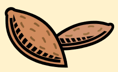
Sacramento Valley Almond News

October, 2014

University of California
Agriculture and Natural Resources | Cooperative Extension

In This Issue



Franz Niederholzer
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Fall-Winter Almond Orchard Management Considerations

Emily Symmes, UCCE Area IPM Advisor, Sacramento Valley
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Activities looking ahead:

Nutrition:

- Applications of foliar zinc sprays in fall effectively correct zinc deficiency. The incidental leaf removal reduces both storm wind resistance and the opportunity for shothole fungus to increase overwintering spores.
- Potassium band applications on both sides of the tree rows will help prevent potassium deficiency and subsequent loss of fruiting spurs. Make applications after 6 inches of rain or equivalent irrigation have wetted the soil profile and ensure that at least 6 inches of rain or irrigation follow the application before trees emerge from dormancy.
- Avoid nitrogen applications until after growth begins next spring.

Insect pest management:

- Grade sheets may only identify damage as worms or off grade. Collecting nut samples from windrows and cracking out the nuts to identify which pest(s) infested almonds allows for evaluation of the current season's pest management program and estimation of next season's pest pressure. Descriptions of navel orangeworm (NOW), peach twig borer (PTB), and Oriental fruit moth (OFM) larvae and damage are described in this link (select the moth of interest from the list of Insects and Mites): ipm.ucdavis.edu/PMG/selectnewpest.almonds.html
- Be sure that equipment and hullers are cleaned of all nuts to minimize overwintering sites for NOW larvae.
- Winter sanitation of mummy nuts is critical for effective NOW management. Ensure that mummy nuts are removed from trees, blown to orchard middles, and destroyed by flail mowing before next season. It is important to bear in mind overwintering NOW survival is better in nuts both in trees and on the ground during drought conditions. In winters with minimal rainfall, typical sanitation practices should be enhanced accordingly. See Winter Sanitation article in this newsletter for more information.
- If PTB is the primary off grade, *Bacillus thuringiensis* (BT) sprays at petal fall and 2 weeks after petal fall effectively control PTB and pose minimal risk to honeybees. Avoid treating with any other insecticides when honeybees are present in the orchard.
- Dormant spur samples for San Jose scale, European red mite, brown almond mite, and European fruit lecanium can help determine the need for dormant treatments. Samples can be taken anytime between early November and early January. Sampling guidelines, treatment thresholds, and a link to the dormant spur sample monitoring form can be found at: ipm.ucdavis.edu/PMG/C003/m003dcdmtspursmpl.html

s for winter weed control mid to late fall. Watch the weather and apply shortly before rainfall so that rain will move the herbicide into the soil before seedlings emerge and include a postemergence material if rains have already stimulated weed growth.

Disease management:

- If almond scab has been a problem, a dormant copper with oil spray will delay sporulation of overwintering scab lesions for a month next spring --- possibly past the end of the rainy season, reducing disease next year. Dormant oil will also smother overwintering eggs of European Red and Brown almond mites and control moderate populations of San Jose scale.
- Removal and destruction of mummy nuts as part of a sound NOW management program may help minimize Hull rot (*Monolinia* and *Rhizopus* spp.).
- Scout for rust in young orchards and watch for leaf blight (individual dead leaves remaining on shoots) to inform potential disease management next season.

Looking back at 2014 issues:

- Rhizopus hull rot was noted in a number of orchards after the August rain. Twig dieback and more mummy nuts resulted. See Winter Sanitation article, this newsletter.
- Almond leaf scorch continues to be observed in a number of orchards around the Sacramento Valley. For more information visit ipm.ucdavis.edu/PMG/r3101211.html
- Nutritional deficiencies are more common when soil profiles are too dry or too wet, resulting in reduced root activity. Manganese and zinc deficiencies were noted last spring following the dry winter.
- NOW began activity earlier in spring 2014 due to warm weather. NOW was able to complete an additional generation resulting in 4th generation egg laying this fall. This additional worm pressure may increase the overwintering NOW infestation percentage in mummy nuts making winter sanitation even more critical.

Winter Sanitation – Hull Rot & Navel Orangeworm

Dani Lightle, UCCE Farm Advisor, Glenn, Butte, & Tehama Cos.
Katherine Pope, UCCE Farm Advisor, Yolo, Solano, & Sacramento Cos.

Mummy nuts provide cozy homes for navel orangeworm (NOW) larvae to overwinter. Mummy nuts result when shaking fails to remove the entire crop and may be aggravated by shoot or spur death before nuts abscise. Boron toxicity is a common cause of this in some parts of the Sacramento Valley. Another cause is hull rot. The rain event we experienced in the Sacramento Valley in early August may have encouraged hull rot resulting in more mummy nuts left behind in the trees. So what is hull rot and what impact might it have on winter sanitation?

