Grass control in medic pastures in semi - arid ley farming systems

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Summary. The effects of herbicides on productivity and grass control through two years of grazed medic pasture are presented. Glyphosate applied 8 weeks after emergence limited dry matter production only in the establishment year but reduced the grass component in both years. Selective grass removal increased medic seed yield, consequent medic density and herbage production in the regeneration year. Pasture topping in the spring decreased medic seed yield and regenerating plant densities.

Introduction

Soil-borne cereal root diseases including Take-all, Gaeumannomyces graminis var. (rind, and Cereal Cyst Nematode. Heferodera avenue, constitute a significant cost in terms of lost cereal production in the semi-arid regions of southern Australia (5). Annual medics (Medicago spp.) are not a host plant for these diseases and when grown in rotation with cereals provide a disease break. However, volunteer annual grasses and cereals in medic-based pastures reduce the effectiveness of the disease break.

The grass component of medic pastures may be controlled using a number of strategies including: (i) competition from medic densities of more than 400 plants/m2 (I), (ii) modify grazing pressure to increase the legume component of annual pastures (2) and (iii) the selective removal of annual grasses with herbicides (3).

In traditional systems of pasture and crop rotations, in the semi-arid zone, grass control in annual pastures has had limited appeal. Reasons for this include:(i) unsuitable crop and pasture management strategies have resulted in low medic densities, (ii) conservative stocking rates (determined by climatic variability) reduce the potential for capitalising on better medic pasture, (iii) the significant expenditure required for selective grass control and (iv) Vulpia spp. which are not susceptible to grass-selective herbicides.

Because legumes are generally more tolerant to glyphosate than annual grasses, "winter cleaning" and "pasture topping" with applications of the non-selective herbicide, glyphosate, is an option to reduce the grass component in a medic pasture and provide a disease break for future crops. In this paper we report the results from a comparison between selective and non-selective herbicides on a grazed medic pasture. We measured pasture yield, seed production and plant regeneration.

Methods

The experiment commenced in April 1991 at the Mallee Research Station. Walpeup. The soil at the site is a gradational calcareous earth (4): pH in H20 is 7.4 to 8.2. Seeds of Medicago truncanda cv. Paraggio and Medicago lilroralis cv. Harbinger AR were sown at 4.0 and 3.0 kg/ha respectively on 22 April, 40 days prior to opening rains on 2 June. The 10 ha site was fenced into paddocks for grazing with sheep at high (Hsr) and low (Lsr) stocking rates over the period of the study. Three pasture herbicide treatments were each applied in 1991 and randomised twice within each paddock. making tour replicates of each herbicide treatment at each stocking rate.

The herbicide treatments were as follows:

(i) Control (Nil).

(ii) Pasture topping with 330 mL/ha of glyphosate, 360 g a.i./L, at grass anthesis on 26 September, to inhibit seed set (Pt).

(iii) Winter cleaning with 330 mL/ha of glyphosate, 360 g a.i./L. at the six to eight leaf stage of the medic on 31 July, to restrict grass development (We).

(iv) Selective grass control with 500 mlJha of Fusilade (fluazifop. 212 g a.i./L), at the six to eight leaf stage of the medic on I August. to eradicate grasses (Sel).

The We and Sel treatments were applied eight weeks after the break in the season.

Results and discussion

The 1991 and 1992 seasonal rainfall contrasted markedly. In 1991 there was a dry start and finish but a wet winter (Table 1). In 1992 there was a wet start and finish with a drier period during winter. Initial emergence commenced on 2 June in 1991 and on 6 April with further emergence on 8 May in 1992.

Table 1. Growing season rainfall (mm) for 1991, 1992 and long-term mean (1911-1992)

	Apr.	May	June	July	Aug.	Sep.	Oct.	Ann.Total
1991	18	0	68	54	32	26	0	303
1992	43	82	23	15	44	88	53	520
Long-term mean	21	33	31	32	35	33	36	337

Table 2. Plant densities established in 1991 prior to imposing herbicide treatments.

	Plants (#/m^2)	s.e.
Annual medic	130	36
Volunteer annual grass	100	14
Broad-leaved weeds	12	6

The Hsr reduced early herbage yields in 1991 in comparison to Lsr: however, there was no difference in total herbage production or medic seed yields. The Hsr increased total herbage yield in 1992 (Table 3).

In 1991 early production and total herbage yields were similar in all treatments (Figs. la and lb), except We, due to reduced medic production in comparison to Scl and reduced grass production in comparison to Nil and Pt. With a late seasonal break and short growing season. 130 plants/m^2 of grass-free medic (Sel) produced similar herbage yields to 130 and 100 plants/m^2 of medic and grass respectively (Nil) (Table 2). The We treatment reduced herbage yields.

Medic seed yields (Fig. Ic) reflected the medic component in 1991 except for Pt which significantly reduced yields. Medic seed yields were less than the 200 kg/ha considered necessary for adequate regenerating densities (1). However. medic establishment counts were greater than 400 plants/m^2 in all treatments except Pt (Fig. 1d).

The significant species and percentages of grass were *Hordeum leporinutn* 29%, *Lobito? rigidum* 48%, *Triticum aestivum* 22%. *Sisymbrium* spp. was the major broad - leaved weed.

Table 3. Early production and total herbage yields in 1991 and 1992 as a result of imposing low (Lsr) and high (Hsr) stocking rates.

