HALOXYFOP EE — SELECTIVE CONTROL OF PAMPAS GRASS IN NEW ZEALAND COMMERCIAL FORESTS

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SUMMARY

Field trials conducted over three years evaluated the new selective grasskiller haloxyfop EE for the control of introduced pampas grasses (*Cortaderia* spp.) in new forest plantations. Haloxyfop EE at 1.5 kg ai/ha gave 90% control of pampas up to 1 m high without tussock formation. Ground broadcast, aerial and spot application all gave equivalent control. An emulsifiable paraffinic oil applied at 1% v/v is recommended as an adjuvant.

INTRODUCTION

Introduced pampas grasses (*Cortaderia selloana* and *C. jubata*) have been recognized as important problem weeds in northern exotic forests of New Zealand since the late 1970's (Gadgil *et al* 1984). Pampas grasses have aggressive infestation potential and compete vigorously with young trees for nutrients, moisture and light resulting in poor tree establishment, reduced and uneven tree growth and increased silvicultural costs (Ecroyd *et al* 1984).

Control measures currently in use, or under investigation, include hard cutting, chemical site preparation with glyphosate or releasing with hexazinone, and grazing programmes (Gadgil *et al* 1984). Each of these methods has recognised limitations. There is a need for a selective herbicide effective on pampas grass in forest on a range of soil types. It should also be safe on desirable ground cover plants including lupins (*Lupinus luteus*) and lotus (*Lotus pedunculatus*). Haloxyfop-ethoxyethyl is a new, selective, broad spectrum post-emergence grass herbicide. It is completely specific to graminaceous species with no observed activity on broadleaf weeds, crop or sedges (Anon. 1984), and is considered to have potential for pampas grass control without damaging trees or beneficial broadleaf species. This paper reports the results of 10 trials established to identify a rate of haloxyfop EE effective for pampas grass control in radiata pine (*Pinus radiata*) under commercial forest establishment conditions.

MATERIALS AND METHODS

Ten field trials were conducted over three seasons between 1984 and 1986 at either Maramarua State Forest, or New Zealand Forest Products, Matakana Island plantation in the Bay of Plenty. Three trials were broadcast, applied with a back-pack precision sprayer and hand held boom fitted with either Teejet 730-154 or 730-231 flat fan nozzles operating at 200 kPa delivering 200-400 litres/ha in either a single or double pass. Treatments were applied to 20-30 m^2 plots replicated three times and randomised in complete block designs. Two large scale trials were applied by helicopter fitted with D6/46 disc and core nozzles applying 300 litres/ha using the half overlap double pass technique. Each treatment was applied to a single 0.5 ha plot. Five spot treatment trials were applied by knapsack sprayer fitted with a single 730-231 fan nozzle calibrated to apply the equivalent of spraying 400-500 litres/ha. Plot size and trial designs were the same as that in the small scale broadcast trials.

Applications were made in either spring or autumn to actively growing vegetative pampas no taller than 1 m, prior to tussock formation and within 2 years of site preparation. At all sites, pampas infestations were predominantly *Cortaderia selloana* although small numbers of *C. jubata* were identified in some trials.

Haloxyfop EE (Gallant) was formulated as an emulsifiable concentrate containing 240 g ai/litre, and in all cases was applied with either 0.25% v/v surfactant (Multifilm X-90) or 1% v/v emulisfiable paraffinic oil (Shell Sunspray Oil). The choice of adjuvants was based on previous work with other perennial grasses.

A further small plot trial was established to compare specific enhancement of haloxyfop EE by each adjuvant. The trial was broadcast, applied under the same conditions and procedures as described above.

Glyphosate (Roundup) was applied as a standard treatment in two small scale broadcast trials. Hexazinone (Velpar 900 g/kg soluble powder) was used in one small scale broadcast trial and both the aerially applied trials.

Pampas control was visually assessed by at least two independent observers and evaluations recorded as mean percent control.

RESULTS AND DISCUSSION

Table 1 summarises mean percent pampas control 3.5 months after treatment with haloxyfop EE applied alone or in combination with penetrant adjuvants.

TABLE 1: Pampas grass control with haloxyfop EE + adjuvants 3.5 months after treatment.

