Sacramento Valley Walnut News

Issue 52, Winter 2024

University of California
Agriculture and Natural Resources | Cooperative Extension

In This Issue

- Winter Walnut Management Resources
- 2024 Meetings
- Winter Chill, Dormancy and Walnut Management
- Fungicide Efficacy

Submitted by:

Clarissa Reyes
UCCE Farm Advisor
Sutter, Yuba, Butte. Placer

Walnut Winter Management UCCE Resources

Jaime Ott, UCCE Tehama, Shasta, Glenn, and Butte Counties
Luke Milliron, UCCE Butte, Glenn, and Tehama Counties
Kat Jarvis-Shean, UCCE Sacramento, Solano, and Yolo Counties
Janine Hasey (Emerita), Sutter, Yuba, Colusa Counties

Take a hard look at your orchard operation: take some time to Stop, Think, Observe, and Plan.

Pre-Season Airblast Sprayer Calibration: If you're paying to spray, make those sprays as effective as possible. Take the time now to maintain and calibrate your airblast sprayers. A properly calibrated sprayer is needed for good pest and disease control. Full coverage is especially necessary for walnut blight– if it's not covered, it's not protected! Check your sprayer for worn or broken parts (nozzles, strainers, pressure gauge(s), etc.). Calibrate the sprayer by measuring ground speed and spray flow. The general rule is at least 2/3rd of the spray volume (gallons per minute) through the top half of open nozzles.

Sanitation is the best insurance program against NOW; you must decide what level of this "insurance" you want to buy to help protect your 2024 crop. Your economics may not allow for shaking/hand poling, blowing berms, and then flail mowing mummies prior to next season, but remember that any sanitation is better than none.

Codling Moth Mating Disruption: If you use mating disruption for codling moth, stay the course. Mating disruption is proven effective for reducing codling moth populations and damage, with return on investment maximized over multiple years of use. Good codling moth management can also mitigate NOW infestation. If using mating disruption, order mating disruptants and hang before typical spring biofix in your orchards. Remember that you will need to use monitoring approaches that evaluate female activity as well as male activity in mating disruption orchards. BE KIND to your neighbors and let them know if you are using mating disruption, as traps in nearby orchards can be impacted.

2024 Sacramento Valley Orchard Meeting Save the Dates!		
Jan 30, 8:00am - Noon	Almond Meeting, Arbuckle	Arbuckle Golf Club
Jan 30, 1:00pm - 5:00pm	Almond Meeting, Woodland	Norton Hall, Woodland
Jan 31, 7:00am - Noon	North Valley Nut Conference	Silver Dollar Fairgrounds, Chico
Feb 1, 7:30am - Noon	Northern Sacramento Valley Prune Day	Elk's Lodge Red Bluff
Feb 20, 7:30am - Noon	North Sac Valley Olive Day	Orland, CA
Feb 21, 8:00am - Noon	Sacramento Valley Pistachio Meeting	Norton Hall, Woodland
Feb 27, 8:00am - Noon	South Sacramento Valley Prune Day	UCCE Sutter-Yuba, Yuba City
Feb 28, 7:30am - 2:00pm	Sutter-Yuba Walnut Day	Sutter Co. Veterans Hall, Yuba City
Feb 29, 7:30am - Noon	Northern Sacramento Valley Walnut Day	Elk's Lodge, Red Bluff
Mar 12, 8:00am - Noon	Sac-Solano-Yolo Walnut Day	Norton Hall, Woodland

Scale Pests: Delayed-dormant is one of the effective pesticide application timings for managing scale pests. If an insect growth regulator insecticide was used for scale within the last two years, monitoring may indicate that a spray is not needed this year.

Replanting Missing Tree Spots: Make sure you're evaluating the chances of replant survival and follow the replanting best practices. In addition, if much more than half of the replant spot is shaded at midday, a replant is unlikely to succeed.

