



Orchard weed management

Brad Hanson

UC Cooperative Extension

Weed Science Specialist

University of California
Agriculture and Natural Resources

UC DAVIS
DEPARTMENT OF PLANT SCIENCES
College of Agricultural and Environmental Sciences

Some common weed management problems



Not properly identifying or understanding the problem



Not making an appropriate plan or implementing it poorly



Over-treating.
Challenges: economics, sustainability, crop safety

- The right tools, used well, and at the right time, make orchard weed management a much easier, cheaper, and effective proposition

Emerging weed issues

- Herbicide resistance
 - Glyphosate
 - Other herbicides
 - “multiple” resistance
- A few newer orchard weeds to be aware of
- Some weed issues outside the orchard system
- Discussion of management approaches

Glyphosate resistance in CA orchards

Confirmed

- Broadleaves
 - Horseweed (mostly winter)
 - Fleabane (mostly winter)
 - Palmer amaranth (summer)
- Grasses
 - Ryegrass (fall/winter)
 - Annual bluegrass (fall/winter)
 - Junglerice (summer)

Suspected or questionable

- Broadleaves
 - Lambsquarters (summer)
- Grasses*
 - Threespike goosegrass (spring)
 - Feather fingergrass (summer)
 - Windmillgrass (summer)
 - Sprangletop (summer)
 - Witchgrass (summer)

*Resistance in the world in several other Elusine, Chloris, Leptocloa, Echinochloa, Eragrostis spp.

Conyza species



Hairy fleabane

- Gly-R widespread
- Shorter, more branched vs horseweed. Shorter lifecycle



Horseweed / marestail

- Gly-R widespread
- Taller, single-to-few stems vs fleabane



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Palmer amaranth

- Yes, still another pigweed species!
 - Look also for common waterhemp which may be spreading
- Male and female plants. Can be very large stature. Prolific.
- Palmer amaranth confirmed as Gly-R in California
 - Larger issues in SJV. More problems on roadsides and RR crops, but some T&V



Brad Hanson
UC Cooperative Extension Weed Science Specialist



Photo: Lynn Sosnoskie

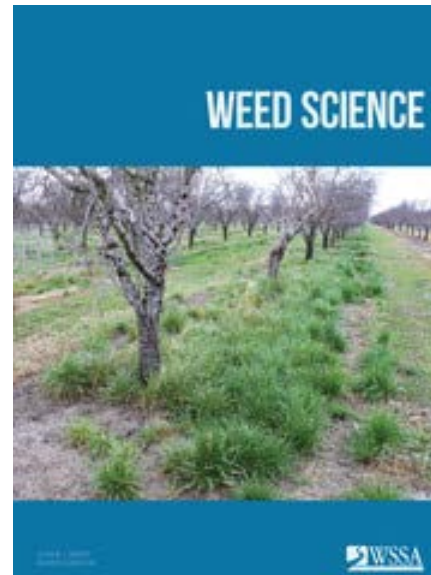


Lolium (ryegrasses)

- Highly prone to resistance worldwide
- Gly-R ryegrass widespread in CA
- Recent reports and confirmation of resistance to paraquat, glufosinate, ACCase inhibitors, ALS inhibitors
 - So far, not extremely widespread in T&V
 - Increasingly an issue in cereals (M. Galla)



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Junglerice

- *Echinochloa colona*
- Summer annual grass
 - (related to barnyardgrass and the rice watergrasses)
- Gly-R populations around CA
- Orchards, RR crops



Multiple resistance

- Increasing issues with “stacked” resistance
- Widespread glyphosate-resistance in some species
- Starting to see gly-R plus resistance to some one or more other chemistries
 - Conyza, Lolium, Poa so far.
 - Paraquat, ACCase, some glufosinate reports



A tale of two goosegrasses



Author: Brad Hanson

Published on: October 11, 2013

In the past couple of years, I've gotten a lot of questions about goosegrass in orchard production systems, particularly about suspected glyphosate-resistant biotypes.