Hull Rot 101

Symptoms of hull rot are shoots with leaves that wither and die out beyond where an infected nut is attached. Nuts frequently remain attached to symptomatic shoots after trees have been shaken. Two different fungal pathogens may be responsible for the observed symptoms, and the culprit can be determined by observing the almonds. Brown rot hull rot caused by *Monolinia fruticola* (*M. laxa* causes almond blossom brown rot), appears as a tan fungal growth on the inside or outside of the almond hull (Figure 1). *Rhizopus stolonifer* (bread mold) produces black fuzzy mold around the nut - most commonly inside the hull but sometimes on the outside of the hull as well (Figure 2). These fungi infect hulls and produce toxins that move into and kill the shoot at the point where the infected nut is attached. The result is the loss of nuts on that shoot in the current season, as well as loss of fruit wood in future growing seasons.

Figure 1. Tan growth of *Monolinia* hull rot.

Figure 2. Black fuzzy mold of *Rhizopus* hull rot inside almond hulls.

Risk Factors & Management

Aside from wet conditions during hull split, there are several factors that have been linked to higher incidence of disease susceptibility. Nonpareil is the most susceptible of common cultivars. Butte and Winters are highly susceptible, while Price and Sonora are moderately susceptible. When surveying your orchard for hull rot, take a particularly close look at these cultivars. Management practices can also increase the risk of hull rot, such has excessive nitrogen applications or watering excessively during the hull splitting period.

Recent work by UC Plant Pathologist Jim Adaskaveg has found that *Rhizopus* can be managed by the application of one of several available fungicides during early hull split. These can often be applied with NOW sprays if such treatment is warranted. *Monolinia* treatments at hull split were not as effective. Earlier fungicide applications were more effective for *Monolinia*, indicating the pathogen infects the fruit earlier than *Rhizopus* and requires treatment in early June, as opposed to waiting for hull split.

Hull Rot & NOW Management

If hull rot was observed this season, it's likely there are more mummy nuts left in the trees. Hull rot molds do not deter NOW from using these mummy nuts as overwintering feeding sites. Winter sanitation is an important step in NOW management because it removes overwintering sites as well as oviposition sites in your orchard for NOW females through the early spring and summer until after hull split begins.

Survey your orchards for mummy nuts, looking at 20 or more trees per block. If you find more than an average of two mummies per tree, sanitation is advised. Mummies can be removed by poling or winter shaking. This should be done by the end of January, before buds swell and become vulnerable to pole or shaking damage. Although high rainfall and weed growth helps to rot nuts on the ground increasing overwintering NOW mortality, dry conditions increase survival in grounded nuts. All nuts should be blown or raked to row middles and mowed by mid-March to ensure NOW destruction.

<u>Irrigation System Maintenance</u>

Dani Lightle, UCCE Farm Advisor, Glenn, Butte & Tehama Cos.

Kevin Greer, TCRCD Mobile Irrigation Lab

Over the last several years, the UCCE's Sacramento Valley newsletters for tree crop growers have emphasized optimizing irrigation efficiency and scheduling through approaches such as soil moisture monitoring, estimated evapotranspiration (ET), pressure chambers, and increasing system distribution uniformity (DU). High DU ratings indicate even water supply across the orchard, a vital key to ensuring that all trees are receiving similar quantities of water. Low DU results in simultaneous over- and under-irrigation occurring across the orchard block, higher water use to meet the demands of every tree, and unnecessarily long pump run times.

Assuming good irrigation system design, elements that contribute to high DU are balanced pressures, matching sprinkler types and nozzle sizes, and system maintenance. The most commonly identified irrigation issues reported in the Sacramento Valley between 2002 and 2013 were pressure and maintenance problems (Figure 1). Poor maintenance is one of the leading causes of systems that are not applying water uniformly to each plant. Greater than 80% of the systems with below average DU (DU < 83%) had pressure and/or maintenance problems. Of the systems with above average DU (DU > 87%), nearly half still had maintenance issues that could be corrected to further improve their DU. System maintenance is an essential (although frequently unmentioned) component of an efficient irrigation system that is easy to overlook amid the numerous demands required to run an effective growing operation.

It is best to purposefully schedule system maintenance during the intensive irrigation season. All types of irrigation systems can benefit from maintenance, although the intensity and amount of time required varies pointedly by irrigation system type. While micro and drip systems tend to be the most uniform in application when well maintained, the amount of attention they require to run at optimal levels is substantially higher than other systems. Regardless of the system, adopt routine maintenance practices.

