

## Alternative For Control of Glyphosate Resistant Conyza Species in Non-Cropland

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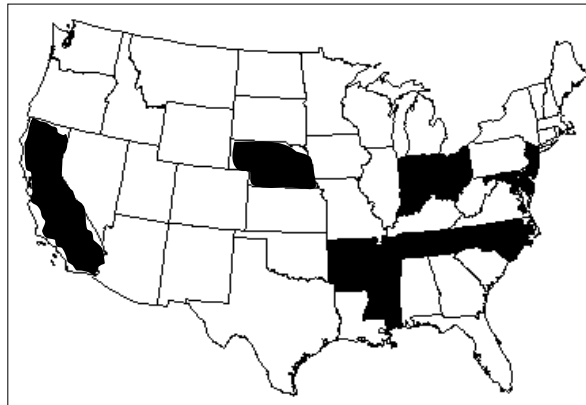
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*Conyza* species (horseweed or marestail and flaxleaf fleabane) are rapidly infesting orchards, vineyards, roadsides and canal banks throughout the San Joaquin Valley. Glyphosate resistant horseweed has shown up throughout the United States particularly in the cotton regions of the United States. Table 1 shows the distribution. Glyphosate resistance was demonstrated in 2005 in California. Research by University of California Farm Advisors Kurt Hembree and Anil Shrestha demonstrated that it took up to a 4X rate of glyphosate for some measure of control along some ditch banks where continuous low application rates of glyphosate had been used.

### Glyphosate resistant horseweed in the US.

- KY (2001)
- TN (2001)
- IN (2002)
- MD (2002)
- NJ (2002)
- OH (2002)
- AK (2003)
- DE (2000)
- MS (2003)
- NC (2003)
- CA (2005)
- NE (2006)



Source:  
[www.weedscience.org](http://www.weedscience.org)

**Global Occurrence of glyphosate resistant *Conyza sp.*** Source:  
[www.weedscience.org](http://www.weedscience.org)

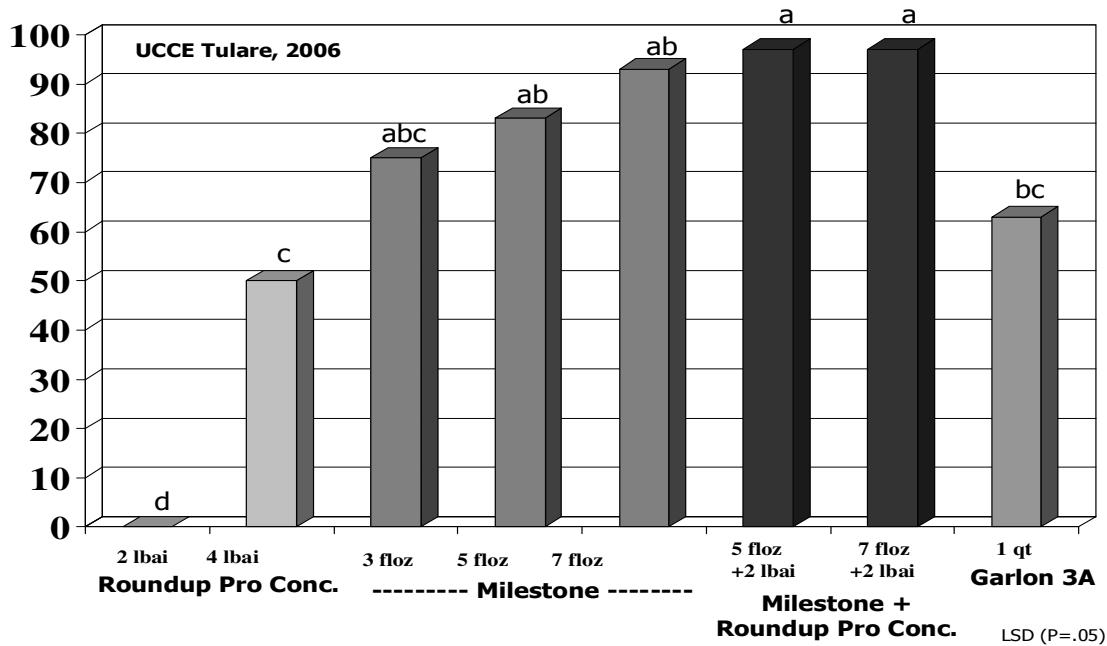
<i>Conyza bonariensis</i>	2003 – South Africa
Hairy Fleabane	2004 – Spain
	2005 – Brazil
	2005 – Brazil
<i>Conyza Canadensis</i>	2000 – USA (Delaware)
Horseweed	2001 – USA (Kentucky)
	2001 – USA (Tennessee)
	2002 – USA (Indiana)
	2002 – USA (Maryland)
	2002 – USA (Missouri)
	2002 – USA (New Jersey)
	2002 – USA (Ohio)
	2003 – USA (Arkansas)
	2003 – USA (Mississippi)
	2003 – USA (North Carolina)
	2003 – USA (Ohio) Multiple – 2 MOA's
	2003 – USA (Pennsylvania)
	2005 – Brazil
	2005 – USA (California)
	2006 – China

Across the Cotton Belt glyphosate resistance showed up in areas that were on the average 92% Roundup Ready, 2.40% Strip till, 3.88% not cultivated and 4. There was a trend away from using residual herbicides. California weed shifts in permanent crops and non cropland occurred where there was a combination of reliance on postemergent herbicides, reduced residual herbicides and reduced tillage. There were several years with one or more glyphosate application each year. Reduced rates of glyphosate were used; discontinued use of other herbicides; Reduced

or eliminated tillage; allowed the escapes to reproduce; finally weeds were spread by wind and equipment.

