HERBICIDES FOR PAMPAS GRASS CONTROL

N.A. DAVENHILL

Forest Research Institute, Rotorua

SUMMARY

Thirteen herbicides in various formulations and mixtures were tested in small plot trials over a 4-year period for the control of seedling pampas grass (*Cortaderia* spp). Glyphosate, hexazinone, haloxyfop, imazapyr (ac) and clethodim were the most effective herbicides.

INTRODUCTION

Since the mid-1970's pampas grass (*Cortaderia selloana* and *C. jubata*) has become a serious weed problem in some northern exotic forests, suppressing growth of young trees and causing a fire hazard (Gadgil *et al* 1984). Infestations of pampas can add considerably to forest establishment and maintenance costs (Gadgil *et al* 1984).

The four trials outlined in this paper were undertaken during 4 successive years as part of a wide-ranging project set up in 1984 by the Forest Research Institute to study all aspects of pampas grass control. The trials were primarily aimed at reducing costs, lowering application rates and extending the range of herbicides suitable for the control of pampas grass seedlings in forestry plantations.

METHODS

In each trial, nine pampas seedlings were planted into 2 × 2 m plots, located in the Institute's nursery at Rotorua, on light, cultivated, weed-free loam soils of pumice origin. Randomised block designs were used throughout, with three plot replications per treatment. Pampas seedlings (*C. selloana* only) used in Trial 1 were obtained from Waiuku Forest in June 1983. The transition from a mild, coastal climate to the frost-prone site in Rotorua resulted in some initial mortality. Only healthy plants from 80-120 cm tall were selected for treatment.

For Trials 2, 3 and 4 seed was collected from identified tussocks of both *C. selloana* and *C. jubata*, sown into boxes and germinated under glass. When tall enough to handle, the seedlings were pricked out into paper pots; these remained in a glasshouse for approximately 4 months until ready for transplanting into prepared nursery plots. When treated the pampas seedlings were 8 to 9 months old and 50-100 cm tall.

Trial 4 included *C. toetoe*, which was obtained from a local nursery as 1 year old potted stock. Little growth occurred between planting in July and spraying in March, when the average height was just 76 cm.

Herbicide application rates and treatment times in Trials 1-4 are shown in Tables 1 to 4. Sprays were applied with a hand-held CO₂ pressurised precision sprayer fitted with Spraying Systems 730077 flat fan nozzles. Applications were in two passes, each at 150 litres/ha. Granular herbicides were bulked up with sieved pumice and hand-applied in split applications of four passes per plot. Mortality of individual pampas plants was recorded by two independent assessors at time of treatment and repeated at appropriate intervals thereafter.

RESULTS AND DISCUSSION

The results of the four trials are shown in Tables 1 to 4.

In Trial 1 (*C. selloana* only) complete kill was achieved with hexazinone and the higher rates of glyphosate and haloxyfop. Fluazifop-butyl was very slow to take effect, giving only 48% kill. Sethoxydim was ineffective. Fluazifop-butyl and sethoxydim were applied at double the rates recommended for controlling mature or hard-to-kill grasses.

In Trial 2, only glyphosate and imazapyr (ac) killed both pampas species. The failure of hexazinone was unexpected and is attributed to halving the recommended

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application rate of 5.4 kg/ha. Haloxypop at 0.96 kg was fully effective only on *C. jubata*, but the addition of amitrole to a reduced rate of haloxypop showed some promise. Amitrole/2,2-DPA gave insufficient control. Granular imazapyr and chlorthiamid treatments were ineffective.

TABLE 1: Trial 1: Control of *C. selloana* with herbicides

Herbicide (applied 23.2.84)	Rate (kg ai/ha)	% plants dead (weeks after treatment)		
		7 weeks	28 weeks	70 weeks
glyphosate	2.16	0	32	77
	3.24	31	75	100
haloxypop*	0.72	0	12	59
	1.44	17	100	100
hexazinone (AC)	6	93	100	100
hexazinone (SP)	5.4	78	100	100
fluazifop-butyl**	0.75	0	0	31
	1.5	0	0	48
sethoxydim*	2	0	0	0
untreated	-	0	0	0
LSD (5%)	-	22	24	28

* Applied with Mobil Superior Spraying Oil 663 (1% v/v)

** Applied with Contact (0.1% v/v) surfactant

TABLE 2: Trial 2: Control of *C. jubata* and *C. selloana* with herbicides

Herbicide	Rate (kg ai/ha)	% plants dead (weeks after treatment)			
		<i>C. jubata</i>		<i>C. selloana</i>	
		20 weeks	53 weeks	20 weeks	53 weeks
Applied 21.2.85					
glyphosate	3.6	100	100	100	100
haloxyfop*	0.96	58	100	74	83
haloxyfop**	0.72	48	92	85	85
amitrole	4				
hexazinone (SP)	2.7	0	0	4	4
imazapyr	2	0	100	15	100
fenoxaprop-ethyl**	0.96	28	51	44	55
amitrole	4.8	21	59	66	74
2,2-DPA	3.7				
untreated	-	0	0	0	0
Applied 3.4.85					
		14 weeks	47 weeks	14 weeks	47 weeks
imazapyr (2% granule)	2	0	0	0	0
chlorthiamid (7.5% granule)	9	0	11	0	0
LSD (5%)		24	21	33	23

