season irrigation when trees are 2-3 bars drier than the fully watered baseline. Ongoing research in the Sacramento Valley has found irrigation can be delayed until June in some years, saving water and pumping costs without negative impacts to yield, size or quality.

- Consider some cost-savings by adapting your IPM program. With the value of the crop down, this may change thresholds of pest population levels at which it makes economic sense to treat.
- Continue monitoring codling moth traps to confirm flight activity and determine treatment thresholds and timings.
- Continue monitoring for walnut scale crawlers and spray if crawlers are present, particularly if you did not treat for scale during the delayed dormant season. If a delayed dormant IGR was applied, it may take longer to see efficacy but it may remain effective for two or more years.
- Aphid sampling should begin this month and continue throughout spring and summer. Collect 5 first sub-terminal leaflets (one back from the last leaflet) from 10 trees, checking the top surface for dusky-veined aphids and the underside for walnut aphids.
- Walnut blight infections remain a concern through May. Amidst lean prices, if you are trying to save a spray, consider trying the Xanthocast model, which uses leaf wetness and temperature for forecasting disease risk and timing re-treatment intervals.
- Apply the first round of nitrogen fertilizer in May, not before. Walnut trees only use stored nitrogen the first month after leaf-out, meaning N applied before May will likely be leached by rain and/or irrigation. Walnut tree nitrogen use is fairly steady over the growing season. Evenly dividing nitrogen applications in 3 to 4 doses between May and mid-August will improve N uptake compared to 1 to 2 applications.
- Survey weeds to see which weeds were not controlled by fall or winter treatment. Use the UC Weed ID Tool to help with identification. Also see Herbicide Chart for weed control information.
- Our dry winter may mean a negative change in water quality. If you may be relying on groundwater more than usual this year, or you think your water quality may have changed, take a water sample to evaluate for specific elements like B, Cl, and Na, if they can be a problem in your area.

JUNE

- Keep an eye on stem water potential and/or soil moisture to avoid overwatering, and potential subsequent harm to root and overall tree health. The best way to determine appropriate irrigation start times is to use a pressure chamber device to determine when stem water potential is 2-3 bars drier than baseline.
- Once the need for irrigation has been determined, follow drought irrigation strategies to avoid overapplication and unintentional water loss through deep percolation. Avoid long irrigation sets that lead to standing water and increased risk of Phytophthora infection.
- Hang walnut husk fly traps by June 1. Yellow sticky traps charged with an ammonium carbonate lure work best. Check traps 2-3 times per week and treat based on detection of eggs in trapped females, overall trap catch numbers, or the first flies caught depending on spray material used, husk fly population, and previous damage.
- Keep monitoring codling moth traps, to determine subsequent biofixes. Use trap catches, dropped nut evaluation, canopy counts, and orchard history to determine need to treat second flight (see UC IPM link above).
- Look for spider mites and their predators on the leaflets already being examined for aphids. Examine an additional 5 leaflets from higher branches for a total of 10 leaflets from 10 trees. Yellows sticky cards for sixspotted thrips will also inform presence and activity of this spider mite predator. Monitor weekly through August. Treatment guidelines based on spider mite and predator presence, as well as organophosphate or pyrethroid use can be found here.
- If applying only one fungicide spray for Bot canker, a mid-June to mid-July spray timing significantly reduced blighted shoots compared with a no spray treatment. Prune out dead branches to reduce inoculum now that threat of rain has passed.

2022 Walnut Blight Management Update

Luke Milliron, UCCE Farm Advisor Butte, Tehama and Glenn Counties
James E. Adaskaveg, Department of Microbiology and Plant Pathology, UC Riverside

For any pest or disease like walnut blight that requires pesticide application to keep in check, there are four key pillars to successful management: timing, material, rate, and coverage. Below are the latest updates for managing walnut blight in 2022.

Timing: Typically, the timing of the first walnut blight spray depends on the orchard's disease history and forecast weather. However, following minimal spring rainfall, and therefore minimal blight pressure in 2020 and 2021, growers have the advantage of entering the 2022 season with very low blight inoculum. Therefore, in 2022, timing of your first walnut blight spray should depend solely on forecast weather. If there is high rainfall forecast, consider spraying as early as bud break or catkin emergence (figure 1) and then following up with a second spray 7-10 days later. If there is little or no rain forecast, consider the timing of 20% prayer stage. In the absence of rain at bloom, avoiding a spray all together to cut expenses, may be a risky proposition. Even a brief dew can be enough to start the disease cycle. Also, this prayer stage timing helps keep the disease's inoculum in check, and this timing may also be useful in providing a free ride for a foliar zinc nutrition spray.

