Field Notes
San Joaquin County
February 2023

University of California
Agriculture and Natural Resources

PRACTICAL • CONNECTED • TRUSTED

Meet Our New Advisor, Justin Tanner

My name is Justin Tanner, and I am the new viticulture farm advisor serving San Joaquin, Stanislaus and southern Sacramento counties. My office is based at the Robert J. Cabral Agriculture Center in Stockton, CA. After the retirement of the former Viticulture Advisor, Paul Verdegaal, in January of 2018, the area was without a UCCE viticulture advisor until I started in this role just last month. I look forward to working closely with grape growers, pest control advisors, the Lodi District Grape Growers Association and Lodi Wine Grape Commission to understand and address the unique production challenges we face as an industry within our region. I plan to use my skills in research and plant physiology to find new and innovative solutions to support the wine grape industry. I am grateful for this opportunity to serve the community and look forward to working collaboratively with vineyards, researchers, organizations and individuals to support the world class production viticulture efforts which have driven the success of the region.

Over the previous two seasons, I have had the great opportunity to work with the UC Davis Department of Viticulture and Enology at the Oakville Station experimental vineyard in Napa County as a post-doctoral scholar where I was a part of research efforts to investigate the effect of rootstock and scion combinations, vineyard cultural practices on vines with Grapevine Red Blotch Virus, mitigation of berry overexposure by influencing canopy architecture through trellis design, as well as trialing biostimulants and light filtering panels designed to reduce plant stress. In my PhD research, I worked to protect temperate fruit cultivars from genetic loss by improving the efficiency of cryopreservation of dormant buds in a collaborative research effort between the USDA ARS and Colorado State University in Fort Collins, Colorado. In my master's research at Texas A&M University-Kingsville, I conducted transmission studies of Citrus Tatter Leaf Virus in the Rio Grande Valley of South Texas using molecular detection and biological indicator-based methods.

As part of my efforts to identify the most pressing viticulture issues and to prioritize research to address these challenges, I have put together a short survey and would greatly appreciate feedback from anyone involved in grape production in anyway within San Joaquin, Stanislaus and Sacramento counties. The survey can be found at: https://surveys.ucanr.edusurvey.cfmsurveynumber=40101 or by using the QR code below. If you have any viticulture related concerns or just want to talk about growing grapes, I would love to hear from you. I can be reached by phone at (209) 953-6119 or by email at jdtanner@ucanr.edu.

Table of Contents:

Distinguishing Between Phytophthora Root and Crown Rot and Bacterial Canker on Almond

Wow, did an 'atmospheric river' hit California in January? Many orchards in the Central Valley received over ten inches of rain since Christmas, and many still have standing water or saturated soils (Figure 1). We may see Phytophthora Root and Crown Rot this spring as a result of all the rain and flooding, especially if our soils stay saturated for an extended period of time. Periods of 24 hours or more of saturated soil can favor Phytophthora infections. Phytophthora is a plant pathogenic, soilborne fungus that is usually present in our soils, just waiting for wet conditions to produce zoospores that can swim and infect tree roots. Rootstocks vary in their susceptibility to Phytophthora, but plum rootstocks are more resistant than peach or peach-almond hybrids. Of the plum rootstocks, Marianna 2624 is the most tolerant.

The roots of Phytophthora infected trees just below the soil line are often brown and decayed, and as you work your way up the tree, cutting into the vascular system, you usually find healthy tissue in the scaffolds and branches. Usually, you find a distinct margin between rotten and healthy vascular tissue as you follow the advance of Phytophthora (Figure 2 on page 3). Phytophthora root rot control typically includes planting trees high on a berm, so that the graft union is above the soil line. Proper irrigation management during the season is also extremely important in controlling root rot. Phosphorus acid treatments have been shown to reduce Phytophthora root and crown rot as a common preventative measure. Recently, Oxythiapiprolin (Orondis), a new fungicide with extremely high activity against all Phytophthora species, was approved for the use in California. It is typically applied through the irrigation system, but it can also be applied to the base of trees in saturated soils. (Check the label for instructions). This may be the year to give Orondis a try.

If we continue to receive cold, wet weather during almond bloom, we may also see bacterial blast and canker this year. Bacterial canker and blossom and bud blast are both caused by the plant pathogenic bacteria called *Pseudomondas syringae pv. syringae* that is usually found living on the surface of healthy plants. *Pseudomondas syringae* lives most of the time as an 'omnipresent epiphyte.' In other words, it's always present on the surface of plants, living happily, just waiting for certain environmental conditions (cold and wet) that allow it to enter the plant, multiply, and build to high enough populations within the tree to trigger a disease (bacterial blast or canker). Relatively little is known about blossom bacterial blast, but we do know that cold, wet weather can be an important predisposing factor that can worsen the disease.

Bacterial blast is usually more severe in the lower canopy of the tree and in the lower part of an orchard. Blast is usually more severe on earlier blooming varieties, but that may be because earlier blooming varieties tend to be in bloom when temperatures are cooler. Aldrich and Fritz seemed much less affected than Nonpareil, Independence, or Carmel. Bacterial blossom blast has been significantly reduced in trials where trees were protected against frost by running water or wind machines.

