

hOT TIPS FOR IMPROVED WEED CONTROL

2012 Annual Pistachio Day

Visalia, CA

January 18, 2012



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<http://cefresno.ucdavis.edu>



Helpful resources for herbicides, rates, timings, and weeds controlled in pistachios:

Pistachio Production Manual

<http://ucipm.ucdavis.edu>

<http://cefresno.ucdavis.edu>

<http://www.cdms.net>

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

	Preemergent herbicides										Postemergent herbicides									
	flumioxazin (Chateau®)	indaziflam (Alion®)	isoxaben (Trellis®)	oryzalin (Surflan®, etc.)	oxyfluorfen (Goal®, etc.)	pendimethalin (Prowl H ₂ O®)	penoxsulfam + oxyfluorfen (Pindar GT®)	rimsulfuron (Matrix FNV®)	thiazopyr (Visor®) - NB	carfentrazone (Shark®)	clethodim (Select Max®) - NB	flazasulfop (Fusilade DX®) - NB	glufosinate (Rely 200®)	glyphosate (Roundup®, etc.)	paraquat (Gramoxone®, etc.)	pyraflufen (Venus®)	sulfentrazone (Trevix®)	sethoxydim (Poast®)	2,4-D amine (Orchard Master®, etc.)	
Annual Broadleaves																				
Cheeseweed	C	C	C	P	C	P	C	C	P	C	N	N	C	P	P	P	C	N	P	
Chickweed	C	C	C	C	P	C	C	C	P	C	N	N	C	P	P	P	C	N	P	
Clovers	-	P	P	N	P	N	C	-	-	P	N	N	P	P	P	P	-	N	N	
Cocklebur	-	-	-	N	P	N	P	P	N	C	N	N	P	C	C	C	C	N	C	
Cudweed	-	C	C	C	N	N	C	-	C	P	N	N	P	C	N	C	-	N	P	
Fiddleneck	-	C	C	C	C	C	C	C	C	C	N	N	P	C	P	P	-	N	P	
Filaree	C	C	C	P	C	N	C	C	C	C	C	N	C	P	P	P	C	N	C	
Goosefoot	C	C	C	C	C	C	C	P	C	C	N	N	P	C	C	C	C	N	C	
Groundcherry	C	C	-	C	N	C	N	P	C	P	C	N	C	C	C	C	C	N	C	
Groundsel, common	C	C	C	C	P	C	N	C	C	C	C	N	P	C	C	C	C	N	P	
Hairy fleabane	C	P	C	C	N	C	N	C	C	P	N	N	C	P	P	P	C	N	C	
Henbit	C	P	C	C	C	C	C	C	C	P	C	N	C	C	C	C	-	N	P	
Horseweed	C	C	C	C	N	P	N	C	C	P	P	N	C	P	P	P	C	N	C	
Knorweed, common	-	P	C	C	P	C	P	C	C	P	N	N	P	P	P	C	-	N	P	
Lambsquarters	C	C	C	C	C	C	C	C	C	C	N	N	P	C	C	C	C	N	C	
London rocket	C	C	C	P	C	P	C	C	C	C	C	N	C	C	C	C	-	N	C	
Morningglory	C	P	C	C	P	C	N	-	N	-	C	N	C	C	P	C	C	N	P	
Mullein, turkey	-	-	C	N	P	N	-	-	C	P	N	N	C	P	P	-	N	P	C	
Mustard	C	C	C	C	N	C	P	C	C	P	C	N	C	C	C	C	C	N	P	
Nettle	C	C	C	P	C	N	C	C	C	C	C	N	C	N	P	C	C	N	P	
Nightshade	C	C	C	N	C	N	C	C	P	P	C	N	C	C	C	C	C	N	C	
Pigweed	C	C	C	C	C	C	C	C	C	P	C	N	C	C	C	C	C	N	P	
Prickly lettuce	P	P	C	N	C	N	C	P	C	C	N	N	C	C	P	C	C	N	C	
Primrose, evening	-	P	C	C	P	P	C	-	C	P	N	N	C	C	C	C	-	N	-	
Puncturevine	C	-	C	C	P	P	P	C	P	P	N	N	P	C	C	P	C	N	P	
Purslane	C	C	C	C	C	C	C	C	N	N	N	N	C	C	C	C	C	N	P	
Russian thistle	C	C	C	P	P	P	C	P	P	P	P	N	C	C	C	C	C	N	P	
Shepherd's-purse	C	C	C	N	C	P	C	C	C	P	N	N	C	C	P	C	C	N	C	
Sowthistle	P	C	C	P	C	N	C	P	C	N	N	N	C	C	P	C	C	N	P	
Spotted spurge	C	C	C	P	P	P	P	C	P	P	N	N	C	C	C	C	C	N	P	
Wild radish	C	-	C	P	C	N	C	C	C	P	N	N	C	C	C	C	C	N	C	
Willowherb	C	C	P	P	P	-	C	-	-	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 any of the 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, September 2011. http://ceffresno.ucdavis.edu																				

Chart 4. Postemergent Herbicide Use Rates, Mode-of-Actions, PHI, and Other Label Recommendations For Use in Pistachios in California

