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Olive News

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In this issue:

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Mid-season olive fly update

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As in prior years, the California Olive Committee has funded trapping for monitoring of olive fly in the Orland and Corning areas. There are six traps set in each location. Weekly trap results from April through August are shown in Figure 1. Flies are monitored using McPhail traps baited with Torula yeast. For instructions on monitoring your own orchard, see the guidelines on the UC IPM website: http://www.ipm.ucdavis.edu/PMG/r583301311.html .

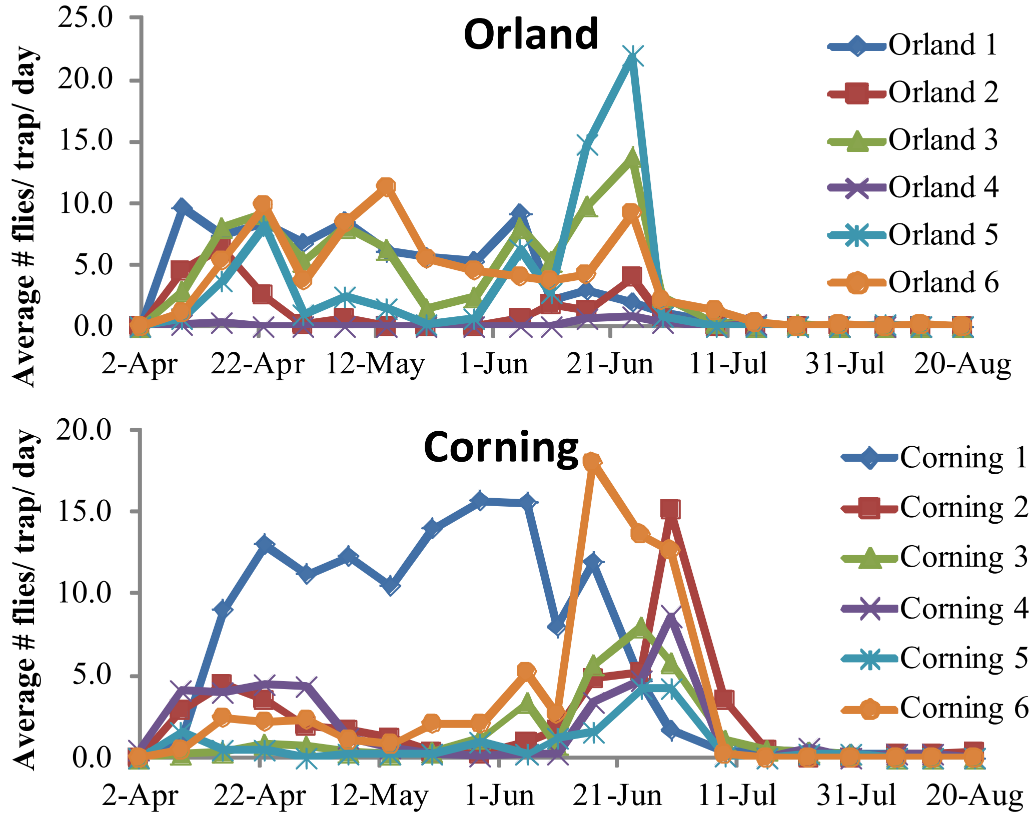

Figure 1. Number of flies per trap per day caught at each trapping site in Orland (top) and Corning (bottom).

2014 has been a stand-out year for olive fly. The numbers of olive fly trapped in the beginning of the season were far greater than in previous years (Figure 2). The reasons why this is the case are not entirely clear. Populations were high at the end of 2013, which meant that a greater number of olive fly than usual were present over the winter. Additionally, on average, the winter was more mild than is typical, which many have enhanced olive fly survival.