Even in a California orchard standpoint, we have two main goosegrasses (*Echinochloa* spp.) to deal with:

Threespike goosegrass vs goosegrass (*E. trystachya* v *E. indica*)



Threespoke goosegrass

- Annual to short-lived perennial
- Emerges in early spring – early summer
- Low growing stature but very prolific
- Tolerant of glyphosate, especially once established
- Early-stage problem, but can be found SJV-Sac Valley





Other summer grasses

- Increasing questions about several summer grasses including:
- Mexican sprangletop, witchgrass, feather fingergrass.
 - SJV, also some orchards and alfalfa in Sac Valley



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Orchard expansion weeds

- As tree nuts expand into new areas, unusual “early-orchard” questions about managing rangeland or wildland weeds. Some “salt-tolerant” weeds too.

tarweed (Fitch’s and others)



alkali mallow



alkaliweed



willowherb

vinegarweed



perennial pepperweed



seaside heliotrope



Row crops

- RR crops
 - Gly-R summer weeds
 - Junglerice, Palmer amaranth, common waterhemp, feather fingergrass, others?
- Dry bean and other agronomic row crops
 - Palmer amaranth concerns
- Processing tomato
 - Recent detections of branched broomrape and Egyptian broomrape (*Orobanche* spp)
 - Root parasites
 - Branched is “A-listed” quarantine pest



Management of resistant weeds in orchards

- Several POST options
 - Glufosinate, saflufenacil, sethoxydim, 2,4-D
- Preemergence herbicides
 - IMO best alternative available
- Greater focus on middles management
 - Seed bank/reservoir



T&V herbicide registrations

Herbicide Registration on California Tree and Vine Crops *(updated May 2018 - 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 -----				----- stone fruit -----														
Preemergence	dichlobenil (Casoron)	L / 20	N	N	N	N	R	R	N	R	N	N	N	N	N	N	R	N	N	N
	diuron (Kamex, Diurex)	C2 / 7	N	R	N	R	R	R	N	N	N	R	N	N	R	N	N	R	N	R
	EPTC (Eptam)	N / 8	R	N	N	R	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	R	N	N	R	N	N	N
	flumioxazin (Chateau)	E / 14	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	N	R	N	N	R	N	R	N
	isoxaben (Trellis)	L / 21	R	R	R	R	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	N	N	N	N	N	N
	napropamide (Devrino)	K3 / 15	R	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	N	N	R	N	N	N
	oryzalin (Surflan)	K1 / 3	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	NB	R	R	R	R	R	R
	pendimethalin (ProwlH2O)	K1 / 3	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	R	R	R	R	N	N	N	N	N	N	R	R
	pronamide (Kerb)	K1 / 3	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	N	R	N	N	R	N	N	N
	sulfentrazone (Zeus)	E / 14	N	N	R	R	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	N	N	R	N	R	N
	trifluralin (Treflan)	K1 / 3	R	R	N	R	N	N	N	R	R	R	R	R	N	N	R	N	N	N
Postemergence	carfentrazone (S hark)	E / 14	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	N	N	N	N	NB	N	NB	N
	2,4-D (Clean-crop, Orchard Master)	O / 4	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
	fluazifop-p-butyl (Fusilade)	A / 1	NB	R	NB	NB	NB	NB	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
	glufosinate (Rely 280)	H / 10	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	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	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	N
	pyraflufen (Venue)	E / 14	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	R	N	N	N	N	R	R
	sethoxydim (Poast)	A / 1	R	R	R	R	R	R	R	R	R	NB	NB	R	NB	NB	R	N	NB	NB
Organic	Caprylic/Capric acid (Suppress)	NC ³	R	R	R	R	R	R	R	R	R	R	R	R	N	N	R	R	R	R
	ammoniated fatty acids (Final-San-	NC ³	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	d-limonene (AvengerAG)	NC ³	R	R	R	R	R	R	R	R	R	R	N	R	N	N	R	N	N	N
	Ammonium nanoate (Axxe)	NC ³	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	N

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>)

Herbicides registered in walnuts

Karmex
EPTC
Chateau
Alion
Trellis
Broadworks
Solicam

Surflan
Goal
Prowl
Pindar GT
Matrix
Zeus
Princep
Treflan

Shark
*Select***
2,4-D
Diquat**
*Fusilade***
Glyphosate

Rely 280
Sanda
Gramoxone
Venue
Treevix
Poast
O-contacts

**Trade names for example only*
*** Registered in NB walnuts only*

Herbicide Registration on California Tree and Vine Crops (updated May 2019, UC Weed Science)

