UC CE | UNIVERSITY OF CALIFORNIA Agriculture and Natural Resources | Cooperative Extension

Sacramento Valley Walnut News

Winter, 2025

In This Issue

Submitted by:

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Save the Dates

Date	Event	Location
Thursday, February 20, 2025 11:30 a.m. – 1:30 p.m.	Third Thursday: Things from the Field - *SGMA & Groundwater*	831 5th St, Orland
Friday, February 21, 2025 8:00 a.m. - Noon	Sac Valley Olive Day	131E Walker St, Orland
Tuesday, February 25, 2025 Morning	South Sac Valley Prune Day	142 A Garden Hwy, Yuba City
Wednesday, February 26, 2025 8:00 a.m. - Noon	Sac Valley Pistachio Meeting	Woodland
Wednesday, March 5, 2025 8:00 a.m. - 2:00 p.m.	Sutter-Yuba Walnut Day	1425 Veterans Cir, Yuba City
Thursday, March 6, 2025 8:00 a.m. - 2:00 p.m.	North Sac Valley Walnut Day	355 Gilmore Rd, Red Bluff
Wednesday, March 12, 2025 8:00 a.m. - Noon	Sac-Solano-Yolo Walnut Meeting	Woodland
Thursday, March 27, 2025 8:00 a.m. - Noon	Sac-Solano-Yolo Almond Meeting	Woodland
Thursday, April 3, 2025 11:30 a.m. - 1:30 p.m.	Third Thursday: Things from the Field - *Vertebrate Pest Mgmt*	142 A Garden Hwy, Yuba City

Walnut Winter Management UCCE Resources

Jaime Ott, UCCE Tehama, Shasta, Glenn, and Butte Counties

With walnut prices modestly up, this is a good time to look at your orchard operation, grade sheets, and pest/disease challenges in the last few years and make a plan for 2025 and beyond. Consider how the 5% rule might apply, where small improvements across multiple aspects of an operation can yield large returns.

Chill accumulation has been low-to-moderate so far this winter, depending on how you count and where you grow. If you're worried about inadequate chill in your orchard, this could be a year to explore dormancy breaking treatments. See more in this newsletter for the latest research.

Mating disruption is an effective method for reducing codling moth damage, which also helps to reduce NOW infestations. If you opt to use mating disruption, hang mating disruptants before the typical spring biofix in your orchard. Remember that these products can affect trap catches in pheromone traps in nearby orchards, so be kind to your neighbors and let them know that you are using mating disruption.

Any sanitation is better than none for NOW control. If you situation doesn't justify the Cadillac treatment (shaking/hand poling, blowing berms, and destroying mummies by flail mowing), consider doing what you can to protect your 2025 crop.

Delayed-dormant is a good time to spray for scale pests If you have used an insect growth regulator in the last two years, monitor to see if you can skip a scale spray this year.

Take the time 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.

Perform irrigation 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, and Shasta Counties- Kevin Greer, kevin@tehamacountyrcd.org or 530-727-1297
Yolo, Colusa, Sutter, and Yuba Counties- Conor Higgins, higgins@yolorcd.org or 530-661-1688 ext. 4
Solano County- Kevin Young-Lai, kevin.young-lai@solanorcd.org or 707-678-1655 ext. 123
Sacramento County- Chris Timmer, chris@sloughhousercd.org

Consider using a pressure chamber to inform irrigation start timing this spring. Careful pressure chamber use can benefit walnut orchard health, as well as achieve water and energy savings.

Follow these best practices for replanting. If more than half of the replant spot is shaded at midday, a replant is unlikely to succeed.

Look for cost savings throughout the year with these articles focusing on labor and cost cutting considerations appropriate to each season.

Check out your regional UCCE meeting this winter for the latest production research and best practices. See the calendar in this newsletter or visit the Events page on SacValleyOrchards.com.

Updated fungicide and bactericide efficacies and timing for 2025 are available now at UC IPM. Walnut-specific tables are included in this newsletter.