Trees growing in sandy soils with high ring nematode populations and low nutrient value, typically flood irrigated with district water, appear to be the most susceptible to bacterial canker. Bacterial canker control usually includes preplant fumigation for ring nematode, proper rootstock selection, proper irrigation and nutrition (especially nitrogen and perhaps calcium and iron), and post plant nematicide treatments (less successful—Movento and Velum-One). Conversion to drip irrigation systems have, in general, reduced bacterial canker incidence. Roger Duncan, UC Farm Advisor in Stanislaus County, has shown Viking and Lovell rootstocks to be more tolerant than peach-almond hybrids (Hansen, Nickels, and Brights) and Nemaguard.

Figure 1. Flooded orchard from January storms.

(Continued on page 3)

I thought I would review the distinguishing characteristics between bacterial canker and Phytophthora root rot. Symptoms of Phytophthora root rot and bacterial canker are often the opposite of each other making diagnosis possible. As previously mentioned, the roots of Phytophthora infected trees just below the soil line are often brown and decayed, and usually you find a distinct margin between rotten and healthy vascular tissue as you follow the advance of Phytophthora. The roots of bacterial canker affected trees are usually healthy and these trees are often suckering because root systems are still alive. Trees with bacterial canker usually have shoots and scaffold death and gumming. Often only one branch or scaffold is infected. If you cut into affected wood you will almost always have a sweet-sour smell, and as you work your way down the tree, cutting into vascular tissue, you eventually find green healthy tissue as you approach the roots. The sour sap phase of bacterial canker may or may not show gum and cankers, but the inner bark can be brown, fermented, and sour smelling. Red colored flecks and pockets of bacterial invasion in bark occur outside canker margins (Figure 3). There is usually not a distinct margin of infected tissue as in Phytophthora. Bacterial canker usually occurs in sandy soils in association with ring nematode, while Phytophthora root and crown rot is more often found in heavier soils where over irrigation or rain can increase disease susceptibility.

Brent Holtz, Farm Advisor and County Director

Figure 2. Phytophthora canker.

Figure 3. Bacterial canker showing red flecks in bark.

2022 Rice Variety Trial Results

UC Cooperative Extension collaborates with the California Rice Experiment Station to evaluate commercial varieties and advanced breeding lines. The San Joaquin County Delta location was one of seven locations in the 2022 statewide trial. The Delta is a test site for very-early maturing varieties because it has cooler growing conditions than other rice growing regions of the state. The trial was drill-seeded on April 19th at a rate of 150 lb/acre and harvested on October 2nd. Plot size was 150 ft^2, and varieties were replicated four times. Table 1 (on page 4) shows variety results at the Delta location (advanced breeding lines omitted). Among the entries, M-206 is the most commonly planted variety in the Delta and across the state. It has good agronomic characteristics and consistent quality across different harvest moistures. Some Delta growers also plant M-105, which is a very-early variety that has yielded well in Delta trials but may be slightly more susceptible to rice blast disease than M-206. Among the newer varieties, M-210 is early maturing, blast resistant, and may be a good option for the Delta. Variety M-211 is not as well adapted to cooler environments, like the Delta, and quality appears to decrease below 18 percent harvest moisture. One of the advanced breeding lines, which is not shown in the table below, but which yielded better the M-206 in the Delta trial, will become CH-203. For a comparison of yield across all seven trial locations, please see the recent edition of the Sutter-Yuba newsletter.

(https://cesutter.ucanr.edu/newsletters/Rice_Notes96177.pdf)

Special thanks goes to Trevor Carlson for hosting the variety trial. If you have questions about the trial or about Delta rice production, please don't hesitate to reach out to me, and good luck in 2023!

Michelle Leinfelder-Miles, Delta Farm Advisor

(Continued on page 4)

Table 1. 2022 San Joaquin County rice variety trial results.

Variety	Grain Type	Yield at 14% Moisture (lb/ac)	Moisture at Harvest (%)	Seedling Vigor (1-5)	Days to 50% Heading	Lodging (0-100)	Plant Height (cm)
S-202	S	11880	16.4	4.7	107	0	84
L-208	L	11050	15.4	4.9	106	0	78
L-207	L	9470	14.7	4.9	110	0	84
M-206	M	9150	16.5	4.8	111	0	82
S-102	S	9150	13.7	4.9	108	0	82
M-105	M	9070	16.3	4.8	107	0	84
M-210	M	9060	15.9	4.9	111	0	85
CM-203	S	8900	16.4	4.9	108	0	89
CH-202	S	8880	16.1	4.5	109	0	79
CM-101	S	8350	14.4	4.7	110	0	83
CH-201	S	8220	15.0	4.9	112	0	79
A-202	L	8070	16.9	4.9	111	0	83
M-211	M	7810	17.2	4.8	120	0	83
M-209	M	7200	18.3	4.8	122	0	82
CJ-201	L	7110	13.4	4.8	120	0	75
CA-201	S	6620	14.9	4.8	107	0	81
CT-202	L	5670	15.6	4.8	117	0	82
Average		8568	16	5	111	0	82

Evaluation of Processing Tomato Varieties for Tolerance of Vine Decline Due to *Fusarium falciforme*

Our UC vegetable advisor team has been collaborating with UC Davis Plant Patholgy researchers and with industry to evaluate control measures for our newest Fusarium disease in tomatoes, caused by *Fusarium falciforme*. We are evaluating crop rotations, pre-plant fumigation, in-season fungicides and variety susceptibility. We know that there are no resistant varieties, so we are seeking varieties that are “tolerant” meaning they get the disease, but they perform well in terms of producing good quality fruit despite having the disease. We all know that both yield and vine decline are complex variables, with many factors contributing to the outcome. Because of this, we cannot rely on trials from a single year or location but should consider results from multiple trials under varying conditions.