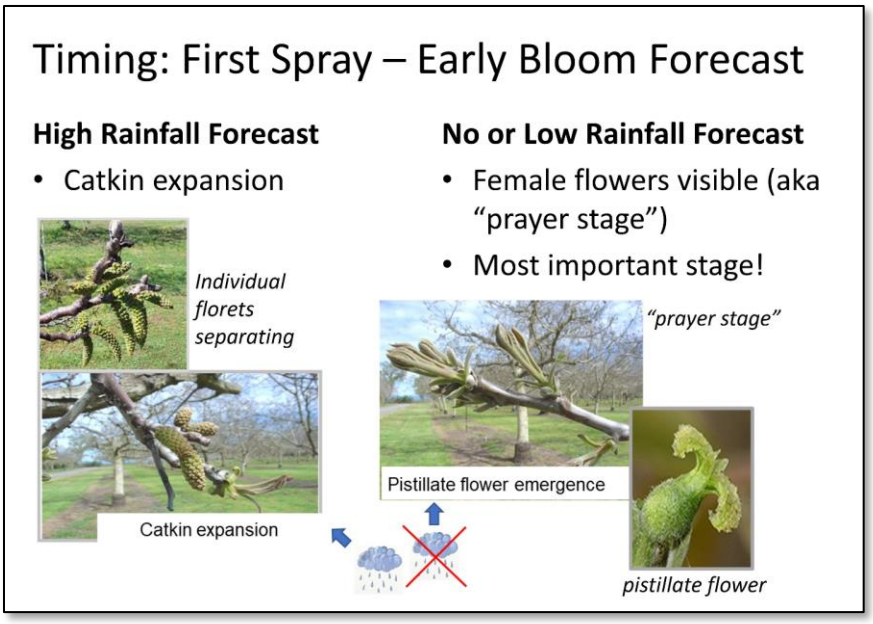

Figure 1. Timing of first blight spray when inoculum is very low (e.g. 2022 bloom) is based on forecast weather. If there is high rainfall forecast spray during catkin expansion. If there is no or low rainfall forecast wait to spray at "prayer stage" (the single most effective timing). Photos and figure by Jim Adaskaveg (UC Riverside).

Material & Rate: The pairing of copper and mancozeb remain the cornerstone of a conventional walnut blight disease management program. This combination is not only highly efficacious, but it also has a greater persistence or shelf-life once applied, compared to other combinations. Jim Adaskaveg has found that applying a mix of a liquid and a fixed copper provides the best of both worlds – an immediate source of copper ions and a residue reservoir of copper for persistence during and after rain. Although copper has had varying levels of resistance between walnut orchards for decades now, to-date mancozeb resistance has not developed. However, high resistance to mancozeb, reported for a disease genetically related to walnut blight in Florida, serves as a warning that mancozeb's effectiveness must be protected. Despite the European Commission's decision to not renew mancozeb, this currently only impacts famers in the EU, California farms can continue to use mancozeb at this time.

Rotating modes of action to combat the development of pesticide resistance is a pillar of integrated pest management. With the registration of Kasugamycin (tradename Kasumin) this became possible for the first time in 2018. Kasumin is applied

at 64 fl oz/ac with a minimum of 100 gallons of water by ground or 20 gallons by air (no off-label use rates). In 2020, the Kasumin label was updated from a maximum of two applications per season to four (with up to two sequential applications before rotation to other modes of action). The newest available blight treatment is Dodine (tradename Syllit). It was registered in 2021, but available for the first time in the 2022 season. Syllit should be used in mixture rotations, either in combination with copper or kasugamycin (i.e. it is a mancozeb substitute). Syllit should be used at a rate of 16 oz/ac (do not exceed). Growers can now use four pesticides in several two-part combinations to rotate through different modes of action that provide good blight control (figure 2). Rotation is critical to preserving the success of copper and mancozeb as the cornerstone of conventional blight management.