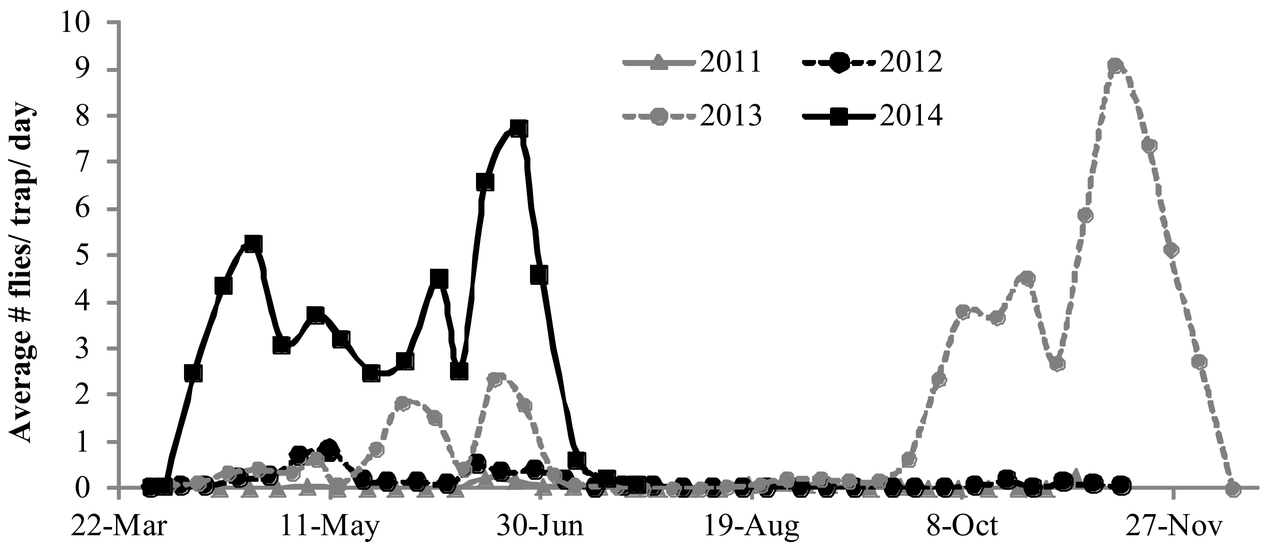

Figure 2. Seasonal catches of olive fly from March until November from 2009 until 2014.

Current olive fly trap counts have been very low. As you can see in Figure 2, low trap counts are typical during the hottest part of the summer. Olive fly becomes inactive during the heat, and extended temperatures above 100 degrees can cause mortality to both adults and developing larvae in olive fruit. Last year, olive fly counts significantly increased beginning in mid-to-late September. If your management of olive fly was discontinued during the hot summer months, management should be resumed as the trap counts increase again. A weekly update of the olive fly trap counts is posted here: http://ceglenn.ucanr.edu/OrchardCrops_MainPage/Olives/Olive_Fruit_Fly_Trapping_Data

Olive "quick decline" in southern Italy may be associated with pathogen common in California

Elizabeth Fichtner, UCCE, Tulare Co., and Dani Lightle, UCCE, Glenn, Butte, and Tehama Cos.

The report of a new disease on olive in Italy, called "quick decline," marks the first report of the bacterial pathogen, *Xylella fastidiosa*, in Europe. This pathogen is not new to the Americas and has been in California for over 100 years. It is perhaps best known as the cause of Pierce's Disease on grape, but also causes citrus variegated chlorosis, peach phony disease, alfalfa dwarf, and scorch on almond, oleander, and pecan. In response to scorch and dieback symptoms (Figure 1 A-C) on landscape and orchard plantings of olives in California, Dr. Rodrigo Krugner, an entomologist with the USDA ARS in Parlier, CA, established a research program to investigate the epidemiology of *X. fastidiosa* on California olives.

The pathogen

X. fastidiosa is a gram-negative, xylem-limited bacterium affecting over 100 known plant hosts. The pathogen multiplies within the xylem and is thought to cause disease by interfering with water and nutrient transport. It is spread naturally from plant to plant by xylem-fluid feeding insects. The pathogen is difficult to culture (Figure 1D); consequently, prompt identification often relies on use of PCR techniques that detect pathogen DNA in plant tissues.