We have established nine variety evaluation trials over the past four seasons, as well as evaluated trials established by the seed dealers AgSeeds and TS & L. Three trials were conducted on the UC Davis Plant Pathology research farm in infested soil. Three were conducted by me in commercial fields near Stockton and three were conducted by Tom Turini on the Westside, Fresno County in commercial fields. All trials were conducted at sites where we have laboratory confirmation of *F. falciforme* vine decline.

What do the numbers in Table 1 mean? This table combines results from seven variety trials at multiple sites conducted from 2019 through 2021. Not all these varieties were represented in every test. To standardize the results so that they could be combined into one set of numbers, we evaluated how varieties performed relative to the average for that trial. For example, in Fresno County in 2020, let’s say that if we averaged all the varieties in the trial, the mean was 58 tons per acre. Now let’s say that the best variety yielded 71 tons per acre (average of four plots). 71 tons is 22% higher than the mean of 58 tons – so the standardized yield number of the top variety would be 1.22. If there was a variety that fell right on the mean, it would get a 1.0, a variety that yielded 10% below the mean would get a 0.90. Therefore, we are seeking varieties with yield numbers over 1 (yields above-average), fruit damage numbers below 1 (less likely to have sunburn and rot), and vine decline numbers below 1 (below-average tendency to suffer vine decline). We have eliminated varieties from this summary if they are no longer being grown or are on their way out of commercial production. If we combine this table with what we learned in 2022 trials, we can draw some preliminary conclusions about variety tolerance.

Varieties that seem to perform relatively well despite *F. falciforme* pressure:

- N6428
- H5608, H1776
- SVTM9016, SVTM9019, SVTM9025
- HM58841, HM5235

(Continued on page 5)

Varieties that seem to be particularly susceptible are HM3887, SVTM9036, SVTM9032, SV8011TM, N6416 and H9663 – many of which are on their way out of production anyway. Note that a few of these *F. falciforme*-tolerant varieties are **not** resistant to Fusarium wilt race 3. That makes it important to have an accurate laboratory-based diagnosis to make sure you know the cause of the vine decline in your field. Field diagnosis of vine decline is not always accurate. Please call me if you need diagnostic help.

Brenna Aegerter, Vegetable Crops Farm Advisor

Table 1. Performace of selected cultivars in replicated field trials conducted from 2019 through 2021 in fields infested with *Fusarium falciforme* (three trials at the UC Davis Plant Pathology farm, four trials in commercial fields in Fresno and San Joaquin counties). See text for explanation of how these variables were calculated from field performance metrics. Note that not all varieties were represented in all trials.

Cultivar	# of Field trials	Normalized yield[x]	Normalized fruit damage levels[y]	Fruit damage average to very low	Normalized vine decline at harvest[z]	Tendency towards vine decline
HIGH PERFORMING						
H1776	3	1.26	0.54	very low fruit damage	0.96	average tendency towards vine decline
SVTM9016	3	1.16	0.52	very low fruit damage	0.82	more data needed
SVTM9019	2	1.15	0.61	very low fruit damage	0.54	more data needed
N6428	7	1.13	0.65	low fruit damage	0.87	less likely to decline prematurely
SVTM9025	3	1.13	0.39	very low fruit damage	0.95	more data needed
H5608	4	1.10	0.77	low fruit damage	0.44	more data needed
N6434	3	1.05	0.73	low fruit damage	0.38	more data needed
HM58841	5	1.05	0.86	low fruit damage	1.04	average tendency towards vine decline
MEDIUM PERFORMING						
BQ273	2	1.04	1.65		0.24	more data needed
H1428	3	1.00	0.81	low fruit damage	0.89	more data needed
HM5235	4	1.00	1.39		0.90	less likely to decline prematurely
H1996	2	0.96	0.57	very low fruit damage	1.50	more data needed
BQ403	2	0.95	1.30		1.06	more data needed
H4707	2	0.90	0.56	very low fruit damage	0.95	more data needed
H1662	2	0.88	0.43	very low fruit damage	0.98	more data needed
LOW PERFORMING						
HM5522	2	1.04	1.63		1.23	more data needed
HM3887	7	0.88	1.35		1.33	more likely to decline prematurely
N6416	2	0.77	1.30		1.30	more likely to decline prematurely

[x] Yield is total fruit biomass, including culls. Normalized means relative to the average for a particular trial; 1.1 would indicate 10% higher than the trial average, 1.3 = 30% higher
[y] Fruit damage levels represents the proportion of harvested fruit that are damaged by sunburn, rot, limited use.
[z] Vine decline is based on a visual evaluation of the foliage at harvest – dead or dying plants are counted.

Early Spring Walnut Pests – Monitoring and Management Considerations

With the 2022 crop in the history books, and finally, it feels like the spring is starting, it is time to turn our attention to some orchard tasks that walnut growers can do to stay on top of things.

Weed management. Good weed management, particularly of herbicide-resistant populations, requires rotating and/or mixing herbicides with different modes of action (MOAs). As these MOAs and labeled crops are not always easy to keep track of, Dr. Brad Hanson, UCCE Weed Specialist, has organized a chart to help, with herbicide name, a common trade name, the site of the action group, and the crops for which an herbicide has been labeled for use (Table 1). This chart is a helpful tool and is intended as a general guide only. Always consult a current label before using any herbicide, as labels change frequently and often contain special restrictions regarding the use of a company's product.