Irrigation System Maintenance: With the cost of water and pumping rising, dialing in your irrigation is critical. An important first step is to perform system maintenance before you start things up in the spring. Contact your local Resource Conservation District Mobile Irrigation Lab for free system evaluations:

Tehama, Butte, Glenn, or Shasta Counties- Kevin Greer, 530-727-1297 or kevin@tehamacountyrcd.org
Yolo County- Conor Higgins, higgins@yolorcd.org
Solano County- Kevin Young-Lai, kevin.young-lai@solanorcd.org or 707-678-1655 ext. 123
Sutter-Yuba-Colusa- Karandave Kang, scrcdoffice@gmail.com.

Don't fly blind with your Irrigation Management: The cost to integrate a pressure chamber into orchard management ranges from about $10 to $20 per acre annually, with potential savings in water and electricity more than triple that cost. Careful pressure chamber use can benefit walnut orchard health, as well as achieve water and energy savings. If you are interested in the pressure chamber, you can ask your local farm advisor to come out and do a spot check on your trees ahead of an irrigation.

Looking for Cost Savings Season-Long: For 2024, there are other cultural and pest management options to improving your profit margin. We have articles that focus on labor and cost cutting considerations appropriate to each season, while discussing which operations you should not scrimp on.

Winter Chill, Dormancy and Walnut Management – 2023-2024 Update

Kat Jarvis-Shean, Orchard Systems Advisor UCCE Sacramento-Solano-Yolo

As discussed in previous newsletter articles, walnuts are one of the highest chill requirement tree crops in California. Though it's easy to forget given the luxuriously high amounts of chill last year, multiple recent winters have fallen short of the chill accumulation needed for a tight, economical walnut bloom (e.g. 2014, 2015, 2020). Inadequate winter chill accumulation can result in delayed budbreak, scattered or prolonged budbreak and buds on southern sides of branches never opening. Prolonged bloom can result in a wider variety in nut sizes, more small nuts, and multiple shakes, while also complicating timing of control measures for blight or husk split pests. In the next 20-40 years, Central Valley walnut orchards will get 14-20% less winter chill than in the 1950s when many of our grandparents were farming. Anecdotal experience suggests the chilling requirement for 'Chandler' is around 60-65 chill portions as quantified by the Dynamic Model. Given decreased chill projections it is likely that currently planted 'Chandler' orchards will not meet their chilling requirement in at least one out of ten years in most of the Central Valley in the coming decades, if left to their own devices. While we wait for high quality lower chill varieties to develop, how can walnut growers manage the chilling requirements of the orchards in the ground now? This has been the topic of many recent years of UC research with funding from the California Walnut Board and the California Department of Food and Agriculture.

Looking at a sampling of four CIMIS weather stations using the UC Fruit & Nut Center chill calculator tool, on average the Sacramento Valley has accumulated 41 chill portions to date (written January 14th). This is about 20% below last year, and more in keeping with the winter of 2019-2020. While 2019-2020 was a low chill accumulation winter, that was due in large part to a fairly warm February. Thus, it's too early to say if this is a year in which dormancy breaking treatments would be beneficial. Keep an eye on the UC Fruit & Nut Center's chill calculator. Nonetheless, it's good to be aware for future winters that there are options in the toolbox.

For three winters, we have been studying the impact of a number of dormancy breaking treatments to give growers tools to deal with low chill winters (see here for more detail on previous years). Rather than wait for low chill years to come along, we've created warm winter conditions in large, open-top chambers that we've built around mature Chandler trees at the UC Davis campus. These trees were coupled with unheated trees that got sufficient winter chill. Approximately 30-40 days before (what we hoped would be) budbreak, dormancy breaking treatments were applied to different scaffolds in each tree. We then monitored budbreak over many weeks to quantify timing of 50% budbreak, the duration of budbreak and the percent of buds that opened on a scaffold.

