UC Cooperative Extension
University of California
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Sacramento Valley Walnut Newsletter

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Upcoming UC Extension Events

Event	Date	Location	Contact
TTTF: Labor economics	Aug 20	Orland	Domena Agyeman
TTTF: IPM Review 2026	Nov 19	Yuba City	Sudan Gyawaly
Tehama County Ag Producer's Day	Nov 19	Red Bluff	Ryan Hill
TTTF: Prune Dormancy	TBD	TBD	Franz Niederholzer

Application timing impacts rimsulfuron efficacy on johnsongrass populations

Ryan Hill, UCCE Weed Science and Agronomy Advisor, Tehama, Shasta, and Glenn Counties

Overview:

Rimsulfuron (sold as Matrix, Hinge, Grapple, Revolt, and others) can be used in tank mixes to control difficult winter-annual weeds like hairy fleabane and Italian ryegrass and even suppress summer perennial weeds like johnsongrass and yellow nutsedge when applied appropriately.

Research conducted in 2025 (linked here) demonstrated suppressive effects of rimsulfuron on established johnsongrass populations when applied in early March, but little is known concerning the ideal time to deploy such an application. Several research trials were installed in 2026 to identify the best time to apply a post-emergent tank mix of glyphosate and rimsulfuron for control of established johnsongrass populations. Results suggest that early March through mid-April allowed for the greatest efficacy, with control ranging from 76 to 98% when applied with adequate rainfall for herbicide incorporation.

Applications in late January, early February, or early May were not ideal and resulted in an unimpressive ~35% boost in efficacy, relative to the control plots.

Note: the mention of products is not a pesticide recommendation, simply the sharing of research results. Products may not be registered for use in California. Consult your PCA and always read the pesticide label; the label is law.

Research methods and results:

Herbicide applications were made in 2024, 2025, and 2026 to test efficacy of a glyphosate + rimsulfuron tank mix on established johnsongrass populations. Rimsulfuron was applied as either Matrix or Revolt (4 oz/A) and glyphosate (Roundup Powermax 3) was applied at 2 pt/A as a reference treatment, or in a tank mix with the rimsulfuron product. Every treatment also included 1% ammonium sulfate at 1% v/v. Two trials (January 26th and February 6th) did not have glyphosate as a control treatment, due to no emerged weeds at time of application. All other trials used glyphosate as a reference treatment. Treatments were rain incorporated withing 2 weeks of application. Weed coverage was rated 8 weeks after each application and the improvement in control assessed as a percent reduction in weed coverage relative to the control treatment.

The results in figure 1 summarize the improvement in johnsongrass control efficacy that the addition of rimsulfuron gave to the tank mix.