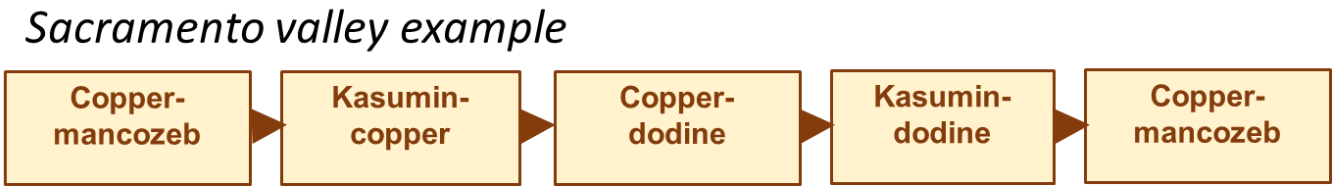

Figure 2. An example of walnut blight material rotation in the Sacramento Valley. In this high rainfall example, the grower first sprays at catkin expansion and with continued forecast rain transitioned to each subsequent two-part mix every 7 to 10 days. The relative efficacy of each of these two-part combinations is detailed in the fungicide and bactericide efficacy tables in this newsletter and at ipm.ucanr.edu/PDF/PMG/fungicideefficacytiming.pdf. This example and the fungicide and bactericide efficacy tables are not pesticide recommendations. Always follow the label, the label is law.

Coverage: Before it's time for the first spray to go out, make sure your sprayer is calibrated for good spray coverage. Coverage is key to blight management because if part of the foliage is not covered, it's not protected. In addition to calibration, avoiding half sprays is critical to achieving good coverage. Half sprays mean you're only half protected. In addition, they are NOT permitted when using Kasumin.

These four pillars of pesticide disease control are only one component of integrated management, you can learn more about the walnut blight disease cycle, details of Kasugamycin use, and the efforts to breed walnut trees for greater blight resistance, at: sacvalleyorchards.com/walnuts/diseases/walnut-blight-management.

Selecting the Best Walnut Rootstock for Your Situation

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Once a site is selected, the three most important decisions in establishing a new walnut orchard are variety selection, rootstock selection, and tree/row spacing. The spacing should be determined after the variety and rootstock are chosen since that combination will determine the ultimate size of the tree, along with the soil type and orchard management. Rootstocks are the foundation of a walnut orchard. Therefore, selecting one with attributes that will tolerate or resist site problems, while providing the vigor for optimum tree performance, is key to orchard health and longevity. There has been extensive team research including nurseries, growers, UC, UCCE, and USDA-ARS with funding from the CA Walnut Board and the USDA's National Institute of Food and Agriculture (NIFA), that have contributed to the great strides in clonal walnut rootstock development over the last 22 plus years. This article provides updates from the latest rootstock research statewide.

Commercially available Paradox clones include Vlach, VX211, RX1, and the most recent clone Grizzly. Vlach has been available since 1999 and came from a vigorous Paradox tree in Stanislaus County. Originally identified as superior seedlings from the statewide Paradox diversity trial in the 1990's and then cloned. VX211 and RX1 were released by UC and USDA in 2007, available to growers in 2008, and patented in 2010 after years of evaluation for vigor, resistance to nematodes, crown gall, and Phytophthora. Clonal Paradox rootstocks are propagated in a lab and sold either as potted

rootstock that is fall budded or spring grafted in the field, or as a June budded or nursery grafted bare root tree. For information on training different nursery products, see sacvalleyorchards.com/walnuts/horticulture-walnuts/walnut-tree-training-different-nursery-products.

Clonal Paradox walnut rootstock attributes

Vlach: One of the first clonal Paradox, and the first to be widely planted. Parentage is Northern California black (*Juglans hindsii*) x English walnut (*J. regia*). It continues to have high growth rates and yields well in ongoing trials. It typically has much less crown gall than seedling Paradox but more than the other clones. It's been a good consistent rootstock for many different sites.

VX211: Parentage of VX211 is Northern California black x English walnut and it is very vigorous. It continues to have high growth rates and yields well in ongoing trials. A main attribute is lesion and root knot nematode tolerance. The nematodes can still reproduce but this rootstock is able to tolerate higher levels of nematodes than the other rootstocks. Recommended for where there have been nematode problems or for replant trees in existing orchards. Replants are very problematic in more mature orchards because of competition for nutrients, light, and different irrigation needs. With the nematode tolerance advantage paired with the vigor, VX211 is a great candidate for replants. Being a clonal Paradox, VX211 has notably less crown gall than seedling Paradox and consistently less crown gall than Vlach in field trials. You can find more replant considerations at: sacvalleyorchards.com/walnuts/cost-and-expense-considerations/replanting.

