LEUCAENA LEUCOCEPHALA AS PROTEIN SUPPLEMENT FOR DUAL PURPOSE MILK AND WEANED CALF PRODUCTION ON SUGAR CANE BASED DIETS: COMPARISONS WITH RICE POLISHINGS[1]

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15 cows and their calves were allocated in a random design to a auger cane based diet and the following supplements: A) 2 kg/d of rice polishings B) 1 kg/d of rice polishings and 3 hr of restricted grazing on a mixture of Leucaena leucocephala and grass; and C) 0.5 kg/d of rice polishings and 3 hr/d of restricted grazing of leucaena/grass. The trial lasted 84 days. The cows were commercial crosses of Brown Swiss/Zebu with about 602 of the latter breeding. they were midway through lactation at the beginning of the experiment. The basal diet wee chopped whole sugar cane to which was added a solution of aqueous urea (20% w/v) at the rate of 50 al/ kg of cane. After 42 days (the end of the dry season) only immature cane could be obtained and the diet was changed to ad libitum sugar cane plus free access to a mixture of molasses/ urea (10% urea w/w) given in a separate feeder. The pasture was a mixture of Leucaena leucocephala and Santo Domingo star grass and wee estimated to contain 60% of the former on a fresh matter basis. The cows were milked mechanically once daily; the calves suckled for a few minutes prior to milking to stimulate let down and after milking for 30 minutes to consume residual milk. Voluntary intake of sugar cane and of molasses decreased as the rice polishings supplement was reduced and substituted by leucaena grazing. However, total intake of DM and the consumption index ratio were superior on the two grazing treatments compared with the control receiving only sugar cane (and molasses), urea and rice polishings. Intake appeared to be greater in the dry than in the wet season. Saleable milk production was the same on the three treatments (2.92, 3.16 and 3.12) (SEx ± .17) kg/d for the control and for the leucaena grazing with 1 kg/d and .5 kg/d of rice polishings, respectively. Milk intake was higher for calves being suckled by the cows on leucaena grazing (2.22, 3.72 and 3.76;tio 61 .37). Total milk production also favoured the leucaena treatment (5.13, 6.90 and 6.88 ± .51). There were no differences in live weight gain of the calves (118, 35 and 21 g/d) or of the cows (499, 517 and 491). It is concluded that restricted grazing of Leucaena leucocephala can effectively substitute 75% of the rice polishings normally fed as a supplement to a sugar cane diet.

Key words: Sugar cane, leucaena, rice polishings, dual purpose, milk/calf production, season

Previous trials in this series with sugar cane feeding (Alvarez and Preston 1976; Alvarez et al 1977) showed that under dry season conditions, restricted grazing of the legume Leucaena leucocephala could replace half of the normal supplementation with rice polishings (2 kg/d) with no change in production, but that total elimination of the

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rice polishings and use of Leucaena leucocephala as the only supplement, led to reduced milk production and loss of live weight in the cows. This latter effect was attributed in part to the grazing of immature leucaena and possible toxic effects of mimosine. In the second experiment (Alvarez et al 1977), carried out in the wet season, chopped sugar cane, molasses containing 10% urea and 750 g/d of rice polishings supported the same cow and calf performance as unsupplemented grazing of a mixed grass/leucaena sward.

The objective of this experiment was to examine varying degrees of replacement of the rice polishings with restricted grazing on Leucaena leucocephala.

Materials and Methods

Treatments and Design: The treatments in a randomised design with 5 cows and their calves on each treatment were: Supplements of A) 2 kg/d of rice polishings; B) 1 kg/d of rice polishings and 3 hr/d of restricted grazing on a mixture of Leucaena leucocephala and grass; and C) 0.5 kg/d of rice polishings and 3 hr/d of restricted grazing of leucaena/grass. The trial lasted 84 days consisting of 14 days of adaptation and 70 for recording of data.

Animals: The cows were commercial crosses with different proportions of Brown Swiss and Zebu. The average level of Zebu blood was estimated to be about 60%. The calves were progeny of sires of similar breeding to the cows, The cows were allocated to the treatments in accordance with stage of lactation, level of production and racial makeup. They were midway through the lactation at the time of beginning the experiment. All had previously been receiving diets based on sugar cane.

Diets: The basal ration consisted of chopped whole sugar cane given free choice after spraying with a solution of aqueous urea (20% w/v) at the rate of 50 ml/kg of cane. This procedure was carried out during the first 42 days of the experiment which coincided with the end of the dry season. At the onset of the rains, only immature cane could be obtained and from this moment the diet was changed to ad libitum sugar cane supplemented by free access to a mixture of molasses/urea (10% urea w/w)) given in a separate feeder. This was to compensate for the drop in the sugar content of the cane and to facilitate the feeding of urea. The cows also had free access to a mixture of salt, rock phosphate and trace minerals. The rice polishings were given before the sugar cane in the morning.

The pasture had a total area of approximately 3 ha and had been established 18 mth previously with a mixture of Leucaena leucocephala and Santo Domingo Star grass and Seataria(variety Kasangula). The legume was planted in Continuous rows separated by 1.6 m; when it reached 40 cm in height the two grasses were planted in the inter row spaces. The aim was not so much to provide an association of legume and grass but to replace the voluntary weeds which otherwise became established between the rows. At the moment of grazing it was estimated that the proportion of legume was approximately 60% on a fresh matter basis.

The calves were managed as one single group (for all treatments) and had free access to chopped whole sugar cane and urea and received 0.5 kg/d of rice polishings plus minerals.