Disease Management

- **Fungicides and walnut blight**. Have your air-blast sprayer ready to apply bloom fungicides/blight. Check calibration and general maintenance (check sprayer filters, replace nozzles as needed, etc). Make sure to refer to the UC IPM 2022 Fungicides and Bactericides Efficacy and Timing document as you plan your fungicide and blight programs for the year (https:ipm.ucanr.edu/legacy_assets/pdf/pmg/fungicideefficacytiming.pdf). Remember to rotate FRAC groups for resistance management. For walnut blight, three elements are necessary for the disease to occur: the pathogen, the host, and favorable weather conditions. This is often referred to as 'the disease triangle'. In the past few years, drought and sunshine can be a benefit in controlling the bacterial pathogen *Xanthomonas arboricola pv. juglandis* (*Xaj*), while this year's rainfall can increase the risk of the disease. Management of this disease depends on the application of protective sprays to buds, flowers, and developing nuts. Timing of your first walnut blight spray should depend on the orchard's disease history and the weather forecast. If rain is in the forecast and the orchard has a high blight history, consider spraying as early as bud break or catkin emergence and following up with a second spray 7-10 days later. If the pressure in the block is moderate/low (low disease history or no rain forecasted), consider the timing of 20% prayer stage.

Table 1. Tree and Vine Herbicide Registration chart update by Dr. Brad Hanson

Herbicide Registration on California Tree and Vine Crops - *(reviewed January 2022 - UC Weed Science)*

	Herbicide-Common Name *(example trade name)*	Site of Action Group[1]	Almond	Pecan	Pistachio	Walnut	Apple	Pear	Apricot	Cherry	Nectarine	Peach	Plum / Prune	Avocado	Citrus	Date	Fig	Grape	Kiwi	Olive	Pomegranate
			----- tree nut -------				- pome -		----------stone fruit ---------												
Preemergence	**dichlobenil** *(Casoron)*	L / 20	N	N	N	N	R	R	N	R	N	N	N	N	N	N	N	R	N	N	N
	diuron *(Karmex,Diurex)*	C2 / 7	N	R	N	R	R	R	N	N	N	R	N	N	R	N	N	R	N	R	N
	EPTC *(Eptam)*	N / 8	R	N	N	R	N	N	N	N	N	N	N	N	R	N	N	N	N	N	N
	flazasulfuron *(Mission)*	B / 2	R	N	R	R	N	N	N	N	N	N	N	N	R	N	N	R	N	N	N
	flumioxazin *(Chateau)*	E / 14	R	R	R	R	R	R	R	R	R	R	R	NB	NB	N	NB	R	N	R	R
	indaziflam *(Alion)*	L / 29	R	R	R	R	R	R	R	R	R	R	R	N	R	N	N	R	N	R	N
	isoxaben *(Trellis)*	L / 21	R	R	R	R	NB	NB	NB	NB	NB	NB	NB	NB	NB	N	NB	R	NB	NB	NB
	mesotrione *(Broadworks)*	F2/27	R	R	R	R	N	N	N	N	R	N	R	N	R	N	N	N	N	N	N
	napropamide *(Devrinol)*	K3 / 15	R	N	N	N	N	N	N	N	N	N	N	N	N	N	N	R	R	N	N
	norflurazon *(Solicam)*	F1 / 12	R	R	N	R	R	R	R	R	R	R	R	R	R	N	N	R	N	N	N
	orthosulfamuron *(Craze)*	B / 2	R	R	R	R	N	N	NB	NB	NB	NB	NB	N	N	N	N	N	N	N	N
	oryzalin *(Surflan)*	K1 / 3	R	R	R	R	R	R	R	R	R	R	R	R	R	N	R	R	R	R	R
	oxyfluorfen *(Goal, GoalTender)*	E / 14	R	R	R	R	R	R	R	R	R	R	R	R	NB	R	R	R	R	R	R
	pendimethalin *(Prowl H2O)*	K1 / 3	R	R	R	R	R	R	R	R	R	R	R	N	R	N	N	R	R	R	R
	penoxsulam *(Pindar GT)*	B / 2, E/14	R	R	R	R	N	N	N	R	R	R	R	N	N	N	N	N	N	R	R
	pronamide *(Kerb)*	K1 / 3	N	N	N	N	R	R	R	R	R	R	R	N	N	N	N	R	N	N	N
	rimsulfuron *(Matrix)*	B / 2	R	R	R	R	R	R	R	R	R	R	R	N	R	N	N	R	N	N	N
	sulfentrazone *(Zeus)*	E / 14	N	N	R	R	N	N	N	N	N	N	N	N	R	N	N	R	N	N	N
	simazine *(Princep,Caliber 90)*	C1 / 5	R	R	N	R	R	R	N	R[2]	R	R	N	R	R	N	N	R	N	R	N
	trifluralin *(Treflan)*	K1 / 3	R	R	N	R	N	N	R	N	R	R	R	N	R	N	N	R	N	N	N
Postemergence	**carfentrazone** *(Shark EW)*	E / 14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	clethodim *(SelectMax)*	A / 1	R	R	R	R	R	R	R	R	R	R	R	N	R	N	N	NB	N	NB	N
	2,4-D *(Embed Extra, Orchard Master)*	O / 4	R	R	R	R	R	R	R	R	R	R	R	N	N	N	N	R	N	N	N
	diquat *(Diquat)*	D / 22	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB
	fluazifop-p-butyl *(Fusilade)*	A / 1	NB	R	NB	NB	NB	NB	R	R	R	R	R	NB	R	NB	NB	R	N	NB	NB
	glyphosate *(Roundup)*	G / 9	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	glufosinate *(Rely 280)*	H / 10	R	R	R	R	R	R	R	R	R	R	R	N	R	N	N	R	N	R	N
	halosulfuron *(Sandea)*	B / 2	N	R	R	R	R	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	paraquat *(Gramoxone)*	D / 22	R	R	R	R	R	R	R	R	R	R	R	R	R	N	R	R	R	R	R
	pelargonic acid *(Scythe)*	NC	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	N
	pyraflufen *(Venue)*	E / 14	R	R	R	R	R	R	R	R	R	R	R	N	N	R	R	R	R	R	R
	saflufenacil *(Treevix)*	E / 14	R	N	R	R	R	R	N	N	N	N	N	N	R	N	R	N	N	R	R
	sethoxydim *(Poast)*	A / 1	R	R	R	R	R	R	R	R	R	R	NB	NB	R	NB	NB	R	N	NB	NB
Organic	**ammonium nanoate** *(Axxe)*	NC	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	N
	ammoniated fatty acids *(Final-San-O)*	NC	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	caprilic/Capric acid *(Suppress)*	NC	R	R	R	R	R	R	R	R	R	R	R	R	R	N	N	R	R	N	R
	d-limonene *(AvengerAG)*	NC	R	R	R	R	R	R	R	R	R	R	R	N	R	N	N	R	N	N	N
	eugenol *(Weed Slayer CA)*	NC	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