RX1: The genetics for RX1 is different than for Vlach or VX211. RX1 parentage is Texas black (*J. microcarpa*) x English walnut. The *J. microcarpa* seems to instill resistance to Phytophthora and maybe to crown gall disease and has been used extensively to breed the new rootstock genotypes we're testing in statewide field trials. As a rootstock, it has more moderate vigor, but grafted trees on RX1 sometimes have equal or more vigor compared to trees on VX211 depending on the field location. In our ongoing statewide rootstock trials planted in 2016, RX1 along with Vlach and VX211 have had the highest scion growth rates across counties. It also has yielded well at most sites.

Disease resistance - RX1 has either moderate to high resistance to Phytophthora depending on the species. In a 5-year field trial concluded in late 2020, RX1 inoculated with Phytophthora developed no symptoms, meaning the resistance is still holding. RX1 is the preferred rootstock for any site with Phytophthora. It also can have what we call moderate resistance to crown gall. Consistently in our greenhouse screening and statewide field trials, RX1 has the least crown gall of the three standard clones.

Water relations – RX1 appears to handle drier conditions in terms of irrigation scheduling and still be vigorous and productive. Note that it's a very subtle difference and we're still in the early stages of researching it.

Salinity tolerance – In early stages of research, RX1 appears to show more salinity intolerance (leaf scorch) than the other clonal rootstocks. It may not be the best choice in situations with soil or water salinity concerns.

Vlach, VX211, RX1 summary (see Table 1): Regardless of whether they are a potted vs. a field grown tree, none of these three clonal rootstocks is resistant to *Agrobacterium tumefaciens* that causes crown gall. Consistently in our long-term field trials however, these clonal Paradox rootstocks have a substantially lower percentage of crown gall compared to the highly susceptible seedling Paradox hybrid rootstock. A well-known nurseryman once said, "It takes 20 years to prove a rootstock". These three clonal Paradox rootstocks have been subjected to 20+ years of screening, field research trials, and observations in growers' orchards for us to have confidence in the attributes listed above. That is why we refer to them as the "standard clones". These three standards are now the controls for comparison against new genotypes in UCCE/USDA rootstock trials.

Grizzly: The most recent commercially available clonal Paradox rootstock, Grizzly is patented by a grower and a nurseryman. Grizzly parentage is Northern California black x English walnut. It came from a mother tree in a replant situation with very sandy soil and lesion nematodes. From observations over 20 years, this tree had twice the size and production of the other trees that were starting to decline much earlier. We lack long-term data on Grizzly but have it in rootstock trials planted in 2016 - at one replicated trial in Lake County, and nine observational trees in Sutter County. So far it has high vigor and no crown gall at either site. The yield on the observational trees is the same as the standard clones, so it looks promising. It would be one to consider where there are tougher, coarse soils or for replant situations. Tolerance or resistance to nematodes has not yet been established in UCCE trials. It can be difficult to propagate so availability can be an issue.

Table 1. Disease rating of the standard clonal Paradox rootstocks for problem situations. Based on data from ongoing UC and USDA-ARS trials.

Clonal Paradox Rootstock	Rootstock Vigor	*Site Challenges*		
		Crown Gall Resistance	**Lesion Nematode** Tolerance	***Phytophthora*** Resistance
RX1	Moderately vigorous	Moderate to low	Intolerant	Moderate to high**
VX211	Highly vigorous	Low	Some tolerance*	Low to moderate**
Vlach	Vigorous	Low	Intolerant	Low

** Nematode tolerance due to a post-infection mechanism.*
*** Level of resistance depends on Phytophthora species.*

For more information on disease resistance ratings and mechanisms of the Paradox clones, see the bulletin on walnuts in the nursery trade, how they are propagated and understanding the terminology.

Seedling walnut rootstock attributes

Northern California black walnut: This was the rootstock of choice in the early 1900's. Fast forward to the present, its main attribute is having the most tolerance to salinity compared to Paradox hybrid seedling or clonal Paradox rootstocks. Vigor is only moderate and in UC trials, yields were always lower compared to trees on Paradox rootstocks. Traditionally they were planted and grew well in deep loamy alluvial soils near rivers. They often have stunted growth when planted on more marginal soils. Northern California black has a lower susceptibility to crown gall vs. seedling Paradox but are very susceptible to Phytophthora and to lesion nematode. Clonal Paradox rootstocks are recommended where any of these problems exist (Table 1). Black walnut rootstocks should be considered where there are salt problems like chloride and only where soils are loamy and well-draining.

