Competitive Pastures for Giant Parramatta Grass

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Giant Parramatta grass (*Sporobolus indicus* var. *major*) is a perennial weed which reduces the productivity and profitability of coastal pastures. This species becomes dominant in the sward by producing large numbers of small seeds. Seed counts made in the Nambucca Valley between November and July recorded 140,000 seeds/m^2 of which 3,500-5,100/m^2 were in soil seed banks (Andrews, 1995). Seed from GPG is sticky when wet, which allows it to be spread by both animals (ingestion and on the animals coat) and machinery. This means most new infestations are found along cattle tracks and roadways.

In addition to being a heavy seeder, the plant has low palatability for cattle which allows GPG tusocks to dominate. Like numerous weeds, GPG prefers to bare around, which highlights the need to maintain ground cover if rate of spread is to be slowed.

Although the chemical control strategies for GPG have been identified, they only provide a temporary solution. An integrated approach is required, therefore, which includes competitive pastures, grazing management and strategic use of chemicals. Frenock® is a selective herbicide which will kill GPG at 1.5 L/ha when applied in late winter or spring. At this application rate the reduction in growth for other grasses is variable. This paper outlines an experiment which evaluated the spread and persistence of 11 grass species selected to be potential competitors for GPG. The effect of Frenock® on establishment of these species was also assessed.

Methods

Location

The trial site was located on the property of Max and Lyn Gleeson at Comara, 80 km west of Kempsey (latitude 30°40'S and longitude 152°24'E, altitude approximately 150 m), on the eastern slopes of the Great Dividing Range. The average annual rainfall is approximately 1000 mm. About 40% of annual rainfall occurs in December-February. Severe frosts are likely to occur only 3 or 4 times per annum. The soil type is a grey podzolic. The site received 125 kg/ha of single superphosphate in 8 of the 10 years prior to 1992 and again in 1993. Every fourth application Mo superphosphate was substituted for plain superphosphate.

Pasture establishment

The area to be sown was selected because of its

dense infestation of GPG. The experiment was a randomised block with 12 treatments (including an unsown species control) with 3 replicates. Each plot was 8 m x 10 m. Glyphosate was applied to the area at 3 L/ha in early March 1992. Ten of the 11 grass species were broadcast on 9/4/1992 at 2 kg/ha of viable seed. Swazi grass was planted vegetatively in 1m rows at a distance of 0.5 m. In addition, 2 kg/ha of Haifa white clover;1 kg/ha of Maku lotus; 250 kg/ha of Mo superphosphate; 250 kg/ha of single superphosphate and 125 kg/ha of Muriate of Potash were broadcast then rolled. Frenock® at 1.5 L/ha was applied to half (4 x 10 m) of each plot, 19 months post-sowing, on the 10/11/93.

Grazing management

The trial was not grazed for the 6 months after sowing. Cattle then grazed the site for variable periods over the next 6 years.

Measurements

The relative frequency of the sown grasses and GPG was measured 32, 42 and 72 months after sowing, or 13, 23 and 53 months after application of Frenock®. Relative frequency (RF) was measured in the 100 holes of a 1 m^2 piece of weldmesh (*ie.* possible range of 0 to 100). Six measurements were taken in a zigzag pattern from a 2m x 8m area in the centre of each 4 m x 10 m subplot.

Results and discussion

General

The first 3 years of the trial were dry with 18 of the 36 months recording less than 30 mm of rain. During the last 3 years of the trial, above average rainfall was received with only 9 of the 36 months recording 30mm or less.

The sowing of all eleven grasses reduced the amount of GPG, but the reduction was not significant ($P<0.01$; AOV site mean =18.9) until April 1998 (Table 1). Despite this, only 6 of the 11 sown species had RF% greater than 10% after 6 years. The main unsown species found were paspalum (*Paspalum dilatatum*), carpet grass (*Axopinus affinis*) and barbed wire grass (*Cymbopogon refractus*).

Frenock® reduced the level of sown grasses significantly ($P<0.01$) by, on average, 10.3% after 13 months. The effect of Frenock® on the sown grass content declined for 8 of the 11 sown species between October 1995 and April 1998. The difference in RF% between the sprayed and unsprayed treatments continued to increase for Creeping blue grass , Paspalum and Narok setaria.