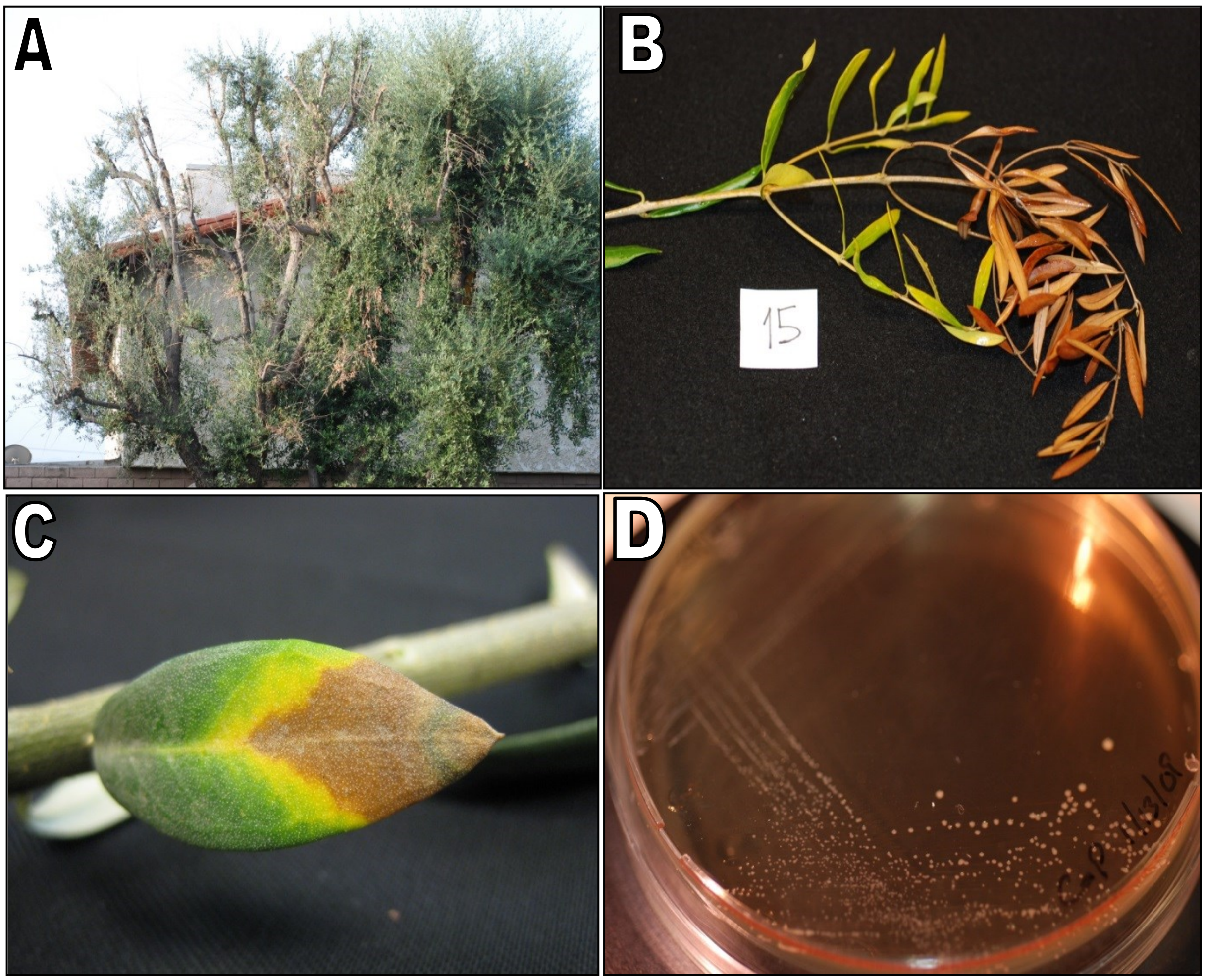

Figure 1. In southern California landscapes, olives exhibited dieback (A and B) and leaf scorch (C). Six strains of *Xylella fastidiosa* subspecies *multiplex* were isolated into pure culture (D) from symptomatic olives trees in southern California. Photos: R. Krugner