	Pasture production (kg/ha)			
	1991		1992	
	Early (30.8)[a]	Late (14.10)	Early (6.7)	Late (19.10)
Lsr	632	2160	1026	4100
Hsr	407	2045	1185	4924
l.s.d. (P=0.05)	150	n.s.	n.s.	788

[a] date of sampling

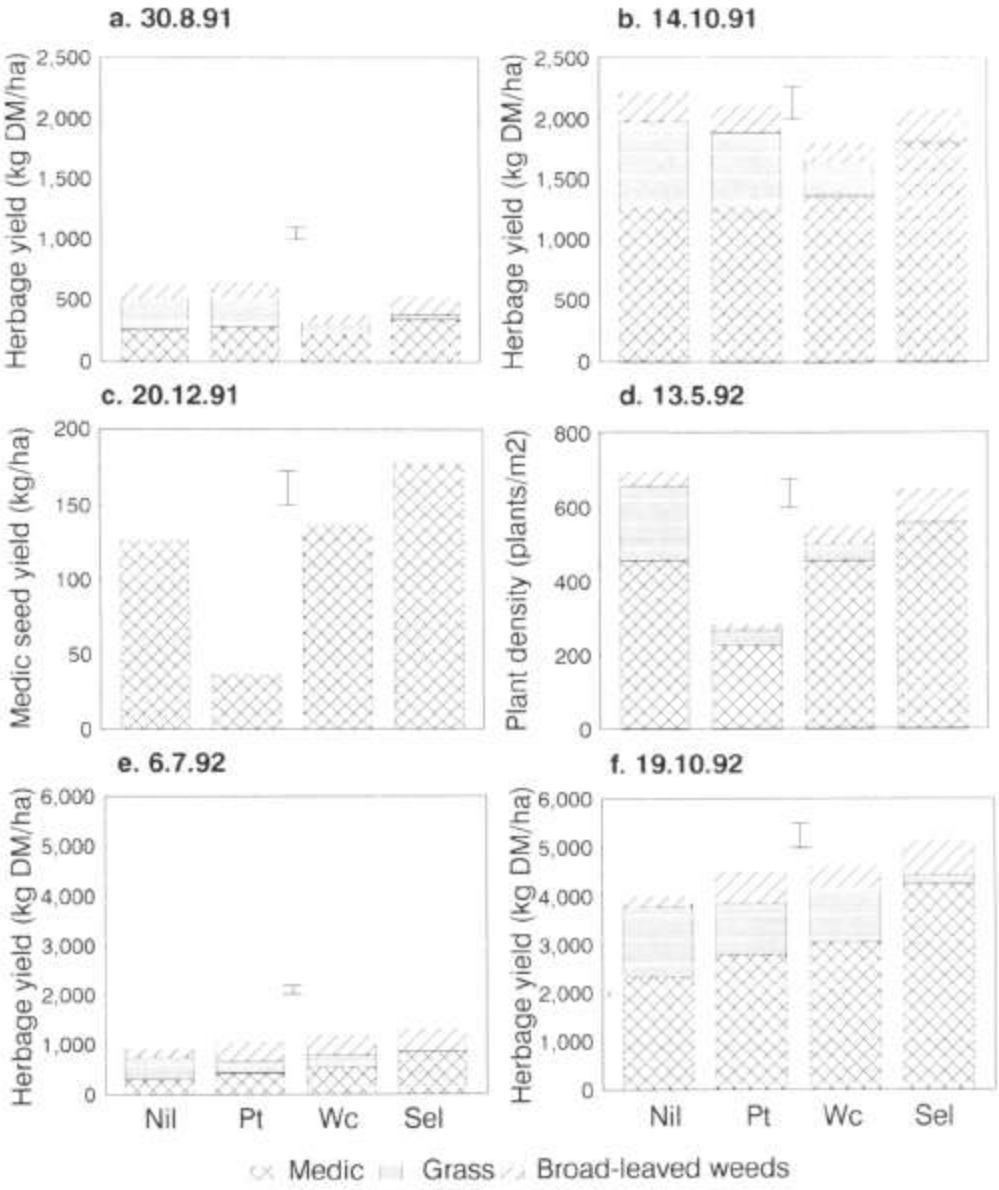

Figure 1. Effects of herbicide treatments Nil, Pt, We and Sel (see text) on sown medic, volunteer grass and broad-leaved weeds on (a) herbage yield 14 weeks after the seasonal break in 1991, (b) herbage yield 21 weeks after the seasonal break in 1991, (c) medic seed yield in 1991. (d)

regenerating plant density in 1992, (e) herbage yield 9 weeks after the seasonal break in 1992 and (f) herbage yield 24 weeks after the seasonal break in 1992. Error bars show l.s.d. (P=0.05) for totals.

In 1992 early production and total herbage yield were increased by We and Sel in comparison to Nil and by Sel in comparison to Pt (Figs. Ic and 1 f). The medic component was increased by Sel in comparison to all other treatments. Wc increased medic in comparison to Nil. Grass density and yield was reduced by Pt and Wc in comparison to Nil. Sel reduced grass density and yield in comparison to all other treatments. There were more broad-leaved weeds in Pt, Wc and Sel compared to Nil. With an early break and long growing season, 550 plants/m2 of almost grass-free medic (Sel) yielded more than Nil with 450 and 200 plants/m2 of medic and grass respectively. The Pt treatment reduced the medic and grass and medic plant density in comparison to Nil and Wc respectively: however. there was no significant reduction in total herbage yields to Nil and We due to excellent seasonal conditions.

The study found that the Sel treatment provided a two year grass-free phase and increased herbage and seed yields. The Pt and We treatments limited pasture production and may not have provided adequate grass control. A high stocking rate during the growing season increased pasture production when imposed on a dense legume base combined with high rainfall.

Acknowledgements

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