MANAGEMENT OF GIANT PARRAMATTA GRASS (*SPOROBOLUS INDICUS* VAR. *MAJOR*) ON ROADSIDES

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Abstract Giant Parramatta Grass (*Sporobolus indicus* var. *major* (Buse) Baaijens) (GPG) is a major weed of NSW north coast pastures. Despite being declared a noxious weed for nearly 20 years and having large sums of public money spent on its control GPG continues to spread. GPG's success can be attributed to production of large numbers of sticky seeds and the ability to germinate and survive under poor soil conditions. A trial was established to investigate methods of vegetation management which would reduce the incidence of GPG on roadsides and thereby reduce its spread by vehicles and travelling stock.

Slashing alone was found to be ineffective and impractical, while the inclusion of rope-wick applied glyphosate at strategic times gave excellent management of all tall grass species. Flupropionate alone controlled GPG, but allowed other tall species to dominate. Roadsides are complex environments with many stake-holders. Weed control along roadsides must be viewed in a wider context.

INTRODUCTION

Giant Parramatta grass (GPG) is a major pasture weed of the NSW north coast and is found from Nowra to Cooktown. GPG's weediness can be attributed to the low palatability of tussocks, prolific seed production (Andrews 1995) and the stickiness of the loosely held seeds when wet.

This stickiness of the wet seeds is a highly effective means of dispersal by stock, native animals, machinery and vehicles.

Despite the presence of GPG in NSW since the 1880s, rapid spread commenced in the mid to late 1960s, which coincided with the development of large scale road transport of stock and the decline in the dairy industry (Laffan 1985).

Despite being declared a noxious weed since 1981 and nearly $2 million of public money spent spraying this species over the last 8 years, GPG has continued to extend its range through NSW.

The failure of past control strategies to halt the spread of this plant led to the implementation of a trial to compare a range of techniques for the management of GPG on roadsides which was first described by Ensbey and Storrie (1997). The trial is looking at both chemical and non-chemical techniques and focussing on changing botanical composition of the sward for a wide range of objectives, including safety, cost, erosion prevention and sustainability, not just the control of GPG.

MATERIALS AND METHODS

The trial is located on a podsolic soil west of Bellingen, NSW, located in a grazing paddock to overcome effects of roadside variability and improve operational safety. Cattle were excluded with electric fencing.

Soil pH($CaCl_2$) was 4.5 and initial soil phosphorus level of 4 ppm (Bray).

No new species were introduced to the trial, with the aim to manipulate the species already present.

There were 13 treatments replicated three times with plots 20 m by 3 m. Some treatments included propane flaming, rope-wicking, mulching, and a non-petrochemical based herbicide. Effective rate of herbicide applied through rope-wick applicators varies with density of vegetation treated. Five treatments have received annual applications of phosphorus and sulfur as single superphosphate (0:9:0:11) totaling 1000 kg ha^{-1} over 3 years.

The trial was commenced in the winter of 1996. Several of the treatments evolved as the trial progressed as it became clear they were not meeting roadside management objectives.

Treatments The treatments discussed in this paper highlight the major trends observed in the trial.

1. Slashing - as required
2. Slashing (spring) + Weedbug™ (summer) 0.72 - 1.1 kg a.i. ha^{-1} glyphosate (360 g L^{-1})
3. flupropionate 1.12 kg a.i. ha^{-1} - boom spray (single application July, 1996)

Assessments were every 6 weeks (approx.) where changes in botanical composition were estimated using the "botanal" technique (Tothill *et al*., 1978). Categories assessed were "GPG", "setaria" (*Setaria sphacelata* (K. Schum.) Stapf & C.E. Hubb), "Carpet grass" (*Axonopus affinus* Chase), and lastly the category "Other grasses" which included; bahia grass (*Paspalum notatum* Flugge cv. Pensicola), kangaroo grass (*Themeda australis* (R. Br.) Stapf), whisky grass (*Andropogon virginicus* L.), blady grass (*Imperata cylindrica* Beauv. var. major (Nees) C. E. Hubbard), broad leaf paspalum (*Paspalum wetsteinii* Hack.

Slashing was done with a 10 hp Deutscher walk-behind mower at a height of 7 cm (maximum setting).

Rope-wicking treatments utilised the Weedbug™ rotary wiper for glyphosate.

Flupropionate was applied at 1.12 L ha^{-1} using a CO_2 pressurised hand held boom with a water output of 110 L $hectare^{-1}$.

RESULTS AND DISCUSSION

Slashing Slashing is the most widely used technique for roadside vegetation control in Australia.