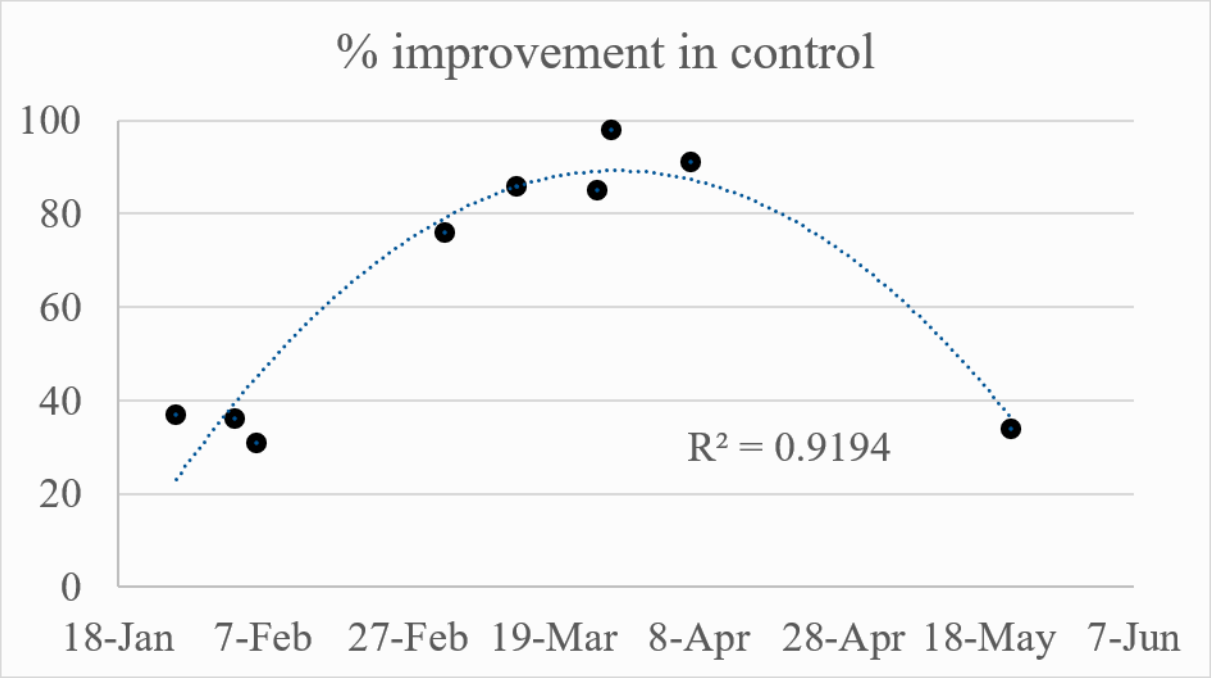


Figure 1. *A tank mix of rimsulfuron and glyphosate was compared to a control treatment for nine different application dates. Percent control 8 weeks after treatment is reported for each tested application date.*

One outlier was excluded from the above image. This was a late-February application performed in 2026, resulting in an 18% improvement in control from the control treatment. This application was unusual because no rainfall occurred following the application for at least a full month, unlike every other treatment.

The April 7th application (91% efficacy) has several other treatments set up for comparison, as shown in figure 2. This trial included glyphosate (Roundup PM3 [2 or 4 pt/A]), clethodim (Clethodim 2EC [8 fl oz/A]), and rimsulfuron (Revolt [4 oz/A] in different tank mixes. Rimsulfuron was not tested as a stand-alone treatment, but when tank mixed with clethodim and glyphosate the johnsongrass populations were reduced by over 90%. Clethodim alone resulted in a ~70% reduction. Glyphosate alone or mixed with clethodim did not maintain control through 8 weeks after treatment.



Figure 2. *Post-emergent treatments were applied to an established johnsongrass population on April 7th, 2026. These images were taken on May 29th, 2026. Treatments include **A)** glyphosate (Roundup PM3, 2 pt/A) **B)** glyphosate plus clethodim (Roundup PM3, 2 pt/A; Clethodim 2EC, 8 fl oz/A) **C)** Clethodim (Clethodim 2ECm, 8 fl oz/A) **D)** glyphosate plus rimsulfuron (Roundup PM3, 2 pt/A; Revolt, 4 oz/A).*

Conclusions:

Rimsulfuron is not a standalone tool for managing johnsongrass but may be incorporated into chemical rotations as a tank mix to improve either post-emergent or pre-emergent herbicide applications that target johnsongrass. If a field is heavily infested, late March or early April applications allow for improved control of johnsongrass with postemergent tank mixes with rimsulfuron. Efficacy seems to be dependent on rainfall, and the mechanism of control is likely direct uptake of rimsulfuron through the rhizomes and roots.

Less infested orchards may also benefit from rimsulfuron applications, though the importance of seedling management with herbicides like indaziflam (Alion) or pendimethalin (Prowl) increase in importance. These herbicides can have much longer residual activity than rimsulfuron, which tends to break down by 2-3 months after treatment in our climate.

For more information on this topic, you can read the article Jorge Angeles (UCCE Tulare) and I wrote for the UC Weed Science Blog linked here.

Walnut mold and how to manage it

Themis J. Michailides & Victor Manuel Gabri, University of California, Davis / Kearney Ag Research and Extension Center

In the last several years, walnut growers in California experienced unusually high levels of mold in their crop. Particularly in 2018, growers in Glenn and Butte counties reported 30-40% mold. Levels of 1-3% mold are considered something the growers expect in a normal year.

Definition of mold. According to the US Standards for grades of walnuts in the shell, mold is one of the seven types of damage which when is attached to the kernel and conspicuous; or, when inconspicuous white or gray mold affects an aggregate area larger than 1 square centimeter or one-eighth of the entire surface of the kernel, whichever is the lesser area.

Characteristics of nuts affecting mold

Initial reports of the 1970s and 80s reported Penicillium spp. causing mold, but in recent years, the predominant fungi isolated from walnut kernels with mold are mainly species of Fusarium and Alternaria. In years with unusually long drought and hot weather Aspergillus niger can also cause mold. Also, in orchards where there is Botryosphaeria and/or Phomopsis canker and blight, Botryosphaeria and Phomopsis fungi can also invade the walnut cavity and cause mold. When isolates of Alternaria and Fusarium fungi were inoculated on walnut fruit, this resulted in mold covering the infected kernels. Back in 1994 and 1995, Drs. M. Doster and T. Michailides cracked about 4,000 walnuts and determined levels of mold after separating them in various categories. In those studies, it was found that nuts had more mold when a) they were infested by the navel orangeworm and/or other insects; b) when nuts were damaged by sunburn; c) nuts had shriveled husks and/or had decay lesion on their hull; d) when the opening of their ostiole was larger than smaller; e) nuts were larger size than smaller size; and f) when nuts stayed on the ground more than 24 hours before harvest (i.e., windfalls, etc.)

