y20	L	8260	(13)	15.1	(8)	5.0	(1)	105	(10)	1	(1)	34	(12)
M205	M	8210	(14)	17.6	(1)	5.0	(1)	112	(17)	1	(1)	32	(2)
CH202	SPQ	7890	(15)	15.3	(5)	3.4	(17)	106	(13)	1	(1)	33	(6)
M208	MB	7790	(16)	16.6	(2)	5.0	(1)	109	(15)	1	(1)	32	(3)
11Y1005	L	7290	(17)	15.1	(6)	5.0	(1)	105	(10)	1	(1)	33	(8)
Mean		8840		15.1		4.9		104		2		33	
CV		5.1		3.5		2.6		0.7		23.5		3.8	
LSD (.05)		640		0.8		0.2		1				2	

S = short; M = medium; L = long; PQ = premium quality; WX = waxy; MB = medium blast resistant.
Subjective rating of 1-5, where 1 = poor and 5 = excellent seedling emergence.
Subjective rating of 1-99, where 1 = none and 99 = completely lodged.
Numbers in parentheses indicate the relative rant in the column.

Table 2. Grain yield (lbs/acre at 14% moisture) summary of very early rice varieties by location and year (2011-2015).

Location	Year	M-104	M-202	M-206	Calmochi 101	S-102	L-206
Biggs (RES)	2011	--	--	--	--	--	--
	2012	10260	10050	10420	8500	9370	10020
	2013	9710	8380	8610	8580	9120	9970
	2014	8150	7330	9200	6540	7640	8580
	2015	8580	7830	9350	7940	9520	8910
Location Mean		9175	8398	9395	7890	8913	9370
Sutter	2011	--	--	--	--	--	--
	2012	8990	8810	9320	7500	8470	9570
	2013	9510	9990	9710	8340	9300	9700
	2014	9510	9060	9710	7780	8770	9440
	2015	9520	9460	9900	7990	9190	9820
Location Mean		9383	9330	9660	7903	8933	9633
Yolo	2011	10020	9590	10230	9320	9050	9490
	2012	9610	8930	9900	7450	8400	9060
	2013	9420	9260	9790	7830	8380	9000
	2014	9610	9450	9770	7580	8980	8760
	2015	8150	7070	7490	5560	6940	7740
Location Mean		9362	8860	9436	7548	8350	8810
San Joaquin	2011	8800	9090	9330	7850	7760	8340
	2012	8460	7490	8990	7880	8180	7570
	2013	8140	8140	8410	7680	7960	8180
	2014	9680	8650	9390	8440	8480	8660
	2015	9650	8590	9970	8750	9240	8400
Location Mean		8946	8392	9218	8120	8324	8230
Loc/Years Mean		9209	8732	9416	7862	8597	8956
Yield % M-104		100.0	94.8	102.2	85.4	93.4	97.2
Number of Tests		18	18	18	18	18	18

*Test locations not included in 2011 due to very high yield CVs.

University of California Agriculture and Natural Resources
Cooperative Extension
San Joaquin County
2101 E. Earhart Ave., Suite 200
Stockton, CA 95206-3949

Non-Profit Org.
US Postage
PAID
Stockton CA
Permit No. 2

Notes from the Field

February 2016

The University of California working in cooperation with San Joaquin County and the USDA.