A COMPARISON OF SOME POST-EMERGENCE HERBICIDES FOR CONTROL OF GRASS WEEDS

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SUMMARY

Several new selective post-emergence grass weedkillers and some non-selective compounds were compared in four field trials. Most selective herbicides gave good control of annual warm-zone grasses although some chemicals required 8-12 weeks for their maximum effect at the late treatment stage. Good control of paspalum (*Paspalum dilatatum*) was also achieved with fluazifop-butyl, CGA-82725, Dowco 453 and sethoxydim but HOE 35609 3H EE 01 provided only 75% control at the highest recommended rate. None of these selective herbicides affected clovers (*Trifolium* spp) and the majority, especially Dowco 453 prevented significant germination and regrowth of ryegrass (*Lolium* spp). The three non-selective herbicides gave good control of annual grasses and paspalum; glufosinate-ammonium allowed very quick regeneration of ryegrass while preventing regeneration of clovers for much longer than SC-0224 or glyphosate.

INTRODUCTION

During the past few years a number of new selective herbicides have been developed for control of grass weeds in broadleaf crops. Most of these new compounds are rapidly translocated to the meristematic growing point resulting in a rapid cessation of growth and death of inner tissues. The outermost leaves usually remain green and healthy for 3-6 weeks before they also wither and die (Velovitch 1982).

Three new non-selective herbicides, all closely related to glyphosate, are also currently being evaluated. These may find a place for selective control of grass weeds through suitable application times and methods in some crops.

The work reported in this paper compared the efficacy of some of these recently developed herbicides for control of several warm-zone grass weeds.

MATERIALS AND METHODS

Four trials were conducted in the Waikato during the 1982-83 season. Trials 1 and 2 (on Horotiu sandy loam and Hamilton clay loam respectively) involved two times of application on annual grass weeds. The principal weeds were summer grass (*Digitaria sanguinalis*), smooth witchgrass (*Panicum dichotomiflorum*) and barnyard grass (*Echinochloa crus-galli*) with small amounts of witchgrass (*Panicum capillare*) and crowfoot grass (*Eleusine indica*). The first application was at commencement of tillering (3-6 tillers) whereas the second was at the first emergence of seedheads. Broadleaf weeds were controlled in these trials with atrazine (Gesaprim 500 FW) applied before grass emergence.

Trials 3 and 4 were laid down in autumn on paspalum-dominant swards. Trial 3 (on Hamilton clay loam) had not been grazed for 3 weeks and had 5 cm of fresh growth while Trial 4 (on Rukuhia peat) had about 20 cm of growth after being closed for 6 weeks.

All trials were of a randomised block design with three or four replications. Plots were 2 m wide and varied from 4-8 m in length.

Treatments were sprayed with a CO_2 powered precision sprayer applying 300 litres/ha at 210 kPa. A white emulsifiable crop oil (BP Crop Oil) was mixed with alloxydim sodium (Alloxol) at 4 litres/ha and with sethoxydim (Alloxol S) and Dowco 453 at 1% v/v of spray mix. A wetting agent (Citowett) at 0.6% v/v was added to fluazifop butyl (Fusilade).

Regular assessments of the efficacy of the treatments were made along with observations on regrowth and/or fresh germination of grasses. In Trials 3 and 4 effects of treatments on the growth of clovers were also assessed.

RESULTS AND DISCUSSION

Annual grasses

The effectiveness of various herbicide treatments on annual grass weeds is shown in Table 1. Differences in the rate of knockdown between the selective and non-selective chemicals are evident in both the early and late treatments. When assessed 3 weeks after application all the non-selective materials had achieved their maximum kill. Paraquat (Gramoxone) gave maximum damage within 10 days and some new growth and/or regrowth had occurred by the end of the third week. Among the grass herbicides, fluazifop-butyl, CGA-82725 (Topik) and Hoe 35609 3H EE 01 appeared to be slower acting than others, the differences being more pronounced at the lower rates of application.

TABLE 1: Percent damage to annual grasses with the early (mid-December) and late (mid-January) times of application. (Data are average of Trials 1 and 2).

	Early application			Late application		
Herbicide	Rate (kg/ha)	3 wks after spraying	12 wks* after spraying	Rate (kg/ha)	3 wks after spraying	12 wks** after spraying
alloxydim-sodium	1.50	100	84	2.0	86	99
CGA-82725	0.25	80	97	0.50	75	90
	0.38	85	98	0.75	90	96
Dowco 453	0.125	100	96	0.25	86	100
	0.25	100	99	0.50	95	100
fluazifop-butyl	0.125	80	88	0.25	75	91
	0.25	91	85	0.50	80	92
Hoe 35609 3H EE 01	0.21	90	89	0.32	60	82
	0.32	100	97	0.42	69	79
sethoxydim	0.125	89	86	0.25	78	92
	0.25	98	95	0.50	88	100
glufosinate-ammonium	0.50	95	44	1.00	100	91
	1.00	99	35	1.50	100	94
glyphosate	0.36	100	29	0.72	94	97
	0.72	100	21	1.40	100	99
paraquat	0.50	97	45	0.75	53	37
SC-0224	0.48	100	38	0.96	99	95
	0.96	98	32	1.92	99	98
SED		9	15		11	9
CV%		34	32		39	41

*Live matter mainly new growth
**Live matter mainly regrowth

Except for paraquat which gave poor control at the late stage there were no marked differences between the other non-selective herbicides. New growth started only 4 weeks after early applications and by 12 weeks plots had attained a considerable amount of cover, although growth and vigour was much less than in the untreated plots. At the late stage, the dead litter prevented new growth but at low rates of application there was some regrowth of summer grass starting from the nodes.

