EFFECT OF SPONTANEOUS FERMENTATION OF SUGAR CANE ON PERFORMANCE OF ZEBU BULLS

F J Alvarez, A Wilson and T R Preston

Centro de Investigacion, Escueal de Medicina Veterinaria y Zootecnia, University of Yucatan, Apartado 116-D, Merida, Yucatan, Mexico

Fermentation of sugar cane begins as soon as it is chopped. The effect of this spontaneous fermentation on animal performance was investigated in this study. Twenty Zebu steers, with a mean liveweight of 270 kg were divided into 4 groups. The two treatments were: (A) feeding the sugar cane (Brix 19.5°) Immediately after chopping and then 6 hr later; and (B) allowing the cane to ferment for 24 hr before the first feed. Urea in solution was mixed with the cane (10 g urea/kg cane) and a daily supplement of 1 kg rice polishings/animal was given to both treatment groups There ware two replicates per treatment. The animals given the fermented sugar cane had a growth rate 13% below the control group and the feed conversion was 17% poorer. In previous experiments, where the quality of the sugar cane was low (Brix 13.6°), there was no effect of spontaneous fermentation on animal growth rates. It was concluded that spontaneous fermentation of chopped sugar cane before feeding was only important when the sugar content of the cane was high.

Key words: Cattle, sugar cane, spontaneous fermentation, fattening

The spontaneous fermentation of sugar cane, which begins immediately it is chopped into small pieces, can lead to the conversion of half of the soluble sugars and organic acids (Gonzalez and MacLeod 1976). Although these end-products can be metabolised by the animal, they are of little nutritive value to rumen micro-organisms, thus it would be expected that the effect of such a fermentation would give rise to reduced synthesis of rumen microbial protein and therefore poorer levels of animal performance.

Meyreles and Preston (1978), in two experiments, compared growth rates of Zebu bulls fed a basal diet of sugar cane, which was given either immediately after chopping or after 24 hr natural fermentation. There were no differences in growth rate of the animals on the two treatments, however, it we. pointed out that the overall level of performance was relatively low (300 and 400 g/d in the two experiments respectively) and that the major determining factor was the poor quality (ie low total sugar content) of the sugar cane. Losada et al (1979) reported a reduction in voluntary intake of sugar cane of about 10% when it was allowed to ferment for 24 hr and that this could be prevented by treating the sugar cane with sodium hydroxide.

Materials and Methods

Treatments, Design and Animals: The two dietary treatments were: chopped whole sugar cane with 50 ml/kg of an aqueous solution of urea mixed with the cane. In treatment (A) the sugar cane was offered to the animals immediately after chopping (9am) and again 6 hr later; and in treatment (B) the feed was stored in hessian sacks in the open and allowed to ferment for 24 hr before being offered to the cattle. The

design was a random block with two repetitions of each treatment. There were 5 Zebu steers in each treatment group, giving a total of 20 in the experiment. The animals were from 18-24 months of age, with a mean weight of 270 kg. They were de-parasitised, vaccinated and housed in lightly roofed pens with concrete floors, giving a apace per animal of approximately 16 m^2.

The composition of the urea solution, added to the sugar cane, was 20 kg urea to which was added 80 litres of water. All the animals received 1 kg/d of rice polishings mixed with sugar cane and had free access to a mineral mixture (50% NaCl, 47% rock phosphate and 3% trace minerals). The rice polishings were mixed in by hand in the feet trough, in equal quantities, at each feed. Unconsumed feed was collected and weighed immediately before the 9am feed.

The trial lasted 112 d. Animals were weighed individually at 14 d intervals. Consumption of cane was recorded daily and the Brix° (by refractometer) and DM determined daily. The proportions of stalk and tops and of green and dry leaf were noted twice weekly. Liveweight gain was estimated from the regression coefficient of liveweight against time, and treatment differences evaluated by an analysis of variance of results for individual animals. Statistical analysis of feed conversion was beset on the analysis of variance for each pen.

