Managing Sirosa phalaris in a predominantly summer rainfall environment

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ABSTRACT

An experimental site was established in 1997 in northern NSW to further investigate the use of strategic grazing management to improve the persistence of phalaris (*Phalaris aquatica* cv. Sirosa). The pasture was sown in 1992 to Sirosa phalaris, subterranean clover (*Trifolium subterraneum* var. *subterraneum* cv. Seaton Park) and lucerne (*Medicago sativa* cv. Aurora). Treatments consisted of; continuous grazing at 12 sheep/ha; continuous grazing at 6 sheep/ha, and two spring and autumn strategies of either resting from grazing for six weeks in each season or reducing stocking rate from 12 to 4 sheep/ha. Despite annual applications of fertiliser and high clover content Sirosa phalaris herbage mass by early-spring 2000 was reduced to less than 850 kg DM/ha in plots continuously grazed at 12 sheep/ha. At the lowest stocking rate (6 sheep/ha), Sirosa phalaris herbage mass was around 8700 kg DM/ha. In comparison, both spring-autumn grazing strategies maintained Sirosa phalaris at around 5000-6000kg DM/ha.

KEY WORDS

Phalaris, grazing management, strategic grazing, production.

INTRODUCTION

Phalaris aquatica is one of the most widely sown perennial grasses in the temperate pasture areas of Australia. Semi-winter dormant cultivars have small seedlings and establish slower than the winter-active types such as Sirosa (8), and there is a grazier perception that winter-active types are not as tolerant of grazing as the original phalaris introduction cv. Australian (2). Winter-active cultivars also appear to be more sensitive to spring management than the Australian type (3). Culvenor (1) indicated that in less favourable areas for phalaris growth, such as northern Victoria and the western slopes of New South Wales, strategic grazing may have to be used more frequently (e.g. each spring) to ensure phalaris persistence. Producer experience and experimental evidence (5) on the North-West Slopes of NSW indicated that under continuous grazing Sirosa phalaris had a stand life of less than five years. In a three-year study of Sirosa phalaris pastures grazed with sheep and cattle, Lodge and Orchard (5) reported that spring and autumn closures markedly increased Sirosa phalaris persistence compared with continuous grazing.

Clearly, the role of grazing strategies in maintaining or improving production and persistence of Sirosa phalaris on the North-West Slopes of NSW required further investigation. As part of the Sustainable Grazing Systems (SGS) Key Program (7) a study commenced in 1997, to further examine the effects of continuous and spring-autumn strategic grazing or rest on the persistence and production of Sirosa phalaris.

MATERIALS AND METHODS

The experimental site was located on the property “Winchfield”, 6 km north-west of Nundle on the North-West Slopes of NSW (31^{o} 24’S; 151^{o} 07’E; 590 m a.s.l.) on a phalaris (*Phalaris aquatica* cv. Sirosa), subterranean clover (*Trifolium subterraneum* var. *subterraneum* cv. Seaton park), and lucerne (*Medicago sativa* cv. Aurora) pasture sown in 1992. From 1992 to the start of the experiment the pasture was grazed intermittently by sheep and cattle at a stocking rate of around 6-8 dry sheep equivalents per ha.

The site had received 500 kg/ha of single superphosphate since sowing; from 1997 a further 450 kg/ha of single superphosphate was applied. Soils were mainly brown chromosols with some solodic brown podsols and the site had a slope of 6.8%. Three replicates of four grazing treatments were randomly allocated to each of 12 plots (0.485 ha) in late-winter 1997. Grazing treatments commenced in early November 1997. The four grazing treatments were; continuous grazing at 12.7 sheep/ha (T1); continuous grazing at 6.3 sheep/ha (T2); continuous grazing at 12.7 sheep/ha, except for a six-week period in spring and autumn when stocking rate was reduced to 4 sheep/ha (T3), and, continuous grazing at 12.7 sheep/ha, except for a six-week period in spring and autumn when stock were excluded (T4). The six-week period in autumn was timed to coincide with rain and subsequent tiller development of phalaris, while in spring it coincided with the start of elongation of the flowering stems.

Species composition and herbage mass (kg DM/ha) were estimated every 13 weeks at the end-start of each season using BOTANAL procedures (4, 6). In each plot, 10 estimates were taken in two permanent transects by two observers and for each sampling time 30 calibration quadrats were harvested.

Only herbage mass data for the end of winter-start of spring sampling each year have been presented. Data for phalaris herbage mass were differenced between years and examined by analysis of variance ($P<0.05$) to determine the statistical significance of the treatments.