Table 1:
Proximate analysis of leucaena forage (leaves and small branches)

	% in DM
Nitrogen	4.8 ± .31
Fibre	16.8 ± 4.2
NFE	42.4 ± 3.1
Ether extractives	1.45 ± .27
Ash	9.46 ± .55

(Mean values with SE; n = I)

Procedure: Each treatment group of cows was housed in a pen with cement floor and palm roof with an area of approximately 16 m^2/animal. The cows were milked mechanically once daily in the morning; the calves suckled for a few minutes prior to milking in order to stimulate let down and after milking for 30 minutes to consume the residual milk. The cows and calves were then separated and remained apart until the following day. The grazing treatments were initiated immediately after milking.

Measurements: Milk yield was recorded daily and the milk consumed by the calf was determined weekly, weighing the calf before and after being suckled. Feed intake was determined daily. The intake of forage on the grazing treatments was estimated every 14 days by weighing the cows before and after grazing, assuming that the increase in live weight was a measure of forage intake. It was appreciated that such data must underestimate the actual intake due to defeaecation and urination during grazing The brix and DM of the sugar cane were determined weekly as was the DM of the leucaena.

Results

Mean values for proximate analyses on 8 samples of leucaena forage (leaves and small branches) taken from different areas of the grazing are given in table 1. Daily feed intakes for the different treatments during the wet and dry season are given in table 2 while animal performance parameters are summarised in table 3. An analysis of feed costs is given in table 4.

Voluntary intake of sugar cane decreased as the rice polishings supplement was substituted by leucaena grazing; molasses intake for the wet season phase of the experiment showed a similar tendency. However, total intake of DM and the consumption index ratio were superior for the two grazing treatments compared with the control receiving only sugar cane (and molasses), urea and rice polishings. Moreover, actual intakes on the grazing treatments were probably higher in view of the almost certain under-estimates of forage intake during grazing. On all treatments, intake appeared to be greater in the dry than in the wet season. There were no differences in saleable milk production on the three treatments but total milk output was significantly higher for the two treatments with leucaena grazing apparently because of greater milk intakes by the calves on these treatments compared with the drylot treatment without grazing. There were no significant differences for change in live weight of the cows or calves on the different treatments.

Table 2:
Mean values for feed intake during the trial (42 days in dry season and 28 days in wet season)

System	Drylot		Restricted grazing				SEx		Probability of "F" test	
Rice polishings, kg/d	2.0		1.0		.05					
Season	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet	Dry	Wet
Feed intake, kg/d										
Sugar cane	24.9	24.2	21.7	19.9	19.2	15.3				
Molasses	-	3.1	-	2.8		2.2				
Urea	.26	.30	.23	.27	.20	.21				
Minerals	.12	.12	.12	.12	.12	.12				
Leucaena forage	-	-	9.9	9		10.0				
Total DM	9.4	8.7	10.0	8.8	8.8	7.6				
Consumption index	1.86	1.76	2.17	2.04	2.17	1.87	.046	.092	.004	.24

[1] For dry and wet seasons Brix was 21.0 and 10.9 and %DM 28.9 and 19.4
[2] Daily intake of DM (kg)/100 kg LW

Table 3:
Means values for milk production and calf performance

System	Dry lot	Restricted grazing		SEx	Probability of "F" test
Rice polishings	2 kg/d	1 kg/d	.5 kg/d		
Saleable milk, kg/d					
Pre-experimental	2.95	2.93	2.87		
Experimental	2.92	3.16	3.12	±.17	.67
Milk consumed by calf, kg/d	2.22	3.72	3.76	±.37	.03
Total milk, kg/d	5.13	6.90	6.88	±.51	.07
Change in live weight, g/d					
Cows	118	35	21	±102	.80
Calves	499	517	491	±49	.93

In general, results were almost identical for the lower level of rice polishings (0.5 kg/d) as for the higher 1 kg/d level. Feeding cost obviously favoured the grazing treatments.

Discussion

The data indicate that restricted grazing of Leucaena leucocephala is an effective substitute for rice polishings as a protein source and may well have led to slightly greater overall production due to greater total voluntary intake. Similar results were reported by Salais et al (1977) when they compared leucaena with sugar cane as forage supplements to a molasses based diet. The increased intake associated with consumption of leucaena may have been due to its characteristics as a bypass protein or to its beneficial effects on rumen motility due to its roughage characteristics.

Table 4:
Estimates of costs and returns ($MN/d/cow)[1]

	Unit price	Drylot	Restricted grazing	
		2 kg/d	1 kg/d	.5kg/d
Sugar cane	100	2.49	2.17	1.92
Urea	2000	.52	.46	.39
Rice polishings	2000	4.0	2.0	1.00
Minerals	1800	.22	.22	.22
Leucaena/pasture			.70	.70
Total cost		7.23	5.55	4.23
Sales				
Milk	4.20	12.3	13.3	13.1
Calves	12.00	5.41	6.18	5.89
Total		17.5	19.5	19.0
Margin		10.5	14.0	14.8

[1] $US 1.00 =$MN 23.50

There were no apparent problems which could be attributed to the presence of mimosine in the Leucaena leucocephala, neither in direct clinical effects on the animals nor on the taste or smell of the milk. There have been reports of taint in milk from cows fed Leucaena leucocephala when the animals had been grazing the legume prior to milking (G Sanchez Rodriguez, personal communication, cited by Anon 1977). Apparently any odour due to leucaena can be avoided by eliminating the legume from the animals diet for 2 hr before milking and, of course, in the present experiment, milking was carried out before grazing.

Conclusions

The results of this study indicate that compact areas of the legume Leucaena leucocephala present an excellent alternative to cereal/oilseed concentrates as a protein source for auger cane based diets.

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