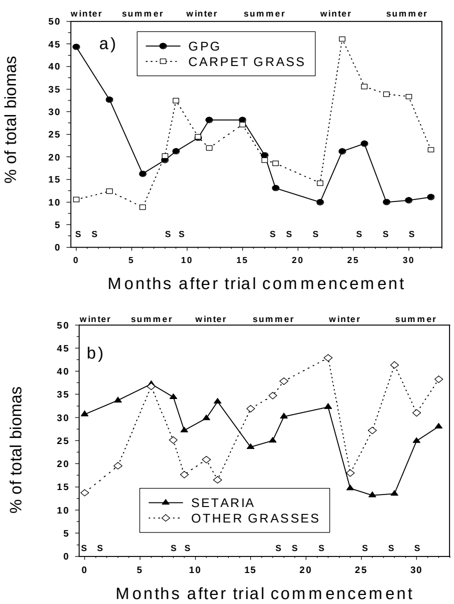

Figure 1. Effect of slashing-only on botanical composition. S = slashing

Figures 1a and 1b show the effects of slashing on botanical composition until April, 1999. There was a general downward trend in the level of GPG with an opposite upward trend in carpet grass. Setaria fluctuates widely, however shows a general decline, particularly as slashing frequency increases. "Other grasses" show a general increase due to an increase in the frequency of bahia grass, kangaroo grass and whisky grass.

The frequency of slashing was increased from January, 1998, because tussock grasses were becoming too tall to meet road safety criteria.

There was an overall trial effect due to the exclusion of cattle removing selective grazing pressure. It is well known that continuous grazing (set stocking) increases the level of GPG in pastures (Hildago and Cauhepe 1991; Mears *et al*. 1996). Removal of stock resulted in an increase in more palatable grasses which effectively compete with GPG.

Mowing or defoliation frequency can strongly influence botanical composition. Figure 1a shows a steady decline in GPG percentage as the slashing frequency increases 16 months after trial commencement.

Table 1. Effect of treatment on botanical composition, expressed as percentage of total biomass, as at April 1999. Natural log. adjusted data in parentheses.

	Percentage of Total Biomass			
Treatment	GPG	Setaria	Carpet Grass	Other Grass
Slashing	(2.1) 11.1 b	(3.1) 28.0 b	21.6 b	38.3 b
Slashing + Weedbug™	(0) 0 a	(1.1) 2.9 a	87.4 c	4.7 a
flupropionate	(0) 0 a	(3.4) 32.5 b	7.6 a	58.1 b
LSD (P=0.05)	(1.0)	(1.5)	12.8	21.0

A reduction in mowing frequency of parks by the Brisbane City Council during 1998 has led to a shift from green and blue couch (*Cynodon dactylon* (L.) Pers.) to bahia grass, which grows up to 250 mm high, and is not suitable as a recreational turf (E. Stevens pers. com. 1999).

Tinklin (1988) surveyed 50 roadside verges in England and found that high intensity mowing led to a reduction in the total number of species present, with a shift towards low growing species such as flat weeds.

Slashing height also strongly influences botanical composition of swards. Slashing height in the trial has remained a constant 7 cm.

A number of studies in the turf industry have shown that mowing heights over 7 cm improve turf competition with weeds and reduce weed invasion.

Low slashing heights can also lead to increased frost damage to desirable species, (Davies and Hunt 1989), opening the sward to invasion by undesirable species.

Table 1 shows that slashing has been relatively ineffective against GPG and has had minor effects on tall species such as setaria.

Despite being popular with road managers, slashing has severe deficiencies when viewed from a broader perspective. In high rainfall environments it is physically impossible to slash all roadsides from October to March as often as required. The slashing frequency required to produce desirable shifts in botanical composition makes slashing a poor option on all but small stretches of road close to town.

The cost of slashing is also relatively high due to the high labour requirement of moving safety signs and the low number of kilometres treated per day. Slashing has also been strongly implicated in the spread of a range of weeds including GPG.

Weedbug™ rope-wick Weedbug™ was used to selectively apply glyphosate to taller species and thereby manipulate botanical composition towards lower growing species such as carpet grass and bahia grass.

Weedbug™ is a system of hydraulically driven, spinning discs, with wicks radiating from a central reservoir. Centrifugal force keeps the ropes wet, and rotational speed can be adjusted while operating, to adjust for target density The spinning action gives good one-pass coverage of the target, and may abrade the plant cuticle facilitating greater absorption of herbicide.

There were no significant differences between any of the Weedbug™ treatments used in combination with flaming or slashing.