Over the course of three years, we've tested hydrogen cyanamide, often marketed as Dormex®, a blend of nitrogen compounds marketed as Erger®, an analogue of the plant hormone cytokinin, marketed as Mocksi®, and calcium ammonium nitrate (CAN-17), all of which were compared with a water control. Dormex is the only one of these products currently labeled for use as a dormancy breaker in walnuts (see label for more use details). Erger and CAN-17 are labeled as fertilizers. Over the last two years (2021 and 2022), we found that at least in terms of budbreak timing, it appears Dormex at 2% and 4% and CAN-17 at 20% could prompt heated scaffolds to behave like they had received enough chill, whereas Erger at 6% only partially compensates for lack of winter chill. Dormex at 4% moved timing even earlier than the sufficiently chilled control, whereas Erger moved the timing but only about halfway between the timing of the heated control and the sufficiently chilled control. No effect was seen using Mocksi over two years.

This previous winter-spring, we put Dormex at 2% and 4% head-to-head. Given that last year was a very high chill winter, it was hard to force insufficient chill accumulation, even with our heated tents. Ambient trees accumulated 78-82 chill portions, while heated trees accumulated 10-12% less, 69-74 chill portions. Both Dormex at 2% and 4% moved terminal and lateral budbreak timing on the heated trees to similar values as seen in the unheated control, in essence compensating for the chill difference. Dormex at 2% also increased the percent of buds that opened, to values as high (lateral buds) or higher (terminal buds) than the unheated control scaffolds. Budbreak percent was not different between Dormex at 4% and the water control within heated or unheated trees. In other words, under these conditions of 69-74 chill portions, it would not have been beneficial to use Dormex at a rate higher than 2%. However, even given this range of chill accumulation, which is considered sufficient, 2% Dormex increased lateral budbreak from 29% to 42% and terminal budbreak from 89% to 98%. That said, in unheated trees, which accumulated 78-82 chill portions, there was no significant increase in budbreak from Dormex use at either rate.

With generous collaboration from two grower hosts, we also compared Dormex at both 2% and 4% and CAN-17 last year at a field scale, to be able to collect yield data, in addition to budbreak data. At one healthy orchard just a few years into its prime yielding years (10th leaf) near Glenn County, where 73 chill portions accumulated (similar to heated trees on campus), we saw the same change in budbreak timing (3 days earlier) across each treatment when compared to no treatment. This did not lead to significant differences in yield, contrary to what the increased percentage of budbreak in the campus heated tented trees might have led us to expect. Yields ranged on average from 6,240-6,690 lb per acre across treatments. Across size quality measurements (percent jumbos, large, average nut weight, edible yield), nuts from the Dormex treatments were not significantly different from the control, though relative to the control nuts, the CAN-17 treatment had a lower average percentage of large and jumbo nuts (52% v. 64%) and lower average weight (9.15 g v. 10.09 g). There were no differences in color quality as measured by reflected light index (RLI) among any of the treatments.

At the Chandler orchard at the Nickels Soils Lab, where 82 chill portions were accumulated (similar to unheated trees on campus), there was a small but significant change in timing of budbreak in each treatment relative to the control (3 days). Surprisingly, however, there was also an increase in yield in the 4% Dormex treatments relative to the control, yielding on average more than 1,400 lb more per acre (5,216 lb vs. 6,857 lb). The average yields in the Dormex at 2% treatment and the CAN-17 treatment were also numerically higher than the control (1,019 lb higher and 719 lb higher, respectively), but there was a great deal of variability in different replicates, making it difficult to statistics to decipher if yield differences can be attributed to the treatments. There were no differences between any of the treatments and the control treatment across size quality measurements (percent jumbos, large, average nut weight, edible yield) or color quality (RLI).