RESULTS

Initially, Sirosa phalaris was the dominant species in all treatments (mean herbage mass 3302 kg DM/ha, mean proportion of the total herbage mass 81%, Table 1). After continuous grazing for 10 month herbage mass had declined to 155 kg DM/ha (19% of total herbage mass) at 12 sheep/ha (T1); at 6 sheep/ha (T2) it had declined to 2139 kg DM/ha (58% of total herbage mass). Sirosa phalaris herbage mass also decreased in the spring-autumn strategic grazing treatments (T3 and T4, Table 1). These declines were probably associated with below average rainfall in summer 1997-98 and autumn 1998.

Since spring 1998 the Sirosa phalaris content of T1 has remained less than 850 kg DM/ha and less than 30% of total herbage mass (Table 1). Phalaris plant density was also substantially reduced in T1. In comparison, phalaris herbage mass was greater than 3400 kg DM/ha and more than 75% of total herbage mass in all other treatments. Heavy continuous grazing at 12 sheep/ha resulted in a degraded pasture with a low perennial grass content, dominated by annual legumes and both winter (Table 1) and summer-growing annual grasses. Plots in this treatment also had around 5000 kg DM/ha of saffron thistle (*Carthamus lanatus*) in summer 1998. These were slashed in autumn 1998 and have subsequently required two applications of herbicide to control emerging seedlings, considerably adding to pasture maintenance costs.

Table 1. Phalaris herbage mass (kg DM/ha), and the percent perennial grass, winter-growing annual legume and winter-growing annual grass (as a proportion of the total herbage mass) in each of the four treatments in early-spring 1997, 1998, 1999 and 2000.

	Continuous grazing		Spring-autumn strategic grazing	
	T1	T2	T3	T4
		Phalaris (kg DM/ha)		
1997	2760	3920	3300	3230
1998	155	2139	658	854
1999	454	6109	3498	4316
2000	823	8727	5062	6607
		Phalaris (%)		
1997	79	83	81	82
1998	19	58	37	37
1999	22	85	75	81
2000	28	84	77	81
		Annual legume (%)		
1997	10	7	8	10
1998	59	28	4	3
1999	14	4	4	3
2000	26	3	8	7
		Annual grass (%)		
1997	5	9	7	5
1998	11	12	24	23
1999	48	16	14	13
2000	46	13	15	12

Analysis of the between year change in Sirosa phalaris herbage mass for each treatment (Table 2) indicated that the differences were not significant from spring 1997 to spring 1998. After that period, however, the change in T1 herbage mass was always lower ($P<0.05$) than the other three treatments, which were not significantly different.

These results confirm the previous findings of Lodge and Orchard (5) in this environment. However, in the previous study the autumn closures were for 13 weeks and the spring closures from 1 September to after seedfall (mid-January or early-February) each year. In the present study, reduced stocking rate (T3) or grazing exclusion (T4) was more closely related to plant growth stage (e.g. tiller initiation and development in autumn and stem elongation in spring). Compared with the previous study (5), better matching of reduced stocking rate (T3) or rest (T4) to plant phenology markedly reduced the grazing exclusion period, while maintaining Sirosa phalaris herbage mass and persistence over three years.

Sirosa phalaris production and persistence was highest in T2 which was continuously grazed at 6 sheep/ha (Tables 1 and 2). However, at this stocking rate it is unlikely that the pasture would be providing an economic return. Interestingly, lenient grazing from 1992-97 at about this stocking rate also favoured Sirosa phalaris persistence.

Both the current and previous studies (5) were at elevations above 500 m. In a similar study, at a lower elevation (440 m) on the North-West Slopes of NSW, where conditions are hotter and drier, spring and autumn closure compared with continuous grazing have had little effect on Sirosa phalaris production and persistence and stands failed after four years (G. Lodge pers. comm.).

Table 2. Statistical analyses of the difference in Sirosa phalaris herbage mass (kg DM/ha) for spring 1998-spring 1997 (Year 1), spring 1999-spring 1998 (Year 2), and spring 2000-spring 1999 (Year 3) for each of the four treatments.

	Year 1	Year 2	Year 3
	Change in herbage mass (kg DM/ha)		
T1-continuous grazing 12.7 sheep/ha	-2605	299	369
T2-continuous grazing 6.3 sheep/ha	-1781	3970	2618
T3-spring-autumn grazing 4 sheep/ha	-2642	2840	1564
T4-spring-autumn rest	-2376	3462	2291
l.s.d. P=0.05	n.s.	1352.8	1154.3

CONCLUSIONS

At elevations above 500 m either excluding grazing or reducing stocking rate for 6 weeks in autumn and spring can substantially increase Sirosa phalaris herbage mass and its contribution to total herbage mass in a predominantly summer rainfall environment. If these grazing strategies can increase the production and persistence of Sirosa phalaris pastures on the North-West Slopes of NSW beyond the “break even” point of 8-10 years (9) then there is a marked economic advantage in adopting these strategies to achieve sustainable, productive perennial grass-based pastures.

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