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DRY SEASON GROWTH OF ZEBU-CRIOLLO STEERS WITH LIMITED ACCESS TO LEUCAENA

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For 120 days of the dry season, 4 groups of zebu-criollo crossbred steers of 251 kg average initial weight, and 12-16 months old, grazed either *Hyparrhenia rufa* or *Brachiaria decumbens* (H and B respectively) grass pastures with or without 4 h/d access to complimentary area of *Leucaena leucocephala* (L) which formed 20% of the grazing area available to that group. Stocking rates were set at 1.1 and 1.5 AU/ha for H and B respectively, and each group consisted of 6 animals. Average daily LWG per head (LWG/ha shown in parentheses) were; H, 0.48 (0.84) H + L, 0.57 (1.00) B, 0.49 (1.18) and B + L, 0.64 (1.54) kg/d. No statistical differences in individual animal performances were detected between the different grasses, but the positive effect of limited access to L was statistically significant at the 5% level. Complimentation with L appeared to increase intake of grass. The stocking rate used was close to optimum for H, but the B was slightly undergrazed. No toxicity symptoms were noted as a result of grazing Leucaena.

Key Words: Grazing, Zebu-criollo steers, *Leucaena leucocephala*, *Hyparrhenia rufa*, *Brachiaria decumbens*.

Leucaena leucocephala (Lam) de Wit is naturalized in Santa Cruz, Bolivia, (latitude 17°S, longitude 63°W, altitude 300 - 400 m above sea level) where it is used to form windbreaks in the agricultural areas, and as an ornamental tree in the city (Paterson and Horrell 1981). It is seldom used for animal feed, although Paterson et al (1982) demonstrated its feasibility as a dry season protein reserve. In order to study low capital cost management techniques for this potentially useful legume the present work was designed to evaluate limited access to leucaena in the dry season growth of zebu-criollo steers.

Materials and Methods

Pastures: At the Estación Experimental Agrícola de Saavedra, 65 km north of the city of Santa Cruz, an eight year old paddock of *Hyparrhenia rufa* (Yaragua) and a two year old area of *Brachiaria decumbens* cv Basilisk were each divided into two parts, one to be grazed alone and the other to be used in conjunction with an adjacent area of leucaena. All grass pastures were in good condition with little invasion of weeds. They were mechanically slashed to a height of 15 cm one month before the start of grazing.

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An area of leucaena, sown one year previously at a rate of 5 kg/ha of hot water scarified seed (88% germination) in rows 2 m apart, was cut to a height of 15 cm at the start of the rains, and allowed to regrow ungrazed for 6 months before introducing the animals, at which time it had reached a height of over 2 m. Vegetation between the rows was mainly *Neonotonia wightii* with some *Panicum maximum*. The leucaena was divided into 6 areas with 3 subdivisions for rotational grazing with each grass species. The leucaena occupied 20% of the total grazing area. No fertilizer was used on any of the pasture species.

Animals: The animals used were zebu-criollo crosses, typical of the area, aged from about 12-16 months, with an average liveweight of 251 kg. They were weighed fortnightly after overnight fasting. All were vaccinated and deparasitized according to normal farm management, and had permanent access to water and rock salt. Each treatment group consisted of 6 animals.

Grazing management: Previous experience (Paterson and Samur,1981) indicated that in the dry season yaragua pastures could support 1.2 Animal Units (AU/ha) (1 AU = 400 kg liveweight). Although no similar information was available for brachiaria, its carrying capacity was obviously greater than the yaragua. Stocking rates were therefore set at 1.1 and 1.5 AU/ha for the two grasses respectively and in calculating the complimented treatments, the grazing area used included the leucaena assigned to that group of animals.

The complimented animals were placed in the leucaena paddocks from 08:00 until mid-day each day, spending the remainder of the time in their respective grass pastures. The non-complimented groups only left their paddocks for fasting and weighing. Each of the 3 leucaena subdivisions was grazed in turn for 10-14 consecutive days until most of the leaf material was consumed. The experimental period was 120 days, begining in June.

Pasture sampling: Samples were taken from each pasture species at 14 day intervals for analysis of crude protein, calcium and phosphorus. The grasses were cut at 15 cm above ground level, while with the leucaena, leaves and stems to 5 mm diameter were taken, as this was the material readily consumed by the animal. At the conclusion of the trial, 10 random samples of 1 m^2 were cut to a height of 6 cm, and bulked to estimate available pasture (grass plus weeds) in each grass paddock. Unfortunately, it proved impossible to measure dry matter (DM) content of these samples, but similar ones cut 2 weeks later were oven-dried to constant weight at 70°C to estimate this parameter.

Results

Over the 120-day grazing period, total rainfall was 270.5 mm compared with the 30-year average (1951-1980) of 197.8 mm for the same period. Temperatures were typical for the months June to September.