Paradox hybrid seedling: This rootstock gained popularity in the 1950s because of its vigor and more tolerance to Phytophthora and lesion nematode than black walnut rootstock. However, Paradox seedling rootstocks are very susceptible to crown gall disease. There are seed sources that have lower crown gall incidence and certain nursery practices that prevent infection by the bacterium during the seed collection phase which can alleviate crown gall from developing. However, clonal Paradox rootstocks typically have much lower crown gall infection than Paradox seedling rootstocks across numerous trials statewide and have the other specific advantages as shown in Table 1. Seedling rootstocks also have genetic variability, so tree size differences are more common than in clonal rootstock orchards. With clonally propagated rootstocks, we have the advantages of Paradox, plus some added advantages (see Table 1), all without the disadvantages of being a seedling with genetic variability across the field.

New clonal walnut rootstock genotype trials: With the walnut rootstock breeding program's long-term goal of developing rootstocks with genetic resistance to all three of the major soil-borne pathogens shown in Table 1, several new genotypes have been bred. Four new genotypes are in statewide field trials planted in 2015 and 2016 and being compared to the standard clonal Paradox rootstocks. The 2016 trials are ongoing, and we are planning to have field meetings at each location in early summer so stay tuned for dates. Several newer walnut rootstock genotypes have been planted in 2022 in various locations statewide making the prospect of future new superior rootstocks an attainable possibility.

For a discussion on walnut rootstocks, visit: growingthevalleypodcast.com/podcastfeed/walnutrootstock.

WALNUT: BACTERICIDE AND FUNGICIDE EFFICACY – CONVENTIONAL

Material	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 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					
Luna Experience	medium (3/7)	0	5	5	ND
Luna Experience + Regalia	medium (3/7 + (BM 01, P 05)	3	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
Quilt Xcel	medium (3/11)	0	5	5	ND
Luna Sensation	medium (7/11)	0	5	5	ND
Quadris Top	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 Duo	medium (3/7)	0	ND	4	ND
Viathon	medium (3/P07, 33)	ND	ND	4	ND
Rhyme	high (3)	0	5	ND	3
Abound	high (11)	0	ND	ND	ND
Luna Privilege	high (7)	0	ND	ND	ND

WALNUT: BACTERICIDE EFFICACY – BIOCONTROLS AND NATURAL PRODUCTS

Organic treatments	Resistance risk (FRAC#)[1]	Walnut blight[2]
Bordeaux[2] (organic with approved copper)	low (M1)	4
Fixed coppers[2,3] (organic with approved copper)	medium (M1)	4
Zinc sulfate + copper + hydrated lime (Zinc Bordeaux) (organic with approved copper)	low (M1)	4
Actinovate	low (BM 02)	3
Regalia	low (BM 01, P 05)	3
Regalia + Copper (organic with approved copper)	low (BM 01, P 05 + M1)	3
Blossom Protect	low (BM 02)	2/3
Serenade (organic)	low (BM 02)	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 '+++'.**

[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 buildup of populations on buds that may increase disease in subsequent years.

WALNUT: TREATMENT TIMING

Note: Timings listed are effective, but not all may be required for disease control. Timings used will depend upon orchard history of disease and weather conditions each year.

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]	----	----	----	++[4]	+++	++	----	----	----	----	----
Botryo-sphaeria blight	----	----	----	+	++	+++	+++	++	----	+	+
Kernel mold[2]	----	----	----	----	----	----	----	++	++	----	----
Walnut blight [3,4,5]	++[5]	+++	+++	+++	++	+	----	----	----	----	----

Rating: +++ = most effective, ++ = moderately effective, + = least effective, and ---- = 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 '+++' 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.

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We are no longer mailing hard copy newsletters, unless you make a special request by calling the office at (530) 865-1107 (note: substantial delivery delay, limited content, and black and white photos will apply to hard copy mailings).

Tree and Vine Crop Herbicide Chart – Updated (2022)

Here's the most updated tree and vine crop herbicide chart organized by Brad Hanson, UCCE Weed Science Specialist. Remember that rotating and/or mixing herbicides with different modes of action (MOAs) is critical to good weed management, particularly with herbicide-resistant populations. Notes: R = registered, N = Not registered, NB = registered only for Non-Bearing. Always check the herbicide label before use.

University of California
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Cooperative Extension · Glenn County

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Walnut Newsletter

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.