Winter Chill & Dormancy Management – 2024 Update

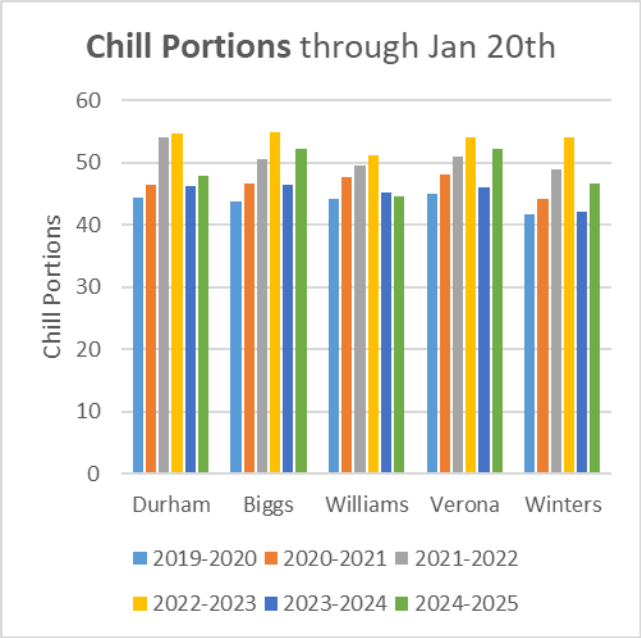
Kat Jarvis-Shean, Orchard Systems Advisor UCCE Sacramento-Solano-Yolo

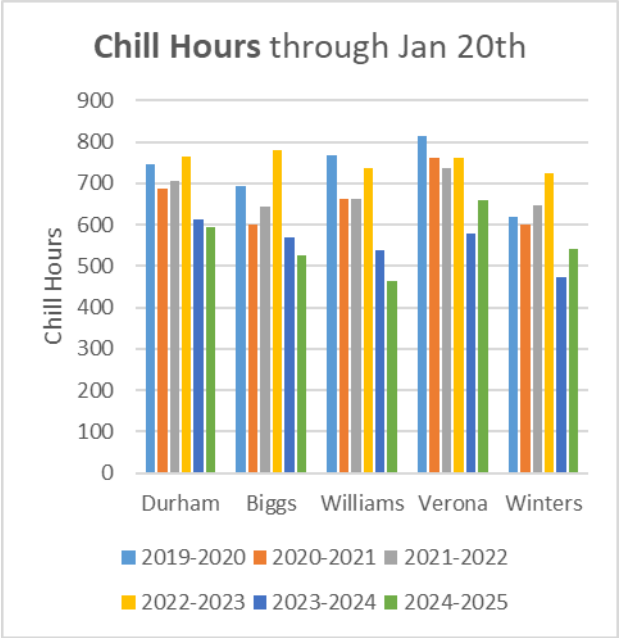
Depending on where you grow and how you count, this is shaping up to be a low-to-moderate chill winter. As discussed previously in 2023 and 2024, walnuts are one of the highest chill requirement tree crops in California. Multiple recent winters have fallen short of the chill needed for a tight, economical walnut bloom (e.g. 2014, 2015, 2020), with more low chill winters expected to come. Recent UC research funded by the California Walnut Board and the California Department of Food and Agriculture have been looking into tools to help walnuts cope with low chill winters.

Chill so far this winter

The graphs below show chill accumulation through January 20th over the last six years at five CIMIS stations in the Sacramento Valley counted in chill portions and chill hours, with this year shown by the green bar farthest to the right in each station grouping. Research has found chill portions more closely represent chill accumulation in Mediterranean

climates like ours than chill hours, better quantifying the chill-deleting effect of warm days that follow cold nights and, most importantly for this year, giving some credit for cool but not cold temperatures. Chill hours stop giving any chill credit at all when temperatures go above 45° F. Chill portions give some credit up to 54° F. Many folks are still more comfortable counting in chill hours and thus are understandably very concerned about our low chill hours accumulation to date. Given the additional information provided by chill portions and all the fog we had in December, I'm not panicked about the chill accumulation this year. It looks like we're on track to be less than the high chill of 2022-2023 (yellow), but more than the low chill of 2019-2020 (dark blue) that led to straggled and decreased budbreak in many orchards. That said, it does look like chill will be low enough in many orchards to potentially see an impact of dormancy breaking treatments.