Postemergent Herbicide	Use Rate Per Acre	Mode-of-Action	PHI	Application Information
carfentrazone (Shark EW®)	2 fl oz/App 7.9 fl oz/Season	Group 14 (WSSA)	3 days	Bearing/non-bearing: weeds <4" tall; adjuvant used; spray volume >30 gpa; tank-mix; spray pH 5-8.
clethodim (Select Max®)	9-16 fl oz/App 64 fl oz/Season	Group 1 (WSSA)	365 days	Non-bearing: grasses; retreat perennial grasses; adjuvant used; spray volume 30-40 gpa.
flazafop (Fusilade DX®)	16-24 fl oz/App 72 fl oz/Season	Group 1 (WSSA)	365 days	Non-bearing: grasses; retreat perennial grasses; adjuvant used; spray volume 30-40 gpa.
flumioxazin (Chateau SW®)	4-6 oz/App 24 oz/Season	Group 14 (WSSA)	60 days	Bearing/non-bearing: weeds <4" tall; adjuvant is used; spray volume >30 gpa; can tank-mix.
glufosinate (Rely 200®)	3-6.6 pt/App 21.5 pt/Season	Group 10 (WSSA)	14 days	Bearing/non-bearing: weeds <6" tall; bright, humid, warm conditions; spray volume >30 gpa; can tank-mix.
glyphosate (Roundup®, etc.)	0.5-1.5 lb ai/App 10.5 lb ai/Season	Group 9 (WSSA)	3 days	Bearing/non-bearing: weeds <6" tall; AMS or buffering agents to bring pH to 5-6; spray volume 5-40 gpa; tank-mix.
oxyfluorfen (Goal®, GoalTender®, etc.)	1-6 pt/App (2 lb gal) 6 pt/Season (2 lb gal) 0.5-3 pt/App (4 lb gal) 3 pt/Season (4 lb gal)	Group 14 (WSSA)	7 days	Bearing/non-bearing: weeds <4" tall; adjuvant used; >30 gpa; tank-mix.
paraquat (Gramoxone Inteon®, etc.)	2.5-4 pt/App 20 pt/Season	Group 22 (WSSA)	7 days	Bearing/non-bearing: weeds <6" tall; Restricted Use Permit, adjuvant used; spray volume >30 gpa; can tank-mix.
penoxsulam + oxyfluorfen (Pindar GT®)	0.5-1 pt/App 4.5 pt/Season	Group 2 + 14 (WSSA)	60 days	Bearing/non-bearing at least 9 month old; applied after nut set; broadleaf weeds <4" tall; NIS or COC adjuvant is used; spray volume 20-30 gpa; can tank-mix.
pyraflufen (Venus®)	0.7-4 fl oz/App 6.8 fl oz/Season	Group 14 (WSSA)	Pre-bloom	Bearing/non-bearing: broadleaf weeds <4" tall; adjuvant used; spray volume >30 gpa; can tank-mix.
sulfenacil (Treevix®)	1 oz/App 3 oz/Season	Group 14 (WSSA)	7 days	Bearing/non-bearing at least 12 month old; broadleaf weeds <4"; MSO must be used; spray volume 20-40 gpa; can tank-mix.
sethoxydim (Poast®)	2.5 pt/App 10 pt/Season	Group 1 (WSSA)	15 days	Bearing/non-bearing: grasses; retreat perennial grasses; adjuvant used; spray volume 30-40 gpa.
2,4-D amine (Orchard Master CA®, etc.)	2-3 pt/App 6 pt/Season	Group 4 (WSSA)	60 days	Bearing/non-bearing: broadleaf weeds <6" tall; Restricted Use Permit; spray volume 20 gpa; can tank-mix.

This is not an endorsement for any of the trade names listed, nor does the omission of specific trade names reflect the view of the author. Refer to your local chemical dealer or manufacturer for specific herbicide products available. Numerous factors influence the performance of herbicides, so consult charts 1 and 2 along with the manufacturer's labels for specific treatment recommendations. Kurt Hembree, UCCE, Fresno County, September 2011. <http://ceffresno.ucdavis.edu>



APPLICATOR'S GUIDE TO SPRAY DROPLET SIZE, DRIFT, NOZZLE SELECTION, AND SPRAY COVERAGE

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Successful weed control with herbicides hinges on the ability to apply weed sprays accurately, uniformly, and efficiently. Spraying with minimal drift and adequate coverage are important factors that influence herbicide performance and must be considered. Spray drift is the physical movement of spray particles through the air from the application site to an area where the treatment is not intended, usually resulting in non-target plant injury. Spray droplet size has the greatest influence on spray drift potential. Spray droplets <200 microns in diameter are light, remain airborne a long time, and are the most prone to drift, so should be avoided when using herbicides. Spray droplet size also influences spray coverage. Generally, as spray droplet size increases, spray coverage decreases. As a general rule, select nozzles, tip sizes, and operating pressures that produce large enough spray droplets (at least medium-sized) that reduce the risk of drift, while giving adequate coverage for the herbicide type (contact, systemic, or preemergent) used. Examples of different types of drift-reducing nozzles and the spray coverage they produce at different spray volumes are shown below. Also, spray when conditions are favorable and make sure spray tips are functioning properly.

Spray droplet size and distribution pattern

Droplet color code	Droplet size	7.5 gpa	15 gpa
VF	Very Fine <145 microns		
F	Fine 145-225 microns		
M	Medium 226-325 microns		
C	Coarse 326-400 microns		
VC	Very Coarse 401-500 microns		
XC	Extremely Coarse >500 microns		

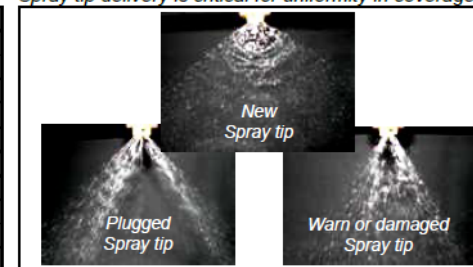
Drift-reducing nozzles and their spray coverage (30 psi and 0.4 gpm)

Nozzle type	15 gpa	25 gpa	35 gpa	45 gpa
Extended Range (XR11004)				
Turbo Teejet (TT11004)				
Turbo Twinjet (TTJ60-11004)				
Air Induction Extended Range (AIXR11004)				
Air Induction (AI11004)				
Turbo Teejet Induction (TTI11004)				

Application and environmental conditions affecting drift

Application factor	Favors less drift	Favors more drift
Spray droplet size	>225 microns	<225 microns
Spray height	Lower	Higher
Spray pressure	Lower	Higher
Spray tip angle	≤80°	>80°
Travel speed (mph)	<6	>6
Environment factor	Favors less drift	Favors more drift
Wind speed (mph)	3 to 7	0 to <3, or >7
Air temperature	<85 °F	>85 °F
Relative humidity	Higher (humid)	Lower (dry)
Air stability	Vertical mixing	Inversion layer

Spray tip delivery is critical for uniformity in coverage



Can I expect residual control if I treated in early December?