Herbicide Common Name (see page trade name)	Site of Action Group ¹	Crop Group															
		Almond	Prune	Pistachio	Walnut	Apple	Pear	Cherry	Plum	Peach	Pine/Avocado	Citrus	Other	EG	Other	Emerging ²	
Nonselective																	
alkaloids (Carbam)	L200	N	N	N	R	R	R	R	R	R	R	R	R	R	R	R	R
dicamba (Dicamba)	D217	N	N	N	R	R	R	R	R	R	R	R	R	R	R	R	R
EPTC (EPTC)	W19	R	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
florasulfuron (Rioson)	W14	R	N	R	R	N	N	N	N	N	N	N	N	N	N	N	N
flumioxazin (Chateau)	W14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
indaziflam (Alion)	L200	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
isoxaben (Trelis)	W20	R	R	R	R	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
mesotrione (Spoton)	F207	R	R	R	N	N	N	R	R	R	R	R	R	R	R	R	R
napropamide (Devon)	W13-16	R	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
terbufos (Zeus)	W13-16	R	R	N	R	R	R	R	R	R	R	R	R	R	R	R	R
pyralis (Surflan)	W13	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
pyrithiopyr (Goal GoalTandem)	W14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
pendimethalin (Provac)	W13	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
penoxsulam (Prowl GT)	W14	R	R	R	N	N	N	R	R	R	R	R	R	R	R	R	R
promoxalin (Prowl)	W13	N	N	N	R	R	R	R	R	R	R	R	R	R	R	R	R
resulfuron (Matrix)	W13	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
sulfentrazone (Zeus)	W14	N	N	R	N	N	N	N	N	N	N	N	N	N	N	N	N
terbufos (Zeus, Caliber 30)	W13-16	R	R	N	R	R	R	R	R	R	R	R	R	R	R	R	R
trifluralin (Treflan)	W13	R	N	N	N	N	N	R	R	R	R	R	R	R	R	R	R
Selective																	
carfentrazone (Surflan)	W14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
chlorimifop (Sanda)	W11	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-D (Clear-crop, Orchard Master)	W14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
flazasulfuron (Rioson)	W14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
flazasulfuron (Rioson)	W14	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
glyphosate (Roundup)	A1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
glyphosate (Rely 280)	A1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
halosulfuron (Matrix)	W13	N	R	R	R	N	N	N	N	N	N	N	N	N	N	N	N
paraquat (Gramoxone)	W13	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
picloram acid (Stylo)	W14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
pyraflufen (Venue)	W14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
terbufos (Zeus)	W14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
terbufos (Zeus)	W14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
Other																	
Carbimethoxim acid (Surflan)	W14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
permetrinic fatty acids (Final Sun)	W14	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
trifluralin (Treflan)	W13	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
trifluralin (Treflan)	W13	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R

Notes: R = Registered, N = Not registered, ND = nonbearing. This chart is intended as a general guide only. Always consult a current label before using any herbicide as label changes frequently and other action labels restrict use regarding site of action or crop.

¹ Herbicide site of action designations are according to the Herbicide Resistance Action Committee (HRAC) and the Weed Science Society of America (WSSA) systems. WSSA is an accepted site of action classification. Please consult herbicide labels for general herbicide designations.

² Emerging is registered on only 1st year plantings.

Weed susceptibility information and the most up to date version of this table can be found at the Weed Research and Information Center (<http://www.wric.ucdavis.edu>)