Infection and other factors affecting mold levels

After opening mature nuts and examining the origin of the fungal colony as it developed on the kernel, up to 80% of the fungal colonies originated from the stylar end, while up to 30% originated from the stem end. This suggests that a high level of mold from fungal infection occurs at the style of the flower/young developing fruitlet.

To check this hypothesis, samples of walnut flowers were collected and the flower style was plated on agar media. The predominant fungi isolated were Alternaria (up to 38%) and Fusarium (up to 12%). Among the serial inoculations of walnut with Alternaria or Fusarium, the inoculations at the end of April (bloom time) resulted in significantly more infection by Alternaria (57%) or Fusarium (55%) than the water-inoculated control. These results suggest that indeed a high incidence of mold infection starts during bloom. Infections also can occur at later stages as well, particularly close to and after the hull split stage of fruit.

Depending on the time of infection, infected nuts show different characteristics. The nuts that are infected at bloom, when the mold develops sooner, result in infected nuts with brownish, wrinkled and intact hulls (without any cracks). Nuts that are infected at the early hull-split stage will have cracked (partially split) hulls. Nuts that are infected at a later hull-split stage will have black hulls and entirely split hulls that develop sections connected at the stem end. Of these nuts, more mold was found in the earlier-infected nuts (those with intact, but shriveled hulls and partially cracked hulls) than in the later-infected nuts (nuts that were black and had entirely split hulls) (Figure 1).

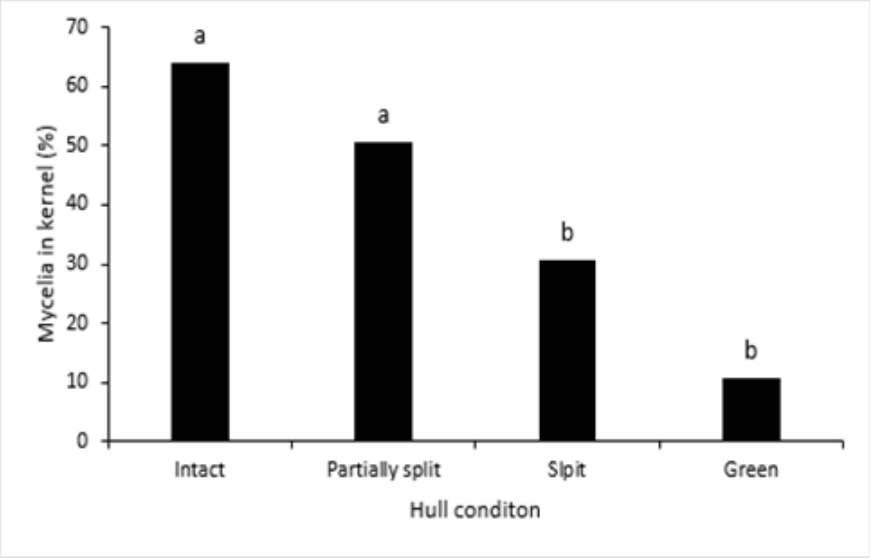


Figure 1. *Incidence of fungal mycelia in the kernel of "black" blighted (moldy) by category of various types of brown/black- and green-hull nuts, depending on the condition of their hulls, intact wrinkled brown hulls; partially split (brown) hulls; and black with well split hull sections. (Bars topped with different letters are significantly different according to an LSDA test (P = 0.05).*

Mold management

Cultural practices: Although controlling relative humidity in the orchard is not easy, avoid having puddles of water in the orchard to decrease humidity. Also, because Alternaria and Fusarium are airborne fungi, be careful about creating dust, especially during bloom and hull split, to reduce inoculum that can infect flowers and hull split nuts.