Irrigation pump

- Clean primary filters (at the pump) and any secondary filters (often located in the field). Backwash to remove organic or particulate matter. If using a sand media filter, check that sand is not caking and replace what is lost in backwash cycles. Be sure you have installed the correct type of filter for the type of debris in your water source.
- Pressure gauges should be installed before and after filters. If there is a 5 to 7 psi difference between the two gauges, check for filtration plugging. Replace gauges (about $15) approximately every 3 to 5 years because reliability decreases in aging gauges.
- Ensure that pressure regulating valves are accurately providing the desired pressure by checking against a quality new pressure gauge.

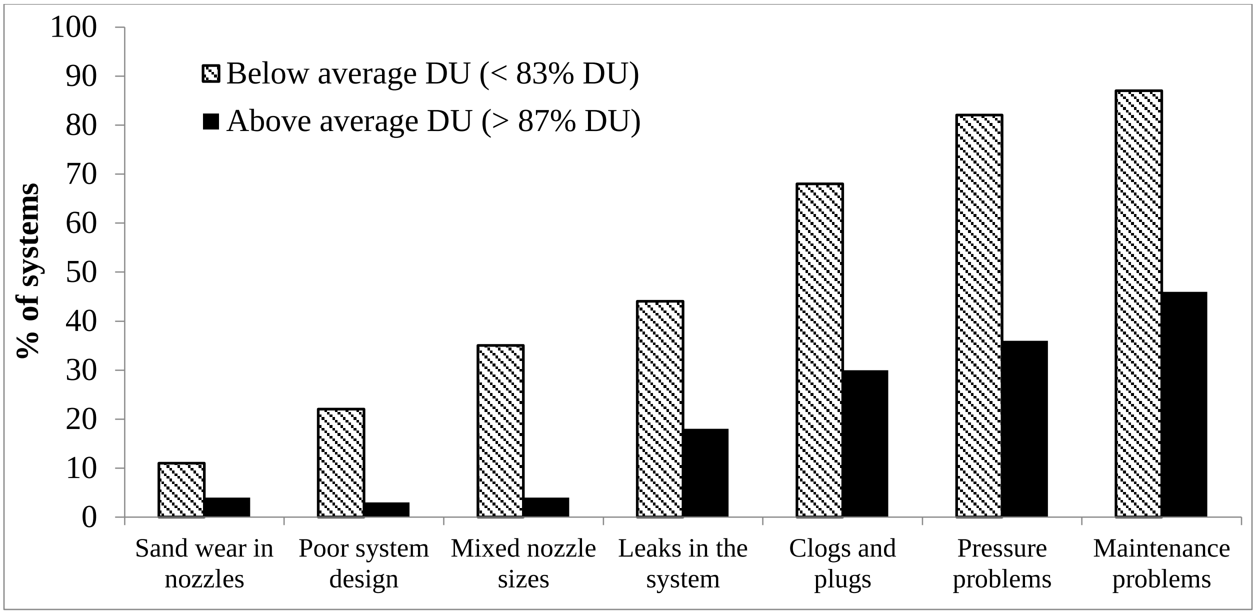

Figure 1. Problems identified in 209 micro-irrigation system evaluations between 2002 and 2013 in the Sacramento valley. Data courtesy the TCRCD Mobile Irrigation Lab.

Flood and furrow irrigation

- Ensure that borders are not leaking or seeping into the neighboring dry checks. This occurs as a result of erosion over time. Check for high or low spots within the check and level as needed.
- Verify there is no erosion around the head above the check valve and repair as needed.

Solid set systems

- Compare the flow rates of your sprinklers to the manufacturers' specifications to determine if sand wear is contributing to worn nozzles. Check nozzles after 5 years and monitor thereafter. When replacing worn nozzles, replace with the same type and model. Replace nozzles in the entire orchard on a regular schedule because new nozzles will have different flow rates compared to old ones.
- Following each irrigation, open the flush out valves at the ends of main and submain lines and leave open until water runs clear. If heavy sand is consistently being flushed, there may be problems with the effectiveness of the pump station filter.

Micro & drip systems

- Systems should be inspected at <u>every</u> irrigation event for plugs and leaks in the lines. Any lines that have leaks should be repaired by splicing the lines together. Tape will not work, and plugs will increase the size of the hole or crack over time.
- Check for clogged nozzles with a flow test for reduced output. If changing nozzle heads, ensure you are replacing with nozzles of the same size. Check drip emitters for clogs and examine around emitters for bacteria or calcium build-up. Depending on the type of clogging, chemical treatments may be needed.
- Plugs can be a significant problem at inlet screens. The type and quantity of debris may indicate a problem with filtration effectiveness at the pumping station, which may need an upgrade. If plugs are a consistent problem, some growers remove the screens. If you remove screens, hose line flushing and checking for plugged emitters should be done more frequently.
- Flush the lines approximately every other week and after chemigation and fertigation applications. Begin with the mainlines, followed by submains, then laterals. Check the clarity of the water on the lines that are hydrologically furthest from the pump station. If water flushed from the lines is dirty, lines need flushed more frequently; if water is clear, the current flushing schedule is sufficient.