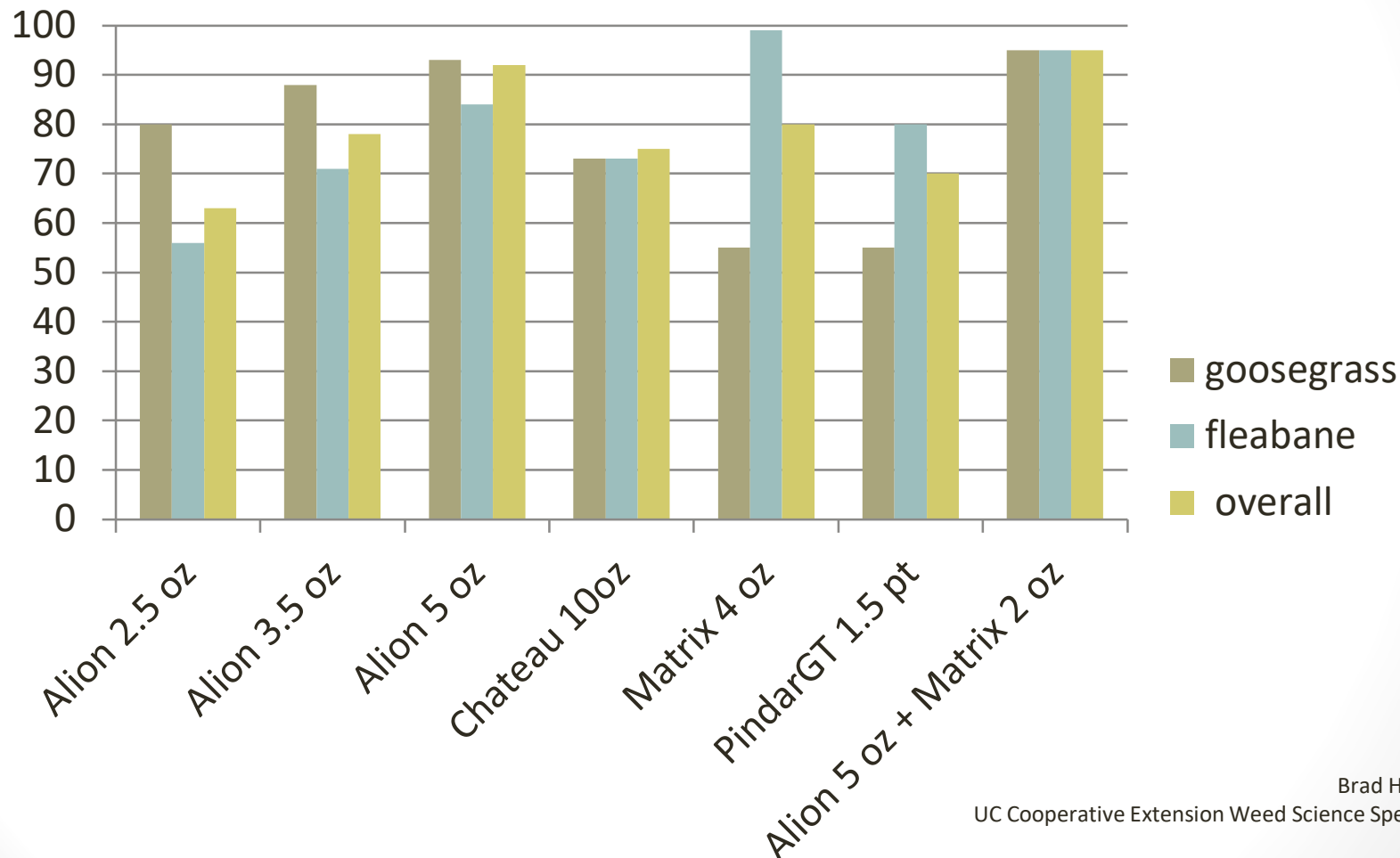
CA walnut herbicide use

	Top active ingredients (by acres)	2016 treated acreage
1	glyphosate	369,511
2	oxyfluorfen (Goal, Goaltender)	195,651
3	glufosinate (Rely)	92,572
4	paraquat (Gramoxone Inteon)	76,206
5	saflufenacil (Treevix)	69,583
6	indaziflam (Alion)	55,898
7	pendimethalin (Prowl)	44,737
8	rimsulfuron (Matrix)	31,000
9	2,4-D	25,588
10	carfentrazone (Shark)	21,368
11	penoxsulam (Pindar GT)**	20,946
12	flumioxazin (Chateau)	14,485

