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LEUCAENA FORAGE AND ELEPHANT GRASS AS ROUGHAGE AND PROTEIN SOURCES IN A MOLASSES/UREA BASED DIET FOR FATTENING ZEBU CATTLE[1]

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12 bulls and 12 heifers of Zebu type were allocated by weight and sex into groups of 4 animals and were given: (A) fresh leucaena forage (4% of liveweight); (B) leucaena (2.5% of liveweight) and elephant grass (2.5% of liveweight); or (C) elephant grass (6% of liveweight) as forage supplements for a liquid molasses/urea (restricted to 1.5% of liveweight) diet. Cottonseed cake was fed at 0.2% liveweight to all animals.

Males given leucaena gained weight faster (760 g/d) than those which received elephant grass (580 g/d), whereas when the two forages were fed together, intermediate gains resulted (670 g/d). Females grew slower than the males (overall means 490 and 670 g/d) and showed no effect of forage treatment. Trends for feed conversion were similar to those for liveweight gain. The molasses contributed about 40% of the dietary DM, and leucaena a maximum of 50%.

Key words: cattle, molasses/urea, leucaena, elephant grass, fattening

Fattening beef cattle on molasses based diets is a well established practice in Mauritius. However, a major drawback of this system is that a relatively large quantity of high quality protein and cereal grain supplement has to be incorporated in the diet in order for the animals to display their genetic potential for growth (Poillot et al 1976). From an economic point of view, these supplements are expensive and have to be imported.

The amount of supplement can be reduced considerably when the molasses/urea is fed with a high protein forage. Hulman et al (1978) demonstrated that when leucaena forage was fed to growing aniamls in conjunction with molasses/urea, performance was the same as when grass and groundnut cake were given.

In Mauritius both leucaena forage and elephant grass (*Pennisetum purpureum*) are common forages which are utilised for cattle feeding.

The objective of the present trial was to provide further data on the use of leucaena forage in a molasses fattening system, and specifically to study combinations of leucaena with elephant grass.

Materials and Methods

Treatment and design: Three dietary treatments were compared in a randomised block design with one group of male and one group of female cattle on each treatment:

(A) Fresh leucaena forage restricted at 4% of liveweight
(B) A mixture of fresh leucaena at 2.5% of liveweight and fresh elephant grass at 2.5% of liveweight
(C) Fresh elephant grass at 6% of liveweight.

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These dietary treatments were the forage supplements in a basal diet of molasses containing 2.5% urea restricted at 1.5% of liveweight plus cottonseed cake at the rate of 0.2% of liveweight per day.

Animals: 12 young bulls and 12 heifers of the Zebu breed were divided in order of body weight, into 3 groups of males and 3 groups of females, which were then allocated at random, within sexes, to the different treatments. The animals weighed 100 to 160 kg at the start of the trial. Before the trial was started the animals were treated with thio - benzole to eliminate any worm infestations. The animals were group fed and housed in partially rooved pens with concrete floors.

Table 1:
Chemical composition of feeds ($\bar{x} \pm SE_{\bar{x}}$)

	Leucaena	Elephant grass	Cottonseed cake	Molasses/ urea
Dry matter	29.5 ± .88	20.7 ± .84	91.0 ± .07	77.1 ± .6[1]
Content in DM%				
N x 6.25	21.4 ± .97	8.54 ± .53	48.7 ± .24	10.6 ± .54
Crude fibre	30.5 ± 2.0	33.1 ± .71	7.76 ± .96	
Ether extract	2.23 ± .08	2.27 ± .04	10.2 ± .12	
Ash	6.26 ± .37	7.51 ± .56	7.11 ± .09	
Ca	1.26 ± .08	0.56 ± .07		
P	0.16 ± .01	0.22 ± .03		

[1] Brix = soluble solids

Procedure: There was a preliminary feeding period of 4 weeks to adapt the animals to the experimental diets. Feeding was once daily. The cottonseed cake was fed first, together with a mineral mixture. The molasses mixture was fed separately. Leucaena and elephant grass were hand cut daily from established fields. The leucaena was harvested after 8-10 weeks regrowth, and consisted of leaf material with branches between 7 and 13 mm thickness. The elephant grass was harvested every 6 - 8 weeks. No chemical fertilizers were applied to the fields.

Measurements: The cattle were weighed individually every 14 days and the experimental diets adjusted accordingly. The rate of liveweight gain was calculated by regression of weight on time. Intakes of forages, molasses and cottonseed cake were recorded daily.

Chemical analyses: Composite samples of the leucaena forage and the elephant grass were analysed weekly. Other feeds were analysed at intervals. The methods were according to standard procedure. Ca and P were determined by atomic absorption.

Statistical analysis : The data were analysed as a 2 x 3 factorial design according to standard practice.

Results

The chemical analyses of the feed samples are given in Table 1. The

forages and supplements showed little variation in composition throughout the duration of the trial.

