HERBICIDES FOR THE CONTROL OF MERCER GRASS (*PASPALUM DISTICHUM*) IN ASPARAGUS

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SUMMARY

Five selective grass herbicides and glyphosate were evaluated for control of Mercer grass (*Paspalum distichum*) in asparagus. Most treatments were effective at the 2-6 tiller stage of the weed in early November, but considerable and continuing emergence of new tillers occurred from underground rhizomes in most plots. Better long term control resulted from treatments at the 'close up' stage of asparagus when Mercer grass was starting to come into head. Haloxyfop, glyphosate and high rates of quizalofop gave good initial control with little regrowth. Fluazifop-butyl and clethodim (⩾720 g/ha) were slow acting but at high rates provided good long term control. Sethoxydim was the least effective.

INTRODUCTION

Satisfactory season-long control of the complete weed spectrum is a major problem in asparagus crops, particularly in the mild, high rainfall regions of the North Island. Soil-applied herbicides with a long residual life are generally used to achieve this at present (Rahman 1986). Cultural weed control measures are only likely to take place at close up or over the winter period after the ferns have been cut down. Such reliance on chemical weed control measures can lead to invasion by plants such as perennial grasses which are tolerant to the herbicides used.

Mercer grass has become a problem weed in asparagus crops in recent years. It is a stoloniferous and rhizomatous grass found throughout the North Island, especially in frost-free localities. Because of its vigorous growth and ability to spread, it has a large competitive effect on the production of asparagus. It also seriously hampers the harvesting of spears during the cutting season. It shows high resistance to most residual herbicides used in asparagus, particularly the triazines, ureas and substituted diazines (Matthews 1975).

The recent discovery of several post-emergence grass herbicides selective to broadleaf crops provides an effective alternative to the traditional pre-emergence treatments. Their activity on some perennial grasses has been reported by many New Zealand and overseas researchers (eg. Rahman *et al* 1983, 1988; Richardson and West 1986; Sanders *et al* 1988; Wells *et al* 1985). Hartley (1984) showed big variations in activity of different grass herbicides on different grass weed species. Very little information is available on the comparative efficacy of these herbicides on Mercer grass. The objective of this research was to evaluate the currently available grass herbicides for selective control of Mercer grass in asparagus.

MATERIALS AND METHODS

This study included two field trials conducted at the same time but at two different growth stages of Mercer grass. Trial 1 was on an infestation that was becoming established after the winter cultivation and a pre-emergence application of terbumeton/terbuthylazine in early September. Treatments were applied on 2 November 1989 (during the harvest season) when the grass had 2-6 tillers and the vegetation was 15-20 cm tall.

Trial 2 was conducted on a more mature stand of Mercer grass which was fairly dense over most of the trial site, up to 40 cm tall and was starting to come ino head. The

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herbicides were applied on 13 December 1989, the day the asparagus block was closed up for the season.

The trial site was an established block of asparagus (cv. N.Z. Beacon) on a Horotiu sandy loam soil near Hamilton. Individual plots were 2 m x 10 m and the treatments were replicated five times in a randomised block design. The herbicides were applied with a CO_2 powered precision sprayer in 200 litres/ha of water at 210 kPa. A white emulsifiable crop oil (BP Crop Oil) was added at 2 litres/ha to clethodim (Select) and at 3 litres/ha to sethoxydim (Alloxol S) and haloxyfop (Gallant) treatments. Fluazifop-butyl (Fusilade) and quizalofop (Zero) had a wetting agent (Citowett) added to the solution at 450 ml/ha.

Visual assessments of Mercer grass control were made at 3, 5, 9 and 12 weeks after treatment (WAT) in Trial 1 and at 3 and 6 WAT in Trial 2. Assessments of regrowths were made by counting the number of shoots (whole plot) in Trial 1 at 6 WAT and by visual scoring in Trial 2 at 15 WAT. Injury to asparagus was also visually assessed in Trial 1 at 3 days after treatment. For the analysis of variance a square root tranformation was used for the regrowth data in Table 1 and the LSD figure for this is only approximate.

TABLE 1: Effect of herbicide treatments on young Mercer grass plants and asparagus spears (treated 2.11.89).

Herbicide	Rate (kg ai/ha)	Mercer grass control (%)			Shoot regrowth (No./plot)	Asparagus injury (%)
		3 WAT*	Maximum	12 WAT	6 WAT	3 DAT*
haloxyfop	0.50	78	100	81	23	4
haloxyfop	1.00	90	100	78	20	10
quizalofop	0.21	59	99	59	45	0
quizalofop	0.32	65	98	66	38	0
quizalofop	0.43	77	100	70	34	0
clethodim	0.48	59	86	69	36	4
clethodim	0.72	58	93	75	33	15
clethodim	0.96	61	95	88	19	10
sethoxydim	0.60	57	86	72	40	3
sethoxydim	1.00	62	86	71	32	0
fluazifop-butyl	0.50	51	83	42	69	0
fluazifop-butyl	0.75	54	86	68	31	10
glyphosate	2.16	74	99	53	65	100
LSD (P = 0.05)		15		24	21	

*WAT — weeks after treatment; DAT — days after treatment.