Notes: R = Registered, N = Not registered, NB = nonbearing. This chart is intended as a general guide only. Always consult a current label before using any herbicide as labels change frequently and often contain special restrictions regarding use of a company's product.

(Continued on page 7)

- **Canker.** Limbs/branches that have been killed by Bot/ Phomopsis/Neoscytalidium canker are easy to identify between budbreak and full leaf expansion but wait to prune dead wood until rain is no longer in the forecast.

- **Management of walnut mold.** Although Botryosphaeria and Phomopsis can cause walnut mold, most walnut mold develops because of infections by Fusarium and Alternaria species. First thing to keep in mind is that controlling sunburn, insect damage, and walnut blight (Xaj) infections will help keep down mold infections. Also, another critical management practice is timely shaking and pick up of nuts; the longer walnuts remain on the tree and especially on the ground, the more mold and other quality problems they will develop.

- **Disease trial update.** In this trial, we confirmed the efficacy of the spray program with three-spray applications that started at bloom time. Results showed a significant disease reduction in plot 1 (41% reduction), compared to the grower's standard fungicide program (Fig. 1 on page 8). Interestingly, the spray program in plot 2 following one bloom-spray application using Luna Experience + Serenade Opti and another spray application one week before hull split using Flutriafol (Rhyme) was not significantly different from the three-spray applications program in terms of disease reduction. These findings highlight that a bloom spray during hull split time reduced Bot/Phomopsis and mold infection by 37%. For plot 3, where we used a single spray application at bloom time using Luna Experience + Serenade Opti, results showed lower disease reduction (14% reduction) compared to the grower's standard fungicide program. Overall, we noticed that with the heat wave we encountered during September, the overall disease incidence was high, suggesting the effect of weather conditions. Thus, we think the heat wave could predispose nut/hulls to more mold infection during hull split time.

Insect Pests Monitoring and Management. Spring is that time of the year when Pest Control Advisers deploy insect traps to determine the beginning of the insect activities (biofix) and calculate the heat accumulation (degree-days) to predict insect life cycle events in the season. Degree-day models for navel orangeworm and codling moth are available through this UCIPM website, http://ipm.ucanr.edu/WEATHER/ddretrievetext.html.

- **Codling moth.** Hang codling moth traps with "1x" lures (standard 1-mg pheromone lures) at 6-7 ft height on trees in March to determine biofix. Biofix for the codling moth is the first date when moths are found consistently in traps and sunset temperatures have reached 62°F. Keep in mind that if your orchard is under codling moth mating disruption or influenced by a nearby orchard's use, the codling moth pheromone traps shut down. We recommend using both 1x and CM-DA combo lures in both situations. In addition to traps, performing in-season nut sampling for codling moth damage is important. More information can be found here:

https:www2.ipm.ucanr.edu/agriculture/walnutcodling-moth/.

- **Navel orangeworm (NOW).** Like with other nut orchards, performing winter sanitation (i.e., removing trash nuts from the orchard) by mid-March is highly recommended. However, this task might be particularly challenging this year due to wet orchard floors and historically low walnut prices. Early generations of the NOW population solely rely on trash nuts or damaged nuts from other causes (codling moth, sunburn, blight, mechanical injury, etc.). For monitoring, use pheromone (for males) and oviposition bait traps (e.g., Peterson traps for females). The oviposition bait and a new PPO (i.e. phenyl propionate) trap can be used under mating disruption. Use a minimum of three traps per orchard for representation.

- **Apply mating disruption products.** Various formulations of mating disruption products are commercially available to manage codling moth and navel orangeworm in walnuts. Although adding mating disruption this year may be challenging because of low walnut prices, this practice helps keep the orchard clean from the worms as part of the long-term IPM strategy. Mating disruption may need to be combined with other control tactics, including supplemental insecticide sprays. Apply mating disruption before the overwintering moths begin to fly in the spring, and it should last the entire season.