Figure 2a shows that GPG was quickly reduced to less than 10% of the total biomass, while carpet grass fluctuates from 50 to 80%. The decline in setaria is evident in figure 2b. The “Other grasses” category fluctuates because it included some tussock grasses such as whisky grass as well as the more prostrate bahia grass, which increased in the Weedbug™ plots.

Table 1 shows slashing plus Weedbug™ gave significantly more effective control of both GPG and setaria while favouring carpet grass.

Pre-management of the sward is critical for effective rope-wick operation. Slashing must take place prior to the major growth period of the target species to lower the height of desirable species, as well as remove excessive biomass of taller species.

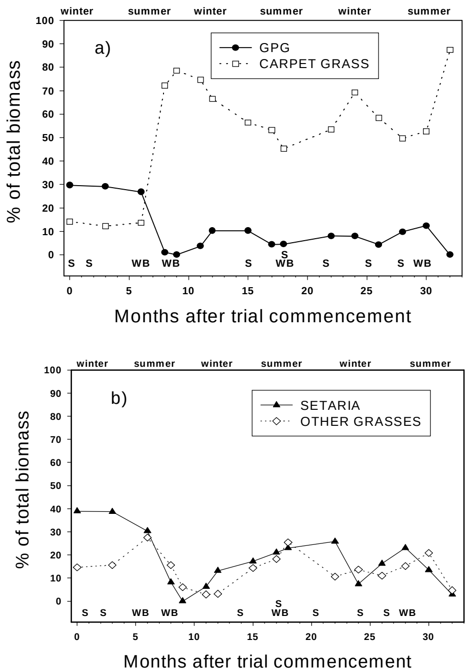

Figure 2. Effect of slashing and Weedbug™ glyphosate applications on botanical composition. S = slashing WB = Weedbug™

This technique enables glyphosate to be applied to fresh regrowth of the taller target species without contacting desirable species. In the case of GPG control at Bellingen, the optimum time for slashing in 1997 was mid November with the first rope-wicking in early January, with the follow-up application in March. However in 1998, a wet and warm spring-summer meant that a growth rates of most species were greater than in 1997 and a four week interval between slashing and the first rope-wicking was optimal. Waiting till January led to more damage to carpet and bahia grass due to their increased height, which is reflected in figure 2a.

Therefore the optimal timing for rope-wicking will vary from year to year.

Fluproponate treatments There were no significant differences between the application methods in the control of GPG. Both were highly effective, although boom spraying gave slightly better control than the rope-wick treatment, while the latter treatment was less damaging to carpet grass.

The effectiveness of fluproponate in controlling GPG is clearly demonstrated in Table 1, however it also favours setaria and strongly suppresses carpet grass.

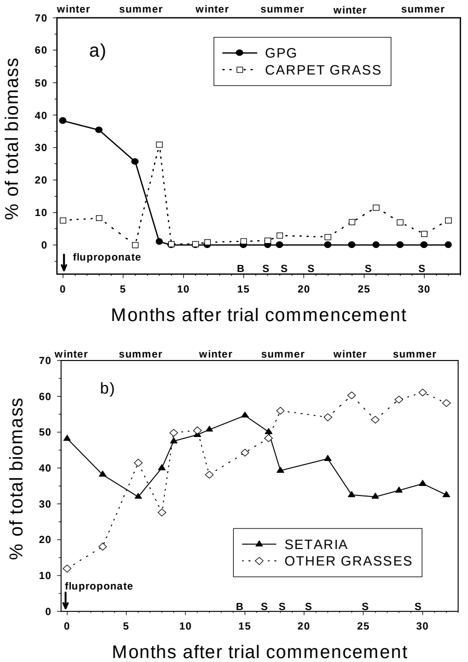

Figure 3. Effect of boom sprayed fluproponate on botanical composition. B = cool burn S = slash

Figure 3a shows excellent control of GPG, with a severe retardation of carpet grass which only began to recover 18 months after application.

Figure 3b shows no trend for setaria and an increase in other grasses. Bahia grass, whisky grass and kangaroo grass all increased in the fluproponate treatments.

Patches of bare soil approximately 0.2 m^2 were evident in the boom sprayed treatment, which was previously occupied by carpet grass.

Slashing of these treatments commenced after 16 months because the vegetation was tall and did not fulfil the roadside management objective of maintaining site lines for safety. This corresponded with a possible decline in setaria and an increase in bahia grass reflected in the "Other grasses" category. It also corresponded to a possible decline in the fluproponate residues in the soil.

Roadsides must be viewed as vegetation associations influenced by management where there are many stakeholders who may have a wide range of needs and interests. Some basic objectives of roadside management must include aesthetics, functionality and safety as well as weed management.

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