You may be thinking "Another spray? In this economy, Jarvis-Shean?" I know prices are tight, and walnut growers are still clawing their way out from years of not even being able to afford to just irrigate and harvest. The tools I'll talk about here aren't for every orchard every year in every situation. What's more, our understanding of these tools and how to best utilize them is still evolving. But given that these tools are currently on the market, and many growers are wondering if and how they may fit into their management, I'm sharing below what we know so far, acknowledging that our understanding will evolve as we get more experience with these tools.

Early research showed us tools to move budbreak

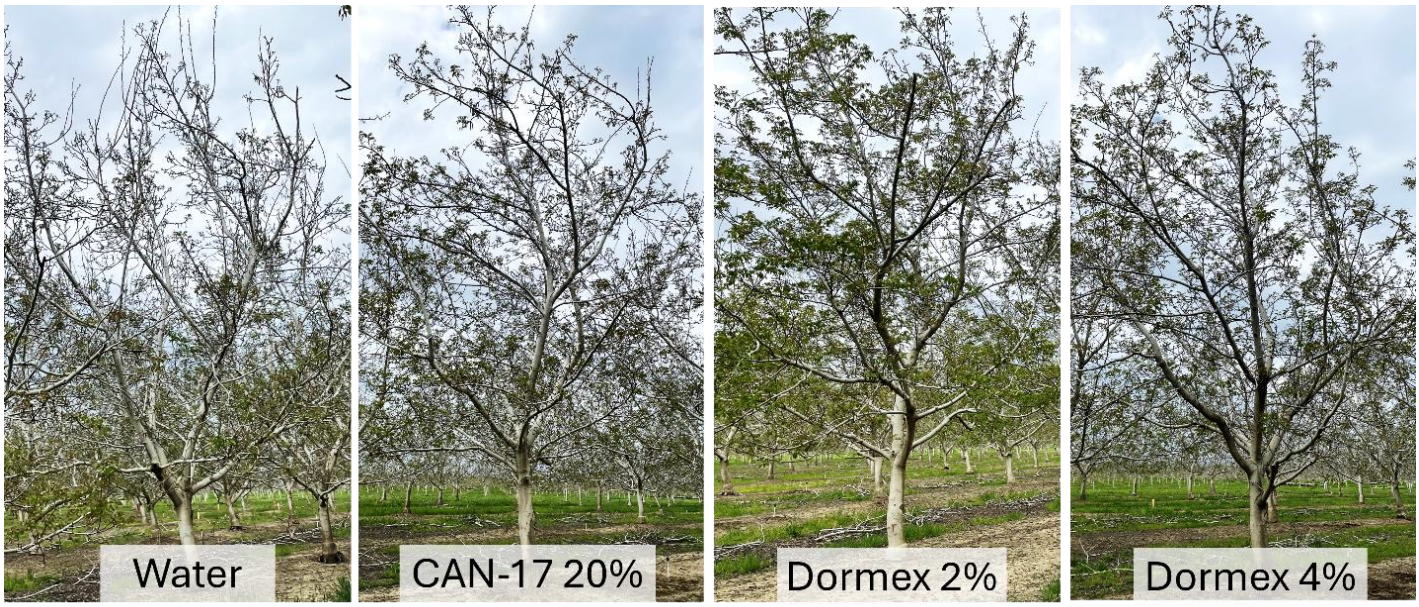
Rather than wait for low chill years to come along, we created warm winter conditions in large, open-top chambers that we built around mature Chandler trees at the UC Davis campus. These trees were coupled with unheated trees that got sufficient winter chill. Dormancy breaking treatments were applied roughly 30 days before anticipated budbreak and we then then monitored budbreak over many weeks. The most promising treatments to come out of years of these trials were hydrogen cyanamide (Dormex®) and calcium ammonium nitrate (CAN-17). Dormex at 2% and 4% and CAN-17 at 20% could prompt heated scaffolds to behave like they had received enough chill, whereas CAN-17 at lower rates (5% and 10%) only partially compensated for lack of winter chill. Heated trees showed Dormex at 2% often also significantly increased the percentages of buds that opened on heated scaffolds, whereas Dormex at 4% and CAN-17 often increased budbreak numerically, but not to a level that statical analysis could differentiate from the control. Dormex is the only one of these products currently labeled for use as a dormancy breaker in walnuts (see label for use details). CAN-17 is labeled as fertilizer. Taken all together, our tented tree trials indicated that hydrogen cyanamide and CAN-17 were worth testing at a field scale.