RESULTS

Trial 1

Visual assessments of the brown off and desiccation of foliage made at various intervals after spraying are expressed as percent control of Mercer grass in Table 1. Most treatments were quite active on the young grass, with the level of control exceeding 50% in every case within 3 WAT. Haloxyfop was the fastest acting and also the most effective at this early stage, while fluazifop-butyl was the slowest acting of the chemicals used. Visual damage increased with time and reached its highest level at different times in different treatments. The maximum control achieved by all treatments was >80% (Table 1), but many new shoots were recorded between 5 and 9 WAT from the underground rhizome fragments in the soil. By 12 WAT the level of control had declined in all plots, with glyphosate and the low rate of fluazifop-butyl showing the most regrowth. Numbers of regrowths/plot at 6 WAT gave similar results to the visual assessments made at 12 WAT. Overall, haloxyfop was marginally more effective, along with the higher rates of clethodim and quizalofop, but treatment at this early stage of weed growth was not totally satisfactory for the season long control of Mercer grass.

Every asparagus spear sprayed with glyphosate was injured sufficiently to be relegated to the reject grade. Haloxyfop, clethodim and fluazifop-butyl damaged a small proportion of the crop by causing bending of spears which received the spray.

Trial 2

The relative effectiveness of various grass herbicides on mature Mercer grass was fairly similar to that recorded in Trial 1. The speed of activity was slower on the established grass in every case, except for glyphosate which provided quick and more effective brown-off than the selective grass herbicides. Results at 6 WAT show that haloxyfop, quizalofop (except the low rate) and glyphosate gave very good initial control of the mature stand (Table 2). Low rates of sethoxydim, clethodim and fluazifop-butyl were not satisfactory, although at high rates all three herbicides provided 75-80% control of the weed. Observations made 15 WAT showed considerable regrowth in plots treated with sethoxydim, low rates of clethodim and quizalofop. There was only small regrowth of shoots (<10%) in all other treatments including glyphosate.

TABLE 2: Effect of herbicide treatments on mature Mercer grass plants (treated 13.12.89).

Herbicide	Rate (kg ai/ha)	Mercer grass control (%)		Shoot regrowth (%)
		3 WAT*	6 WAT	15 WAT
haloxyfop	0.50	59	100	2
haloxyfop	1.00	63	100	2
quizalofop	0.21	59	86†	20
quizalofop	0.32	53	98†	5
quizalofop	0.43	60	98†	7
clethodim	0.48	41	46	23
clethodim	0.72	40	75	5
clethodim	0.96	48	78	5
sethoxydim	0.60	33	36	44
sethoxydim	1.00	41	74	12
fluazifop-butyl	0.50	30	65	7
fluazifop-butyl	0.75	44	81†	5
glyphosate	2.16	80	100	1
LSD (P=0.05)		12.9	14.0	

* WAT — weeks after treatment

† approximate LSD for treatments marked

DISCUSSION

Treatment of Mercer grass in late spring/early summer did not provide effective season-long control of the weed. This was mostly because of the continuing emergence of new tillers from the underground rhizome fragments following winter cultivation. If the weed infestation starts seriously interfering with the harvesting of spears, it is possible to get effective short term removal of Mercer grass with most of the herbicides tested here. Of the herbicides used in this study, however, only sethoxydim is currently registered for use in asparagus during the harvesting season.

More effective long term control of Mercer grass was achieved by treating it at the close up stage of the asparagus crop. Both the initial control and the long term suppression of the weed were adequate from most treatments except the low rate of sethoxydim, clethodim and quizalofop. The level of control achieved by the high rate of sethoxydim was only marginal. The very low regrowth at 15 WAT in plots treated with fluazifop-butyl suggested that this herbicide had not reached its maximum effectiveness by 6 WAT. If broadleaf weeds were also a problem at close up, then glyphosate may be the preferred herbicide as it would provide control of Mercer grass and most broadleaf weeds.

In general the level of Mercer grass control by all herbicides in Trial 2 was superior to that recorded earlier in a cultivated but uncropped situation (Rahman and Scheffer, unpublished). This may have been due to the asparagus crop canopy offering shading and competition, because weed regrowth was usually more dense between the rows than under the asparagus ferns. The lack of crop competition may also have partially contributed to the poorer long term control of the weed in Trial 1, although the continuing new shoot growth from underground rhizomes was probably the major cause of reduced effectiveness. It is possible that in a less competitive crop the initial suppression and damage may not be followed by the similar effective levels of control as recorded in this study.

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