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THE EFFECT OF BROWSE SPECIES WHEN FED AS A SUPPLEMENT TO LOW QUALITY NATIVE GRASS HAY ON ANIMAL PERFORMANCE

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Abstract

A pen trial was conducted to measure the impact of some browse species when fed as a supplement on the nitrogen (N) and dry matter intake of cattle receiving low quality native grass hay. There were 8 treatments consisting of a nil-supplement control treatment, a urea supplement control, a green oaten hay control and 5 treatment groups based on browse supplements (*Albizia lebbeck*, *Carissa* spp. and *Bursaria* spp.). Treatment effect on increased native pasture intake was related to the amount of supplementary nitrogen (N), such that there was a significant linear relationship between dry matter intake of native pasture and the intake of supplementary N. Similarly, there was a significant relationship between total dry matter intake and total intake of N.

Keywords: pentrial, browse, quality, supplements, *Avena sativa*, *Albizia lebbeck*, *Carissa* spp., *Bursaria* spp.

Introduction

Nutrition of domestic ruminants in the tropics is mainly based on the exploitation of rangeland resources which are subject to high quantitative and qualitative variations over the year (Dicko and Sikena, 1992). During the wet season cattle feed on tropical grasses and usually gain weight but with the onset of the dry season the crude protein (CP) content and the dry matter digestibility (DMD) of the tropical grasses drop drastically and cattle start losing weight. The lack of N, which is the major nutritional deficiency of dry season diets, lowers feed intake and exacerbates an already existing energy deficit (Hogan, 1996).

Fodder trees and shrubs are an integral part of the diet of grazing animals in the tropics. The nutrient concentrations are subject to less variation than with grasses and this enhances their value as dry season feeds for livestock (Dicko and Sikena, 1991). On the basis of crude protein content, browse can be considered as a supplement to protein deficient grasslands (Wilson, 1969).

The purpose of this study was to measure the impact of some browse species when fed as a supplement on the N and dry matter intake of cattle receiving low quality native grass hay.

Material and Methods

A pen trial was conducted at Lansdown Pasture Research Station in Queensland, Australia from March 17th to June 3rd 1999 with 24 yearling Droughtmaster heifers.

All cattle were fed a basal diet of low quality native pasture hay consisting of black speargrass (*Heteropogon contortus*), Indian couch (*Bothriochloa pertusa*) and other *Bothriochloa* species. There were 8 treatments consisting of a nil-supplement control treatment, a urea supplement control, a high quality green oaten hay (*Avena sativa*) control and 5 treatment groups based on browse supplements, viz. pods of *Albizia lebbeck*, leaves of *Albizia lebbeck* and flowers of *Albizia lebbeck*, leaves of currant bush (*Carissa ovata* and *C. lanceolata*) and small, vegetative branches of prickly pine (*Bursaria incana* and *B. spinosa*). The design of the pens was such that there was a small risk of the transfer of faecal material between adjacent pens.

Therefore treatments were randomly assigned to blocks of 3 pens per treatment so that if any transfer of faecal material occured it would largely be confined to within treatment. The 24 heifers were allocated at random to the different treatments and replicates within treatments.

The native pasture hay was fed ad lib by feeding at a level which ensured 10% or more refusals on a daily basis. Forage supplements were offered at approximately 20% of total feed but at not less than 700 g and not more than 1000 g per head daily. Diets were fed for a 9 day adaptation period followed by an 8 day collection period for measuring digestibility and voluntary intake.

The N concentration of the native pasture hay and the forage supplements was determined by using the Kjeldahl technique.

The $\delta^{13}C$ analyses were conducted by means of a mass spectrometer for the native pasture hay, the forage supplements, the residual feed and the faecal samples collected from each pen daily during the final 3 days of the collection period. The faecal δ^{13} C values of pure supplements were assumed to be 1 unit lower than the forage δ^{13} C values of the supplements determined by the mass spectrometer (Jones, 1981).

Results and Discussion

The native pasture hay with no supplement was a very low quality diet with a N concentration of 0.4% and an in vivo dry matter digestibility (DMD) of just under 45%. The low intake of only 4.2 g/kg LW/day was indicative of greatly depressed ruminal activity due to a deficiency of N for microbial protein synthesis (Table 1). The N concentration in the forage supplements varied from 0.8% in prickly pine to 4.6% for the oats. Part of the response to the forage supplements was no doubt due to a microbial response to an improved rumen degradable N supply. The total N intake ranged from 0.028 g/kg LW/day for prickly pine to 0.171 g/kg LW/day for oats for the forage supplements compared with 0.017 g/kg LW/day for the nil-supplement control treatment. Compared with the nil-supplement control treatment, urea supplementation doubled the intake of native pasture while the response to the forage supplements ranged from 32% for prickly pine to 213% for oats. Treatment effect on increased native pasture intake was related to the amount of supplementary N such that there was a significant linear relationship between dry matter intake of native pasture and the intake of supplementary N (P=0.002). Similarly, there was a significant relationship between total dry matter intake and total intake of N (P=0.004) (Fig. 1).

Although the nominal forage supplementation rate was set at 20% of total intake, this rate was only achieved for the currant bush treatment. With the exception of the oats supplement which was consumed in total, the intake level of the other forage supplements was apparently limited by low palatability and possibly by negative post-ingestive feedback and perhaps because of the pen trial cattle having no previous exposure to the forage supplements offered.