Grower trials – Similar budbreak story, yield is more complicated

With generous collaboration from Crain Walnuts and the Nickles Soils Lab, we've spent two years so far comparing Dormex at both 2% and 4% and CAN-17 at 20%, monitoring budbreak timing, maturity timing, yield and quality. The two Chandler

orchards we're working in are fairly representative of the industry. One is a healthy orchard just a few years into its prime yielding years (10th leaf) near the town of Glenn, and the other, planted in the hills above Arbuckle, is a few years past its prime, with some limb and spur dieback from tight spacing and Botryosphaeria.

So far, budbreak timing results have been consistent with what we saw in our tented tree trial. In the spring of 2023, after a high chill winter, budbreak was 2-3 days earlier across treatments when compared with the control. In the spring of 2024, after a good but not luxuriously high chill winter, budbreak was **5-6 days earlier at the Glenn site and 8-11 days earlier at the Arbuckle site**. This year we also looked to see if earlier budbreak resulted in earlier maturity. We found at the Glenn site 100% Packing Tissue Brown occurred 10-11 days earlier in the treated trees than the control, with no difference between treatments. At the Arbuckle site, there was a numeric trend of 100% PTB occurring a few days earlier, but it wasn't significantly different from the control. This points to a **potential interesting side-benefit** for these dormancy breaking tools – the **ability to shift harvest timing** for growers with too many acres of Chandler to harvest at once. That said, we need a few more years of data to get a better sense of how consistent these results can be.



Photos. Budbreak timing difference between Control, CAN-17 at 20% and Dormex at 2% and 4%.

Our yield results have been both interesting and surprising. The results are detailed in the table below. Last year, even when chill was more than adequate, we saw a significant increase in yields, 1,600 lb. on average at the Arbuckle site associated with Dormex at 4%, and an increase in yields, though not statistically significant, in the other two treatments at Arbuckle (700-1,000 lb.). We also saw an increase in yield in all treatments, though not significant, at the Glenn site (400 lb.). This year, however, yields were the same or lower in our treatments than the control. Yields were 400-700 lb. lower than the control at the Glenn site, statistically significant with CAN-17, and 200 lb. less to 200 lb. more than the control at Arbuckle, though none of these differences were statistically significant. This was surprising given that 2023-2024 was a milder winter than 2022-2023, so we would have expected a bigger return from using a dormancy breaker. That said, added up over two years, the cumulative yield was not different from the control at the Glenn site, and was still significantly higher (shown by different letters behind the numbers) with Dormex at 4%, at the Arbuckle site.

Location	Treatments	2023 (Lb/Ac)		2024 (Lb/Ac)		Cum. 2023 & 2024 (Lb/Ac)	
Glenn County	Dormex 4%	6,688	n.s.*	3,966	ab*	10,654	n.s.
	Dormex 2%	6,634		4,042	ab	10,676	
	CAN-17 20%	6,603		3,789	b	10,392	
	Control	6,244		4,471	a	10,715	
	Chill Portions	72 CP		71 CP			
Arbuckle	Dormex 4%	6,857	a	3,866	n.s.	10,723	a
	Dormex 2%	6,235	ab	3,791		10,026	ab
	CAN-17 20%	5,935	ab	4,242		10,177	ab
	Control	5,216	b	3,995		9,211	b
	Chill Portions	82 CP		69 CP			

*n.s. indicates no statistically significant difference in yields among treatments. Different letters indicate statistically significant difference in yields.