- Emitters should be run at the pressure ranges listed in the manufacturers' specs. If pressures are too high or too low, the distribution patterns, flow rates, and overall operation is no longer functioning as designed. Pressure regulators maintain uniform pressures to each inlet. If the pressure leading into the regulators is too low, the regulators will not operate and emitters will not function correctly.
- For further troubleshooting help for common problems such as clogging, see http://micromaintain.ucanr.edu.

Irrigation evaluations can be invaluable for determining the nuances in your orchard, in addition to providing a specific DU rating. Through detailed system information, growers obtain another effective tool that can aid in making accurate irrigation decisions. On site evaluations can be scheduled through the Tehama County RCD Mobile Irrigation Lab. The service is completely confidential and free for growers in Shasta, Tehama, Glenn, and Butte counties. Service to growers outside of these counties is available for a fee. More information can be found at http://www.tehamacountyrcd.org/services/lab2.html or by contacting Kevin Greer at kevin@tehamacountyrcd.org or 527-3013 x102.

Building an effective orchard weed management program

Brad Hanson, UC Cooperative Extension Specialist, UC Davis

As I write this article, the end of the 2014 almond and pistachio harvest in California is within site and the beginning of walnut harvest is approaching. In addition to harvest and postharvest orchard tasks going on this time of the year, it's also time to begin planning weed management strategies for the coming season. Here are a few thoughts and reminders about building an effective weed management program.

First, **think about weed management over a multi-year timeframe**. Effectively reducing weed populations in orchards requires persistence and investment in controlling weeds before they set seed. Conversely, a year with poor weed control can result in lots of seed set and heavy weed pressure for several years into the future. Besides the obvious contribution of new weed seed, large weeds can compromise the following year's weed control by interfering with herbicide spray patterns as well as holding leaf litter in place that can shield new seedlings from later control measures (Figure 1).

Herbicide resistance. Some of our current weed management challenges in orchards and some annual crops are related to herbicide resistance, particularly resistance to glyphosate. Glyphosate (e.g. Roundup and others) have been the backbone of postemergence weed control for a number of years because of the broad weed control spectrum and economical price. Unfortunately, reliance on a single mode of action herbicide has led to selection of several broadleaf and grass weed populations able to survive glyphosate in orchards. When building your weed management program, consider herbicide rotations, tankmix combinations, sequential treatments, and incorporation of non-chemical strategies to control current resistant populations and minimize the risk of future cases of resistance.

Consider preemergence herbicides. In recent years, there have been several new registrations of preemergence herbicides for tree nut crops. Several of these herbicides, alone or in various combinations, can provide very good control of many orchard weeds, often for months after application (Figure 2). A good preemergence program can greatly reduce the weed populations that will need to be controlled with later operations. Although preemergence herbicides have a greater initial cost, the residual weed control often can eliminate the need for one or more later spray applications which can offer some management flexibility as well as reducing operator and machine costs. Additionally, most of the preemergence herbicides registered for use in orchards are from different mode of action groups than the available postemergence herbicides which is very beneficial from a resistance management standpoint. Because these treatments usually are applied during the dormant season and at high spray volumes, the chance of foliar crop injury or off site drift is greatly reduced.

The primary drawback to preemergence herbicides is that they must be incorporated into the top layer of soil where weed seed germinate, usually by rain or irrigation. With most of the commonly used preemergence materials, ¼ to ½ inches of water is recommended within a few weeks of the application for best results. However, even in last year's drought conditions, many of the preemergence herbicides still worked surprisingly well despite less than ideal conditions including several weeks on the soil surface and with minimal incorporation. To maximize the impact of preemergence herbicides in the weed management program, evaluate the likelihood of precipitation after application and consider a short irrigation set if water availability and irrigation equipment allow that option.

Use tank mixes or sequential herbicide applications to broaden the spectrum of weeds controlled and to reduce selection for resistant populations. Tank mixes can take several forms: preemergence and postemergence herbicides to control emerged weeds and provide residual control; combining herbicides with activity on grasses with other materials with broadleaf activity; or combining material with different modes of action but overlapping activity on weeds of concern for developing resistance (Table).

Think about how you'll **manage vegetation in the "middles".** Many tree nut producers use strip applications of herbicides in the tree row and less intensive management of the vegetation in the "middles", often mowing several times in the season followed by an herbicide treatment prior to harvest. This approach can work very well, but if the vegetation in the middles is made up of the same weeds you fight to control in the strips, the middles may be a continued source of weed seed in the strips. Weedy vegetation that is allowed to mature, even if repeatedly mowed in the middles, can be very difficult to control with herbicides later. For example, both hairy fleabane and three-spike goosegrass are very difficult to control with any available postemergence herbicide once they reach a reproductive stage. Light tillage, full floor herbicide treatments, and cover crops may all be options to consider for reducing weed problems in the middles. With the recent drought, weed management in orchard middles has been a recurring topic of discussion due to the water used by the weeds.