Several studies were conducted last season in Tulare County to evaluate herbicides and combinations for control of horseweed. A few of the research study location results are presented Tables 1, 2 and figures 1, 2, 3 show the results of these studies. Milestone, Transline at 10.6 oz., Krovar + Accord, Karmex + Accord, and Oust + Accord gave up to 100 percent control of horseweed. The higher rates of Milestone at 7 oz. /A was needed to give the most consistent control. Treatment combinations of Glyphosate at 2 lbs. ai. + Indicate, Citric Acid, ET, Shark, or Chateau gave improved control compared to Glyphosate + AMS. In all treatments glyphosate was an important addition for control of grasses that were present.

**Control of Glyphosate Resistant Horseweed with Milestone. Fig. 1.**



**Table 1. Horseweed control location 1. Dinuba**

<b>Horseweed Percent Control</b>					
<b>Treatments</b>	<b>Rate/A</b>	<b>11 DAT</b>	<b>34 DAT</b>	<b>42 DAT</b>	<b>54 DAT</b>
Milestone + COC	3.2 fl oz + 0.25% v/v	50	43	47	17
Milestone + COC	4.8 fl oz + 0.25% v/v	57	68	77	53
Milestone + COC	6.4 fl oz + 0.25% v/v	57	87	90	90
Milestone + COC	7.1 fl oz + 0.25% v/v	72	90	92	93
Milestone + Garlon + COC	3.2 fl oz. + 33 fl oz. + 0.25% v/v	83	93	90	93
Milestone + Garlon + COC	4.8 fl oz. + 33 fl oz. + 0.25% v/v	87	100	100	100
Milestone + Garlon + COC	6.4 fl oz. + 33 fl oz. + 0.25% v/v	80	100	100	100
Milestone + Garlon + COC	7.1 fl oz. +33 fl oz. + 0.25% v/v	70	100	100	100
Glypro + COC	2 qt + 0.25% v/v	87	70	53	17
Glypro + Goal 2XL + COC	2 qt + 2 qt + 0.25% v/v	90	87	85	73
Roundup Pro Concentrate + Shark + COC	2 qt + 1.6 oz + 0.25% v/v	100	100	100	100
Roundup Pro Concentrate + Chateau + COC	2 qt + 2 oz + 0.25% v/v	87	87	83	83
Roundup Pro Concentrate + ET + COC	2 qt + 0.75 oz + 0.25% v/v	80	82	77	73
Roundup Pro Concentrate + Indicate + COC	2 qt + 3.5 oz + 0.25% v/v	98	93	90	90
Roundup Pro Concentrate + Citric Acid + COC	2 qt + 13.8 oz/100 gal + 0.25% v/v	77	77	80	73
Untreated	---	0	0	0	0

**Table 2. Horseweed control location 5. Dinuba**

<b>Horseweed Percent Control</b>				
<b>Treatments</b>	<b>Rate/A</b>	<b>6 DAT</b>	<b>14 DAT</b>	<b>26 DAT</b>
Roundup Pro Concentrate + COC	2 lb ai + 0.25% v/v	17	52	53
Roundup Pro Concentrate + COC	4 lb ai + 0.25% v/v	27	62	68
Milestone + COC	3 fl oz + 0.25% v/v	30	70	72
Milestone + COC	5 fl oz + 0.25% v/v	40	77	82
Milestone + COC	7 fl oz + 0.25% v/v	50	83	83
Transline + COC	6 fl oz + 0.25% v/v	23	57	67
Transline + COC	10.6 fl oz + 0.25% v/v	27	72	80
Milestone + Roundup Pro Concentrate + COC	5 fl oz + 2 lb ai + 0.25% v/v	43	75	82
Milestone + Roundup Pro Concentrate + COC	7 fl oz + 2 lb ai + 0.25% v/v	50	82	90
Transline + Roundup Pro Concentrate + COC	6 fl oz + 2 lb ai + 0.25% v/v	27	77	85
Transline + Roundup Pro Concentrate + COC	10.6 fl oz + 2 lb ai + 0.25% v/v	37	82	92
Garlon + COC	1 qt + 0.25% v/v	27	73	85
Roundup Pro Concentrate + Shark + Citric Acid	2 qt + 1.6 oz + 13.8 oz/100 gallons	60	82	92
Roundup Pro Concentrate + Et + Citric Acid	2 qt + .75 oz + 13.8 oz/100 gallons	30	83	85
Untreated	---	0	0	0

Fig. 2 Horseweed Control in Ditch banks in Dinuba, Trial location 2.