The pathogen may be grouped into subspecies based on host specificity. For example, *X. fastidiosa* subsp. *fastidiosa* causes Pierce's disease on grapevine as well as scorch on almond; however, the *X. fastidiosa* subsp. *multiplex*, causes disease on almond but not on grapevine.

Vectors associated with *X. fastidiosa* in California

X. fastidiosa is transmitted by xylem-fluid feeding insects, such as spittlebugs, froghoppers, and sharpshooters. While many of these insects may have the potential to transmit *X. fastidiosa*, there are four sharpshooter species in California that are recognized to have the greatest role in *X. fastidiosa* spread. Three of these sharpshooters are native to California and present throughout the state: red-headed sharpshooter, blue-green sharpshooter, and green sharpshooter. The last vector is the invasive glassy-winged sharpshooter (Figure 2A), which became established in southern California in 1990 and is responsible for the rapid spread of *X. fastidiosa* on grapevine.

Sharpshooters acquire *X. fastidiosa* when feeding on infected plant material. Once inside the vector's mouthparts, the bacterium multiplies rapidly and the insect is then capable of transmitting the bacterium for the remainder of its life (if it is an adult) or until it molts (if it is immature). Because sharpshooters are strong fliers and typically feed on multiple host plant species, *X. fastidiosa* may be spread to multiple hosts over the insects' lifetime.

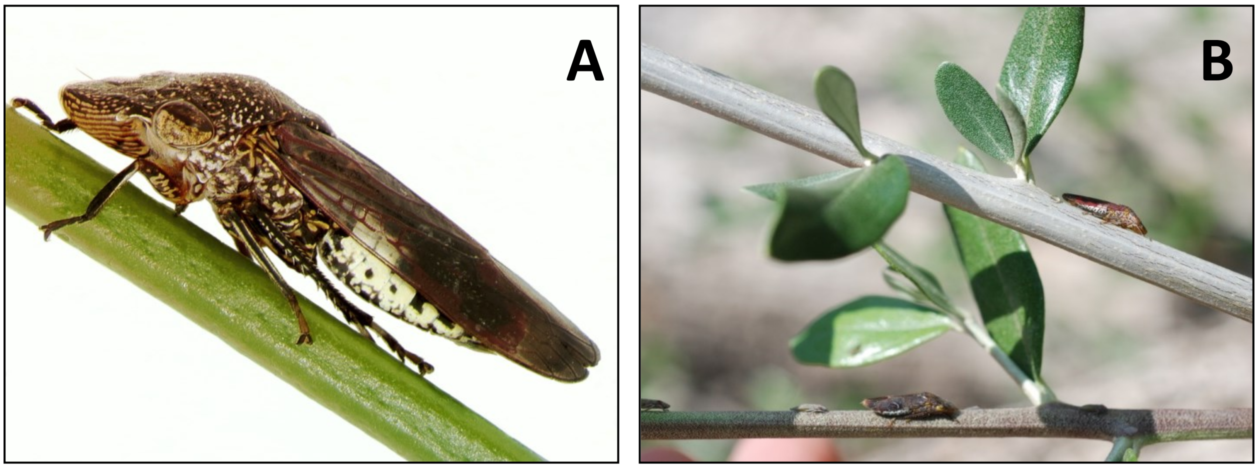

Figure 2. The glassy-winged sharpshooter (A), *Homalodisca vitripennis*, is a known vector of *Xylella fastidiosa* and contributes to the spread of Pierce's Disease on grapevine in California. The glassy-winged sharpshooter can reproduce and overwinter on California olives (B). Photos: R. Krugner.