Fungicide sprays: One spray with flutriafol (Rhyme) at a rate of 7 oz /acre 1-3 weeks before hull split (HS), or at 20-30% HS, resulted in a 60-70% reduction of mold in a Chandler orchard in Butte County. In another experiment in 2023, Chandler trees in a flood irrigated orchard were sprayed with Luna Experience at 17.0 fl oz/acre with three different timings: 1) one spray at bloom, 2) one spray at bloom and one spray 1 week before hull split or 3) two sprays, 3 and 1 weeks before hull split. All treatments reduced blighted (moldy) nuts by 40 to 55%, and there were no significant differences whether the trees received one or 2 sprays.

In 2024, in the same flood irrigated orchard was treated with different fungicide combinations at different times. One spray with Luna Experience combined with Ethephon applied at 20-30% HS reduced blighted (moldy) nuts the most by 54%. Other treatments reduced mold by 40- 48%: One Luna spray alone at 20-30% HS, one Luna spray 1 week before HS, or Ethephon only spray alone at 20-30% HS. All the spray treatments were significantly lower than the untreated control, but they did not differ between each other.

Also in 2024, in a sprinkler-irrigated Chandler orchard with heavy Botryosphaeria canker and blight, one bloom spray with Merivon, Cevya, or Luna Experience each significantly reduced blighted (moldy) nuts by 43-73%. All the sprays showed significantly lower blighted (moldy) nuts than the untreated control (Figure 2). In this orchard, Botryosphaeria canker and blight was severe, and >75% of the moldy nuts had Botryosphaeria species isolated from them causing kernel mold. The results suggest that a new fungicide (Cevya, FRAC 3) can be added as a tool for walnut growers for the control of Botryosphaeria canker and blight and mold.

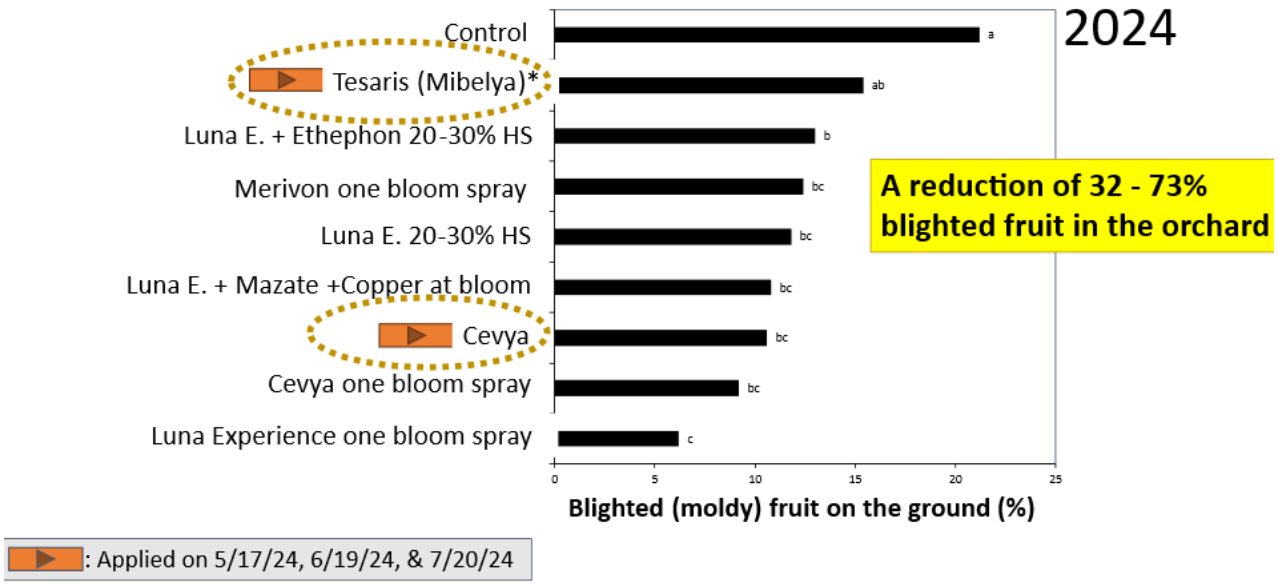


Figure 2. *Effect of fungicide sprays on Botryosphaeria moldy nuts recorded in the field after tree shaking in a sprinkler-irrigated Chandler orchard in Butte Co. Columns with different letters indicate significant differences according to an LSD test (P = 0.05).*

More information: 2025 Project Report to the CA Walnut Board and Commission.

Ethephon use for managing walnut harvest and quality

Clarissa Reyes, Orchards Advisor, Sutter-Yuba, Butte and Placer Counties

While it is too early to predict how severe weather or pest flights might impact walnut harvest, we do know some basic walnut physiology that can inform our ability to adapt depending on what nature throws our way.