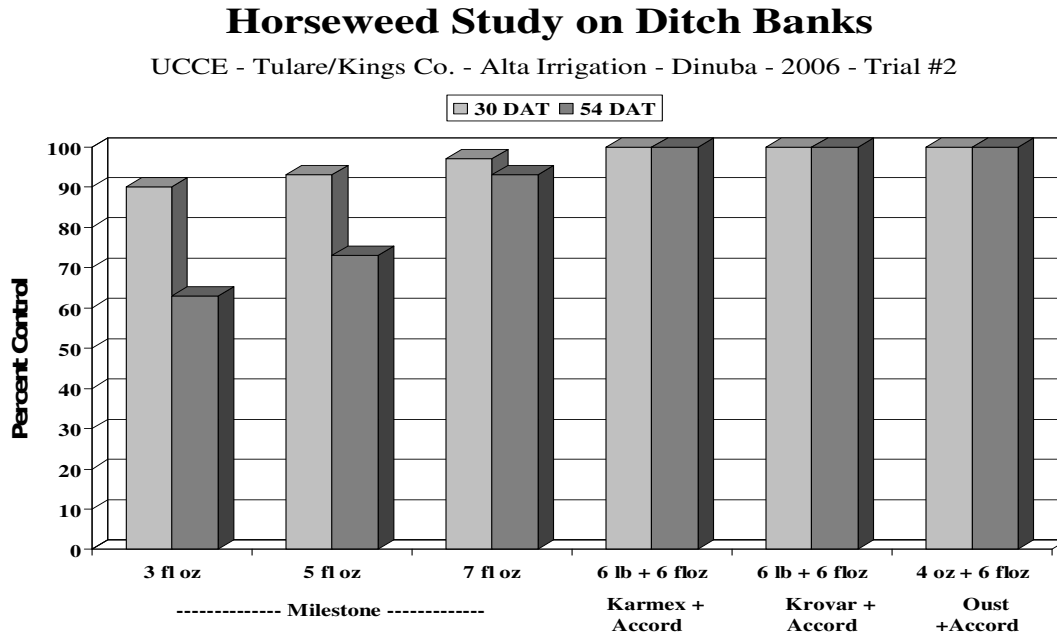
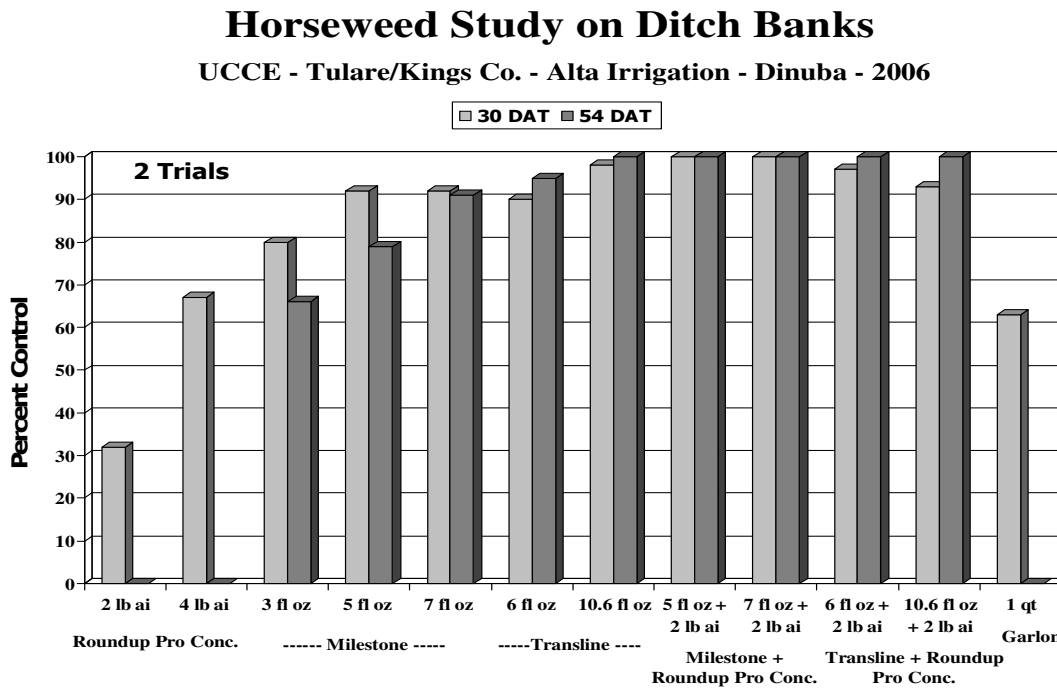


Fig. 3 Horseweed Control in Ditch banks in Dinuba, Trial location 4.



In summary, the non-crop weed management approach must incorporate resistance management strategies: (1) Use minimum number of applications of any one herbicide per season; (2) Rotate herbicides and use tank mixes with different chemistry; (3) Control weed escapes by tillage or hand when appropriate; (4) Monitor and map locations for patterns of weed escapes consistent with developing resistance.

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