Table 2. Products used to control Bot/Phomopsis and mold infection in one trial in San Joaquin County (three plots with 3 different spray programs).

	Treatment	**Rate**	**11-Apr**	**10-Sep**	**20-Sep**
Plot 1	Luna Experience + Serenade Opti	8.5 oz/ac + 20 oz/ac	Luna Experience + Serenade Opti	Merivon + Tebuconazole	Rhyme
	Merivon + Tebuconazole	6.5 oz/ac + 8 oz/ac			
	Rhyme	7.0 oz/ac			
	Treatment	**Rate**	**11-Apr**	**20-Sep**	
Plot 2	Luna Experience + Serenade Opti	8.5 oz/ac + 20 oz/ac	Luna Experience + Serenade Opti	Rhyme	
	Rhyme	7.0 oz/ac			
	Treatment	**Rate**	**11-Apr**		
Plot 3	Luna Experience + Serenade Opti	8.5 oz/ac + 20 oz/ac	Luna Experience + Serenade Opti		

(Continued on page 8)

- **Scale insects.** The best timing for walnut scale (and its natural enemies) monitoring and treatment is during the delayed-dormant period. However, if you miss that opportunity, use double-sided sticky traps to determine crawler activity in May, and treat with insect growth regulators if the monitoring warrants doing so. Unless there is significant pest pressure of scale insects and no natural enemies, the treatment can wait, especially this year, to save the cost of one spray.

- **Spider mites and predators.** For monitoring spider mites and their predators, take sample leaves from 10 trees (10 leaflets/tree from both high and low branches), look for the spider mites, predatory mites, and other mite predators such as sixspotted thrips and Stethorus beetle/larvae (i.e. spider mite destroyer). The treatment thresholds for the orchards can differ based on the pest management programs implemented (with/without broad-spectrum insecticide). In an orchard with no pyrethroid/organophosphate use, no treatment is necessary when >50% of the leaves have predators present, but treat at 20-50% mite infestation level if <50% of leaves have predators. In an orchard with pyrethroid/organophosphate use, the threshold is much lower (i.e. spray at 10-20% infestation level when <10% leaves have predators present). For record-keeping purposes, it is good to use the UC IPM sampling form, http://ipm.ucanr.edu/PMG/C881/walnut-mitemon.pdf.

- **Aphids**. Walnut aphids are much smaller and found on the underside of the leaves, while dusky-vein aphids feed along the midvein on the upper side of the leaves. Both aphid species overwinter in twigs as eggs, which hatch as leaf buds on the early walnut varieties begin to open. Sampling for aphid presence should start in May and continue throughout shoot and nut growth. Take five sub-terminal walnut leaf lets per tree from a minimum of ten trees (i.e. a total of 50 leaflets), and check for the presence of aphids. In most orchards, walnut aphids are now primarily controlled by an introduced parasitic wasp, *Trioxys pallidus,* if the wasp is not disrupted by broadspec trum insecticides or by hyperparasites (i.e. parasites of the parasitic wasp). In the absence of parasitize tion, treatment may be needed if the average num ber of walnut aphids exceeds 15 per leaflet. The Treatment threshold for dusky-veined aphid is when 10 percent of the sample leaflets have six or more dusky-veined active colonies.

- **Pacific flatheaded borer.** Pacific flatheaded borer is a reemerged pest of walnut in California. Adult female flatheaded borer beetles lay eggs on cracked bark, pruning wounds, or other natural openings in the bark of the young trunks and mature tree limbs and branches. After hatching, these young larvae bore into the cambium layer, feed on it, and overwinter inside the wood. Borer-infested branches may show “D-shaped” exit holes. Pruning and chipping the infested branches during the winter is the best practice to reduce the borer population over time.

Mohamed Nouri, Orchard Systems Advisor
Jhalendra Rijal, Area Integrated Pest Management Advisor