* Applied with Mobil Superior Spraying Oil 663 (1% v/v)

** Applied with Triton X-45 (0.2% v/v) surfactant

TABLE 3: Trial 3: Control of *C. jubata* and *C. selloana* with herbicides

Herbicide (applied 11.3.86)	Rate (kg ai/ha)	% plants dead	
		<i>C. jubata</i> (36 weeks after treatment)	<i>C. selloana</i>
glyphosate	3.24	100	100
haloxyfop*	0.96	100	93
	1.2	100	100
	1.44	100	100
haloxyfop* amitrole	0.96	100	88
	1.2		
hexazinone (SP)	4.5	81	37
fenoxaprop-ethyl*	1.2	100	55
	1.44	100	81
atrazine	6		
simazine	6	48	4
amitrole	1		
amitrole**	6		
2,2-DPA	5.9	74	55
untreated	-	0	0
LSD (5%)		27	23

* Applied with Mobil Superior Spraying Oil 663 (1% v/v)

** Applied with Triton X-45 (0.25% v/v) surfactant

TABLE 4: Trial 4: Control of *C. jubata*, *C. selloana* and *C. toetoe* with herbicides

Herbicide (applied 30.3.87)	Rate (kg ai/ha)	% plants dead (40 weeks after treatment)		
		<i>C. jubata</i>	<i>C. selloana</i>	<i>C. toetoe</i>
glyphosate	2.5	86	93	96
haloxyfop*	1	100	100	100
	1.5	100	100	90
clethodim*	0.96	96	78	100
	1.44	100	85	100
	1.92	96	92	96
untreated		0	0	0
LSD (5%)		19	27	14

* Applied with Mobil Superior Spraying Oil 663 (1% v/v)

In Trial 3, *C. selloana* showed markedly more tolerance than *C. jubata* to all treatments other than glyphosate, haloxyfop and haloxyfop/amitrole. The reason for this is not clear. Increased rates of amitrole/2,2-DPA failed to give adequate control. A mixture of atrazine/simazine/amitrole was also unsatisfactory, with virtually no activity at all on *C. selloana*. The hexazinone application rate of 4.5 kg/ha was inadequate with rapid brown-off followed by basal regrowth.

In Trial 4, clethodim, an experimental compound, was compared with glyphosate and haloxyfop. At the three rates tested clethodim gave promising results on both pampas species and *C. toetoe*.

These trials confirm previous work (Saville *et al* 1986) showing that haloxyfop at rates above 1 kg/ha is effective on pampas up to 1 m high. Glyphosate, imazapyr and clethodim also gave good results. However, other work (unpublished) has indicated that imazapyr residues may preclude the planting of trees within 6 months of application which would restrict the usefulness of this herbicide. Hexazinone at 5.4 kg/ha was also effective and pine trees (*Pinus radiata*) have been shown to tolerate the different formulations of this herbicide at rates up to 10 kg/ha (Preest 1986).

CONCLUSIONS

Glyphosate (Roundup). Indications are that a minimum application rate of 3.2 kg/ha is required to ensure complete kill of pampas seedlings.

Hexazinone (Velpar). Reducing the application rate to 4.5 kg/ha in Trial 3 resulted in rapid brown off, followed by basal regrowth. This indicates the need to maintain the recommended rate of 5.4 kg/ha.

Haloxifop (Gallant) plus crop oil. The trials indicated 1.0 - 1.5 kg/ha is required to kill pampas up to 1 m high, but the effect of lower rates of haloxyfop may be enhanced by adding amitrole (Trial 2).

Fluazifop-butyl (Fusilade) plus surfactant. Very slow activity which resulted in only 48% *C. selloana* kill when applied at double the rate recommended for mature grasses suggests that this herbicide is not suitable for pampas control. Not tested on *C. jubata*.

Sethoxydim (Alloxol-S) plus crop oil. No activity on *C. selloana* when applied at double the rate required to kill mature grasses. Not tested on *C. jubata*.

Imazapyr (Arsenal). The aqueous concentrate killed both pampas species. Locally manufactured granules (a "one-off" product) were ineffective. Both formulations were applied at 2 kg/ha.

Chlorthiamid (Prefix). Ineffective. No control of *C. selloana*. Only 11% kill of *C. jubata*.

Amitrole/2,2,DPA. Insufficiently active. Not recommended at the rates tested.

Atrazine/simazine/amitrole. Ineffective on *C. selloana*. Killed 48% *C. jubata*. Further work with adjustments in rates of individual components may be justified.

Clethodim plus crop oil. Clethodim was effective on both pampas species and *C. toetoe*. More work on application rates and perhaps timing may be needed.

Fenoxaprop-ethyl (Furore) is no longer available.

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