STUDIES IN UREA UTILIZATION IN SUGAR CANE DIETS: EFFECT OF DIFFERENT METHODS OF INCORPORATING UREA IN THE RATION

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30 Zebu steers were used to compare the different methods of supplying urea in diets of whole chopped sugar cane supplemented with rice polishings at the rate of l kg per animal per day. The methods were: (A) mixing the urea with the cane as an aqueous solution (200 g urea/kg of solution) at the rate of 50 ml per kg fresh cane; (B) giving the urea separately as a solution in molasses (100 g urea/kg solution) to which the animals were allowed free access. (C) mixing the urea as a solution (248 g urea/litre) in molasses sprayed on the cane at the rate of 50 ml of the solution/kg of fresh cane. The 112 day trial was carried out during the dry season. Mean weight gains for the systems A, B, and C were not significantly different at 793, 796 and 833 g/day. Feed conversion (DM basis) was 7.97, 8.47 and 8.25 and did not differ significantly but DM consumption per 100 kg of body weight was significantly lower for treatment A (2.00) (P <. 04) than for B (2.20) or C (2.14).

Key words: Sugar cane, urea, cattle

The production of meat and milk in tropical areas is frequently severely limited by pasture availability and quality during the dry season. Pasture supplementation, or drylot feeding, of diets based on sugarcane which reaches its maximum nutritive value in the dry season, offer promising solutions to such problems of tropical cattle production. Several studies (Preston et al 1976: Alvarez and Preston 1976a) have established that satisfactory growth of steers (up to 900 g/day) and moderate levels of milk production (5 to 7 kg/day) from dual purpose cows can be obtained on rations based on chopped mature sugar cane supplemented with molasses, urea and rice polishings. The responses to urea (Alvarez and Preston 1976b; Silvestre et al 1976; Perez and Garcia 1975; Ferreiro and Preston 1976a) and to the rice polishings component (Preston et

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al 1976; Lopez et al 1976) were established very conclusively. Molasses has proved a useful vehicle for the urea but compared with sugar cane it is a more expensive energy source.

The aim of the present experiment was to compare the existing methods of supplying urea in molasses (either on a free access basis or sprayed over the cane) with urea simply mixed as an aqueous solution with the freshly chopped cane.

Materials and Methods

Animals and Housing: 30 Zebu steers from 18 to 24 months of age with a mean weight of 270 kg were deparasitized vaccinated and distributed at random in groups of five to give 2 replications of 3 treatments an allotted to lightly - roofed pens with concrete floors giving a living space per animal of approximately 16 square metres.

Treatments and Design: The three dietary treatments were:

A) Chopped whole sugar cane with 50 ml/kg of an aqueous solution of urea (A, table 1) mixed with the cane.

B) Whole chopped sugar cane as free access and a solution of urea in molasses (B, table 1) freely available from a separate trough.

C) Whole chopped sugar cane mixed with 50 ml/kg of a solution of urea in molasses (C, table 1) mixed with the cane.

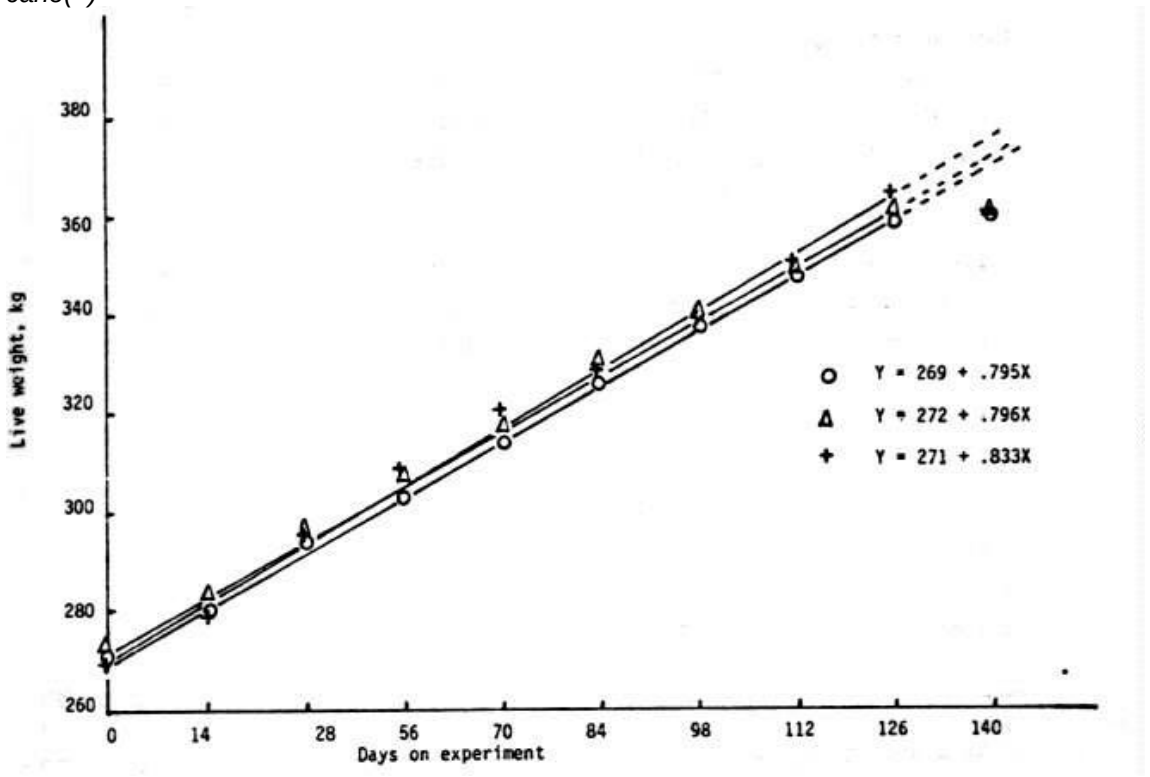
Table 1:
Composition of urea solutions

		Cane + Molasses/urea	
	Cane/urea	Separate	Mixed
Urea, kg	20	10	35
Water, litres	80	10	30
Molasses (80°Brix), kg		80	115