Product	Time to activation	Minimum rainfall	Can you cemigate
Matrix	<21 days	1/2"	Yes
Alion	<21 days	1/4"	No
Trellis	<21 days	1/2"	No
Pindar GT	<21 days	1/4"	No
Surflan	<21 days	1/2"	Yes
Visor	<21 days	1/2"	No
Prowl H2O	<21 days	1/2"	Yes
Chateau	<28 days	1/4"	No
Goal	<28 days	1/4"	Yes

***Cool/moist conditions favor product stability.**

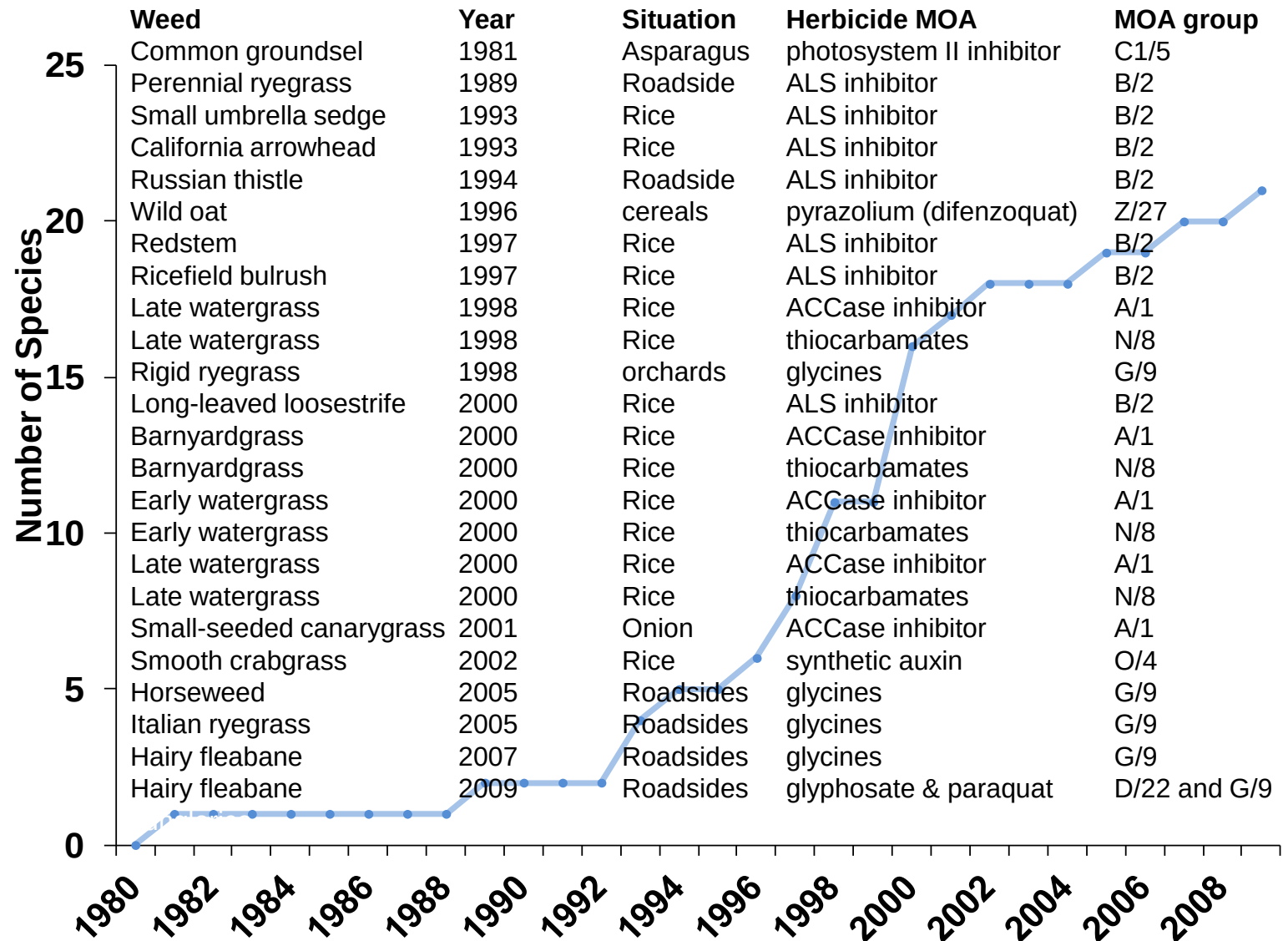
Things to consider if you sprayed preemergents before December 15:

- You may have to retreat (lower label rates).
- Be ready for weeds as soon as the rain hits; don't delay postemergent treatments or the weeds will get away from you.
- You may want to apply your pre/post combos between the first and second rain if they are within a couple weeks of each other (it should get most of the winter and summer annuals).