Follow up during the year with **field scouting and cleanup operations**. Any effective weed management program should be built on data, whether that data is actual weed counts and ratings or a manager's mental assessment after walking or driving through the orchard multiple times during the season. Integrated weed management is not a once-and-done decision for an orchard; instead it should be fine-tuned based on what is working (or not) and what new problems are coming into the orchard (Charts 1 & 2). Additionally, field scouting provides an opportunity to identify and manage problems such as new species or suspected herbicide resistance while the problem is small and localized. Timely spot treatments or hand labor at the beginning of a problem could save a great deal of effort and expense later.

Figure 1. Orchard weed control should be considered in a multi-year context because poor control in one year can result in increased weed seed production and plant debris that interferes with future control measures.

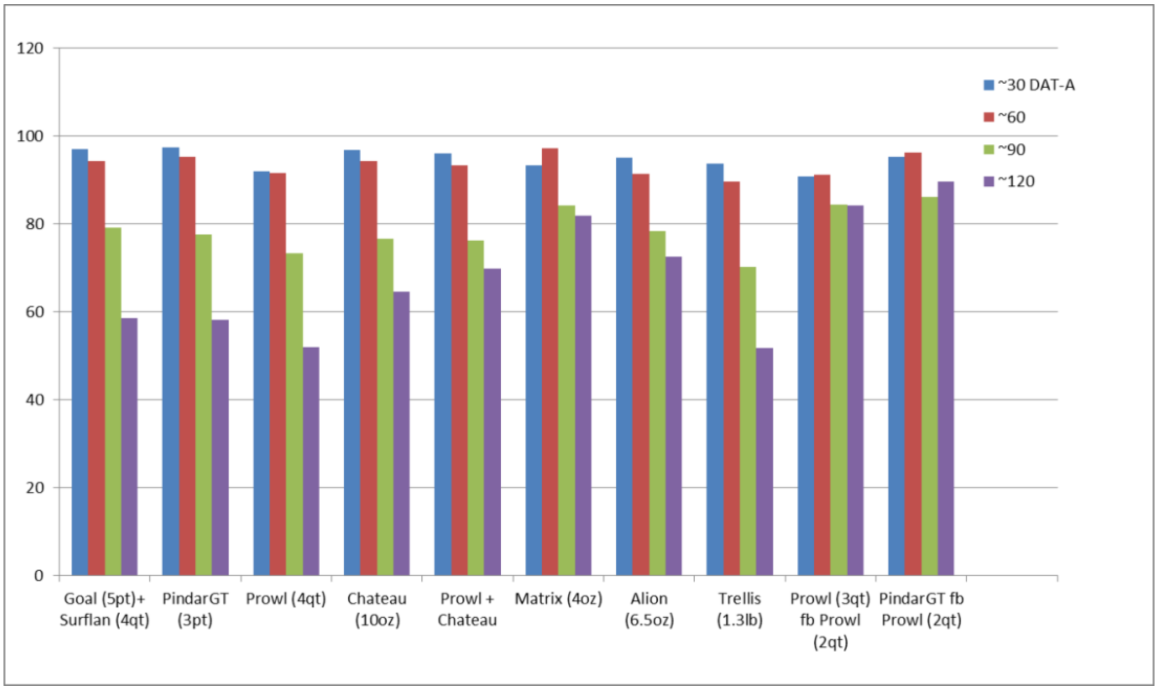

Figure 2. Overall weed control ratings from five large-plot nut orchard trials in 2013 and 2014. Weed control was evaluated approximately monthly after an "A" timing in December or January; some treatments also had a "B" timing in March. Data are averaged over diverse sites including a Davis site dominated by winter grasses; two Wasco sites with junglerice and fleabane; Delhi with fleabane, geranium, and bluegrass; and Escalon with mixed grasses and broadleaves. The success of any treatment was largely dictated by the weed spectrum at that location, rainfall pattern following application, and the previous level of weed control at the site.

Table. Selected weed control evaluations from 2013-14 comparison of Alion and other preemergence tankmix and sequential partners in an almond orchard near Escalon, CA. All treatments included a high rate of Rely 280 and Roundup Powermax to ensure good control of existing weeds.