Procedure: All the animals received 1 kg per day of rice polishings mixed with the cane and had free access to a mineral mix (50% NaCl, 47% rock phosphate and 3% trace minerals). Cane was weighed and given twice daily at 9 a.m. and 3 p.m. and the dietary additives mixed in by hand in the feed trough. Unconsumed feed was collected and weighed immediately before the 9 a.m. feed. The trial was begun 29 February 1976 and lasted 112 days. Animals were

weighed individually at the beginning of the experiment and subsequently at 14 day intervals. Consumption of cane was recorded daily and consumption of molasses every 14 days. Brix and DM of the cane were measured daily. The proportions of stalk and tops, the DM and Brix of these with number of internodes, proportions of dry and green leaf and cane variety were noted twice weekly as a means of defining the quality of cane consumed. Effects on animal performance due to stage of maturity of sugar cane were reported by Alvarez and Preston (1976c) and due to stalk/tops ratio by Ferreiro and Preston (1976b).

Figure 7:
Live weight of steers fed sugar cane and a urea solution mixed with the cane (○), a solution of urea/molasses fed separately free choice (△) or a urea/molasses solution sprayed over the cane(+)



The experimental design was a random block with 10 replications (animals) for weight gain and 2(corrals) for consumption data. The effects on live weight gain were analysed by comparing the regressions of weight on days on experiment between diets with that of animals within diets. The data on feed conversion were analysed in a similar fashion by comparing the between and within diet regressions of total cumulative feed consumption on liveweight. Indices of consumption (daily DM intake/100 kg of live weight) were calculated on the basis of the mean consumption per pen in each period against the mean liveweight for the period and were analysed in the form of a one way analysis of variance.

Results and Discussion

Table 2 :
Mean values for live weight, feed intake and conversion for different methods of supplying urea to cane diets (10 animals per treatment groups: trial period of 112 days)

		Cane + Molasses/urea	
	Cane/urea	Separate	mixed
Live weight, kg			
Initial	270.2	270.3	269.8
Final	358.4	360.1	364.4
Daily gain [1]	.795	.706	.833
Feed Intake, kg/day			
Fresh cane	19.18	15.86	18.48
Rice polishings	1.00	1.00	1.00
Molasses	.00	1.61	.725
Urea	.188	.201	.220
Minerals	.111	.110	.104
Total DM	6.27	6.95	6.76
Consumption index[2]	2.00[a]	2.20[b]	2.14[b]
Conversion[3]	7.97	8.47	8.25
N X 6.25 in diet,% DM	13.05	12.56	13.67
N from urea, %	66.1	66.2	68.4

[1] By least square regression
[2] Daily intake of DM (kg)/100 kg LW
[3] DM intake/gain in LW, kg/kg
[ab] Means without letter in common differ at P <.04

Weight gains, consumption of dietary components, indices of consumption and feed conversion for the three treatments are given in table 2. Differences in weight gains due to the different methods of supplying urea were not significant nor were there significant differences in feed conversion ratio, although there was a tendency (P = 0.11) towards better conversion for the simple urea/water treatment, which appeared to be due to a lower feed intake. These observations suggest that digestible DM from cane is better utilized than digestible DM from molasses, perhaps due to significantly higher ratios of sucrose to reducing sugars in the digestible organic matter of the cane.

The effect on feed costs of reducing the molasses component is seen in table 3, where cost per unit of liveweight gain is obviously superior for the simple aqueous urea method over the other two treatments. The results therefore indicate practical advantages from eliminating molasses, which has to be purchased and transported.

Table 3:
Analysis of feed costs for the three diets

	Cost		Cane + Molasses/urea	
	MN$/ton [1]	Cane/urea	Separate	Mixed
Whole sugar cane	$100/ton	1.92	1.59	1.85
Urea	$2000/ton	.38	.40	.44
Molasses	$700 /ton	.00	1.13	.51
Rice polishings	$1800/ton	1.80	1.80	1.80
Minerals	$1500/ton	.17	.17	.16
Total feed cost	-	4.27	5.09	4.76
Cost/kg gain	-	5.37	6.39	5.71

[1] Mexican pesos

Silvestre et al (1976) reported superior animal performance when sugar cane and a 10% urea/molasses mixture were offered free choice, as compared with giving only sugar cane and urea The authors considered that part of this response might have been due to a nutrient such as sulphur deficient in cane and provided by the molasses.

The stalk content of the whole chopped cane used in this experiment was 59.85 ± 3.14%. During the course of the experiment there were gradual changes of cane quality; Brix in juice rose from 14!to 23! and DM from 25% to 30% Mean Brix was 19.5 ± 1.08° and mean DM 27.95 ± 0.85 during the first 112 days of the trial. After 112 days, there was a sharp decline in quality with the onset of the rainy season, the Brix falling to 13.5° and DM to 23%. During these last fourteen days weight gains were negligible in all three groups (figure 1) confirming the poor performance in the wet season observed in other experiments (Alvarez and Preston 1976c).

Conclusion

With diets of cane/urea/rice polishings there is no advantage in growth performance in supplying the urea in molasses compared with mixing the urea in aqueous solution with the cane.

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