PRE weed control in pistachios:

	Chateau	Trellis	Goal	Matrix	Pindar GT	Prowl	Surflan	Alion	Visor
Cheeseweed									
Common purslane									
Filaree									
Hairy fleabane									
Henbit									
Horseweed									
Knotweed									
Mullein								?	
Nettle									
Panicle willowherb									
Prickly lettuce									
Puncturevine								?	
Russian thistle									
Annual grasses									

Herbicide resistance in CA:



Other weeds to watch for:

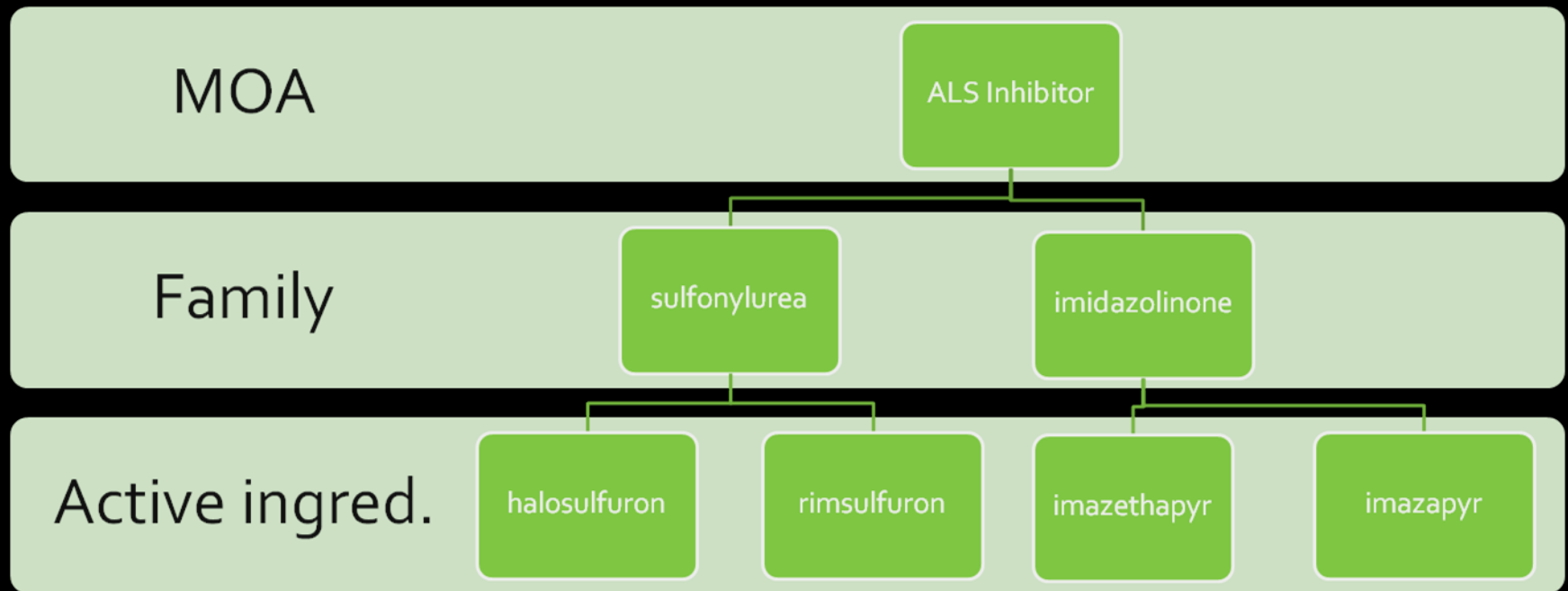
- Lambsquarters, Palmer amaranth (glyphosate)
- Junglerice and sprangletop (dinitroanilines)



Be vigilant to stay ahead of herbicide resistance:

1. Rotate and/or tank-mix herbicides with different MOAs.
2. Treat when weeds are the most sensitive (<4" tall, but preferably within a couple weeks of emergence).
3. Go after escapes and don't let them go to seed.

MOA vs. herbicide family vs. active ingredient:



MOA numbers for herbicides used in pistachios:

Preemergent	MOA (group)	Postemergent	MOA (group)
Matrix	2	Select, Fusilade, Poast	1
Surflan, Prowl, Visor	3	2,4-D	4
Chateau, Goal	14	Roundup (all glyphosate products)	9
Trellis	21	Rely 280	10
Alion	29	Shark, Goal, Venue, Chateau, Treevix	14
Pindar	2 + 14	Gramoxone Inteon	22

Quadris®

Flowable Fungicide

FRAC

Broad spectrum fungicide for control of plant diseases

GROUP 11 FUNGICIDES

Active Ingredient:

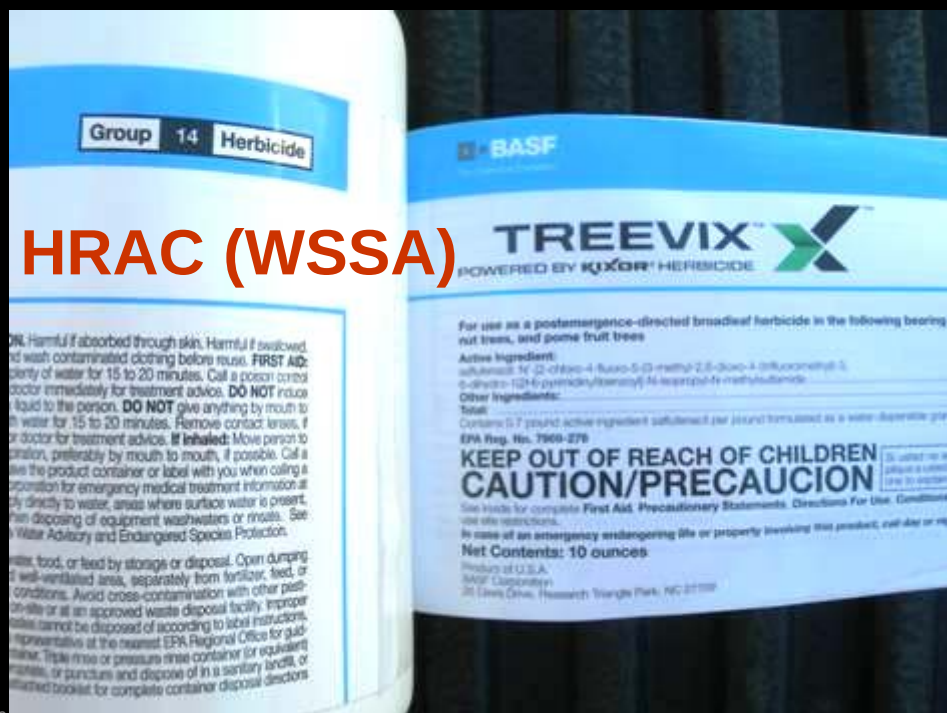
Azoxystrobin: methyl (E)-2-[6-(2-cyanophenoxy)
pyrimidin-4-yloxy]phenyl]-3-methoxyacrylate* 22.9%