	Treatment	Rate			3 spike goose-grass	Crab-grass	Sow-thistle	Hairy fleabane	Spotted spurge	Overall	Overall	Overall
					122 DAT-A						164 DAT	196 DAT
					% control							
1	Untreated Check				0	0	0	0	0	0	0	10
2	Alion	2.5	oz/a	A	45	100	100	88	100	80	70	55
3	Alion	3.5	oz/a	A	45	100	93	100	100	86	78	68
4	Alion	5	oz/a	A	70	100	100	98	100	92	85	83
5	Chateau	10	oz wt/a	A	38	38	55	93	50	73	43	33
6	Matrix	4	oz wt/a	A	38	50	43	98	0	73	50	28
7	Pindar GT	2.5	pt/a	A	18	25	15	78	0	65	8	13
8	Goaltender	4	pt/a	A	18	45	5	45	0	55	18	18
9	Alion Chateau	5 6	oz/a oz wt/a	A	58	100	95	93	100	85	86	73
10	Alion Matrix	5 2	oz/a oz wt/a	A	59	100	100	100	100	91	89	73
11	Alion Pindar GT	5 1.5	oz/a pt/a	A	55	100	100	100	100	89	86	80
12	Alion Goaltender	5 2	oz/a pt/a	A	90	100	98	98	100	94	91	84
13	Chateau Alion	10 3.5	oz wt/a oz/a	A B	60	100	100	98	100	94	93	84
14	Chateau Alion	12 5	oz wt/a oz/a	A B	75	98	100	100	100	98	94	91
15	Matrix Alion	4 5	oz wt/a oz/a	A B	63	100	100	100	100	97	94	84
16	Alion Alion	5 5	oz/a oz/a	A B	75	100	100	100	100	98	96	91
17	Alion	3.5	oz/a	B	50	100	100	78	100	92	71	60
18	Alion	5	oz/a	B	65	100	98	83	100	95	79	74
LSD (P=.05)					*32*	*34*	*20*	*22*	*14*	*11*	*17*	*18*

The 'A' timing was applied December 17, 2013 and the 'B' timing on March 19, 2014. All treatments at both timings included Roundup Powermax plus Rely 280 and AMS for control of emerged weeds.

Chart 1. Selectivity of Annual Broadleaf Weeds to Herbicides Registered in Almonds in California