The mean values for liveweight gain, voluntary feed intake and feed conversion are shown separately for males and females (Table 2). The an-

Table 2:
Mean values for liveweight change, feed intake and conversion

	Males			Females			SE-x
	Leucaena	Leucaena/ elephant grass	Elephant grass	Leucaena	Leucaena/ elephant grass	Elephant grass	
Liveweight, kg							
Initial	176	166	143	156	119	145	
Final	271	255	217	214	185	205	
Daily gain	0.764	0.672	0.575	0.489	0.491	0.496	±0.49
Feed intake, kg/d							
Leucaena	8.8	5.10	-	7.40	3.90	-	
Elephant grass	-	5.10	10.7	-	3.90	10.7	
Cottonseed cake	0.43	0.39	0.34	0.37	0.28	0.33	
Molasses/urea	3.25	3.0-	2.60	2.80	2.20	2.60	
Total DM	5.12	4.89	4.22	4.35	3.63	4.18	
Consumption index	2.30	2,32	2.34	2.35	2.39	2.38	
Molasses, % of diet DM	42	40	40	42	39	40	
Conversion	6.70	7.28	7.34	8.20	7.39	8.43	

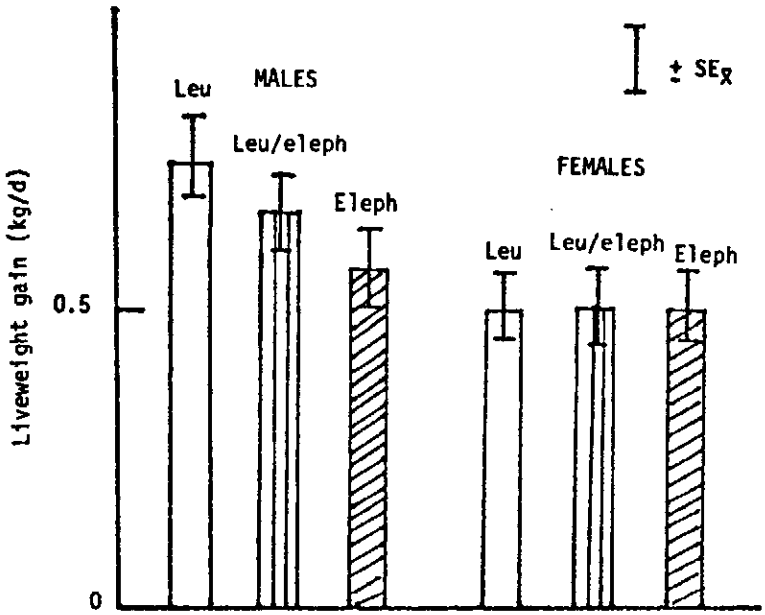
alysis of variance for liveweight gain (Table 3) showed a highly significant difference due to sex (P = .001),a tendency towards differences be - tween forages (P = .21) and a strong indication of a sex x forage inter-

Table 3:
Analysis of variance for liveweight gain

Source of variation	Degrees of freedom	Sum of squares	Mean squares	F	Probability
Total	23	0.4366			
Treatments	5	0.2622	0.0524	5.45	0.003
Forage	2	0.0333	0.0166	1.72	0.21
Sex	1	0.1903	0.1903	19.7	0.001
Forage x sex	2	0.0386	0.0193	2.0	0.16
Error	18	0.1744	0.0096		

action (P = .16). Thus, within the males the leucaena treatment supported faster growth rate than did the elephant grass but there were no differences due to the forage type within the females (Figure 1). There were similar tendencies for feed conversion, and total DM intake.

Figure 1:
Effect of leucaena, elephant grass or both, as roughage sources in a molasses/urea diet for growing cattle



Discussion

The tendency towards a significant interaction between sex and forage type for liveweight gain and feed conversion could be interpreted as indicating that the leucaena forage was superior to the elephant grass, only when there was sufficient potential for the difference to be expressed. In other words, the bulls with their known superiority for growth compared with heifers - were able to respond to the higher nutritive value of the diet containing leucaena, wheras the heifers showed no differential response. It should be remembered also that the breed used was Zebu, and that the particular strains available in Mauritius appear to be of lower than average growth potential (Preston, personal communication). Hulman et al (1978) gave leucaena as the only forage and protein sources in a molasses/urea diet to growing Friesians. They reported gains of 850 g/d, which were slightly better than those for grass and groundnut cake. Zebu bulls in the Dominican Republic gave better gains on leucena forage than on sugarcane tops, also with a basal diet of molasses/urea (Meyreles et al 1982).

In none of the abovementioned trials were there any apparent ill effects associated with feeding leucaena, which might have been attributable to mimosine toxicity (ter Meulen 1979). One of the reasons for this may have been the restricted level of leucaena in the diet, which usually did

not exceed 35% of the dietary DM in the trials of Hulman et al (1978) and Meyreles et al (1982), although in the present experiment it accounted for 50% of the dietary DM on the best treatment.

In the classical system of using high levels of molasses for cattle fattening, it is customary to give the molasses/urea on a free choice basis (e.g. Munoz et al 1970; Meyreles et al 1982). The decision to restrict the molasses to 1.5% of liveweight in the present trial was based on the belief that there is that there is some factor associated with Mauritian molasses which leads to inefficient utilization and poor performance in both growing (Gaya et al 1981a) and milking cattle (Gaya et al 1981b) Some evidence to support the idea that the molasses should be restricted was provided by Teeluck et al (1982, personal communication). In a commercial farm trial, they limited the molasses/urea to 1.5% of liveweight and gave maize forage (2.5% of liveweight). Weight gains were over 800 g/d, with only 500 g/d of cottonseed cake.

The reason for the apparent difference between molasses from Mauritius and molasses from other sugarcane producing countries is not known but may be related to its lower content of sugars, and higher ash concentrations, due to efficient sucrose extraction at the factories.

Conclusions

The results of this trial provide further evidence for the belief that *Leucaena leucocephala* has a particularly useful role to play as a combined roughage and protein source in molasses/urea based diets for fattening cattle.

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