Other Ingredients: 77.1%

Total: 100.0%

FRAC Code on the Quadris label

HRAC (WSSA)



POISON

KEEP OUT OF REACH OF CHILDREN
READ SAFETY DIRECTIONS BEFORE OPENING OR USING

Dow AgroSciences

Lorsban® 750 WG

Insecticide

ACTIVE CONSTITUENT: 750 g/kg CHLORPYRIFOS (an anticholinesterase compound)

GROUP 1B INSECTICIDE

For control of certain insect pests in FRUIT and OTHER SITUATIONS as specified in the Directions For Use Table.

WATER SOLUBLE PACKAGING. KEEP DRY.

Dow AgroSciences Australia Limited A.B.N. 24 003 771 659
20 Rodborough Road FRENCHS FOREST NSW 2086
www.dowagrosciences.com.au
CUSTOMER SERVICE TOLL FREE 1-800 700 006
* Trademark of Dow AgroSciences

IRAC

Dow AgroSciences

Information on Weed Resistance:

GROUP 9 HERBICIDE

Glyphosate, the active ingredient in this product, is a Group 9 herbicide. Target site resistance to Group 9 herbicides is rare. Although rare in occurrence, any weed population may contain plants naturally resistant to Group 9 herbicides. Weed species resistant to Group 9 herbicides may be effectively managed utilizing another herbicide from a different Group or using other cultural practices.

Weed resistance management recommendations for Group 9 herbicides are:

- Ensure optimum weed control by making applications at the right time (correct weed size) and utilizing the recommended label rate for the most difficult to control weed in your field.
- Base decisions on local needs and use the tool(s) necessary to obtain optimum weed control and minimize weed escapes.
- Avoid tank mixtures that reduce this product's efficacy (through antagonism) or which encourage rates of this product below the label recommendations.
- Scout treated weed populations for escapes 2 to 4 weeks after application.
- Report any incidence of repeated non-performance of this product on a particular weed to the local retailer, county extension agent, or Monsanto representative.

Chart 3. Preemergent Herbicide Use Rates, Mode-of-Actions, PHI, and Other Label Recommendations For Use in Pistachios in California

Preemergent Herbicide	Use Rate Per Acre	Mode-of-Action	PHI	Application Information
flumioxazin (Chateau SW®)	6-12 oz/App 24 oz/Season	Group 14 (WSSA)	60 days	Bearing/non-bearing; ¼-½" rain in 21-28 days; spray volume 20-40 gpa; can tank-mix; don't disturb treatment.
indaziflam (Alion®)	5-6.5 fl oz/App 10.3 fl oz/Season	Group 29 (WSSA)	14 days	Bearing/non-bearing at least 3 year old; ¼" rain within 21 days; 10-30 gpa; can tank-mix.
isoxaben (Trellis®)	0.66-1.33 lb/App 1.33 lb/Season	Group 21 (WSSA)	60 days	Bearing/non-bearing; ½" rain in 21 days; spray volume at least 10 gpa; can tank-mix.
oryzalin (Surflan A.S.®, etc.)	2-6 qt/App 12 qt/Season 2.4-7.1 lb/App 14 lb/Season	Group 3 (WSSA)	0 days	Bearing/non-bearing; ½-1" rain in 21 days; spray volume 20-40 gpa; can chemigate; can tank-mix.
oxyfluorfen (Goal®, GoalTender®, etc.)	5-6 pt/App (2 lb/gal) 6 pt/Season (2 lb/gal) 2.5-3 pt/App (4 lb/gal) 3 pt/Season (4 lb/gal)	Group 14 (WSSA)	7 days	Bearing/non-bearing; ¼" rain in 28 days; spray volume 20-40 gpa; can chemigate; can tank-mix.
pendimethalin (Prowl H ₂ O®)	2-6.3 qt/App (H ₂ O) 6.3 qt/Season (H ₂ O) 2.4-4.8 qt/App (3.3EC) 4.8 qt/Season (3.3EC)	Group 3 (WSSA)	60 days (H ₂ O) 365 days (3.3EC)	(H ₂ O) - Bearing/non-bearing; ½" rain in 21 days; spray volume 20 gpa; can tank-mix; (3.3EC) – Non-bearing; preplant.
penoxsulam + oxyfluorfen (Pindar GT®)	1.5-3 pt/App 4.5 pt/Season	Group 2 + 14 (WSSA)	60 days	Bearing/non-bearing at least 9 month old; applied up to green leaf tissue; ½" rain within 14 days; spray volume 10-30 gpa; can tank-mix; don't disturb after treatment.
rimsulfuron (Matrix FNV®)	2-4 oz/App 4 oz/Season	Group 2 (WSSA)	14 days	Bearing/non-bearing >1 year old; ½" rain in 21 days; spray volume 20-40 gpa; spray pH >5; can chemigate; can tank-mix.
thiazopyr (Visor 2E®)	2-4 pt/App 4 pt/Season	Group 3 (WSSA)	365 days	Non-bearing; ½" rain in 28 days; spray volume 20-40 gpa; split treatments of 2 pt/A for nutsedge control; can tank-mix.