It is perilous to draw conclusions about dormancy treatment efficacy at a field scale based on one high chill year's data. The difference in yield effects at the Glenn County orchard and Nickels Soils Lab is intriguing. The Nickels site is an older orchard at a tighter spacing, suffering from significant limb dieback from shading coupled with Botryosphaeria infections. One possible explanation for the yield difference would be that the Nickels site benefitted from treatments that encouraged additional budbreak, whereas at the healthy, high yielding Glenn County orchard there was already sufficient budbreak without intervention. Knowing that June drop generally reduces cropload, it'd make sense that increased budbreak, as we saw in the campus trees with 2% Dormex, would not necessarily lead to increased yield. Given high chill accumulation in healthy orchards, dormancy breaking treatments are unlikely to pay for themselves at current walnut prices. If chill accumulation is lower than ~60 chill portions, our heated tent data indicates they may pay for themselves, but we'll need yield data at production scale to know for sure. The Nickels results point to the possibility that dormancy breaking treatments may be of use in orchards with limb dieback. At the same time, we need to be cautious to watch for swings in yield this coming year that may result from over-taxing the already struggling trees. Particularly given how tight walnut budgets are these days, I'd wait for more data before trying out this orchard-renewal strategy at a large scale if I were a grower.

We'll continue this project with funding from the California Department of Food and Agriculture to improve understanding of ideal rates and timings, and the physiological response to these treatments inside the trees. Stay tuned!

Up-to-date orchard-related events, news & articles from UC Cooperative Extension farm advisors from the Sacramento Valley.

Visit: sacvalleyorchards.com

Excerpt from Adaskaveg et al. "Fungicides, bactericides, biocontrols, and natural products for deciduous tree fruit and nut, citrus, strawberry, and vine crops in California – 2024" UC IPM, Agricultural Pests and Diseases.

WALNUT: BACTERICIDE AND FUNGICIDE EFFICACY – CONVENTIONAL

	Resistance risk (FRAC#)[1]	Walnut blight[2]	Anthrac-nose	Botryo-sphaeria blight***	Kernel mold***
Bactericides					
Copper + mancozeb (Manzate, Dithane)	low (M1 + M3)	5	5	3(2)	0
Kasumin + copper	low (24 + M1)	5	0	0	0
Kasumin + mancozeb	low (24 + M3)	5	0	0	0
Syllit + copper	high (U12 + M3)	4	ND	0	0
Syllit + Kasumin	high (U12 + 24)	4	ND	0	0
Bordeaux[2]	low (M1)	4	0	0	0
Fixed coppers[2,3]	medium (M1)	4	0	0	0
Zinc sulfate + copper + hydrated lime (Zinc-copper Bordeaux)	low (M1)	4	0	ND	0
Kasumin	high (24)	4	0	0	0
Copper + mancozeb + surfactant[4]	low (M1 + M3)	2	ND	ND	0
Fungicides					
Syllit	high (U12)	3	5	ND	ND
Luna Experience	medium (3/7)	0	5	5	3
Luna Experience + Regalia	medium (3/7 + (BM 01)	3(2)	5	5	ND
Merivon	medium (7/11)	0	5	5	3
Pristine	medium (7/11)	0	5	5	ND
Quash	high (3)	0	5	5	ND
Inspire Super	Medium (3/9)	ND	4	ND	ND
Quilt Xcel	medium (3/11)	0	5	5	ND
Luna Sensation	medium (7/11)	0	5	5	ND
Quadris Top, Acadia ESQ	medium (3/11)	0	5	4	ND
Ph-D	medium (19)	0	5	4	ND
K-Phite[3]	low (P07, 33)	2	ND	5	ND
Fontelis	high (7)	0	ND	4	ND
Cevya	high (3)	0	ND	4	ND
Teb, Tebuconzole, Toledo	high (3)	0	ND	4	3
Miravis Prime	medium (7/12)	0	ND	4	ND
Miravis Duo	medium (3/7)	0	ND	4	ND
Viathon	medium (3/P07, 33)	2	ND	4	ND
Rhyme	high (3)	0	5	4	3
Abound, Quadris, Acadia	high (11)	0	ND	ND	ND
Luna Privilege	high (7)	0	ND	ND	ND

