Chemical control of prickly lettuce (*Lactuca serriola* L.) in wheat and chickpeas in the Victorian Wimmera

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Summary

Herbicides were evaluated for the control of prickly lettuce (*Lactuca serriola* L.) in wheat and chickpeas during 1981 to 1984. Post-emergence applications of MCPA, dicamba, 2,4-D, chlorsulfuron and metribuzin plus methabenzthiazuron and pre-emergence chlorsulfuron were the most effective herbicides in wheat. Cyanazine applied before sowing and post-sowing pre-emergence, metribuzin and metribuzin plus methabenzthiazuron were effective in chickpeas.

Introduction

Lactuca serriola L. (prickly lettuce, wild lettuce, whip thistle) is an autumn–spring germinating annual which causes harvesting problems in cereals and grain legumes. Its incidence appears to be increasing, probably because of the extensive use of the pre-emergence herbicide trifluralin which does not control this weed. In recent years it has been particularly noticeable in crops of field peas and is an important problem in chickpeas because of the slow initial growth of the crop (Mahoney 1984).

This paper reports the results of field trials conducted between 1981 and 1984 to evaluate herbicides for the control of prickly lettuce in wheat and chickpeas.

Methods

General

The trials were located on alkaline, grey, self-mulching clays (Ug 5.2, Northcote 1979). Unless stated otherwise, the herbicide treatments were arranged in four randomized blocks. The plot size was 1.4 × 15 m, except in a trial on wheat in 1984 when the

Table 1 Control of prickly lettuce in wheat

Herbicide	Rate (kg a.i. ha^{-1})	Weeks after sowing	1981 Prickly lettuce plants m^{-2} (17 Sept.)	1981 Crop yield (t ha^{-1})	1983 Prickly lettuce plants plot^{-1} (7 Dec.)	1983 Crop yield (t ha^{-1})	1984 Prickly lettuce plants m^{-2} (22 Sept.)	1984 Crop yield (t ha^{-1})
unsprayed			4.2(0.720)[A]	4.2				
trifluralin	0.4	−3			28.7(1.147)	3.59	139.1(2.146)	5.36
chlorsulfuron	0.02	0			7.3(0.919)	3.24		
chlorsulfuron	0.02	6			0.9(0.270)	3.45		
chlorsulfuron	0.01	8	1.3(0.362)	4.6				
chlorsulfuron	0.02	8	0.7(0.223)	3.8				
chlorsulfuron	0.04	8	0	4.4				
metribuzin + methabenzthiazuron	0.10 + 0.42	4					3.3(0.639)	3.76
metribuzin + methabenzthiazuron	1.10 + 0.42	6			5.4(0.806)	3.52		
metribuzin + methabenzthiazuron	0.05 + 0.21	8	0	4.6				
metribuzin + methabenzthiazuron	0.10 + 0.42	8	0	4.5				
metribuzin + methabenzthiazuron	0.21 + 0.84	8	0	4.7				
Bayer SSH 0860	1.0	4					1.0(0.294)	4.32
Bayer SSH 0860	1.0	6						
methabenzthiazuron	0.6	4					31.2(1.508)	5.28
methabenzthiazuron	0.6	6			7.4(0.927)	3.55		
MCPA[B]	0.42	8			18.8(1.297)	3.27		
MCPA	0.42	10			1.2(0.345)	3.34	28.6(1.472)	4.88
MCPA	0.42	14					0.5(0.175)	5.06
dicamba	0.14	10			0.3(0.119)	3.48		
dicamba	0.14	14					0.6(0.195)	5.11
2,4-D amine	0.35	10			0.3(0.119)			
2,4-D amine	0.35	14					0.3(0.119)	4.93
l.s.d. P = 0.05			(0.288)	n.s.	(0.254)	n.s.	(0.545)	0.98

[A] Values in parentheses are log (x + 1) transformations.
[B] MCPA applied in amine form.