Chemical	Rate (kg ai/ha)	% Control* (Top kill)
haloxyfop EE	0.75	25 c
haloxyfop EE + oil	0.75	65 ab
haloxyfop EE + surfactant	0.75	45 b
haloxyfop EE + oil	1.0	80
		CV = 21%

*Transformed to Arcsin $\sqrt{x/100}$ for ANOVA.

The addition of either an emulsifiable paraffinic oil (1% v/v) or a non-ionic surfactant (0.25% v/v) significantly increased the control of pampas given by haloxyfop EE over application without adjuvant. This result is consistent with that found on a wide range of perennial grass species (Sharpe 1985).

Table 2 summarises the mean pampas grass control, 6 months after treatment by either broadcast or spot application.

TABLE 2: Mean percentage pampas grass control 6 months after treatment.

Chemical	Rate	Broadcast Application			Spot application		
	kg ai/ha	% control	SED	No. trials	% control	SED	No. trials
haloxyfop EE + oil	0.5	62		1			
	1.0	83	12.6	3	87	18.5	3
	1.5	90	5.2	4	82	24.0	2
	2.0	98	2.8	2			
haloxyfop EE + surfactant	1.0	27	4.9	2	77	9.2	2
	1.5	70	7.3	2	70	24.2	3
	2.0	92		1			
hexazinone	5.4	53	33.1	3			
glyphosate	3.2	97	4.2	2			
	4.2				99	2.0	2

Pampas grass control was influenced by both the rate of haloxyfop EE applied and the penetrant adjuvant added.

Haloxyfop EE at a minimum of 1.0 kg ai/ha provided adequate control (up to 87%) of pampas grass for release of young radiata pine trees when applied as either a

broadcast or spot treatment. Increasing the rate to 1.5 kg ai/ha broadcast increased both pampas kill (90% of sprayed plants) and reliability. No rate effect was evident in the spot treatments, which is considered to be due to better spray coverage with spot application (400-500 litres/ha) relative to broadcast (200-300 litres/ha). Additional control by rates above 1.5 kg ai/ha were not considered necessary or economic. Haloxyfop EE 1.5 kg ai/ha applied with 1% emulsifiable oil provided higher mean pampas control (90%) than the present standard release herbicide hexazinone 5.4 kg ai/ha (53%).

In two trials now more than 12 months old haloxyfop EE treatments at rates above 1.0 kg ai/ha have kept forest stands free from pampas competition.

Although both emulsifiable paraffinic oil (1% v/v) and non-ionic surfactant (0.25% v/v) were effective as adjuvants to haloxyfop EE, emulsifiable crop oil resulted in a generally higher and more consistent level of pampas control than that obtained with the non-ionic surfactant (Table 2). This result was independent of application method and is consistent with the haloxyfop EE adjuvant study.

In all trials applications were made over recently planted pine seedlings (up to 2 years old). No tree damage was observed in any haloxyfop treatment, even in the light sandy soils of Matakana Island typical of coastal forest plantations for which no releasing herbicide is currently available. Five tree tolerance trials reported by Sharpe (1985) are confirmed by these findings. In addition haloxyfop EE removed only pampas and other grasses leaving, ground cover, broadleaved species to inhibit pampas re-infestation from airborne seed, and as a necessary stock diet supplement in forests employing *Lotus pedunculatus* oversowing and grazing regimes.

Comparison of spring and autumn applied trials indicate adequate pampas control can be achieved at both application times. Plant size at treatment is the single most important factor influencing control. In these trials plants were less than 1 m tall without tussock formation. Other work has shown haloxyfop EE to be less effective on larger tussock plants. Ideally plants should be as small as possible at treatment and spraying should be as soon as possible after site preparation and/or planting but when full pampas germination has occurred.

Cortaderia selloana was the dominant species present in the trials but *C. jubata* also occurred. No difference between species susceptibility to haloxyfop EE was observed.

CONCLUSIONS

Haloxyfop EE applied at 1.0-1.5 kg ai/ha provided over 80% control of young pampas grass species up to 1 m tall, without tussock formation. Both an emulsifiable paraffinic oil (1% v/v) and a non-ionic surfactant (0.25% v/v) enhanced the activity of haloxyfop EE. Emulsifiable paraffinic oil (1% v/v) was more effective. Haloxyfop EE was effective when applied by ground broadcast, knapsack or aerially.

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