At the early stage all selective herbicides provided good control of annual grasses, although CGA-82725 and fluazifop-butyl took longer to show their maximum effectiveness in Trial 1 which had patches of dense and large grasses in some plots. The lower damage scores 12 weeks after spraying in some plots (Table 1) were due to the regrowth of summer grass and crowfoot grass. Differences in damage levels between the selective and non-selective herbicides 12 weeks after application demonstrate the amount of new growth that had occurred in plots treated with the non-selective materials.

At the late time of application the grass herbicides took longer to show their maximum effect. Even at 12 weeks after application some plants had apparently healthy foliage but the inner tissues were dead and the foliage came off very easily when pulled. The low damage scores for low rates of sethoxydim, CGA-82725 and fluazifop-butyl 12 weeks after spraying were due to regrowth of summer grass and barnyard grass. Plots treated with Hoe 35609 3H EE 01 also had some crowfoot grass.

Paspalum

The three non-selective herbicides tested were all effective in controlling paspalum in both trials. Glufosinate-ammonium (Hoe 39866), which gave quicker knockdown than glyphosate (Roundup) or SC-0224 showed some chlorotic regrowth when assessed 4 weeks after application (Table 2). The higher damage scores at 8 weeks were the result of secondary die-back.

Most of the selective herbicides had not attained their maximum level of damage at the 4-week assessment (Table 2). However, 8 weeks after spraying all chemicals gave satisfactory control of paspalum except Hoe 35609 3H EE 01 which allowed regrowth in both trials. The purple colouring of the foliage after sethoxydim and fluazifop-butyl treatments as mentioned by Naish *et al* (1982), Rahman and Sanders (1982) and Stewart *et al* (1982) was observed in many plots in both trials.

TABLE 2: Effect of herbicides on paspalum and on regeneration of clover and ryegrass.

Treatment 31.3.83	Rate (kg/ha)	% damage to paspalum 4 weeks		% damage to paspalum 8 weeks		% cover at 8 weeks Clover		% cover at 8 weeks Ryegrass	
		Trial 3	Trial 4	Trial 3	Trial 4	Trial 3	Trial 4	Trial 3	Trial 4
CGA-82725	0.75	68	70	99	89	81	80	17	7
	1.50	73	68	100	92	78	73	12	13
Dowco 453	0.50	77	67	100	92	83	90	4	0
	0.75	80	77	100	98	83	90	0	1
fluazifop-butyl	0.75	68	72	100	95	83	85	11	8
	1.13	80	70	100	95	82	82	8	7
Hoe 35609 3H EE 01	0.42	60	57	53	50	78	56	20	43
	0.84	63	70	70	77	78	72	20	26
sethoxydim	0.50	77	65	90	87	77	85	20	10
	0.75	72	63	100	87	90	85	8	8
glufosinate-ammonium	1.50	78	78	100	100	0	0	75	35
	2.20	83	85	97	100	0	0	72	40
glyphosate	1.40	98	97	100	100	20	2	27	8
	2.00	99	99	100	100	17	2	17	13
SC-0224	1.92	98	93	100	100	20	2	23	8
	2.88	99	99	100	100	10	7	18	12
SED		4.4	3.8	9.8	6.4	5.7	7.6	6.2	5.6
CV%		3.9	3.6	8.5	5.4	7.3	10.5	17.1	24.2

Effect on clover and ryegrass

Glufosinate-ammonium gave a rapid kill and also allowed quick regeneration of ryegrass in the pasture (Table 2). Only 4 weeks after spraying the ryegrass cover in Trial 3 was 73 and 57% for the low and high rates of glufosinate-ammonium respectively. This chemical however, completely prevented the regeneration of clovers. In contrast, plots treated with glyphosate or SC-0224 had attained a cover of up to 20% clover in Trial 3. The clover population was low overall in Trial 4 but the differences between the three chemicals above were still evident.

The selective grass herbicides did not show any adverse effects on clovers in either trial and variations in the amount of clovers were mainly due to the abundance of ryegrass and broadleaf weeds. Most selective herbicides allowed some regeneration of ryegrass by 8 weeks after spraying. The highest populations were in plots treated with Hoe 35609 3H EE 01 while Dowco 453 kept plots virtually free of ryegrass at least up to the 8 week period.

The results reported here show that all three non-selective chemicals gave good control of annual grasses and paspalum, but glufosinate-ammonium differed from the other two in its effect on clovers and ryegrass. Thus glufosinate-ammonium could be more useful when good suppression of clovers is a major requirement such as for minimum tillage and direct drilling.

There were large differences in the speed of kill between the selective and non-selective herbicides, especially when sprayed at the late growth stage of grass weeds. All the selective grass herbicides gave good control of annual grasses and paspalum except for Hoe 35609 3H EE 01. Alloxydim-sodium was not included in trials on paspalum because it proved ineffective on this weed in previous work (Rahman and Sanders 1982).

While grass herbicides used in this work showed similar activity on annual grasses, further trials may confirm major differences in their effectiveness on perennial grasses. Despite their similar chemical structure, therefore, each of these herbicides could find a place in the market for controlling specific weeds.

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