NEW HERBICIDES FOR CONTROL OF CUTLEAF MIGNONETTE AND CREEPING KNAPWEED IN SOUTH AUSTRALIA

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Summary. Cutleaf mignonette, *Reseda lutea* and creeping knapweed, *Acroptilon repens* are deep-rooted perennial weeds of cereal crops in S.A. Several new herbicides were tested for efficacy against these species. Chlorsulfuron, metsulfuron and CGA 131-036 were effective against cutleaf mignonette but clopyralid was not. Clopyralid alone in mixtures with 2,4-D, MCPA, dicamba or metsulfuron were effective against creeping knapweed but metsulfuron and fluoroxpyr were not.

INTRODUCTION

Perennial weeds of cropping systems are competitive and difficult to control A range of perennial weeds with extensive root systems occur in S.A. including cutleaf mignonette, silverleaf, nightshade, *Solanum elaeagnifolium*, skeleton weed, *Chondrilla juncea*, field bindweed, *Convolvulus arvensis*, hoary cress, *Cardaria draba*, creeping knapweed, and bladder campion, *Silene vulgaris*.

The aim of this field research was to evaluate the efficacy of some new herbicides against cutleaf mignonette and creeping knapweed. These species share some common characteristics: an extensive perennial root system which produced new shoots each year; shoot emergence and growth in late winter and spring; strong competition with cereal crops, tolerance to grazing and cultivation; susceptibility to picloram; and the ability of most individuals to re-shoot after treatment with 2,4-D. 2,4-D is commonly applied to cereal crops to suppress shoot growth of these weeds until after harvest, but this treatment is not a satisfactory long-term control measure. Picloram is effective against both of the species but this treatment is not used for large infestations because of its expense and long soil persistence under southern Australian conditions.

Although creeping knapweed does not appear to be spreading rapidly, cutleaf mignonette continues to spread to new areas of S.A.

METHODS

Details of the various field trials conducted in S.A. from 1984 to 1986 were as follows:

<u>Design</u>. Randomized complete block with 4 replications.

<u>Plot size</u>. 10x2 m

<u>Application</u>. Hand-held CO_2 plot sprayer delivering 200 L/ha at 200 kPa using Spraying Systems TeeJet[R] 80015 flat fan spray tips.

<u>Assessments</u>. Visual scoring using the EWRC rating system.

Cutleaf mignonette

Site	Wasleys (1985)	Paskeville (1986)
AAR	450 mm	375 mm
Soil Type	Red-Brown loam	Calcareous sandy-loam
Soil pH (water)	7.6	8.4
Crop	Barley (cv. Galleon)	Wheat (cv. Warigal)
Treatment date		
- Before weed emergence	-	18/7/86
- Early flowering of weed	13/9/85	8/9/86
Assessments (DAT)	67	51

Creeping knapweed

Site	Georgetown	
AAR	450 mm	
Soil type	Red-clay-loam	
Soil pH (water)	7.1	
Site use: 1984	Barley (cv. Galleon)	
1985	Volunterr pasture	
1986	Volunteer pasture	
Treatment dates	29/8/84; 30/9/85	(applied to same plots)
Stage of weed at application	Mid-rosette	

RESULTS AND DISCUSSION

The sulfonyl urea herbicides chlorsulfuron, metsulfuron and CGA 131-036 were all effective against cutleaf mignonette (Table 1) but metsulfuron had little activity against creeping knapweed (Table 2). Clopyralid and clopyralid mixtures were effective against creeping knapweed but clopyralid was not effective against cutleaf mignonette. Clopyralid has also been shown to be effective against skeleton weed (1). Clopyralid is an analog of picloram and, although these three species are known to be susceptible to picloram, the tolerance of cutleaf mignonette to clopyralid demonstrates an important difference between the two herbicides.

Chlorsulfuron at 7.5 to 15 g ha^{-1}, metsulfuron at 3 to 9 g ha^{-1} and CGA 131-036 at 18.8 to 30 g ha^{-1} provided acceptable control of cutleaf mignonette. Lower rates of chlorsulfuron (7.5 g ha^{-1}) and metsulfuron (3 g ha^{-1}) were also effective when mixed with 2,4-D ester (560 g ha^{-1}). None of the sulfonyl urea herbicides tested gave satisfactory control when applied prior to the emergence of cutleaf mignonette. This is significant because the optimum time for treatment of annual weeds often occurs before cutleaf mignonette emerges.