Performance observations



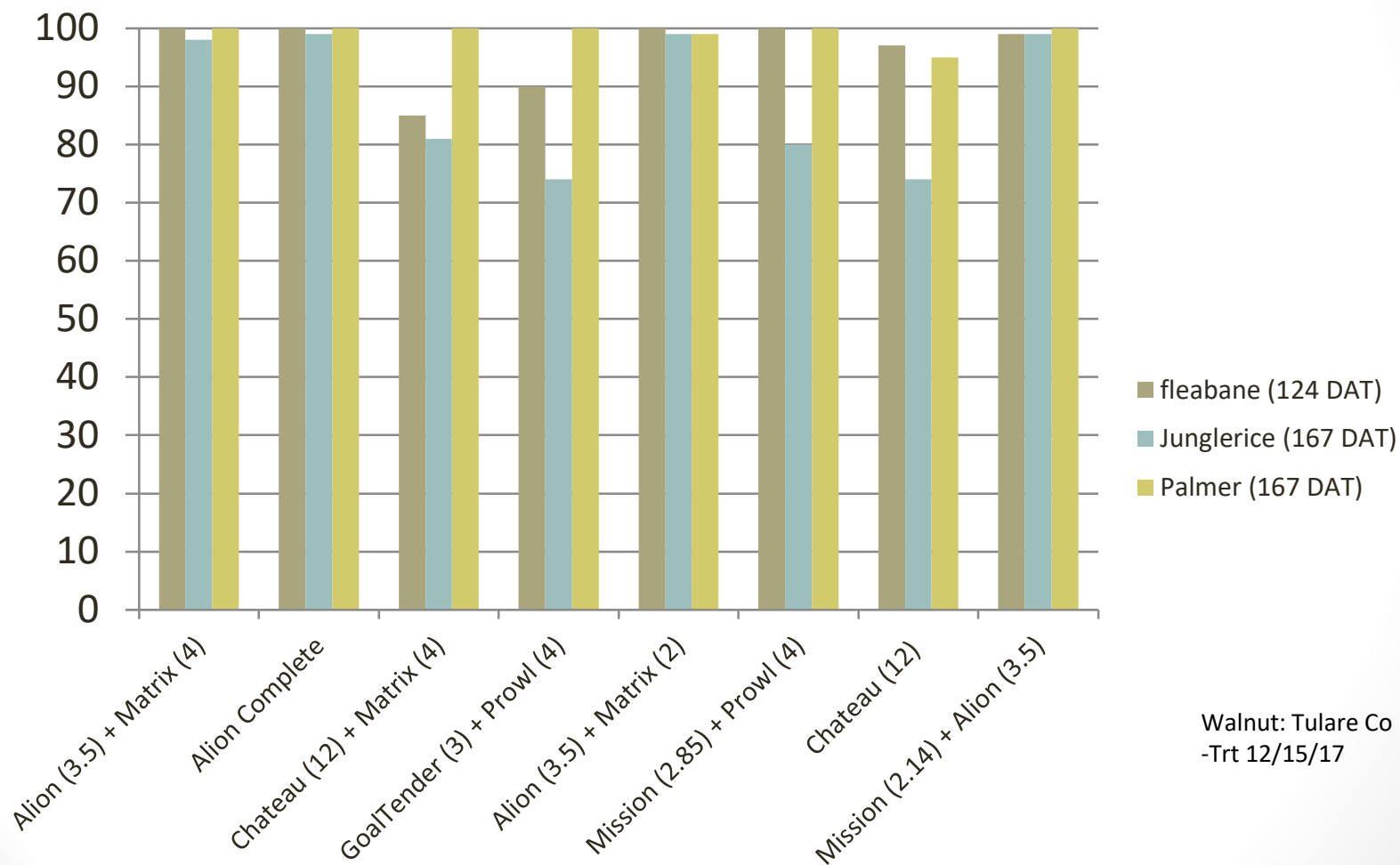
Almond Alion tankmix trial 128 DAT (Escalon)



Brad Hanson
UC Cooperative Extension Weed Science Specialist

Note: 2nd year of trial. Application December 17, 2013 and January 13, 2015
All treatments included glyphosate and glufosinate for burndown in both years.