Results and Discussion

The estimates that were made to characterize the quality of the sugar cane are summarized in Table 1. On the whole, the sugar cane can be judged to be of good

Table 1:
Composition parameters for the sugar cane (variety POJ 2878) fed during the experiment

	Stalk			Tops		Whole cane[1]	
	% of cane	Brix	DM%	Brix	DM%	Brix	DM%
Maximum	74.3	23.4	31.8	14.8	26.1	22.9	30.7
Minimum	52.1	15.5	20.5	9.8	19.3	14.1	24.1
X	59.8	19.8	26.8	12.2	23.1	19.5	27.9
SEx	3.1	.88	.14	.56	.91	1.08	.85

[1] Brix° tends to be lower and DM% higher in whole cane tan would be expected from the separate analyses a of the stalk and tops; this is due to the presence of dead leaves (trash) in the whole cane (Brix by r refractometer)

quality (in terms of its sugar content and proportion of tops). In contrast, the sugar cane used by Meyreles and Preston (1978) had a Brix of only 13.6° compared with 19.5° recorded in this experiment.

Mean values for change in liveweight, feed intake and feed conversion are given in Table 2, and the analysis of variance for liveweight gain and feed conversion is given in Table 3. There were significant effects on animal performance due to the spontaneous fermentation. Liveweight gain was depressed (P = .009) and feed DM conversion was lower (P = .057). There appeared to be no effect on voluntary intake

Table 2:
Mean values for change in live weight (LW), feed intake conversion for Zebu bulls fed basal diets of fresh or fermented (24 hr) chopped whole sugar cane (two groups of 5 bulls per treatment; experimental period 112 days)

	Fresh cane	Fermented cane	P[1]
Initial LW, kg	270	268	.009
Daily LW gain, g	795	658	
Feed intake, kg/d			
Fresh cane	19.2	17.6	
Rice polishings	1.0	1.0	
Urea	.19	.18	
Minerals	.11	.13	
Total DM	6.27	6.12	
Consumption index[2]	2.00	2.00	
Conversion[3]	7.97	9.30	.007

[1] Probability of variance ratio (see Table 3)
[2] Daily intake DM/100 kg LW
[3] DM intake/LW gain

and this indicates that the effect of pre-fermentation of sugar cane on animal performance was mediated through a poorer utilization of the ingested feed.

The 13% depression of liveweight gain and the 17% poorer feet conversion rate brought about by spontaneous fermentation of the sugar cane in this experiment are not in agreement with the results reported by Meyreles and Preston (1978). Unfortunately, records were not kept of the Brix° in the fermented cane at the time of feeding, but it seems reasonable to conclude that the negative effect of spontaneous fermentation arises because of the reduction in total sugar availability to the rumen micro-organisms, and a reduction in the total amount of digestible energy.

Table 3:
Analysis of variance for gain in live weight for feed conversion:treatments were fresh sugar cane and fermented (24 hr) cane

Source of Variation	df	Live weight gain		Feed conversion	
		Mean square	P	Mean square	P
Diets	1	1,100	.009	16.9	0.57
Animals within diets	18	128			
Pens within diets	2			1.04	

Conclusions

The results of this experiment show that when good quality sugar cane is fed to cattle, it is important to feed this in as fresh a state as possible to avoid what are obviously deleterious effects brought about by spontaneous fermentation. In large feedlots, using sugar cane grown in close proximity, it may well be advantageous to give the sugar cane in several feeds daily so that each feed represents material freshly harvested. It should be emphasised, however, that such a management practice is only likely to be important when sugar cane of high Brix is used, since the results of Meyreles and Preston (1978) show conclusively that spontaneous fermentation was not important when sugar cane of low Brix was fed.

References

Gonzales E & MacLeod N A 1976 Spontaneous fermentation of sugar cane Tropical Animal Production 1:80- 85

Losada H, Arando E, Alderete & Ruiz J 1979 The voluntary intake by cattle of chopped sugar cane treated with sodium hydroxide Tropical Animal Production 4.51-54

Meyreles L & Preston T R 1978 Effect of pre-fermentation level of wheat bran and access or no to molasses containing 10% urea on performance of Zebu boll. fed a sugar cane basal diet Tropical Animal Production 3:218-223

Received 10 April 1979