WALNUT: BACTERICIDE EFFICACY – BIOCONTROLS AND NATURAL PRODUCTS

Organic treatments	FRAC code[1]	Resistance risk	Walnut blight[2]	Botryosphaeria blight***
Actinovate	BM 01	low	2	NL
Blossom Protect	BM 02	low	3 (2)	NL
Bordeaux[2] (organic with approved copper)	M1	medium	4	3 (2)
Fixed coppers[2,3] (organic with approved copper)	M1	medium	4	3 (2)
Guarda, Thyme Guard	BM 01	low	2	2
Howler	BM 02	low	ND	3
Regalia	BM 01	low	2	3
Regalia + Copper (organic with approved copper)	BM 01 + M1	low	3 (2)	3
Serenade (organic)	BM 02	low	2	2
Zinc sulfate + copper + hydrated lime (Zinc Bordeaux)	M1	medium	4	2

Rating: 5 = excellent and consistent, 4 = good and reliable, 3 = moderate and variable, 2 = limited and/or erratic, 1 = minimal and often ineffective, 0 = ineffective, NL = not on label, and ND = no data.

* **Registration pending in California**

** **Not registered, label withdrawn or inactive in California**

*** **Research is ongoing to determine the most efficacious materials and the optimum timing of treatments for management of Botryosphaeria blight and kernel mold of walnut. Fungicides rated for kernel mold may have to be mixed (e.g., Merivon - FC 7/11 and Teb-FC 3) and rotated to another fungicide (e.g., Rhyme - FC-3). This mixture rotation is 4 (good and reliable).**

[1] Code numbers are assigned by the Fungicide Resistance Action Committee (FRAC) according to different modes of actions (for more information, see http://www.frac.info/). Fungicides with a different Code number are suitable to alternate in a resistance management program. In California, make no more than one application of fungicides with mode-of-actions (MOA) with high resistance risk before rotating to a fungicide with a different MOA (Code number); for other fungicides, make no more than two consecutive applications before rotating to fungicide with a different MOA (Code number).

[2] Copper resistance occurs within sub-populations of *Xanthomonas arboricola* pv. *juglandis*.

[3] Phytotoxicity may occur. For fixed coppers, injury can be reduced by the addition of lime or agricultural oils to the tank mixture.

[4] A single application with a surfactant is not recommended because of an increase in bud populations that may increase disease later in the season or in subsequent years.

WALNUT: TREATMENT TIMING

Disease	Catkin emerg-ence	Terminal bud break	7–10 day intervals	Apr.	May	June	July	Aug. (3-wk before hull split)	Sept. (20–30% hull split)	Oct.	Nov. (1st wk)
Anthracnose[1]	0	0	0	2[4]	3	2	0	0	0	0	0
Botryosphaeria blight	0	0	0	1	2	3	3	2	0	1	1
Kernel mold[2]	0	0	2	0	0	0	0	2	2	0	0
Walnut blight [3,4,5]	2[5]	3	3	3	2	1	0	0	0	0	0

Rating: 3 = most effective, 2 = moderately effective, 1 = least effective, and 0 = ineffective

[1] Make the first application when the size of the expanding leaves is about half of its final size. This first application stage is critical.

[2] Timing for kernel mold is based on a mixture rotation of Merivon (FC 7/11) and Teb (FC 3) followed by Rhyme (FC-3) at the timings indicated. This mixture rotation is '5' based on the ratings in the efficacy table above.

[3] A temperature-leaf wetness model (e.g., XanthoCast) is available for determining optimum timing of bactericide applications.

[4] Late spring rains are less conducive to disease, provided bloom is not delayed by low chilling.

[5] Male and female flowers are susceptible beginning with their emergence, depending on wetness and temperatures conducive to disease development.

Herbicide Registration on California Tree and Vine Crops - *(reviewed April 2023 - 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	R	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	NB	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	NB	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.

[1] Herbicide site of action designations are according to the Herbicide Resistance Action Committee (letters) and the Weed Science Society of America (number) systems. NC = no accepted site of action classification; these contact herbicides are general membrane disruptors. [2]Simazine is registered on only tart cherry in CA. Weed susceptibility information and the most up to date version of this table can be found at the Weed Research and Information Center