Table 2 Control of prickly lettuce in chickpeas

Herbicide	Time of application[A]	Rate (kg a.i. ha^{-1})	Trial 1 (1983) Prickly lettuce plants $plot^{-1}$ (27 Sept.)	Trial 1 (1983) Crop yield (t ha^{-1})	Trial 2 (1983) Prickly lettuce plants $plot^{-1}$ (27 Sept.)	Trial 2 (1983) Crop yield (t ha^{-1})	1984 Prickly lettuce plants $plot^{-1}$ (22 Sept.)	1984 Crop yield (t ha^{-1})
handweeded			nil	3.23	nil	2.95	nil	2.60
unsprayed			18.43(1.288)	2.09	25.41(1.422)	2.35	18.31(1.286)	1.64
oxyfluorfen	Pre	0.12	6.27(0.862)	2.57				
oxyfluorfen	Pre	0.24	10.00(1.041)	2.60				
oxyfluorfen	Pre	0.36	1.74(0.437)	2.51				
terbutryne	Post-pre	0.28			16.01(1.231)	2.78	24.31(1.403)	1.85
terbutryne	Pre	1.0	11.35(1.092)	2.84				
cyanazine	Pre	2.0	9.22(1.010)	2.87			1.06(0.314)	2.89
methabenzthiazuron	Post	0.38			4.98(0.777)	1.18		
methabenzthiazuron	Post-pre	1.0					22.66(1.374)	1.48
methabenzthiazuron	Pre	1.75	9.33(1.014)	2.72				
Bayer SSH 0860	Post-pre	1.0	0.19(0.075)	3.55				
metribuzin	Post-pre	0.4			3.00(0.602)	2.81		
metribuzin + methabenzthiazuron	Post-pre	0.10 + 0.42			5.34(0.802)	3.05		
prometryne	Post-pre	0.5			21.52(1.353)	2.66		
Prometryne	Post-pre	0.55					13.64(1.165)	2.16
MCPA[B]	Post	0.12			3.78(0.679)	2.40		
MCPA	Post	0.22			1.91(0.464)	1.60		
MCPA	Post	0.34			1.52(0.401)	1.38		
l.s.d. P = 0.05			(0.323)	0.44	(0.293)	0.81	(0.340)	0.60

[A] Terbutryne and methabenzthiazuron were incorporated with harrows.
Pre, pre-sowing; Post-pre, post-sowing, pre-emergence; Post, post-emergence, 6 weeks after sowing.
[B] MCPA applied as sodium salt.

length was 2 m. Herbicides were applied through Spraying Systems flat fan, teejet nozzles mounted on a hand-held boom delivering 100–110 l ha^{-1} at 200–210 kPa. Trifluralin applications were incorporated with harrows.

The number of prickly lettuce plants was counted per plot or in five 1 m^2 quadrats per plot, depending on the density present. The other main weeds occurring in the trials were Indian hedge mustard (*Sisymbrium orientale* L.), deadnettle (*Lamium amplexicaule* L.), hogweed (*Polygonum aviculare* L.) and fumitory (*Fumaria parviflora* Lam). Grain was harvested with a small-plot harvester.

Control in wheat

Herbicides were evaluated in wheat sown into naturally occurring populations of prickly lettuce at the Cereal Experimental Centre, Dooen, in 1981 (three replicates) and at Blackheath, 23 km from Dooen, in 1983. In both 1983 and 1984, plots sprayed with trifluralin only were used as the controls as it was known that this herbicide controlled most of the other weeds without significantly affecting prickly lettuce. Because there are few naturally occurring uniform populations of prickly lettuce, seed was sown by hand on another site at Dooen in 1984. In all plots, Olympic wheat was sown at 80 kg ha^{-1} with 9 kg ha^{-1} phosphorus applied as superphosphate. The herbicide treatments are shown in Table 1.