Pasture quality: Crude protein content of the grasses fell steadily throughout the trial period from 6.1 to 4.6% in yaragua and from 7.7 to 4.9% in the brachiaria, while the leucaena herbage showed a slight increase from 22.0% in early June to 25.6% in early October. Calcium and phosphorus contents showed no steady trends, and the averages over 8 sampling dates were 0.57, 0.38 and 1.28% for Ca and 0.27, 0.33 and 0.45% for P contents of the yaragua, brachiaria and leucaena, respectively.

Animal growth: Weight gains averaged over the 6 animals in each group are presented in Tables 1 (absolute weights) and in Table 2, liveweight gains per day.

Table 1:
Initial and final fasted weights and liveweight gains (LWG) in 120 days (kg)

Pasture	Initial (kg)	Final (kg)	LWG (kg)
Brachiaria	251.0	309.2	58.2
Brachiaria + Leucaena	249.3	326.5	77.2
Yaragua	253.3	311.0	57.7
Yaragua + Leucaena	249.0	317.8	68.8
Standard Error (±)			5.35

Table 2:
Liveweight gains (kg/d) averaged over 120 days

Pasture	Without Leucaena	With Leucaena	Means
Brachiaria	0.49	0.64	0.56
Yaragua	0.48	0.57	0.53
Means	0.48	0.61	0.55

Standard Errors In body of table ± 0.045 kg/day
of means ± 0.032 kg/day

Table 3:
Available pasture (kg/ha) on completion of grazing (cut at 6 cm)

Pasture	Without Leucaena			With Leucaena		
	Fresh, kg	%DM*	Estimated DM kg	Fresh, kg	%DM*	Estimated DM kg
Brachiaria	8400	32.6	2738	7100	34.7	2464
Yaragua	5450	39.3	2142	4300	38.0	1634

* Measured from samples cut 2 weeks later

Available pasture: Estimates of available pasture at the conclusion of the trial are presented in Table 3, for the grass paddocks only.

Discussion

Total annual rainfall since 1976 has been considerably above the average for the 24 preceeding years, with the exception of the 1977 - 78 agricultural year, which was similar to the long term average. The experiment was carried out in a dry season which was 37% better than the 30 year average, but was similar to those of recent years. Climatic conditions were therefore representative of the current wet cycle, but dry season pasture growth was probably better than could be expected with a return to the drier conditions experienced in previous meteorological cycles. Monthly mean temperatures have not been influenced by the changes in the rainfall pattern.

The brachiaria pastures were almost weed-free due to the characteristic closed sward. Yaragua has a more erect growth habit, and weeds have more space in which to develop. While the yaragua areas had a higher weed content than brachiaria, they were considered to be typical of good quality pastures of this species. At the start of the grazing period, the leucaena reserve area contained appreciable quantities of other pasture species, mainly *Neonotonia wightii*, which may have influenced animal performance, particularly in the first grazing cycle. These species were not favoured by the intense grazing pressure and rapid rotation, and their contribution to available grazing was not great in subsequent cycles. The leucaena was readily eaten in all cycles, and regrowth in the rest periods was rapid. Animals bent the taller plants with their bodies in order to reach the higher leaves.

Brachiaria was consistently higher in crude protein and phosphorus, but lower in calcium content than the yaragua, while leucaena was superior to both grasses in these components at all sampling dates.

Animal growth rates on all treatments were considered to be extremely good for Santa Cruz conditions, although the performance of animals without access to legume was better than would have been predicted (NRC 1970) from the modest protein contents of the grass pastures. This may be explained by higher efficiency either in dietary selection or in digestion of the zebu-criollo animals.

General growth rates confirm the results of Paterson and Samur (1982) who reported 0.5 kg/d LWG from similar animals grazing glycine/green panic pasture on the same property in the 1979 dry season, and suggested that zebu-criollo crossbreds showed better efficiency of feed utilization than Brangus animals of similar age.

No statistically significant differences were obtained between yaragua and brachiaria in terms of average daily gain/animal although the lower carrying capacity of the former grass would result in considerably poorer gains per ha (0.84 and 1.00 kg/ha/day from yaragua and 1.18 and 1.54 kg/ha/d from brachiaria from uncomplimented and grazing respectively). The effect of access to leucaena on LWG/animal was statistically significant at the 5% level.

Although pasture availability data at the end of the trial period must be treated with caution, since the calculations of available DM were estimated from samples cut at different times, it is clear that less pasture was left unconsumed in paddocks grazed by complemented

animals than in those utilized by animals without access to legume. Since the pastures were selected in the first instance for their uniformity, it seems likely that access to leucaena stimulated both animal growth and pasture consumption. While neither grass was over grazed in the dry season, the stocking rate on the yaragua was close to the optimum, while the brachiaria was relatively under-utilized. It is thought that the initial stocking rate of 1.5 AU/ha could have been increased to 1.6 or 1.7 AU/ha without decreasing the productivity per animal.

This work demonstrates that limited access to leucaena (4 hours per day) is sufficient to have a significant effect on LWG, and that 1 ha of the legume will successfully compliment 4 ha of either brachiaria or yaragua. Legume productivity can be sustained throughout a 4 month dry season by a rapid rotation around 3 areas. At the low levels of leucaena intake permitted by this management technique, no symptoms of mimosine toxicity were observed.

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