'Quick decline' in Italy

In October 2013, *X. fastidiosa* was reported in the Puglia region of southern Italy, marking the first report of the pathogen in Europe. Characteristic symptoms included extensive leaf scorch and branch dieback, as well as discoloration of vasculature. Along with isolation of several putative fungal pathogens, presence of *X. fastidiosa* was confirmed by serological and PCR tests. Almond and oleander plants near the infected olives also tested positive for the pathogen. Scientists in Italy are currently surveying the area surrounding the outbreak and regulatory agencies have prohibited the movement of propagation materials from susceptible hosts out of the infected area. Additionally, researchers are working to determine the subspecies of *X. fastidiosa* associated with symptomatic olives and to obtain pure cultures of the pathogen for pathogenicity tests. Currently, the origin and strain(s) of *X. fastidiosa* introduced to Europe, as well as the insect species responsible for transmission, are unknown.

Association of *X. fastidiosa* with California olives

Leaf scorch and dieback symptoms have been observed in commercial olive orchards and landscape plantings (Figure 1 A and B) in California. Krugner's laboratory found that only 17% of the trees sampled tested positive for *X. fastidiosa* by PCR, with rates of pathogen detection higher in southern CA (39%) than in the Central Valley (2.5%). The pathogen was only successfully cultured from samples collected in southern California, suggesting that the pathogen population on olive is limited in the Central Valley. Reintroduction of the pathogen into multiple varieties of olive resulted in low levels of infection, and asymptomatic infections were common. Dr. Krugner's work also demonstrated that California strains of *X. fastidiosa* belong to the *multiplex* subspecies, which is pathogenic on almond, but not grapevine. Consequently, California olives are not considered a source of inoculum for Pierce's Disease on grapevine; however, olives may harbor insect vectors (Figure 2B) responsible for transmission of the bacterium to grapes or other crops.

What does the "Quick Decline" in Italy mean for California olive growers?

Dr. Krugner's work demonstrated low levels of pathogen recovery from olives in the Central Valley and minimal association of the pathogen with disease upon reintroduction to healthy plants. Further studies, however, are necessary to determine a) the subspecies responsible for the 'quick decline' in Italy, and b) the pathogenicity of isolates recovered from symptomatic plants in Italy. It is possible that pathogen strains recovered in Italy may be different, and more aggressive on olive, than strains endemic in California. California olive growers and landscape managers should report new incidences of extensive dieback or scorch on olives to farm advisors.

Acknowledgements

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Select references

Carlucci, A., Lops, F., Marchi, G., Mugnai, L., Surico, G. 2013. Has *Xylella fastidiosa* "chosen" olive trees to establish in the Mediterranean basin? Phytopathologia Mediterranea. 52:541-544.

Krugner, R., Sisterson, M.S., Chen, J., Stenger, D.C., Johnson, M.W. 2014. Evaluation of olive as a host of *Xylella fastidiosa* and associated sharpshooter vectors. Plant Disease. 98*: in press*.

Preemergence herbicides for olive orchard weed control

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Weed control is always important in table and oil olives and is critical during the first few years after planting when the trees are more vulnerable to weed competition. Olive producers often rely on a combination of tillage and chemical control strategies to manage weeds. Herbicides are primarily used as "strip" or "berm" treatments within the tree rows and are becoming increasingly important as much of the newer olive production systems shift to moderate- or high-density production systems which limits within-row cultivation. In addition, the shift to low-volume irrigation systems in olive and other tree crops has affected weed emergence and growth, herbicide persistence, and further limits mechanical weed control within the tree row in these orchards.

In terms of herbicides used in olive orchards, there is a heavy reliance on just two active ingredients; glyphosate (Roundup® and similar products) and oxyfluorfen (Goal®, GoalTender® and similar materials) (Table 1). Glyphosate has postemergence activity on many weeds and oxyfluorfen has both postemergence and preemergence control of many broadleaf weeds. However, the increasing prevalence of glyphosate-resistant broadleaf and grass weeds in orchards and vineyards has led to increasing interest in other herbicide options, especially preemergence materials.