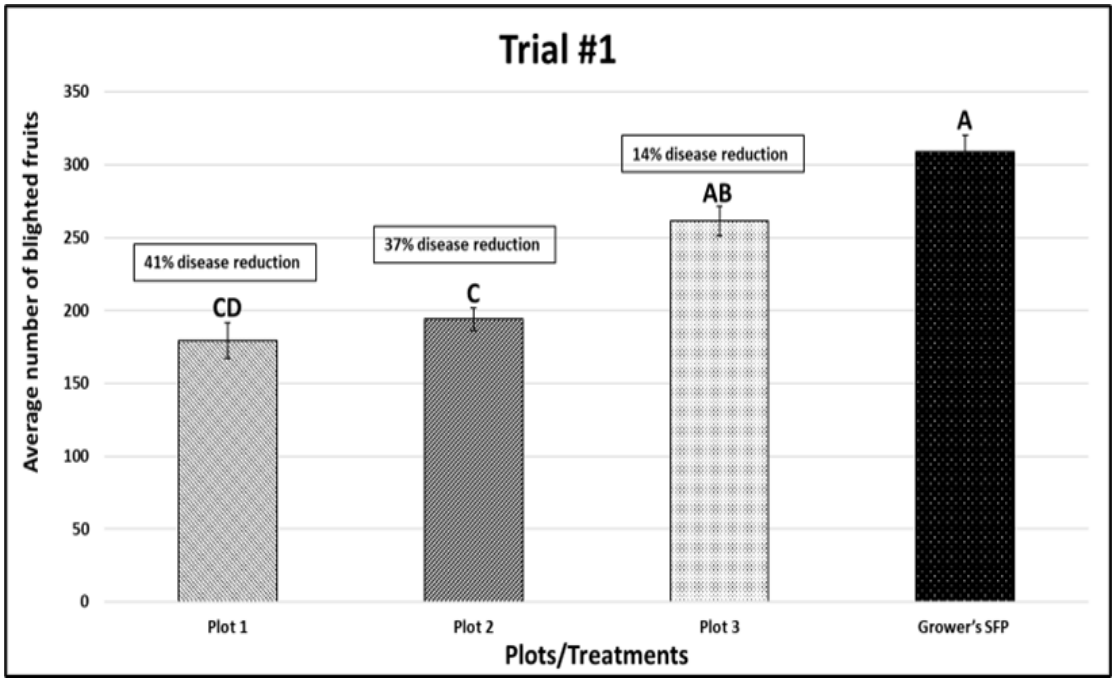

Figure. 1. Efficacy of three different spray programs on blighted fruit and fruit with mold compared with the grower’s standard fungicide program (SFP). Specific program: Plot 1) bloom spray (Luna Experience + Serenade Opti); 3-4 weeks before hull split (Merivon + Tebuconazole); and early hull split (Rhyme). Plot 2) bloom spray (Luna Experience + Serenade Opti); and early hull split (Rhyme). Plot 3) bloom spray (Luna Experience + Serenade Opti).

US EPA Proposed Changes to Rodenticide Labels for Agricultural Use

Rodents cause substantial damage and health risks in agricultural production systems through direct consumption of fruit, nuts, and vegetative material; damage to the plant (e.g. girdling of stems and trunks); by providing a food safety hazard from contamination; damage to irrigation infrastructure; damage to farm equipment; burrow systems posing a hazard to farm laborers; posing a health risk through potential disease transmission; and increased soil erosion by water channeling down burrow systems, among other potential damage outcomes. They also cause substantial damage and food contamination risks in livestock holding facilities, food processing facilities, barns, and other agricultural-related structures. As such, effective management is needed to minimize these risks. The use of rodenticides is often considered the most efficacious and cost-effective tool for managing rodent pests, and as such, it is often included in Integrated Pest Management (IPM) programs designed to mitigate rodent damage and health risks. Given the significance of rodenticides in managing rodent pests, it is important to know that the US EPA released a list of Proposed Interim Decisions (PIDs) for public comment that, if approved, will substantially alter if and how rodenticides may be used to manage rodent pests in the near future. As such, we felt it was important to inform California's agricultural producers as to the extent of these proposed changes.

All rodenticides are currently under review. These include first-generation anticoagulants (FGARs; chlorophacinone, diphacinone, and warfarin), second-generation anticoagulants (SGARs; brodifacoum, bromadiolone, difethialone, and difenacoum), zinc phosphide, strychnine, bromethalin, and cholecalciferol. Of these, only FGARs, zinc phosphide, and strychnine have labels for use against field rodents (e.g. ground squirrels, pocket gophers, voles, rats, and mice found in agricultural fields), but not all of these active ingredients can be used for all rodent species. As always, it is imperative to fully read a rodenticide's label before determining if it is appropriate for use against a particular species and in a specific situation. That said, the following are some significant changes that have been proposed that you should be aware of. Other potential changes have been proposed as well, so please check out the PIDs for additional details (linked at the end of this document).

1. All rodenticides for field applications will become restricted-use products. This means that applicators will need to be certified to use restricted-use products in these settings. They will also have increased reporting requirements for their use.
2. Aboveground applications would be eliminated in rangeland, pastureland, and fallow land. This is a substantia deviation, as many/most applications in these areas have traditionally been through broadcast applications or spot treatments. This change would leave only bait stations for ground squirrels and voles.
3. Within-burrow applications of FGARs will generally not be allowed in croplands during the growing season. This would eliminate FGAR application for pocket gophers for much of the year and would eliminate it for all uses in some crops (e.g. citrus and alfalfa in certain areas of the state).
4. Carcass searches will be required every day or every two days (starting 3-4 days after the initial application), depending on the product used and where applied, for at least two weeks after the last application of the rodenticide. When carcasses are found, they must be disposed of properly. Any non-target mortalities must be reported to the US EPA. Collectively, this will require a major increase in labor, potentially making rodenticide applications impractical in many settings.
5. Extensive endangered species designations are anticipated that will limit or eliminate the potential to apply rodenticides. This could have large-scale impacts, although the full extent is not known at this time.
6. New labels will require the use of a PF10 respirator and chemical resistant gloves during application. This is a substantial change for some rodenticide labels, requiring fit testing for all applicators, with the requirement of respirators ultimately making rodenticide application more physically challenging.

Additional details on these proposed changes can be found at the following websites:

1. Anticoagulant PID: https://www.regulations.gov/document/EPA-HQ-OPP-2015-0778-0094
2. Zinc phosphide PID: https://www.regulations.gov/document/EPA-HQ-OPP-2016-0140-0031
3. Strychnine PID: https://www.regulations.gov/document/EPA-HQ-OPP-2015-0754-0025
4. Bromethalin and cholecalciferol PID: https://www.regulations.gov/document/EPA-HQ-OPP-2016-0077-0024

As mentioned previously, these proposed changes are likely to have a substantial impact on the use of rodenticides in agricultural settings. These changes were open for public comment. The deadline for making comments to the US EPA was February 13, 2023. We will await a final decision.