Frenock® reduced the RF% of GPG across the whole trial for up to 53 months post spraying. From October 95 to April 1998 the difference between the sprayed and the unsprayed treatments began to decline the RF of GPG increased.

Controls

Although no measurement of RF was made outside the trial, is was obvious that the GPG infestation there was denser than that in the controls. This suggests that the combination of one application of 3 l/ha of glyphosate 6 years ago and intermittent grazing, reduced the density of the GPG (compared with the set stocking policy used outside the trial).

The application of Frenock® to half of each control plot 14 months after spraying with glyphosate, reduced the RF of GPG by approximately 15.8% (Table 2). There was 32% less GPG in the Frenock® treated control plots 53 months after application.

Sown species

Swazi grass proved to be the most competitive grass against GPG. Within 13 months of sowing the RF% of Swazi grass was 64.5% without Frenock®. The combination of active growth and apparently

Table 1. Relative frequency counts for sown grasses and Giant Parramatta Grass (GPG).

	Sown grass (%)			GPG (%)		
Sampling time	Dec. 94	Oct. 95	Apr. 98	Dec. 94	Oct. 95	Apr. 98
Months post-sowing	31	42	72	32	42	72
Control				12	21	39
Bahia grass	11	14	60	4	4	7
Creeping blue grass	19	22	35	4	3	3
Premier digit grass	10	10	1	4	8	7
Kikuyu	2	3	0	8	6	9
Paspalum	9	23	32	7	8	15
Callide Rhodes	19	14	5	5	9	12
Pioneer Rhodes	10	8	1	5	1	7
Kazungula setaria	8	3	15	5	9	8
Narok setaria	14	9	19	6	5	2
Solander setaria	2	1	2	5	3	4
Swazi grass	39	90	99	3	6	1
Site mean	13.0	18.0	24.4	5.8	6.9	9.5

Table 2: The change in relative frequency (RF) (untreated RF%-treated RF%) of eleven sown grasses and Giant Parramatta Grass (GPG) due to the application of 1.5l/ha of Frenock in November 1993.

	Change in sown grass (%)			Change in GPG (%)		
Sampling time	Dec. 94	Oct. 95	Apr. 98	Dec. 94	Oct. 95	Apr. 98
Months post-spraying	13	23	53	13	23	53
Control				-16	-30	-32
Bahia grass	-3	8.2	6	-1	-3	-6
Creeping Blue Grass	-5	8	21	-1	-3	-1
Premier Digit Grass	-7	-1.9	-1	-1	-3	6
Kikuyu	1	-2.2	0	-2	-5	1
Paspalum	-6	4.1	13	-7	-11	-5
Callide Rhodes	-1	5.9	2	-4	-11	-12
Pioneer Rhodes	-20	-5.6	-1	-2	-1	-1
Kazungula Setaria	-8	-1.7	1	-5	-7	1
Narok Setaria	-12	-2.6	-18	-1	-6	1
Solander Setaria	-3	-1.5	-3	-3	-2	1
Swazi Grass	-50	-16.9	1	-2	-4	1
Site mean	-10.3	-0.6	2.0	-3.6	-7.2	-4.0

high sensitivity to the Frenock® resulted in a 49.7% decline in RF% for Swazi grass after 13 months. The sprayed Swazi grass did, however, rapidly recover after Frenock® application. As a result, 53 months after application there was no difference between the RF% of the sprayed and unsprayed Swazi grass. Control of GPG with Swazi grass was faster without Frenock®. Thus the application of Frenock® to Swazi grass is not recommended. The 99% RF for Swazi grass (April 1998) provided excellent control of GPG. The area covered by Swazi grass increased by around 50% over the 6 years of the trial. As a result, Swazi grass was encroaching on adjoining plots. Where Swazi grass had spread through the fence cattle grazed it, confirming its high palatability. Swazi grass has potential as a competitive species against GPG but is restricted in its use until a seeding line is available.