	Preemergent herbicides													Postemergent herbicides										
	eptc (Eptam®)	flumioxazin (Chateau®)	indaziflam (Alion®)	isoxaben (Trellis®)	norflurazon (Solicam®)	oryzalin (Surflan®, etc.)	oxyfluorfen (Goal®, etc.)	pendimethalin (Prowl H_2O®)	penoxsulam + oxyfluorfen (Pindar GT®)	rimsulfuron (Matrix SG®)	simazine (Princep®)	thiazopyr (Visor®) - NB	trifluralin (Treflan 4E®, etc.)	carfentrazone (Shark®)	clethodim (Select Max®) - NB	fluazifop (Fusilade DX®) - NB	glufosinate (Rely 280®)	glyphosate (Roundup, etc.)	msma (MSMA®) - NB	paraquat (Gramoxone®, etc.)	pyraflufen (Venue®)	saflufenacil (Treevix®)	sehtoxydim (Poast®)	2,4-D amine (Orchard Master®, etc.)
Annual Broadleaves																								
Cheeseweed	N	C	C	C	P	P	C	P	C	C	P	P	N	C	N	N	C	P	N	P	P	C	N	P
Chickweed	C	C	C	C	P	C	P	C	C	C	C	P	C	C	N	N	C	C	C	C	C	--	N	N
Clovers	N	--	P	P	N	N	P	N	C	--	C	--	N	P	N	N	P	P	N	P	P	--	N	N
Cocklebur	N	--	--	--	C	N	P	N	--	P	C	N	N	C	N	N	P	C	P	C	C	C	N	C
Cudweed	P	--	C	C	C	N	N	N	C	--	C	C	N	P	N	N	P	C	N	N	C	--	N	P
Fiddleneck	C	--	C	C	P	C	C	C	C	C	C	C	C	C	N	N	P	C	N	P	P	--	N	P
Filaree	P	C	C	C	P	P	C	N	C	C	C	C	P	C	N	N	C	P	N	P	P	C	N	C
Goosefoot	C	C	C	C	P	C	C	C	C	P	C	C	C	C	N	N	P	C	N	C	C	C	N	C
Groundcherry	C	C	--	C	C	N	C	N	P	C	C	P	P	C	N	N	C	C	P	C	C	C	N	C
Groundsel, common	C	C	C	C	P	P	C	N	C	C	P	C	N	C	N	N	P	C	N	C	C	C	N	P
Hairy fleabane	C	P	C	C	P	N	P	N	C	C	P	P	N	P	N	N	C	P	N	P	P	C	N	C
Henbit	C	C	P	C	P	C	C	C	C	C	C	P	P	C	N	N	C	C	C	C	C	--	N	P
Horseweed	C	C	C	C	P	N	P	N	C	C	P	P	N	P	N	N	C	P	N	P	P	C	N	C
Knotweed, common	P	--	P	C	P	C	P	C	P	C	C	C	C	P	N	N	P	P	N	P	C	--	N	P
Lambsquarters	C	C	C	C	P	C	C	C	C	C	C	P	C	C	N	N	P	C	N	C	C	C	N	C
London rocket	C	C	C	C	P	P	C	P	C	C	C	P	N	C	N	N	C	C	N	C	C	--	N	C
Morningglory	P	C	P	C	C	P	C	N	--	N	C	--	C	C	N	N	C	C	P	P	C	C	N	P
Mullein, turkey	N	--	--	C	P	N	P	N	--	--	N	C	P	P	N	N	C	P	N	P	P	--	N	P
Mustard	N	C	C	C	P	N	C	P	C	C	C	P	N	C	N	N	C	C	N	C	C	C	N	P
Nettle	C	C	C	C	C	P	C	N	C	C	C	C	N	C	N	N	C	N	N	P	C	C	N	P
Nightshade	P	C	C	C	C	N	C	N	C	P	C	P	N	C	N	N	C	C	N	C	C	C	N	C
Pigweed	C	C	C	C	P	C	C	C	C	C	C	P	C	C	N	N	C	C	N	C	C	C	N	P
Prickly lettuce	C	P	P	C	P	N	C	N	C	P	C	C	N	C	N	N	C	C	N	P	C	C	N	C
Primrose, evening	--	--	P	C	N	P	P	P	C	--	C	C	P	P	N	N	C	C	N	C	C	--	N	--
Puncturevine	N	C	--	C	C	C	P	P	P	C	P	P	P	P	N	N	P	C	P	C	P	C	N	P
Purslane	C	C	C	C	C	C	C	C	C	C	C	C	C	N	N	N	C	C	N	C	C	C	N	P
Russian thistle	P	C	C	C	C	P	P	P	C	P	C	P	P	P	N	N	C	C	N	C	C	C	N	P
Shepherd's-purse	P	C	C	C	P	N	C	P	C	C	C	C	N	P	N	N	C	C	N	P	C	C	N	C
Sowthistle	C	P	C	C	P	P	C	N	C	P	C	C	N	N	N	N	C	C	N	P	C	C	N	P
Spotted spurge	N	C	C	C	C	P	P	P	P	C	P	P	P	P	N	N	C	C	N	C	C	C	N	P
Wild radish	N	C	--	C	P	P	C	N	C	C	C	C	N	P	N	N	C	C	N	C	C	C	N	C
Willowherb	--	C	C	P	P	P	C	--	C	--	N	--	--	P	N	N	C	P	--	N	P	C	N	P

NB = NB = non-bearing only
C = control, P = partial control, N = no control, -- = no information

This is not an endorsement for of any trade names listed, nor does the omission of specific trade names reflect the view of the author. Please refer to your local dealer or chemical representative for specific herbicide products available but not listed. Always read and follow the label directions carefully before using any pesticide. Ratings reflect appropriate timing and dose according to label recommendations. Kurt Hembree, UCCE, Fresno County. January 2012. http://cefresno.ucdavis.edu

Chart 2. Selectivity of Annual Grass and Perennial Weeds to Herbicides Registered in Almonds in California