All this together points to the notion that these tools, applied at the timing and rates we used, are likely not suited for every orchard every year. We tried a high rate of Dormex to look for a tipping point of "too much", and with the data we have, it looks like Dormex at 4% is rarely worth the additional cost compared with 2%. In other countries, where they've been able to use hydrogen cyanamide for more than a decade on walnuts, 1.5% is a more common application rate in mature trees, and lower in younger trees. The big swing in yields we saw across both sites this year indicates to me that applying dormancy breakers after optimal chill winters like 2022-2023 to an orchard that is already thriving, like the Glenn site, is unlikely to warrant the cost in the long run. That said, they are **likely to still be valuable tools following low and medium chill winters**, have potential for encouraging **additional budbreak in stagnant orchards** like Arbuckle, and have exciting **potential for moving harvest timing** for growers with a lot of Chandler acreage.

We'll keep working in these same orchards for a few more years to gather data after more, different chill winters. You can catch me talking about this in more detail at Tri-County Walnut Day, February 6th in Tulare, Sutter-Yuba Walnut Day , March 5th in Yuba City, North Sac Valley Walnut Day, March 6th in Red Bluff, Yolo-Solano-Sacramento Walnut Day, March 12th in Woodland, Quad County Walnut Day, March 18th in Modesto or reach out through kjarvisshean@ucanr.edu.

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Walnut Newsletter

Digital Newsletter Announcement

Important Update: Our Newsletter is Going Digital!

We want to let you know that Sac Valley Orchard newsletters are moving to a digital format. Starting in Summer 2025, you'll receive our articles, updates, and news directly in your email inbox.

To ensure you're on our new mailing list, please take a moment to sign up using the link:
https://surveys.ucanr.edu/survey.cfm?surveynumber=21282.

You can also visit **SacValleyOrchards.com** anytime for the latest updates, additional resources, and archived articles. We'll be updating this website this year as well!

We understand that not everyone is fully comfortable with digital tools, but don't worry—we're here to help make this transition as smooth as possible. Please contact your local UCCE Office or advisor if you do not have access to email.

Herbicide Registration on California Tree and Vine Crops - *(reviewed January 2025 - 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	**R**	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**
	caprylic/Capric acid (*Suppress*)	NC	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	**R**	N	N	**R**	**R**	**R**	**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.

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 (M 01 + M 03)	5	5	3(2)	0
Kasumin + copper	low (24 + M 01)	5	0	0	0
Kasumin + mancozeb	low (24 + M 03)	5	0	0	0
Syllit + copper	high (U 12 + M 01)	5	ND	0	0
Syllit + Kasumin	high (U 12 + 24)	4	ND	0	0
Bordeaux[2]	low (M 01)	4	0	0	0
Fixed coppers[2,3]	medium (M 01)	4	0	0	0
Zinc sulfate + copper + hydrated lime (Zinc-copper Bordeaux)	low (M 01)	4	0	ND	0
Kasumin	high (24)	4	0	0	0
Copper + mancozeb + surfactant[4]	low (M 01 + M 03)	2	ND	ND	0
Fungicides					
Syllit	high (U 12)	3	5	ND	ND
Luna Experience	medium (3/7)	0	5	5	3
Luna Experience + Regalia	med. (3/7 + P 05)	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 (P 07/33)	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, P 07/33)	2	ND	4	ND
Rhyme	high (3)	0	5	4	3
Quadris, Acadia, (Abound discontinued)	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 02	low	2	NL
Blossom Protect	BM 02	low	3 (2)	NL
Bordeaux[2] (organic with approved copper)	M 01	medium	4	3 (2)
Cinnerate, Seican, Cinnacure	BM 01	low	3	ND
Fixed coppers[2,3] (organic with approved copper)	M 01	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+M 01	low	3 (2)	3
Serenade (organic)	BM 02	low	2	2
Zinc sulfate + copper + hydrated lime (Zinc Bordeaux)	M 01	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	3	2[4]	3	2	0	0	0	0	0
Botryosphaeria blight	0	0	3	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.