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Preemergent (before weeds germinate)

TRIFLURALIN (Treflan, Trilin)

Rate: 0.5 to 1.0 lb a.i./Acre

WSSA MODE OF ACTION GROUP NUMBER: 3

COMMENTS: Broadcast preplant incorporated. Plant tree roots below treated soil. Do not place treated soil near roots during planting. Controls many annuals and is helpful on perennial weeds. Residual period: 2–12 months.

Postemergent (after weeds emerge)

GLYPHOSATE (Roundup WeatherMax, etc.)

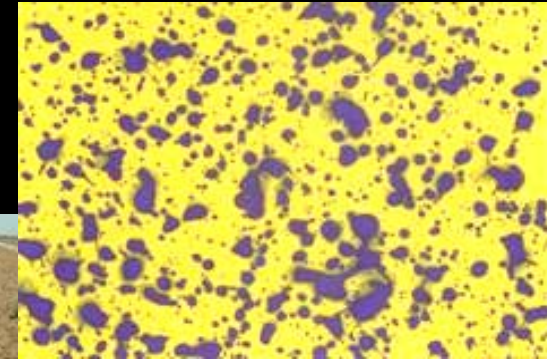
Rate: 1 to 4 lb a.i./Acre

WSSA MODE OF ACTION GROUP NUMBER: 9

COMMENTS: Apply with a controlled applicator or with low-pressure flat fan nozzles. For annual weed control use 1 lb/acre in 3–10 gal water. Apply to young annuals or vigorously growing perennials in flowering stage. Some perennials require the 4 lb/acre rate for control. May be used on young weeds in the planting row followed by planting into the dead weeds. New weeds usually do not establish for a month or more, as a result of the no-till effect. Do not use more than 10.6 lb/year. Residual period: less than one month.

Try and avoid all the pitfalls that can lead to treatment failure:

- Correct weed ID (susceptibility)?
- Sprayer functioning properly?
- Appropriate rate?
- Environmental conditions conducive?
- Spray volume and coverage adequate?
- Spray additives?
- Weed stage?
- Mechanical disturbance?
- Applicator attitude?

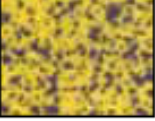


POST weed control in pistachios:

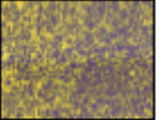
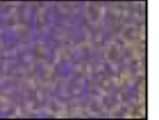
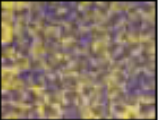
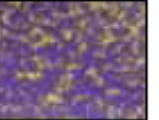
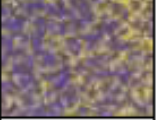
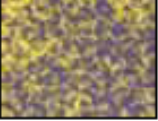
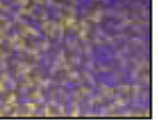
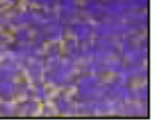
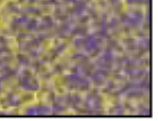
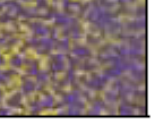
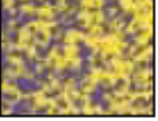
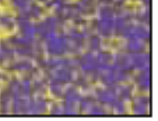
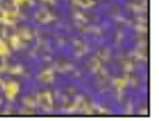
	Goal	Gramox. Inteon	Poast	Rely 280	Roundup	Shark	Treevix	Venue	2,4-D
Cheeseweed									
Common purslane									
Filaree									
Hairy fleabane									
Henbit									
Horseweed									
Knotweed							?		
Mullein							?		
Nettle									
Panicle willowherb									
Prickly lettuce									
Puncturevine									
Russian thistle									
Annual grasses									

Always consider drift and coverage:

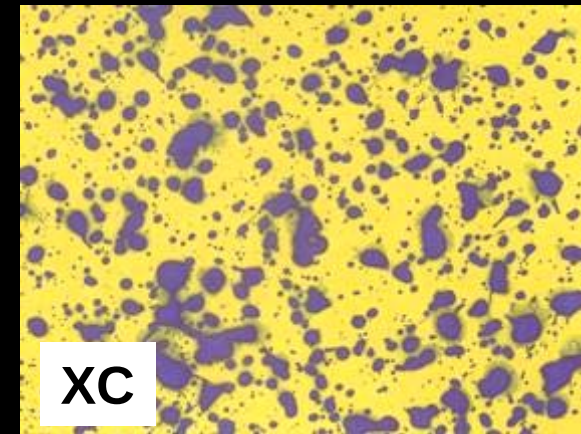
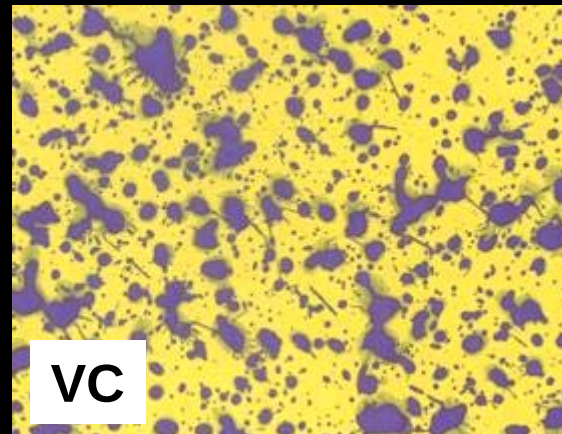
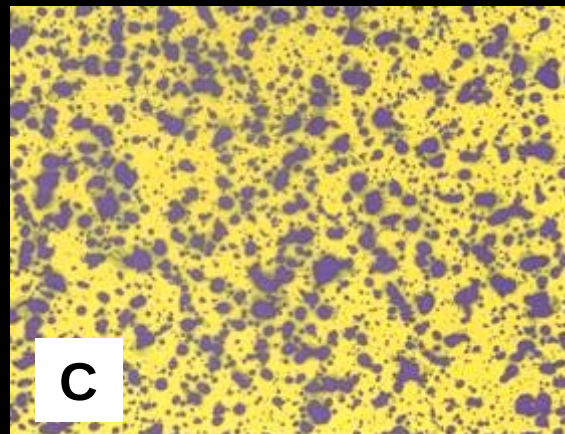
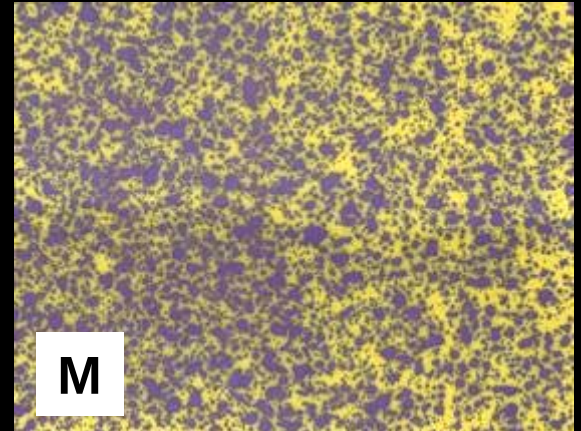
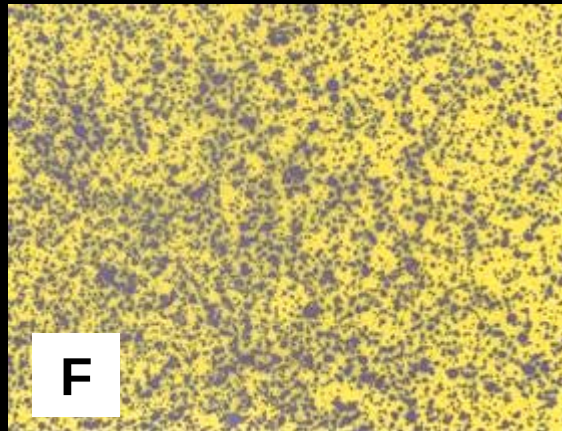
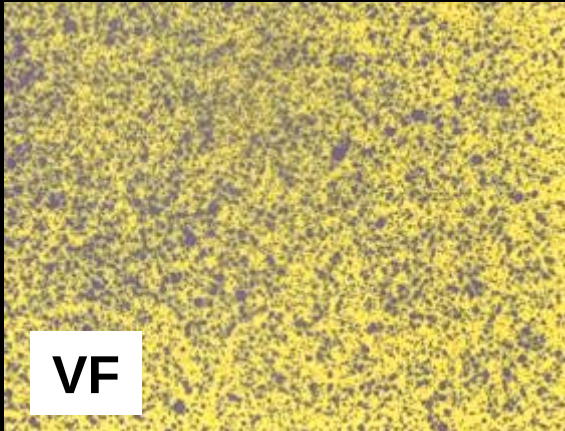
Spray droplet size and distribution pattern

Droplet color code	Droplet size	7.5 gpa	15 gpa
	Very Fine <145 microns		
	Fine 145-225 microns		
	Medium 226-325 microns		
	Coarse 326-400 microns		
	Very Coarse 401-500 microns		
	Extremely Coarse >500 microns		

Drift-reducing nozzles and their spray coverage (30 psi and 0.4 gpm)

Nozzle type	15 gpa	25 gpa	35 gpa	45 gpa
 Extended Range (XR11004)				
 Turbo Teejet (TT11004)				
 Turbo Twinjet (TTJ60-11004)				
 Air Induction Extended Range (AIXR11004)				
 Air Induction (AI11004)				
 Turbo Teejet Induction (TTI11004)				

Spray droplet distribution (15 GPA)



Fallow nozzle trial WSREC 2011

Broadleaf control by <i>nozzle type, volume, and droplet size</i>			
Nozzle; volume; droplet size	10 DAT	21 DAT	40 DAT
1. XR11002; 13 gpa; F	9.7 b	9.6 ab	9.4 a
2. XR11004; 26 gpa; M	9.9 a	9.8 a	9.6 a
3. TTJ60-11002; 13 gpa; M	9.9 a	9.7 ab	9.5 a
4. TTJ60-11004; 26 gpa; C	9.9 a	9.8 a	9.7 a
5. AI11002; 13 gpa; VC	9.4 c	8.0 c	7.3 c
6. AI11004; 26 gpa; XC	9.6 b	9.3 b	8.3 b
<i>CV (%)</i>	<i>1.22</i>	<i>3.26</i>	<i>6.45</i>
<i>LSD</i>	<i>0.21</i>	<i>0.46</i>	<i>0.82</i>

Hairy fleabane trial:

Treat	Nozzle type	GPA	% control 8 DAT	% control 18 DAT
1	Unt	---	0.0 e	0.0 e
2	XR8002	20	95.3 a-d	94.8 abc
3	TTJ11002	20	96.0 bcd	94.5 abc
4	TT11002	20	95.0 bcd	97.3 a
5	AI11002	20	93.3 d	89.0 cd
6	XR8004	40	96.5 ab	95.5 ab
7	TTJ11004	40	95.0 bcd	94.8 abc
8	TT11004	40	97.8 a	90.5 bcd
9	AI11004	40	93.5 cd	88.0 d