Control in chickpeas

Various herbicides and herbicide rates are being evaluated for general weed control in chickpeas at Dooen. Two of the field trials were utilized in 1983 and one in 1984 to investigate the control of prickly lettuce. Chickpeas (cv. CPI 56296B) were inoculated and sown at 120 kg ha^{-1} with 9 kg ha^{-1} phosphorus applied as superphosphate. A mixture of weed seeds, including prickly lettuce, was sown just before the pre-sowing applications of herbicides. The numbers of prickly lettuce plants per plot were counted for selected herbicides and rates based on previous experience with the chemicals (Table 2).

Results

Control in wheat (Table 1)

Chlorsulfuron (0.02)* applied pre-emergence resulted in 75% control of prickly lettuce in 1983, whilst the same rate applied post-emergence gave 83% and 97% control in 1981 and 1983 respectively. Chlorsulfuron (0.04) achieved 100% control in 1981.

All rates of metribuzin plus methabenzthiazuron provided 100% control in 1981, and a rate of (0.10 + 0.42) gave 81% and 98% control in 1983 and 1984 respectively. However, this rate caused a significant reduction (P = 0.05) in wheat yield in 1984. Methabenzthiazuron (0.6) alone was less effective, resulting in 74% and 78% control in 1983 and 1984.

MCPA (0.42), dicamba (0.14) and 2,4-D (0.35) all provided excellent control. However, the results in 1983 and 1984 indicate that MCPA should be applied as late in the season as possible. In 1983 and 1984 this resulted in 96% and 99.6% control.

SSH 0860 (1.0) also provided excellent control but there was a significant reduction (P = 0.05) in the wheat yield in 1984.

*All rates of application of the herbicides expressed as kg active ingredient ha^{-1}.

Control in chickpeas (Table 2)

In trial 1 (1983), pre-sowing application of oxyfluorfen (0.36) and SSH 0860 (1.0) applied post-sowing, pre-emergence resulted in 91% and 99% reductions in prickly lettuce respectively.

In trial 2 (1983), post-sowing, pre-emergence metribuzin (0.4) and post-emergence MCPA (0.12) resulted in 88% and 85% control. Higher rates of MCPA were more effective but there was a significant reduction in crop yield. Post-emergence methabenzthiazuron (0.55) gave 80% control but also significantly reduced the yield.

In 1984, pre-sowing applications of cyanazine (2.0) provided a 94% reduction in the density of prickly lettuce and a significant increase in crop yield.

Discussion

It has been shown that several herbicides selectively control prickly lettuce in wheat. The post-emergence herbicides MCPA, 2,4-D and dicamba are best applied as late as possible because germination of the weed continues into spring (Amor, unpublished data). Possibly for the same reason, chlorsulfuron (0.02) appears to be more effective post-emergence than when applied before sowing.

Methabenzthiazuron (0.6) is less effective than metribuzin plus methabenzthiazuron (0.10 + 0.42) but the latter can cause depressed wheat yields, as in 1984. Bayer SSH 0860 (1.0) provides excellent control of prickly lettuce but also reduces yield.

Cyanazine (2.0) applied before sowing is the most promising herbicide for the control of prickly lettuce in chickpeas. Post-sowing, pre-emergence applications of metribuzin (0.4) and metribuzin plus methabenzthiazuron (0.10 + 0.42) are also worth further investigation. Terbutryne (1.0) pre-sowing, (0.28) post-sowing, pre-emergence, (1.5) post-sowing, pre-emergence and prometryne (0.5–0.55), post-sowing, pre-emergence were ineffective. Methabenzthiazuron (0.38) post-emergence and oxyfluorfen (0.36) are not sufficiently selective (J. Mahoney, unpublished data) and Bayer SSH 0860 is unlikely to be marketed in Australia.

With the range of herbicides available it is possible to obtain a high level of control of prickly lettuce in cereals and grain legumes, as well as on fallows. This, together with the suppression of the weed by dense crops grown under high levels of soil fertility (Amor, unpublished data), indicates that it is feasible, with good crop husbandry, to achieve long-term control of prickly lettuce in the Wimmera.

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