	Preemergence herbicides													Postemergence herbicides										
	eptc (Eptam®)	flumioxazin (Chateau®)	indaziflam (Alion®)	isoxaben (Trellis®)	norflurazon (Solicam®)	oryzalin (Surflan®, etc.)	oxyfluorfen (Goal®, etc.)	pendimethalin (Prowl H_2O®)	penoxsulam + oxyfluorfen (Pindar GT®)	rimsulfuron (Matrix SG®)	simazine (Princep®)	thiazopyr (Visor®) - NB	trifluralin (Treflan 4E®, etc.)	carfentrazone (Shark®)	clethodim (Select Max®) - NB	fluazifop (Fusilade DX®) - NB	glufosinate (Rely 280®)	glyphosate (Roundup, etc.)	msma (MSMA®) - NB	paraquat (Gramoxone®, etc.)	pyraflufen (Venue®)	saflufenacil (Treevix®)	sehtoxydim (Poast®)	2,4-D amine (Orchard Master®, etc.)
Annual Grasses																								
Annual bluegrass	C	C	C	N	C	C	P	C	C	C	C	C	C	N	C	N	C	C	N	P	N	N	N	N
Barnyardgrass	C	C	C	N	P	C	P	C	P	C	P	C	C	N	C	C	C	C	P	P	N	N	C	N
Bromegrasses	C	P	C	N	C	C	N	C	--	C	--	C	C	N	P	P	C	C	--	P	N	N	P	N
Canarygrass	C	P	--	N	C	C	P	C	--	--	P	C	C	N	C	C	C	C	N	P	N	N	C	N
Crabgrass, large	C	C	C	N	P	C	N	C	P	C	N	C	C	N	C	C	C	C	C	C	N	N	C	N
Fescues	C	P	C	N	C	C	N	C	--	C	P	P	C	N	P	P	P	C	--	P	N	N	P	N
Foxtails	C	C	C	N	P	C	N	C	--	C	C	C	C	N	C	C	P	C	--	C	N	N	C	N
Junglerice	C	C	C	N	P	C	P	C	P	C	P	C	C	N	C	C	P	C	P	P	N	N	C	N
Lovegrass	C	C	C	N	P	C	P	C	--	P	P	P	C	N	C	C	C	C	--	P	N	N	C	N
Ryegrass, Italian	C	P	C	N	C	C	N	C	P	C	P	C	C	N	C	C	C	C	N	P	N	N	C	N
Sandbur	C	C	C	N	C	P	N	C	--	--	C	C	C	N	C	C	C	C	C	P	N	N	C	N
Sprangletop	C	P	C	N	P	C	N	C	--	--	N	C	C	N	C	C	P	C	N	N	N	N	C	N
Wild barley	C	P	C	N	C	C	P	C	--	P	P	C	C	N	C	C	C	C	N	P	N	N	C	N
Wild oat	C	C	C	N	C	C	P	P	C	P	C	--	P	N	C	C	C	C	N	P	N	N	C	N
Witchgrass	C	P	--	N	P	C	P	C	C	--	P	--	C	N	C	C	P	C	N	P	N	N	C	N
Perennials (seed)																								
Bermudagrass	C	N	--	N	C	C	N	C	N	N	P	C	C	N	C	C	C	C	N	P	N	N	C	N
Dallisgrass	C	--	--	N	C	C	N	C	N	N	C	C	C	N	C	C	C	C	C	N	N	N	C	N
Johnsongrass	C	C	--	N	C	C	N	C	N	P	C	C	C	N	C	C	C	C	C	C	N	N	C	N
Field bindweed	N	--	--	C	P	P	N	P	P	P	P	C	P	C	N	N	C	C	N	P	P	C	N	P
Perennials (estab.)																								
Bermudagrass	N	N	N	N	P	N	N	N	N	N	N	N	N	N	P	P	P	P	N	N	N	N	P	N
Dallisgrass	N	N	N	N	P	N	N	N	N	N	N	N	N	N	P	P	P	P	C	N	N	N	P	N
Johnsongrass	N	N	N	N	C	N	N	N	N	N	N	N	P	N	P	P	P	P	N	N	N	N	P	N
Field bindweed	N	N	N	P	N	N	N	N	N	P	N	P	P	P	N	N	P	P	N	N	N	N	N	N
Nutsedge, purple	P	N	N	N	P	N	N	N	N	P	N	P	N	N	N	N	P	P	P	P	N	N	N	N
Nutsedge, yellow	P	N	N	N	P	N	N	N	N	P	N	C	N	N	N	N	P	P	C	P	N	N	N	N

NB = NB = non-bearing only

C = control, P = partial control, N = no control, -- = no information

This is not an endorsement for any trade names listed, nor does the omission of specific trade names reflect the view of the author. Please refer to your local dealer or chemical representative for specific herbicide products available but not listed. Always read and follow the label directions carefully before using any pesticide. Ratings reflect appropriate timing and dose according to label recommendations.

-Kurt Hembree,UCCE, Fresno County. January 2012. http://cefresno.ucdavis.edu

Herbicide Registration on California Tree and Vine Crops -*(updated February 2014 - 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	N	N	N	N	N	N	N	N	N	N	N	N	N	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
	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
	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	N	R	R
	penoxsulam *(Pindar GT)*	B / 2	R	R	R	R	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
	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
Postemergence	carfentrazone *(Shark)*	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	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	NB	N	R	N	N	NB	N	NB	N
	clove oil *(Matratec)*	NC[3]	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	2,4-D *(Clean-crop, 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
	d-limonene *(GreenMatch)*	NC[3]	R	R	R	R	R	R	R	R	R	R	R	N	R	N	R	R	R	N	N
	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	N	N	N	N	N	N	N	N	N	N	R	N	N	N
	halosulfuron *(Sandea)*	B / 2	N	R	R	R	N	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[3]	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	N	N	N	N	N
	sethoxydim *(Poast)*	A / 1	R	R	R	R	R	R	R	R	R	R	NB	NB	R	NB	NB	R	N	NB	NB

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 (http://wric.ucdavis.edu)