Table 1. Effect of herbicides on the control of cutleaf mignonette, and pod contamination of cereal grain at Wasleys (W) and Paskeville (P).

Herbicide	Rate ($g\ ha^{-1}$)	Efficacy (EWRC Score)		Contamination (pods $kg.^{-1}$)	
		W	P	W	P
Before weed emergence					
Chlorsulfuron	15	-	3.3	-	20
Cetsulfuron	6	-	7.0	-	167
CGA 131-036	30	-	4.0	-	13
Early weed flowering					
Chlorsulfuron	7.5	2.8	2.0	2	0
Chlorsulfuron	15	2.3	1.0	1.2	0
Metsulfuron	3	-	1.5	-	10
Metsulfuron	4.2	2.1	-	3.2	-
Metsulfuron	6	-	1.5	-	0
Metsulfuron	9	1.9	-	0	-
CGA 131-036	18.8	-	1.5	-	0
CGA 131-036	26.3	-	1.5	-	0
CGA 131-036	30	2.4	-	2.4	-
Chlorsulfuron + 2,4-D ester	7.5+560	-	1.8	-	10
Metsulfuron + 2,4-D ester	3+560	-	1.5	-	0
Chlorsulfuron + metsulfuron	6+2.4	-	1.5	-	3
2,4-D ester	560	-	5.5	-	20
Clopyralid	150	-	8.8	-	90
Clopyralid	300	-	7.8	-	177
Untreated	-	9.0	9.0	304	237
l.s.d. (P = 0.05)				88	84

None of the treatments caused visible crop damage and there were no significant (P = 0.05) yield reductions. There were some significant yield increase at Paskeville, but it is believed these effects resulted from the control of some annual weeds rather than the cutleaf mignonette and so the data are not presented.

Table 2. Herbicide efficacy against creeping knapweed and number of survivors after the first (No. 1, 1984) and second (No. 2, 1985) spray applications at Georgetown (shoots m^{-2}).

Herbicide	Rate ($g\ ha^{-1}$)	Efficacy (EWRC score)		Number of Survivors	
		62 DAT[a]		387 DAT	362 DAT
		No.1	No. 2	No. 1	No. 2
Clopyralid	600	2.5	1.3	12.4	2.5
Clopyralid	1,200	1.3	1.0	0	1.4
Clopyralid + metsulfuron	600+14	1.8	1.0	3.3	6.1
Clopyralid + 2,4-D amine	600+500	1.8	1.5	14.6	5.6
Clopyralid + MCPA amine	600+500	1.8	1.5	9.0	4.9
Clopyralid + dicamba	600+200	1.8	1.8	8.5	3.3
Metsulfuron	7	8.5	6.5	49.3	58.4
Metsulfuron	14	7.3	4.5	45.3	52.6
Metsulfuron	21	6.0	4.5	56.6	67.0
Fluoroxypr	1,000	9.0	8.5	69.4	68.1
Picloram + MCPA	52+840	5.5	8.0	54.8	45.6
Untreated	-	9.0	9.0	70.1	68.8
l.s.d. (P = 0.05)				18.1	17.2

[a] Days after treatment.

Clopyralid alone at 600 and 1200 kg ha^{-1} clopyralid at 600 kg ha^{-1} mixed with 2,4-D (500 kg ha^{-1}), MCPA (500 kg ha^{-1}), dicamba (200 kg ha^{-1}), or metsulfuron (14 g ha^{-1}) significantly reduced creeping knapweed regrowth one year after both the first and second years of treatment (Table 2). There was no significant different between the 600 and 1200 kg ha^{-1} rate of clopyralid. The synergism that has been reported between clopyralid and 2,4-D, MCPA or dicamba for the control of skeleton weed (1) was not evident with creeping knapweed. Metsulfuron was generally ineffective against creeping knapweed except for a small reduction in regrowth one year after the first treatment (7 and 14 g ha^{-1}). Fluoroxypyr (1000 kg ha^{-1}) was not effective.

The efficacy of the clopyralid treatments (600 and 1200 kg ha^{-1}) were similat but slightly less than that reported in earlier work by Pritchard (2) in Victoria. Picloram+MCPA (52+840 kg ha^{-1}) significantly reduced regrowth after two applications but this treatment was not as effective as clopyralid.

REFERENCES

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2. Pritchard, G.H. 1984. Proc. 7th Aust. Weeds Conf. Perth 1, 286.