Compared to some other tree crops, California olives have relatively few registered preemergence herbicide options (see below). However, several recent label changes have increased these options and a few new herbicides are currently being tested and may be registered in the relatively near future.

Table 1. Top ten herbicides used in California olive orchards (CDPR data).

	Active ingredient	2011 treated acreage
1	glyphosate (eg. Roundup)	64,051
2	oxyfluorfen (Goal, GoalTender)	23,209
3	diuron (Karmex, Diurex)	7,910
4	simazine (Princep, others)	7,457
5	carfentrazone (Shark)	7,297
6	pendimethalin (Prowl H2O)	4,513
7	oryzalin (Surflan, others)	4,255
8	paraquat (Gramoxone)	3,541
9	flumioxazin (Chateau)	752
10	pyraflufen (Venue)	331

Briefly, here is a rundown of the preemergence herbicides registered in California olives:

Diuron (Karmex®, Diurex®, others). Diuron provides preemergence and some postermergence control of many broadleaf and grass weeds, including suppression of some perennial weeds. This herbicide works by blocking photosynthesis at photosystem II (Group 7 herbicide). This older chemistry typically is used at 1-2 lbs/A once or twice during winter and early spring and requires water for incorporation. Because diuron is quite water-mobile, it can be a leaching hazard in coarse soils and is subject to additional use restrictions in some areas.

Flumioxazin (Chateau®, others). Flumioxazin recently received approval for a supplemental label that allows it to be used on bearing olive (previously Chateau could only be used in non-bearing olive orchards). It is a Group 14 herbicide that has good residual weed control activity and also helps with postemergence control of emerged broadleaf weeds when tank-mixed. Flumioxazin usually is applied at 6-12 oz/acre with longer residual control resulting from the higher rates.

Indaziflam (Alion®). Indaziflam is the newest preemergence herbicide to be registered in olive. It is a long lasting, Group 29 herbicide that controls many grass and broadleaf weeds preemergence but has no postemergence activity. In tree nut trials, indaziflam has provided excellent control of many common orchard weeds including both grasses and broadleaf weeds. In olive, indaziflam can be used at 5-6.5 fl oz/A, but trees should be at least three years old before this herbicide is used.

Isoxaben (Trellis®, Gallery®). Isoxaben can currently only be used in **<u>nonbearing olive</u>** orchards. Isoxaben is cellulose synthesis inhibitor (Group 21 herbicide) that has little or no activity on grass weeds and will not provide acceptable control of emerged or germinated weeds. When applied in the winter at 1 to 1.33 lb/A and properly incorporated, isoxaben can provide 4-5 months of control of many winter and summer broadleaf weeds.

Oryzalin (Surflan®, others). Oryzalin is a Group 3 herbicide that provides preemergence control of annual grasses and small-seeded broadleaf weeds but has no postemergence activity. It is typically applied at 2-4 qt/A and must be incorporated by water or tillage for effective weed control. This herbicide is similar to pendimethalin in its weed control spectrum and residual activity.

Pendimethalin (Prowl H2O®). Pendimethalin is a Group 3 herbicide that provides preemergence control of annual grasses and small-seeded broadleaf weeds but has no postemergence activity. It is typically applied at 2-4 qt/A and must be incorporated by water or tillage for effective weed control. This herbicide is similar to oryzalin in its weed control spectrum and residual activity.

Simazine (Princep®, others). Simazine is a photosynthesis inhibitor (Group 5 herbicide) that controls many broadleaf and some grass weeds preemergence, but has little postemergence activity. In olive, it is typically applied once or twice in the winter at 1-2 lb/acre. Because simazine is water-mobile, it can be a leaching hazard in coarse soils and is subject to additional use restrictions in some areas of the state.

