EVALUATION OF POST-EMERGENCE HERBICIDES FOR WEED CONTROL IN SEEDLING PHALARIS PASTURES

R.W. Watson[1], N. Strachan[2], and M.J. Hill[1]
[1]Department of Agriculture, PO Box 168, Scone N.S.W. 2337
[2]Agricultural Research & Advisory Station, Glen Innes N.S.W. 2370

Summary. A range of post-emergence herbicides were evaluated for weed control in a seedling pasture of phalaris and legumes. Phalaris seedlings displayed symptoms of phytotoxicity to many of the herbicide treatments at 21 days after treatment. However at 64 days after treatment, dry matter production from phalaris was largely unaffected, except in the case of metsulfuron which killed most of the pasture species. Low rates of MCPA alone and in mixtures with dicamba and diuron, gave good weed control and caused minimal damage to seedling phalaris pasture. Lucerne was highly sensitive to all herbicides except 2,4-DB. Subterranean clover displayed a moderate to high tolerance to many of the phenoxy herbicide treatments.

INTRODUCTION

Approximately 150,000 ha of phalaris based pasture are sown each year in N.S.W. This area is expected to increase significantly as many producers reduce cropping areas and increase the area sown to pastures. Heavy competition from annual weeds during the establishment phase of these pastures can result in poor pasture establishment and production.

There are a limited number of cost-effective herbicides registered for annual weed control in seedling pastures. Bromoxynil and 2,4-DB are the most commonly used products at present. However their use is limited by the high cost, $18-25/ha, which represents 20-30% of the cost associated with establishing a pasture. In addition these products have a lower efficacy on a number of important broad-leaved weeds and are effective only on a limited range of weed species.

It has been shown that the phenoxy group of herbicides such as 2,4-D, MCPA and dicamba, alone or in mixtures with other herbicides, may offer a wider and more cost-effective option than 2,4-DB or bromoxynil for broad-leaved weed control in phalaris pasture (1, 2, 3,). In this study we evaluate the sensitivity of seedling phalaris pastures containing sown legumes to phenoxy and other herbicides having potential for early post-emergence weed control.

METHODS

The site was a seedling phalaris (cv. Sirolan) pasture growing on self mulching basalt soil (pH 6.5;$CaCl_2$) at Scone N.S.W. (32°S, elevation 250 m). The pasture consisted of phalaris, *Phalaris aquatica* cv. Sirolan; 94 plants/m^2, lucerne, *Medicago sativa* cv. Pioneer 577; 33 plants/m^2, Subterranean clover, *Trifolium subterraneum* cv. Clare; 26 plants/m^2 and a range of annual grass and broad-leaved weeds.

The treatments used are listed in Table 1. The trial was arranged as a randomized complete block with four replications. Plots were 8x4 m. At application the phalaris had 2 to 5 leaves, lucerne 4 to 5 trifoliate leaves and subterranean clover 3 to 4 trifoliate leaves.

The herbicides were applied on 16 September under excellent growing conditions using a hand-held 3 m boom, applying 130 L of water/ha at 240 kPa. The effect of the herbicides on phalaris were scored visually 21 and 64 days after treatment (DAT) using a 0-10 rating scale (0-3, minimal damage; 4-7, moderate damage and suppression that would be unacceptable; 8-10, severe damage to complete death). The same scale was used to rate lucerne, subterranean clover and broadleaf weeds. In addition, 64 days after spraying two 0.25 m^2 quadrats were harvested from each plot, and the botanical composition and dry matter yield determined.

RESULTS AND DISCUSSION

Visual Phytotoxicity. Visual scores of herbicide effects on phalaris and legumes are presented in Table 1.

Table 1. Visual scores of damage to pastures species 21 and 64 DAT (0-10 scale where 0 = no effect)

Herbicide	Rate (kg ai/ha)	Phalaris		Lucerne		Subclover	
		21	64	21	64	21	64
2,4-DB	1.40	0.0	0.8	1.0	0.0	0.0	0.0
2,4-D amine	0.75	7.3	3.3	10.0	8.0	6.8	1.0
	1.50	8.0	2.0	10.0	8.3	7.3	0.5
MCPA amine	0.375	0.0	2.8	9.0	3.8	1.0	1.0
	0.75	3.3	1.0	9.0	3.8	4.0	1.0
	1.50	5.3	0.8	10.0	10.0	5.8	0.0
MCPA/diuron	0.25/0.25	0.0	1.5	8.5	1.5	1.0	0.0
Dicamba/MCPA	0.08/0.34	0.8	1.0	9.0	4.0	4.5	1.3
	0.16/0.68	4.3	1.3	10.0	9.5	7.8	1.3
Metsulfuron	0.0042	9.0	8.0	10.0	8.0	10.0	9.8
	0.009	9.5	9.5	10.0	8.5	10.0	10.0
Unsprayed		0.0	0.0	0.0	0.0	0.0	0.0
l.s.d. (P=0.05)		0.8	2.4	0.2	2.9	0.7	1.9

Phalaris seedlings displayed symptoms of phytotoxicity to varying degrees depending on treatment. These consisted of purple and red discolouration, "onion leafing", retarded leaf and root development, leaf-tip burn and with metsulfuron, severe plant mortality. Except in the last case, seedlings had largely recovered from these effects 64 DAT. During brief dry periods, symptoms of plant moisture stress occurred earlier and with more severity in 2,4-D amine and MCPA treatment; a result of the apparently retarded root development. Under dry conditions these herbicides may produce effects on phalaris seedlings even more severe than those exhibited here.