Despite supplement intake levels being below 20% of total intake, the response to the different supplements must be regarded as highly beneficial.

These findings suggest that further studies on the various aspects and consequences of browsing behaviour in cattle are warranted and that the current perception of the value of browse plants may be substantially underrated.

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Table 1 - Effects of some browse species on dry matter and nitrogen intake and digestibility when fed as a supplement to cattle receiving a low quality native grass hay in N.E. Australia.

Supplement	*No supplement*	*P. Pine*	*Carissa*	*Albizia leaves*	*Albizia pods*	*Albizia flower*	*Urea*	*Oats*
N concentration of supplement (%)		0.80	1.11	1.67	2.09	3.30	46.00	4.58
Total DMI (g/kg LW/day) **	4.20^{e}	6.23^{de}	7.34^{cd}	7.41^{cd}	9.57^{b}	9.13^{bc}	8.43^{bc}	15.72^{a}
Total DDMI (g/kg LW/day) **	1.90^{d}	3.10^{c}	3.17^{bc}	3.08^{c}	4.07^{bc}	4.16^{b}	3.50^{bc}	7.29^{a}
DMI native pasture (g/kg LW/day) **	4.20^{f}	5.55^{ef}	5.82^{def}	6.29^{cde}	8.19^{bc}	7.69^{bcd}	8.42^{b}	13.13^{a}
DDMI native pasture(g/kg LW/day) **	1.90^{c}	2.71^{bc}	2.77^{bc}	2.64^{bc}	3.38^{b}	3.19^{b}	3.50^{b}	5.12^{a}
DMI supplement (g/kg LW/day) **		0.67^{c}	1.52^{b}	1.11^{bc}	1.38^{b}	1.45^{b}		2.59^{a}
DDMI supplement (g/kg LW/day) **		0.39^{c}	0.41^{c}	0.44^{c}	0.69^{bc}	0.96^{b}		2.17^{a}
Total nitrogen intake (g/kg LW/day) **	0.017^{f}	0.028^{ef}	0.04^{de}	0.044^{de}	0.062^{cd}	0.079^{c}	0.131^{b}	0.171^{a}
Faecal output (g/kg LW/day) **	2.30^{d}	3.12^{cd}	4.17^{bc}	4.33^{bc}	5.50^{b}	4.98^{b}	4.93^{b}	8.43^{a}
Overall DMD (%)*	45.00^{ab}	50.00^{a}	43.67^{ab}	41.33^{b}	42.67^{ab}	45.67^{ab}	41.67^{b}	46.33^{ab}
DMD native pasture (%)*	44.85^{ab}	49.01^{a}	47.68^{a}	42.15^{ab}	41.37^{ab}	41.91^{ab}	41.85^{ab}	38.97^{b}
DMD supplement (%)**		62.57^{b}	26.39^{d}	36.79^{cd}	50.43^{bc}	66.51^{ab}		83.82^{a}

DM=dry matter, DMD=dry matter digestibility, DMI=dry matter intake, DDMI=digestible dry matter intake

Treatments means followed by the same superscript do not differ significantly (** indicates significance level of $P<0.05$, * indicates significance level of $P<0.10$).

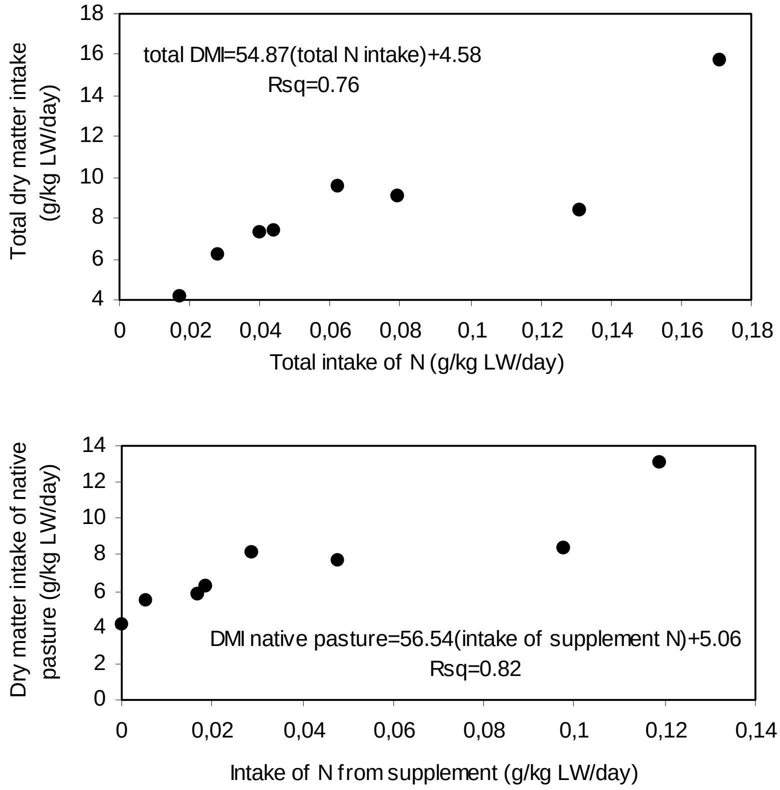

Figure 1- Relationship between total dry matter intake and total N intake and the relationship between dry matter intake of native pasture hay and intake of supplementary N.