PRE tankmix trial (Tulare)

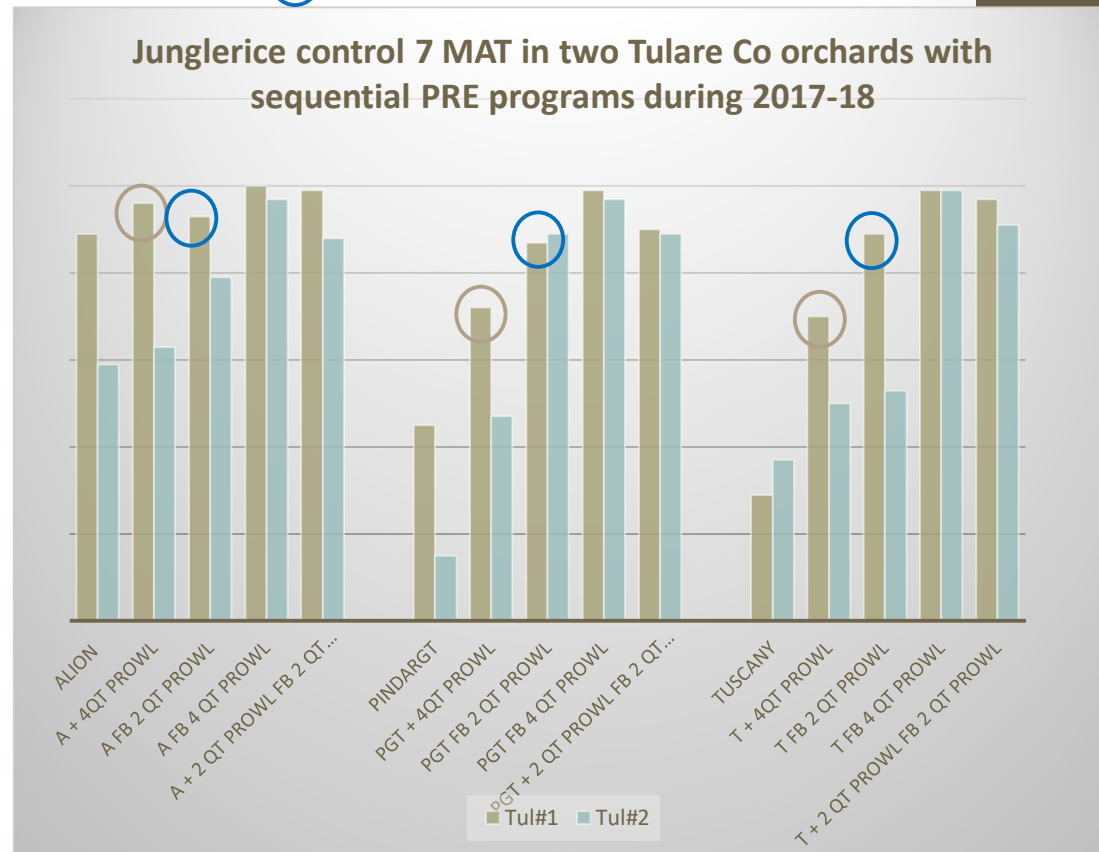


Walnut: Tulare Co
-Trt 12/15/17

Example of a sequential approach

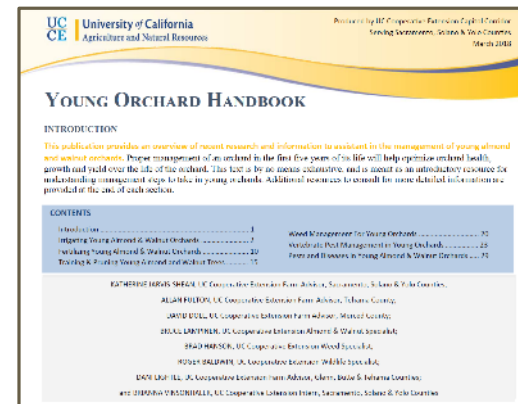
- Goal:
 1. control of winter weed complex
 2. and control of summer-emerging grasses
- Evaluated:
 - Sequential approach using a targeted PRE
 - Alion, PindarGT, and Tuscany as foundation
 - Added Prowl to help with grasses
 - 4 qt in winter with foundation
 - 2 qt in March
 - 4 qt in March
 - 2 qt in winter + 2 qt in spring
- -junglerice emerges ~May-Aug
- -pendimethalin is effective on many grasses, but a high rate of pendimethalin in Dec is needed for it to “last” until July
- ? Can we use a lower rate but apply it later to achieve the same outcome (with economic and environmental benefits)?