Lucerne was severely affected by all herbicide treatments except 2,4-DB; stems and leaves were twisted and distorted typifying hormone herbicide damage. Only at low rates of MCPA alone and in mixtures with diuron, and low rates of dicamba did these symptoms diminish significantly 64 DAT. Sub clover was moderately to severely damaged by a number of treatments 21 DAT but recovered from all except metsulfuron which was lethal 64 DAT.

Pasture Production. Dry matter yield of the pasture 64 DAT is presented in Table 2. All herbicides except metsulfuron significantly reduced broad-leaf weeds when compared with the unsprayed control treatment. Metsulfuron controlled turnip weed, stagger weed and deadnettle. However, saffron thistle and bathurst burr were not controlled, and their subsequent growth was enhanced by the removal of all pasture species.

All herbicide treatments except metsulfuron increased production of sown pasture species over that of the control treatment. Metsulfuron significantly reduced total biomass production because it killed the pasture species.

Table 2. Dry matter production (kg/ha) 64 DAT

Herbicide	Rate (kg ai/ha)	Phal.	Luc.	S.C.	Tot. Past.	B.L. Weeds	R.G.	Total Biomass
2,4-DB	1.40	3060	860	920	4840	1040	1160	7040
2,4-D amine	0.75	3320	60	580	3960	520	580	5060
	1.50	2720	20	1160	3900	280	860	5045
MCPA amine	0.375	3940	220	660	4820	760	360	5940
	0.75	3880	60	900	4840	360	1160	6360
	1.50	3200	0	680	3880	64	1840	5784
MCPA/diuron	0.25/0.25	3240	300	780	4320	880	1040	6240
Dicamba/MCPA	0.08/0.34	4480	420	740	5620	620	580	6820
	0.16/0.68	4580	0	320	4900	140	320	5360
Metsulfuron	0.0042	740	140	3	883	2600	320	3803
	0.009	340	120	3	463	2820	30	3313
Unsprayed		2540	560	220	3240	2600	1180	7040
l.s.d. (P=0.05)		1360	240	480	1600	1060	920	2460

Phalaris dry matter production was a function of:

1. reponse to herbicide treatments
2. competition from sown legumes remaining after herbicide treatment
3. competition from weed species not controlled by the herbicide treatment.

Although many herbicides treatments induced moderate to severe phytotoxic effects in phalaris seedlings 21 DAT, there was little difference in phalaris dry matter production between herbicide treatments 64 DAT except for metsulfuron. Metsulfuron killed most phalaris seedlings and hence dry matter production was greatly reduced. 2,4-D amine at 1.5 kg/ha controlled most weeds but phalaris production was reduced when those treatments with equivalent weed control are compared. The combination of dicamba and MCPA increased the yield of phalaris relative to other treatments through relatively good broad-leaf weed control and some suppression of legumes.

Although not significantly different, MCPA at equivalent amounts of active ingredient, consistently produced a lower visual damage score 21 DAT and 15% higher dry matter production 64 DAT on the phalaris when compared to 2,4-D amine.

All herbicide treatments, except 2,4-DB, dramatically reduced lucerne density and dry matter production, although some plants in all treatments (MCPA 1.5 kg/ha excluded) continued to survive. Dry matter production of subterranean clover was largely unaffected by the majority of herbicide treatments; minor effects were attributed to differences in competitive pressure from other components of the sward induced by herbicide effects.

CONCLUSION

This and previous screening trials (1, 2, 3) indicate that phenoxy herbicides can be safely applied to seedling phalaris pasture. In this trial, any suppression of phalaris as a direct result of the herbicide treatment was far less significant than the suppression induced by weed competition.

The addition of lucerne to a phalaris pasture reduces the herbicides which can be safely used for broad-leaved weed control; bromoxynil, prometryn and 2,4-DB are registered in N.S.W. but these are more expensive than the phenoxy herbicides. However, the contribution of lucerne to pasture production and quality may more than pay for the extra expense. Subterranean clover displays tolerance to the phenoxy herbicides, enabling a wide range of weeds that can be controlled cost effectively in a phalaris pasture containing this legume.

From this trial we conclude that MCPA at 0.375 kg/ha, dicamba/MCPA at 0.08/0.34 kg/ha and MCPA+diuron at 0.25+0.25 kg/ha are relatively safe, effective and inexpensive alternatives to 2,4-DB or bromoxynil on phalaris pastures containing legumes. Where lucerne is included in the pasture mix only 2,4-DB or bromoxynil should be used.

REFERENCES

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