Recent research:
Several new herbicides have been registered in other tree and vine and UC weed scientists have conducted several experiments with the support of the California Olive Commission, the USDA IR-4 Project, and the crop protection industry to evaluate their crop safety in olives. Although <u>these herbicides are not currently registered</u> in olive, early crop safety results have been mostly promising with penoxsulam (PindarGT®), rimsulfuron (Matrix®), mesotrione (Callisto®), flazasulfuron (Mission®), and saflufenacil (Treevix®) – hopefully some of these will eventually be registered in this crop.

Two demonstration trials were conducted in commercial table olive orchards in 2012-13 to evaluate registered preemergence herbicides. At the Corning site (Table 2), the overall weed control ratings were quite good into early summer following a March application. Note: the Corning orchard was previously treated with glyphosate; thus the untreated plots should really be considered a "glyphosate-only" program. At the Porterville site, weed control was excellent up to 6 months after a November application with Princep, Goal/Prowl, Goal/Surflan, and both Chateau (10 oz or 6 + 6 oz) treatments.

Table 2. Effects of preemergence herbicides on weed control in a young table olive orchard near Corning

		Rate (lb	Timing*	Overall weed control (%)**					
				35 DAT		63 DAT		94 DAT	
1	untreated			45	a	42.5	a	15	b
2	simazine (Princep)	3	A	81.5	a	76.8	a	67.5	ab
3	oxyfluorfen (Goal 2XL)	1.5	A	83.8	a	62.5	a	25	b
	pendimethalin (Prowl H2O)	3.8	A						
4	oxyfluorfen (Goal 2XL)	1.5	A	88.3	a	67.5	a	35	ab
	oryzalin (Surflan)	4	A						
5	isoxaben (Trellis)	1	A	62.5	a	60	a	57.5	ab
6	flumioxazin (Chateau)	0.38	A	83.8	a	77.5	a	27.5	b
7	flumioxazin (Chateau)	0.191	A	88.3	a	78.8	a	80	a
		0.191	B						
LSD (P=.05)				29.95		35.43		35.91	

*The "A" timing was applied March 19, 2013 and the "B" timing on May 21, 2013. DAT = days after treatment.
**Prior to treatment the site had been treated with glyphosate; thus the weed control data are not solely the residual treatment.
***No treatment resulted in visible injury to the olive trees at any rating date.

In general, an integrated weed management program that includes a mix of preemergence herbicides, postemergence herbicides, and tillage is recommended for conventional olive production systems. Including several herbicide modes of action in a tank-mix or in rotation will help reduce the selection pressure for herbicide-resistant weeds. This is particularly important as glyphosate-resistant weeds become more widespread in California orchard and vineyard cropping systems.

For the most recent Pest Management Guidelines for olive check out UC IPM Online at http://www.ipm.ucdavis.edu/PMG/crops-agriculture.html. An update to the Olive Pest Management Guide is in progress and should be posted online by the end of 2014. Additional weed control information can be found at the UC Weed Research and Information Center (http://wric.ucdavis.edu/) and at the UC Weed Science blog (http://ucanr.org/blogs/UCDWeedScience/).

Additional resources for the olive industry available from the UC Davis Olive Center

The UC Davis Olive Center at the Robert Mondavi Institute offers diverse resources and courses for olive growers, oil millers and buyers. For more information visit: www.olivecenter.ucdavis.edu.

Upcoming events - registration for both events is at www.olivecenter.ucdavis.edu

- *Advanced Sensory Evaluation of Olive Oil Certificate Course* - for the professional buyer, importer, category manager, and producer, this advanced course will address official methods of the International Olive Council as well as protocols used by major food and beverage companies. The compact three-day course is packed with smelling, tasting and other opportunities to hone your evaluation skills. September 16-18, 2014.
- *Master Milling Certificate Course* - Experience the best olive oil milling course in the United States. October 9-12, 2014

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