Bahia grass cv. Competitor. For the first 3½ years, the Bahia grass spread slowly reaching a RF of 14.4%. In the following 2½ years the Bahia grass spread rapidly, increasing to 60.3%, to be the species with the second highest RF after 6 years. There were a number of isolated patches of Bahia grass throughout the trial which indicates it was being spread by seed. There was 1.5% less GPG in the Bahia grass (5.2 vs 3.7) 13 months after spraying with Frenock®. After 53 months, the GPG% in the sprayed area remained unchanged (4%) but had increased to 10.2% in the unsprayed treatment. The spraying of Frenock® made little difference to the establishment of Bahia grass (63.1 vs 57.5%). Bahia Grass was shown to be a good competitor against GPG but is slow to establish. The control of GPG in Bahia grass was better with Frenock®. Perhaps Bahia grass should be planted with species that are fast to establish but are less persistent.

Creeping blue grass cv. Hatch was amongst the fastest species to establish (18.8% after 32 months). Since that time it has increased to 34.8%. Although this species has not spread as well as Swazi grass and Bahia Grass it has a role in the control of GPG. The GPG% after 6 years was 2.7%, which suggests Creeping blue grass is reasonably competitive. Although the RF% for creeping blue grass was lower (21.6 vs 16.2%) 13 months after Frenock® application, 40 months later the RF% was greater on the sprayed plots (24.7 vs 45.6%). Creeping blue grass appeared to be well grazed throughout the trial. The results suggest creeping blue grass requires some post-sowing GPG control (either Frenock® or glyphosate applied by a wick wiper) to allow a significant stand to establish. Bisset creeping blue grass, a more recently released cultivar, may also have potential.

Paspalum was slow to establish but continued to increase up to a RF of 31.8% after 6 years. Unlike Swazi grass and Creeping blue grass, Paspalum had one of the highest RF% for GPG throughout the trial period (7.3 up to 15%). The removal of GPG by Frenock® improved the amount of Paspalum by 13.4% (25.3 vs 38.7%) over the whole trial. The results of this trial suggest that Paspalum is not sufficiently competitive against GPG to make it worth including in a pasture mix destined to control GPG.

Setaria species establish and persist well in this area, yet none of the 3 varieties tested proved to be outstanding competitors against GPG. Narok produced the highest RF% (19.5), followed by Kazungula (14.9) and Solander (1.8). Narok had a low GPG plants percentage (2.5, April 1998) which was second only to Swazi grass. The level of GPG was also low for Solander (4.1%) despite having few surviving plants. Kazungula had 8% GPG which suggests it does not compete with GPG. As has been observed by J Betts, personal communication, setaria cultivars can be, and in this trial were, sensitive to Frenock®. By 13 months after spraying, Frenock® had reduced the RF of Narok, Kazungula and Solander by 59.6 (20.8 vs 8.4), 63.9 (11.9 vs 4.3) and 82.5% (4 vs 0.7). For

both Narok and Solander this had a lasting effect on the RF of these species. Of the setaria species trialed, Narok has the greatest potential. The establishment of Narok may have been improved if in the spring following sowing it was grazed to restructure the plant heights within the sward. This would allow the GPG regrowth to be wick wiped with glyphosate, rather than sprayed with Frenock®, in summer.

Rhodes Grasses. Both Callide and Pioneer Rhodes grass had good RF percentages (19.2 and 10.4%) in December 94, yet, as time progressed the RF of both declined. The population of Pioneer Rhodes was reduced by 88% (22.3 vs 2.7%) with Frenock® yet Callide remained unaffected. There is little to suggest that either cultivar would be competitive against GPG.

Premier digit grass was disappointing.

Little Whittet kikuyu established on this site.

Conclusions.

- Swazi grass was the most competitive grass trialed. Unfortunately, until a seeding variety is released it will be uneconomic as a competitor against GPG. Selection of a seeding Swazi grass line has commenced at Grafton.
- Bahia grass is an aggressive species which was competitive against GPG long term but is slow to establish. Control of GPG in Bahia grass was improved by Frenock®.
- Of the other species only Hatch creeping blue grass and Narok setaria showed potential.
- The results of this trial highlights the need for other species which have competitive ability as good as bahia grass but without its weed potential.
- Without grasses suitable for the range in rainfall and soil types in which GPG grows, control of GPG will have to rely on regular applications of herbicides.
- The fact that the GPG infestations inside the trial area were lighter than outside suggest improvements in the pasture composition can be made with one application of glyphosate and strategic grazing.

Reference

Andrews, T.S. (1995). The population biology of giant Sporobolus R. Br. Species as an aid to their management in pastures on the North Coast of New South Wales. PhD Thesis. University of New England Armidale, NSW.