Roger A. Baldwin, Professor of Cooperative Extension, UC Davis
Niamh Quinn, Cooperative Extension Advisor, UC South Coast Research and Extension Center

UC ANR Announcements and Calendar Events

Quad-County Walnut Institute
February 28, 2023
7:30 am - 12:00 pm
Robert J. Cabral Agricultural Center
Contact: Mohamed Nouri, 209-953-6100 or mnouri@ucanr.edu
More information: https://ucanr.edu/sites/CE_San_Joaquin/files/379585.pdf

Principles of Fruit and Nut Tree Growth, Cropping and Management
March 13-23, 2023
UC Davis
Please visit https://fruitsandnuts.ucdavis.edu/events/2023-principles-fruit-nut-tree-growth-cropping-and-management for information and to register. Questions can be directed to fruitsandnuts@ucdavis.edu.

Rice Production Workshop
An in-depth workshop on the principles and practices of rice production in California
March 15 and 16, 2023
8:30 am - 4:00 pm
Lundberg Family Farms, 5311 Midway, Richvale, CA 95974
Contact: Michelle Leinfelder-Miles, mmleinfeldermiles@ucanr.edu
For program and to register: https://ucanr.edu/sites/RiceTestSite/files/380233.pdf

2023 Water Measurement and Reporting Course Scheduled

Senate Bill 88 requires that all water right holders who have previously diverted, or intend to divert, more than 10 acre-feet per year (riparian and pre-1914 claims); or who are authorized to divert more than 10 acre-feet per year under a permit, license, or registration; to measure and report the water they divert. Detailed information on the regulatory requirements for measurement and reporting are available on the State Water Resources Control Board (SWRCB) Reporting and Measurement Regulation webpage. The legislation requires that installation and certification of measurement methods for diversion (or storage) greater than or equal to 100-acre feet annually be approved by an Engineer/ Contractor/Professional. Diverters across CA were concerned about this requirement.

California Cattlemen's Association heard from their membership and worked with Assemblyman Bigelow on a bill that would result in a self-certification option. Assembly Bill 589 was passed and became law on January 1, 2018. This bill allows **any diverter** *who has completed this instructional course on measurement devices and methods administered by the University of California Cooperative Extension, (*including passage of a proficiency test) to be considered a qualified individual when installing and maintaining devices or implementing methods of measurement. **The bill requires the University of California Cooperative Extension and the SWRCB to jointly develop the curriculum for the course and the proficiency test.**

At the workshop you will:

- *Clarify reporting requirements for ranches.*
- *Understand what meters are appropriate for different situations.*
- *Learn how to determine measurement equipment accuracy.*
- *Develop an understanding of measurement weirs.*
- *Learn how to calculate and report volume from flow data.*

There will be a limited number of trainings offered in 2023. The scheduled training is:

Date: March 2, 2023
Time: 9:00 am – 12:30 pm
Location: UC ANR Building
2801 2nd Street

Registration Fee: $30
Pre-Registration is required
Registration material: https://ceshasta.ucanr.edu or request by email
Email: Larry Forero (lcforero@ucanr.edu) or Sara Jaimes (sbjaimes@ucanr.edu)
Phone: 530-224-4900.

Course Registration & Fees

Registration is now open.
Please use the online registration available on the UC Fruit & Nut RIC website:
fruitsandnuts.ucdavis.edu

The enrollment fees will cover classroom instruction, all course materials, coffee breaks, lunches, and evening social.

Reservations will be accepted on a first paid, first enrolled basis.

- $1,595 for Week 1
- $2,595 for Week 1 and Week 2

Registration is requested no later than March 1st, 2023.



For more information, contact:

Registration Coordinator
Kevin Taniguchi
fruitsandnuts@ucdavis.edu
(530)-723-6741

UCDAVIS
FRUIT & NUT RESEARCH & INFORMATION CENTER

PRINCIPLES OF FRUIT AND NUT TREE GROWTH, CROPPING & MANAGEMENT

March 13 - March 23, 2023

On Campus & In The Field

Understanding the fundamentals of tree biology is essential in making sound orchard management and business decisions in the tree fruit and nut industry. However, access to educational courses on basic fruit and nut tree biology, and how it relates to agronomic practices, is limited. Our course incorporates lecture, lab exercises, and field demonstrations to provide information on all aspects of basic plant biology and the relationship between plant biology and nuts and fruit orchard management.

The mission of the Fruit & Nut Research & Information Center (FNRIC) is to aid in the coordination and dissemination of University of California research and extension activities related to fruit and nut crops. The FNRIC has developed educational websites and extension courses.

Course lectures will be held in the UC Davis Activities and Recreation Center and field demonstrations will take place in the UC Davis Teaching Orchards. An optional four day field trip will be held March 20-March 23, 2023 for an additional fee. This field trip will provide a view of fruit and nut breeding, growing, and processing facilities throughout the Sacramento and San Joaquin Valleys.

UC Pomologist Emeritus Ted DeJong

Course Topics

- Tree growth, development & pruning
- Dormancy, chilling & rest breaking
- Flowering, pollination & fruit set
- Fruit development & thinning
- Tree water relations & irrigation
- Plant nutrition & fertilization
- Root growth & rootstocks
- Tree fruit pests and pathogens
- Harvesting

University of California
Agriculture and Natural Resources

Cooperative Extension
San Joaquin County

2101 E. Earhart Ave., Suite 200
Stockton, CA 95206-3949

Notes from the Field

February 2023