THE EFFECT OF THREE DIFFERENT NITROGEN BASED SUPPLEMENTS ON THE UTILIZATION OF TROPICAL FORAGE DIETS BY ZEBU CROSSBRED STEERS

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SUMMARY

Thirty-two Bos indicus crossbred steers were offered ad libitum a basal diet of low quality tropical native pasture hay. Supplements of urea (US), urea and formaldehyde cottonseed meal (US+PP) or urea, soyabean meal and maize (UPM) were compared in a 64 day pen feeding study. The unsupplemented controls lost 27 kg and those fed urea lost 14 kg. Liveweight gains of 18 kg and 11 kg were observed in treatments US+PP and UPM respectively. The liveweight responses were related to a 60% increase in roughage intake and the increased nutrient supply from supplemental protein and energy.

INTRODUCTION

Native pastures in the sub-humid tropics rapidly decline in digestibility and N content with the onset of the dry season. The resultant low intake of digestible energy can be increased by offering supplemental N as urea (Siebert and Kennedy 1972) and a further increase is possible when urea and protected protein are fed (Lindsay et al. 1982). The digestible energy intake can also be increased by feeding an energy supplement which does not depress roughage intake (Ørskov et al. 1978).

The present experiment compared supplements of urea, urea and protected protein and urea, protected protein and maize. These supplements were fed with a basal diet of native pasture hay to growing cattle and live weight and feed intake were measured.

MATERIALS AND METHODS

Animals and diets

Thirty-two Bos indicus crossbred castrated males of 215 ± (SE) 1.9 kg mean live weight were used in a 64 day pen feeding study. Animals were allocated by stratified randomisation to 8 pens with two replicates of four treatments as follows: control - basal diet of native pasture hay - NP; basal diet plus 30 g N as urea - US; basal diet plus 30 g N as urea and 37 g N as formaldehyde cottonseed meal - US+PP; basal diet plus 69 g N as urea, 37 g N as whole soyabeans and 400 g maize - UPM. The basal diet contained 0.4% N and was chaffed. All animals were offered a mineral supplement containing Na, S and trace elements. The cottonseed meal was treated with a 20% solution of formaldehyde (1.5 g formaldehyde per 16 g N) and the ingredients of treatment UPM were mixed and extruded at 150°C.

Experimental procedures

The supplements were offered daily. The urea and minerals in US were sprayed on the hay and in US+PP and UPM the mixed supplement was fed in a separate trough. The cattle were weighed at weekly intervals and feed residues were removed at the same time.

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The live weight and feed intake data were analysed by analysis of variance using the Students t test to compare treatment means.

RESULTS

Palatability of the extruded mixture (UPM) was a problem and 100 g of molasses per day per animal was mixed with the UPM to ensure complete intake. The US + PP mixture was avidly consumed. The results for liveweight change and feed intake are presented in Table 1.

TABLE 1 The effect of various nitrogen supplements on feed intake and liveweight gain of growing steers offered a native pasture diet for 64 days

	Treatment				
	NP	US	US+PP	UPM	SEM
Initial live weight (kg)	214.9	213.3	213.3	220.1	1.9
Liveweight change (kg/d)	-0.42a*	-0.21a	+0.28b	+0.17b	0.07
Dry matter intake (kg/d)					
Roughage	2.18a	3.48b	4.14b	3.60b	0.26
Total	2.23a	3.57b	4.72b	4.63b	0.27

* Means with dissimilar letters differ significantly ($P < 0.05$).

The NP and US groups lost significantly more ($P < 0.05$) live weight than the other two groups. The difference in liveweight gain between US+PP and UPM was not significant ($P > 0.05$). The data on roughage intake showed that intake increased by 60% ($P < 0.05$) when US was fed and a further small increase of 3% and 19% above the US intake occurred when the UPM and US+PP supplements were fed.

DISCUSSION

This study has confirmed earlier work and clearly demonstrated that a urea, mineral supplement will stimulate intake of low quality native pasture. When protected protein or protected protein and energy were fed with the urea a liveweight loss was converted into a liveweight gain.

The lack of a liveweight response to added energy in the form of maize when N is non-limiting agrees with work using sheep fed diets of oat straw, urea and less than 15% starch (Mulholland et al. 1976). Leibholz and Kellaway (1982) have also demonstrated that a cracked wheat supplement to a paspalum hay plus meat meal diet did not increase liveweight gain in steers. However, recent studies at Swan's Lagoon with protected protein and alkali treated grain indicate a 43% response in liveweight gain due to the grain component (Lindsay, J.A. unpublished data). The differences between experiments may be related to the rate of degradation of dietary starch in the rumen. Alkali treated whole grain is digested more slowly and the energy released can be utilised more efficiently (Ørskov et al. 1978). It is also possible that the heat generated in the extrusion process used to manufacture UPM was excessive causing some of the protein in the supplement to be indigestible.

The increase in roughage intake when the urea, protected protein supplement was fed was due almost entirely to the urea component. However, the response in liveweight gain has been attributed to the slow release of N in the rumen from protected protein and the energy in the protein contributing to the glucose economy of the animal. MacRae and Lobley (1982) have recently postulated that the large quantities of acetate produced from roughage feeds may be utilised more

efficiently if reduced coenzyme is available. Such a source may be the amino acids liberated in the small intestines from protected proteins.

Cattle are grazed under a regime of low stocking rates on unimproved pastures in the sub-humid tropics. This usually ensures that there is an abundance of dry standing pasture remaining after a normal season of growth. The urea, protected protein supplement described in this paper should offer a suitable means of reducing the live weight normally lost during the dry season and may also produce a net gain over the period of feeding. However, it should be noted that the cattle offered this supplement will eat more pasture and the normally lenient stocking rate may just be sufficient to carry the stock during a period of extended feeding.

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