○ = foundation prog. tankmix w 4 qt Prowl H2O
 ○ = foundation prog. & seq 2 qt Prowl H2O



Extra challenges in young orchards

- Crop less competitive with weeds
- Greater sensitivity to weed competition
- Greater sensitivity to injury from weed control tactics
- Fewer herbicides registered on new plantings



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UC Cooperative Extension Weed Science Specialist

Herbicides for <2 yr tree nuts

PRE

- EPTC (well-established)
- Chateau (1yr need carton)
- Alion (1yr)
- Trellis
- Broadworks (12 mo)
- Solicam (18 mo)
- Goal
- Prowl
- Surflan
- PindarGT (9 or 15 mo)
- Matrix (1 season)

POST

- Shark (not green bark)
- Select (NB only)
- Dri-Clean (1 yr)
- Diquat (NB only)
- Fusilade (NB on some)
- Glyphosate
- Rely (not green bark)
- Gramoxone (not green bark)
- Venue (not green bark)
- Treevix (not green bark)
- Poast

A few take home messages

- Good burndown programs are essential
- Heavy weed pressure may take several years to clean up
- Herbicide-soil contact is crucial for maximum efficacy
- We have several really good PRE herbicides available in tree nuts if we use them correctly
- May need sequential programs if challenged by both winter and summer weeds

Integrated weed management

- Basing control decisions on actual weed problems
 - Control the weeds you KNOW you have (or will have)
- Identify new weed problems when they are small
 - New invasive species, resistant biotypes, etc.
 - Can use more intensive control strategies on the pockets that need it rather than field-wide
- Avoid ineffective treatments
 - Using the wrong tool for the job wastes time and money
 - Will likely have to be retreated or controlled some other way
- Avoid overtreatment
 - Wastes money and time
 - Puts a higher than necessary load of pesticide in the environment (+ regulatory burden)
 - Increases crop safety concerns



Herbicides and IWM

- All weed management choices, including doing nothing, have consequences
- Herbicides are tools that can provide efficient and effective weed control
- However, should not be the only tool considered.
- Instead herbicides better as part of an integrated management plan that fully considers the specific situation and recognizes the tradeoffs and opportunities of the available options

- The right tools, used well, and at the right time, make orchard weed management a much easier, cheaper, and effective proposition



Questions and discussion?

- I have a few potential categories...



Brad Hanson

bhanson@ucdavis.edu

<http://hanson.ucdavis.edu>

**UC Davis Weed Research
and Information Center**

<http://wric.ucdavis.edu/>

<http://ucanr.org/blogs/UCDWeedScience/>



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In the news...

- Glyphosate as “probable carcinogen” in 2015
- IARC evaluation
 - New interpretation of existing data
 - Other agencies (USEPA, EU) previously interpreted these data – and more - differently
- What does this mean for CA ag?
 - Added to CA Prop 65 list in 2017
 - I anticipate relatively little near term impact (ag)*

Glyphosate likely to remain in the news

- Currently, a lot of litigation related to alleged glyphosate-caused cancer
 - Thousands (8-10k?) plaintiffs
- Several important cases in CA state and Federal court jurisdictions

If you or someone you know has been exposed to Roundup in any way and been diagnosed with cancer, your first step toward recovery against Monsanto is directly in front of you.



CALL TOLL-FREE AND SPEAK DIRECTLY TO AN ATTORNEY
FREE CASE EVALUATION • NO OBLIGATION

In the news (2)...

- EPA currently evaluating several important herbicides for trees and vines:
 - Paraquat – likely will see more changes in who can use and how it must be handled
 - Simazine – under even more scrutiny due to environmental concerns (mostly water-related)

Herbicide symptomology website

The screenshot shows a web browser window displaying the UC IPM Herbicide Symptoms website. The browser's address bar shows the URL <http://herbicidesymptoms.ipm.ucanr.edu/>. The website header includes the UC IPM logo and the text "University of California Division of Agriculture and Natural Resources Herbicide Symptoms".