Hanson and Moretti, UC Davis 2011

20 GPA



XR



TTJ



TT

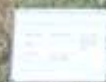


AI

40 GPA



XR



TTJ



TT



AI

Almond spray nozzle trial 2008

Herbicide: Rely 200 at 5 pt/acre

Pressure: 30 psi

Weeds: up to 16" tall

Volume: 26 gpa

Speed: 4 mph



28 DAT

	Hw	Hf	St	Pl	Bg
XR11004 (M)	9.7 a	9.4 b	9.9 a	9.8 a	9.3 a
TTJ60-11004 (C)	9.8 a	9.9 a	10 a	10 a	9.5 a
AI11004 (XC)	7.5 b	7.0 c	9.6 b	9.4 b	5.0 b
<i>CV (%)</i>	<i>1.46</i>	<i>1.05</i>	<i>0.50</i>	<i>1.44</i>	<i>1.37</i>
<i>LSD</i>	<i>0.37</i>	<i>0.26</i>	<i>0.12</i>	<i>0.37</i>	<i>0.81</i>

28 DAT



XR11004



TTJ60-11004



AI11004

***When using contacts,
treat **SMALL**
weeds (especially
fleabane, malva,
filaree, and mullein)!***

Don't kick-up dust when spraying:



Lower side



Upper side

Tips when using glyphosate:

Trade Name	Formulated Salt ^b	Concentration ^c		0.75 lb ae product rate
		lb ai/gal	lb ae/gal	(oz/acre)
Roundup Original	IPA	4	3	32
Roundup Original	K	5.5	4.5	22
Roundup PowerMax	K	5.5	4.5	22
Roundup Ultra	IPA	4	3	32
Roundup WeatherMax	K	5.5	4.5	22
Touchdown	DA	3.75	3	32
Touchdown Total	K	5	4.2	24
Touchdown HiTech	K	6	5	19
Durango	IPA	5.4	4	26
Glyphomax XRT	IPA	5.4	4	26
Most generics	IPA	4	3	32

Fertilizers and water conditioners:

- Fertilizers and water conditioners can decrease antagonism of herbicides in hard water and enhance the ability of a herbicide to be translocated within a plant
- Ammonium Sulfate (AMS) or Ammonium Nitrate (AN)
 - Normally used at 2%, wt/v (17 lbs/100 gals)
- Urea + Ammonium Nitrate (URAN)
 - Liquid formulations containing 28 or 32% N
 - Used at up to 4% v/v (4 gal/100 gal)

Glyphosate and hard water:

- Glyphosate salts are antagonized by other salts in hard water such as Ca, Na, Mg, and Fe.
 - These elements form cations (positively charged ions) that react with negatively charged glyphosate salts.
- Both ammonium (NH_3^{1+}) and sulfate (SO_4^{2-}) active
 - Glyphosate is more readily absorbed into foliage when combined with ammonium than when combined with Ca^{2+} , Na^{1+} , Mg^{2+} , or Fe^{2+} ions.
 - Free sulfate binds with Ca^{2+} , Na^{1+} , Mg^{2+} , or Fe^{2+} ions

Buffering agents and glyphosate:

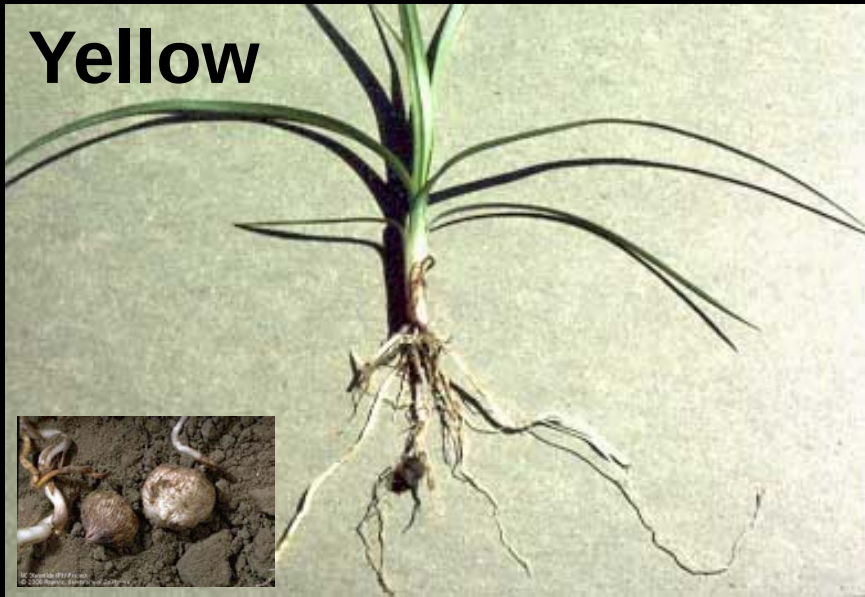


- Buffers modify the pH of a solution
- At low pH, more glyphosate exists as a salt than as the free acid
 - Slightly acidic spray solution applied to leaves results in better glyphosate uptake
 - So when spraying glyphosate, it's best to use water with a pH from 4 to 6
 - If water exceeds pH 7, consider using a buffer





Yellow



Purple



For nutsedge control:

- Preemergents are weak (except maybe Matrix)
- Treat with glyphosate at 0.75 lb ae/A or paraquat at 2.5 pt/A when plants have <4 leaves.
- Treat every 21-28 days (2-5X/yr)
- Use AMS, AN, or URAN + a surfactant

SUMMARY

- Looks like rain this weekend – are you ready?
- Be proactive when it comes to herbicide resistance.
- Make sure your applicator knows what they're doing.
- Always consider drift and coverage, particularly when using systemics and contacts.
- Treat weeds when they are SMALL.
- Condition the spray water, especially when glyphosate is being used (add AMS with all postemergent sprays).
- Plan on treating nutsedge early and often.

THANK YOU!

Questions?

<http://cefresno.ucdavis.edu>