Typically, walnut kernels reach maturity and have the highest market quality 3-4 weeks before they can be harvested, but hulls are not loose enough at that time in the Sacramento Valley. So, while we wait for hulls to loosen from the shell and split, kernel quality may decrease on the tree due to heat, mold, and insect damage.

The point at which walnut kernels are mature, lightest in color, and of highest value is reached when packing tissue between kernel halves has just turned brown, commonly referred to as “packing tissue brown” or PTB. Climate greatly influences this – there is less time between PTB and the time when hulls have separated from the shell in cooler, coastal areas than there is in the hotter and drier valley regions.



Figure 1. *Examples of mature nuts at packing tissue brown (PTB), left, and immature nuts, right. Photo: Bob Beede.*



Figure 2. *Examples of mature nuts at packing tissue brown (PTB), circled, with immature nuts for comparison. Photo: Clarissa Reyes.*



Figure 3. *Purple arrow indicating where kernel still attached to packing tissue on immature nut, left; red arrow indicating the kernel detached from the packing tissue close to maturity, right. Photo: Clarissa Reyes*

Ethephon is a compound that accelerates separation of the walnut hull from the shell. This enables harvest at an earlier time after PTB, when the kernels are at the highest quality.

It can be ethephon is useful either to 1) to move harvest closer to PTB to preserve kernel quality, or 2) to facilitate a one-shake harvest, which can help with harvest cost efficiency. Both objectives might be worth considering if you have a lot of acreage that will harvest around the same time, because strategic applications among some select blocks can ensure harvest timing will be staggered and that equipment and dryer space will be available at optimal timing.

If your goal is to advance harvest, either to preserve kernel quality or spread out the harvesting of different blocks of the same variety, apply ethephon when 100% of nuts reach PTB. This will move harvest up by 7-10 days, then a second shake should occur approximately two weeks later.

In this case, assess PTB by crossing diagonally across an orchard, collecting 100 nuts, and splitting them in half. This should begin at least two weeks before expected PTB. Mature nuts will have oak-colored brown tissue throughout the hull. Treatment should not occur until 100% of collected nuts are at PTB.

If your goal is to remove the most nuts in a single shake to save the cost of sending the harvest crew through the block a second time, apply ethephon about 10 days before normal harvest. Even applying ethephon as early as five to seven days after PTB will improve percent nut removal and the chances of having to only harvest once, avoiding an uneconomical second shake. Although a complete harvest (meaning 100 percent in one shake) may not be feasible, a far greater first harvest, and in some cases a near complete harvest, is possible earlier than normal with the use of ethephon.

Ethephon can be a helpful tool to manage harvest timing, but its use comes with some caveats:

- Research on ethephon application was conducted in the 1970s on Ashley, Chico, Franquette, Hartley, Manchetti, and Payne and in the 1990s on Serr. We do not have replicated research on Chandler or Howard, or newer varieties such as Solano, Durham, or Wolfskill. Anecdotally, growers report that Tulare produces the most ethylene and nuts fall off the tree shortly after treatment. Howard is responsive to ethephon in

Northern California, resulting in increased quality and value. Several growers report success using ethephon on some of their Chandler blocks to stagger harvest.

- Ethephon is labeled for use between 300-900 ppm (3-5 pints/acre). Care must be taken with concentration because some varieties are more susceptible to leaf drop than others, which will affect photosynthetic recovery after harvest, and potentially affect subsequent tree growth and nut production the following year.
- Ethephon is most effective when applied between 60-90°F and with higher humidity conditions. Rainy, hot, or windy weather decreases ethephon efficacy.
- Ethephon is slow to translocate so complete nut coverage is necessary to achieve the full effect of the application.
- Growers who do not have their own harvest equipment or who, for some other reason, cannot harvest the crop promptly should not use this material. Once ethephon is applied, harvest must start as soon as feasible to avoid loss in kernel quality.
- Ethephon should not be used in stressed orchards because this may lead to defoliation. This can complicate harvest due to excessive leaf debris, and again, potentially impact trees the following year.

Notes on quality:

Regardless of ethephon use, nut quality is greatly impacted by temperature.

Once the connection between nut and tree is broken and the transpiration stream ceases, the temperature of sun exposed walnut kernels increases rapidly, while sun-exposed nuts on the tree remain cooler. Nuts on the ground exposed to sun will lose quality and value when air temperatures reach approximately 90°F. Placing nuts in the shade minimizes color change. If air temperatures exceed 100°F, even nuts in shade will experience excessive heat that can result in rapid darkening of kernel color. Nuts that are harvested with hulls will reach excessive temperatures faster than those without hulls.