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YIELD AND FORAGE QUALITY IN ALFALFA-WEeping LOVEGRASS MIXTURES

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Abstract

Little is known about the relative performance of weeping lovegrass in mixtures with alfalfa. Our objective was to compare the productivity and forage quality of monocultures and binary mixtures of the species. Mixtures always gave higher yields than any of the monocultures and the highest was obtained in the mixture with the largest proportion of alfalfa. In the second year weeping lovegrass N concentration in the mixtures were higher than in monoculture. Weeping lovegrass did not affect the alfalfa N concentration. There was not differences in the NDF, for between these species.

Keywords: Intercropping, land equivalent ratio, semi-arid region

Introduction

High yielding legume-grass mixtures are an important part in forage-animal production. Legume grass forage mixtures offer several potential advantages over pure grasses or pure legume, such as transfer of symbiotically fixed nitrogen to grasses (Ledgard, 1991), extended stand longevity and weed control (Drolson and Smith, 1976). But it is difficult to keep the components in the mixture and specially to maintain each component at a

specified level (Smith *et al.*, 1986) due to a high degree of competition between its components. They compete for light, water and mineral nutrients (Jones *et al.*, 1988). The production of better quality forage (Jung *et al.*, 1991) and reduced nitrogen inputs (Whitehead, 1995) makes legume-grass mixtures very attractive.

Alfalfa (*M. sativa*) is well adapted throughout Argentina. The area in production is over 5.0 million ha, including pure stands and alfalfa-grass mixtures. Weeping lovegrass is the most important forage crop in the semi-arid region of Argentina. It is sown over 700,000 ha.

Our objectives were to evaluate yield potential and nutritional value of a mixed sward of alfalfa-weeping lovegrass during a 2-year period.

Material and Methods

The experiment was conducted at the Agronomy Department of the Universidad Nacional del Sur, Bahía Blanca (38° 45'S, 62° 11'W), Argentina.

Treatments were,

two monocultures:

1) Weeping lovegrass (W)

2) Alfalfa (A)

and three mixtures:

3) Alternate single rows, one row of weeping lovegrass, one row of alfalfa (W/A)

4) Alternate double row of alfalfa, one row of weeping lovegrass (W/2A)

5) Interseeded, weeping lovegrass and alfalfa together in the same row at a plant density proportion of 1:1 (WA).

There were 6 replications per treatment. Each plot was 2.4 by 6 m.

Weeping lovegrass (*Eragrostis curvula* (Schrad.) Nees) cv. Ermelo and alfalfa (*Medicago sativa* L) cv. Armona, were seeded in October 1993 in a deep sandy soil. Plots were hand weeded during the experiment.

Dry matter yield was obtained by clipping, at a stubble height of 7 cm in all cases. Percentage composition of alfalfa-weeping lovegrass mixtures on a dry weight basis was obtained after hand separation of the species at each harvest. Plant material was dried to constant weight at 60°C. Neutral detergent fiber (NDF) was determined (Goering and Van Soest, 1970) and total nitrogen (N) by semimicroKjeldahl procedure. The land equivalent ratio (LER) was calculated following Willey (1979).

Data were analysed by analysis of variance using a randomized complete block design with Duncan's multiple range test to determine differences among treatment means.

Results and Discussion

Mixtures of alfalfa and weeping lovegrass had higher dry matter yields than monocultures (Table 1). These results agree with the ones reported by Ta and Faris (1987), Adúriz and Gargano (1989) and Gökkus *et al.* (1999). In the second year there was a decrease in dry matter yields for all treatments, but again the mixtures gave the highest yields (Table 1). There were no significant differences among the mixtures, but the one with greatest proportion of alfalfa (W/2A) gave the highest yield (Table 1).

In the second year LER values of the mixtures were higher than 1.2 (Table 1). A LER value higher than 1.0 indicates that monocultures used more land than the intercrop to provide equal quantities of the products and the magnitude of LER shows the increase in biological efficiency of the intercropping. The results indicated the advantage of the mixtures compared to weeping lovegrass alone or alfalfa alone. Similar results were observed by Ta and Faris (1987).

In the second year there was a significant increase in the weeping lovegrass N concentration grown in mixtures, up to 21%, over weeping lovegrass alone (Table 2). Similar results were observed by Haystead and Marriott (1979) and Ta and Faris (1987). This result can be due to a decomposition of alfalfa tissues (Butler *et al.*, 1959) or to a root excretion of N (Ta *et al.*, 1986). In the first year, N concentration of weeping lovegrass was also higher in the mixtures but the differences were not significant. An increase in the alfalfa proportion of the mixtures resulted in an increased concentration of weeping lovegrass nitrogen. Alfalfa nitrogen concentration was not affected by the presence of weeping lovegrass.

Neutral detergent fiber of alfalfa and weeping lovegrass did not change by the presence of the other species in both years (Table 2).

The results showed the advantages of mixing weeping lovegrass and alfalfa over weeping lovegrass alone or alfalfa alone for herbage production and quality.

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Table 1 - Dry matter (DM) yield of weeping lovegrass (W) and alfalfa (A) in pure stands (W or A, alone) and mixtures (W/A or W/2A or WA interseeded) and the percentage of the alfalfa in each stand in 1994 and 1995. Land equivalent ratio (LER) of weeping lovegrass and alfalfa mixtures (W/A or W/2A or WA interseeded) in 1995.

Treatment	1994		1995		
	DM	A proportion	DM	A proportion	LER
	t ha ⁻¹	(%)	t ha ⁻¹	(%)	
A alone	6.53* b	100	3.29 b	100	-
W/A	7.51 a	47	4.73 a	38	1.22 a
W/2A	8.35 a	68	4.61 a	51	1.35 a
WA interseeded	7.92 a	48	3.81 ab	35	1.30 a
W alone	5.68 c	0	3.26 b	0	-

*values within any column followed by the same letter are not significantly different at the 0.05 level using Duncan's multiple range test.

Table 2 - Average total nitrogen (N) and neutral detergent fiber (NDF) concentration of weeping lovegrass (W) and alfalfa (A) on pure stands (W or A alone) and mixtures (W/A or W/2A or WA interseeded in 1994) and 1995.

Treatment	1994				1995			
	N		NDF		N		NDF	
	W	A	W	A	W	A	W	A
	%							
A alone	-	3.59 a	-	39.5 a	-	3.51 a	-	40.1 a
W/A	1.07* a	3.44 a	78.3 a	40.1 a	1.13 a	3.44 a	79.5 a	39.8 a
W/2A	1.10 a	3.50 a	76.5 a	36.6 a	1.19 a	3.47 a	80.0 a	37.6 a
WA interseeded	1.10 a	3.51 a	78.0 a	37.9 a	1.12 a	3.44 a	79.3 a	39.2 a
W alone	1.01 a	-	78.3 a	-	0.98 b	-	81.0 a	-

*values within any column followed by the same letter are not significantly different at the 0.05 level using Duncan's multiple range test.