The main content area is titled "Home / Search" and contains a search interface. It features a navigation menu on the left with options like "Home / Search", "More Information", "Herbicide Damage", "Modes of Action", "Herbicides (Active Ingredient & Trade Name List)", "Plants", and "About Us". Below this is a "Contact Information" box for Kassim Al-Khatib, Professor at the University of California, Davis, with his address, phone numbers, and email.

The central search area has a heading "Home / Search" and a prompt: "Select from the categories below to display images that matches the selection. Add additional category selections to include more images. Click the 'x' to remove the selection." Below this are five filter categories: "Mode of Action (MoA)", "Chemistry", "Herbicides", "Plants", and "Symptoms". Each category has a dropdown menu. The "Herbicides" dropdown is currently open, showing a list of herbicide names including 2,4-D, EPTC, MCPA, MSMA, acetochlor, acifluorfen-Na, alachlor, aminopyrid, amitrole, atrazine, benfenf = benfluralin, bensulfuron-methyl, bensulfide, bentazon, bispiribac-Na, bromacil, bromoxynil, carfentrazone-ethyl, chloxiuron-ethyl, chloxsulfuron, cletodim, clomazone, clopyralid, cycloate, cyhalofop-butyl, dicamba, dichlobenil, dimethanamid, and dimquat.

Below the filters is a "Sample selection from gallery:" section with a grid of six images showing various plant symptoms. The footer of the website includes the text "UNIVERSITY OF" and "Division of Agriculture and", "Site Information" and "Get PDF Reader", and "© 2015 Regents of the University of California" and "Nondiscrimination Statement".

<http://herbicidesymptoms.ipm.ucanr.edu/>

T&V herbicide registrations

Herbicide Registration on California Tree and Vine Crops *(updated May 2018 - 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 -----				----- stone fruit -----														
Preemergence	dichlobenil (Casoron)	L / 20	N	N	N	N	R	R	N	R	N	N	N	N	N	N	R	N	N	N
	diuron (Kamex, Diurex)	C2 / 7	N	R	N	R	R	R	N	N	N	R	N	N	R	N	N	R	N	R
	EPTC (Eptam)	N / 8	R	N	N	R	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	R	N	N	R	N	N	N
	flumioxazin (Chateau)	E / 14	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	N	R	N	N	R	N	R	N
	isoxaben (Trellis)	L / 21	R	R	R	R	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	N	N	N	N	N	N
	napropamide (Devrinol)	K3 / 15	R	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	N	N	R	N	N	N
	oryzalin (Surflan)	K1 / 3	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	NB	R	R	R	R	R	R
	pendimethalin (ProwlH2O)	K1 / 3	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	R	R	R	R	N	N	N	N	N	N	R	R
	pronamide (Kerb)	K1 / 3	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	N	R	N	N	R	N	N	N
	sulfentrazone (Zeus)	E / 14	N	N	R	R	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	N	N	R	N	R	N
	trifluralin (Treflan)	K1 / 3	R	R	N	R	N	N	N	R	R	R	R	R	N	N	R	N	N	N
Postemergence	carfentrazone (S hark)	E / 14	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	N	R	N	N	NB	N	NB	N
	2,4-D (Clean-crop, Orchard Master)	O / 4	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
	fluazifop-p-butyl (Fusilade)	A / 1	NB	R	NB	NB	NB	NB	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
	glufosinate (Rely 280)	H / 10	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	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	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	N
	pyraflufen (Venue)	E / 14	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	R	N	N	N	N	R	R
	sethoxydim (Poast)	A / 1	R	R	R	R	R	R	R	R	R	NB	NB	R	NB	NB	R	N	NB	NB
Organic	Caprylic/Capric acid (Suppress)	NC ³	R	R	R	R	R	R	R	R	R	R	R	R	N	N	R	R	R	R
	ammoniated fatty acids (Final-San-	NC ³	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R
	d-limonene (AvengerAG)	NC ³	R	R	R	R	R	R	R	R	R	R	N	R	N	N	R	N	N	N
	Ammonium nanoate (Axxe)	NC ³	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	R	N

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>)

Brad Hanson

bhanson@ucdavis.edu

<http://hanson.ucdavis.edu>

**UC Davis Weed Research
and Information Center**

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