

DIURON AS A PRE-EMERGENCE HERBICIDE FOR WEED CONTROL IN CEREALS

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Summary. The results of two experiments in which diuron was used for pre-emergence weed control in cereals are given. In the first experiment, diuron when used in conjunction with 2,4-D amine, controlled capeweed which had germinated prior to seeding and doublegee which germinated in the crop. Diuron applied as a post-planting pre-emergence treatment in combination with either pendimethalin or metribuzin effectively reduced annual ryegrass and medic populations in the second experiment. In both experiments, the addition of diuron to the herbicide mixture resulted in increased yields where weed control was achieved.

INTRODUCTION

Residual herbicides provide the opportunity for controlling weeds with a staggered germination pattern. This can reduce the need for repeated treatments with contact or non-residual translocated herbicides when repeated germination occurs. Diuron is one herbicide with the capacity to control both grasses and broad-leaved weeds over an extended period. Post-emergence applications of diuron have been shown to control both grasses and broad-leaved weeds in South Australia (1), while combinations with MCPA amine have given excellent control of a range of broad-leaved weeds (2). Initial studies of herbicides for weed control in lupins indicated that diuron rates of 0.4 kg to 0.8 kg/ha as pre-emergence treatments were effective in controlling a range of broad-leaved and grass weeds (3). Many broad-leaved and grass weeds may also be suppressed for up to three weeks prior to seeding by pre-sowing applications of diuron (4).

This paper reports the results of two experiments in which diuron was used alone or in combination with other herbicides for broad-leaved and grass weed control. Timings ranged from 14 days prior to seeding to three days after seeding.

METHODS

Experiment 1. A site with both capeweed, *Arctotheca calendula*, and brome grass *Bromus diandrus*, and with a residual doublegee *Emex australis*, seed bank was selected. Capeweed plants were at the 4 to 10 leaf stage at a density of 250 plants/m², while doublegee plants were at the 4 to 6 leaf stage with a density of 3 to 4 plants/m². Brome grass was at the 2 to 4 leaf stage with density ranging from 0 to 100 plants/m². Herbicide treatments (Table 1) were applied 14 days prior to seeding with or without a cultivation with a tyned implement 6 days prior to seeding with wheat cv Eradu. A post-emergence treatment was applied at Zadoks 13 to control broad-leaved weeds in the plots receiving only cultivation. Trial design was a randomised complete block using three replications of plots 2.5 x 40.0 m. Five samples (1.0 x 0.15m) were taken at random from each plot 110 days after seeding. The weeds were separated, dried and weighed and at crop maturity harvesting cuts of 1.25m width were taken from the entire length of the plot and grain weight recorded.

Experiment 2. A site with an expected population of annual ryegrass, *Lolium rigidum*, medic, *Medicago polymorpha* and wild turnip, *Brassica tournefortii*, was seeded with barley cv Stirling. Herbicide treatments (Table 2) were applied either immediately before seeding (IBS) or post-planting pre-emergence (PPPE) at three days after seeding. Weed numbers were counted 50 days after seeding. No wild turnip plants emerged at this site. The trial design was a strip plot using three replications of plots 3 x 10m. The results were analysed using the nearest neighbour technique (Spatial Analysis of Field Experiments (5)). The area harvested in each plot was 1.4 x 10m.

RESULTS AND DISCUSSION

Diuron + 2,4-D and glyphosate + 2,4-D controlled the capeweed, which resulted in no transplants of capeweed in the crop (Table 1). Doublegee plants did not emerge prior to seeding, except in the cultivated treatments. Of the cultivated treatments, diuron + 2,4-D gave the best control of doublegee in the crop. Brome grass plants were controlled by either cultivation or glyphosate treatments, but not by the diuron + 2,4-D treatment alone. Crop yields were largely a reflection of weed dry weights, although the yield from the glyphosate + 2,4-D treatment with no cultivation was less than expected. A response to cultivation other than for weed control may have occurred. Transplanted capeweed on the nil pre-seeding herbicide treatment was not controlled by diuron + MCPA applied at Zadoks 13 and the capeweed suppressed the other weed species.

Table 1. The effect of herbicide treatments on weed dry weight and crop yield in both direct and conventionally seeded wheat.

Pre-planting Treatment	Rate(g/ha)	Weed dry weight(g/m ²)			Crop Yield (t/ha)
		Capeweed	Doublegee	Brome	
Diuron + 2,4-D amine	500 + 500	0	0	769	1.73
Diuron + 2,4-D amine(+) ^a	500 + 500	0	0	0	3.25
Glyphosate + 2,4-D amine	180 + 180	9	13	13	2.60
Glyphosate + 2,4-D amine(+)	180 + 180	0	339	7	2.73
Nil ^b (+)		600	0	9	1.95
l.s.d. (P=0.05)					0.84

^aTreatments designated (+) were cultivated 6 days prior to seeding.

^bThis treatment received diuron (175 g/ha) + MCPA amine (200 g/ha) at Zadoks 13 for broad-leaved weed control.

In the second experiment, diuron effectively reduced annual ryegrass and medic plant numbers, but was most effective when applied as a post-planting pre-emergence treatment in combination with pendimethalin or metribuzin (Table 2). These two treatments produced large increases in yield compared to the other four treatments. Both treatments where diuron was applied immediately before seeding resulted in visible diuron damage to barley and this may have produced yield reductions.

Table 2. The effect of six pre-emergence herbicides on weed numbers and crop yield of Stirling barley.

Treatment Yield	Rate (g/ha)	Timing	Weed numbers (/m ²)		Crop (t/ha)
			Ryegrass	Medic	
Untreated			338	188	1.26
Pendimethalin	500	IBS	331	151	1.67
Metribuzin	150	IBS	253	164	1.69
Diuron	500	IBS	266	216	1.53
Pendimethalin + diuron	330 + 500	IBS	151	201	1.60
Pendimethalin + diuron	330 + 500	PPPE	139	32	2.17
Metribuzin + diuron	100 + 500	PPPE	44	22	2.29
l.s.d. (P=0.05)					0.19

^aIBS; incorporated by sowing. PPPE; post-planting pre-emergence.

These results indicate that diuron, applied pre-emergence in combination with other herbicides, can be used to control doublegee, capeweed and annual ryegrass in cereals. Diuron has also given high levels of silvergrass, *Vulpia* spp, control at 500 g/ha when applied up to 21 days prior to seeding (J. R. Peirce, unpublished), as well as good control of annual ryegrass when used in combination with metolachlor (D.G. Bowran, unpublished). While diuron applied prior to seeding may cause crop plant death where incorporation is poor or insufficient time is allowed for degradation prior to seeding, the post-planting pre-emergence option, in mixture with other herbicides, is worthy of further research. This treatment allows for better spatial separation of the diuron from the crop root system.

ACKNOWLEDGEMENTS

The authors wish to thank B. Rayner and N. Thomson for their assistance in conducting this work.

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