RICE POLISHINGS AS A SUPPLEMENT IN SUGAR CANE DIETS: EFFECT OF GIVING IT AS A SEPARATE MEAL OR MIXED WITH THE SUGAR CANE

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Two experiments were carried out. In the first, 40 Zebu bulls in groups of 5 were used in a 2 x 2 factorial design to study the following main treatments in a basal diet of chopped whole sugar cane and urea: (A) 500 or 1000 g/d of rice polishings; (B) mixing the supplement with the sugar cane or giving it as a separate meal before the cane was offered. In the second experiment a changeover design was used with three rumen cannulated Zebu bulls to study the effect on rumen fermentation of giving the rice polishing (500 g/d) mixed with the sugar cane or as a separate meal. In experiment 1, the rate of live weight gain was increased from 421 to 559 g/d by the higher level of supplementation with rice polishings but there were no differences due to the method of giving this supplement. Voluntary dry matter intake was increased by the higher level of supplementation and there was an improvement in feed conversion. Neither of these parameters was affected by the method of giving the rice polishings. In the second experiment, there was an indication of slightly lower values for pH of rumen fluid between 11:00 am and 5:00 pm, but no effects on the molar proportion of the VFA, when rice polishings were given as a separate meal rather than mixed in the cane. There were significant changes in molar proportions of VFA due to time of sampling with increases in C_3 and decreases in C_2 after feeding; C_4 molar proportions did not change.

Key words: Sugar cane, cattle, rice polishings, growth, rumen fermentation

The role of rice polishings in determining rate of animal performance on basal diets of sugar cane/urea (Preston et al 1976; Lopez et al 1976), is thought to be as a source of by-pass nutrients, since it apparently has no effect on the pattern of rumen fermentation (Valdez et al 1977; Minor et al 1977). The objective of the experiment described here was to determine if effectiveness of rice polishings in stimulating animal performance on sugar cane diets is affected by the method of feeding: as a single feed before offering the sugar cane/urea or mixed into the cane, the latter being the standard procedure (Preston et al 1976).

Materials and Methods

Animals:
Experiment 1: 40 Zebu bulls of about 200 kg and 18 months were housed in groups of 5 in open-sided partially shaded concrete floored pens.

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Experiment 2: 3 young Zebu bulls weighing about 200 kg, fitted with permanent rumen cannulas were kept in individual slatted floor pens.

Treatments and Design:

Experiment 1: 4 dietary treatments were imposed in a 2 x 2 factorial design replicated twice. A basal diet of sugar cane and urea was supplemented with 500 or 1000 g/d of rice polishings. This supplement was given mixed in with the cane or as a separate meal before the cane was offered. The trial lasted 70 days.

Experiment 2: Two dietary treatments were imposed in a change over design: 500 g/d of rice polishings were given (A) mixed with the sugar cane/ urea or (B) as a separate meal, 1 hr before the sugar cane was given. Each period was of 14 days, 9 days for adaptation and 5 days for sampling.

Procedure:

In both experiments mature (12-14 month old) sugar cane was used and the whole plant was transformed into particles of 5-20 mm using a high speed mechanical chopper. In experiment 1, an aqueous urea solution (200 g/litre) was sprayed over the cane in the ratio of 50 ml/kg fresh cane. In experiment 2, a urea/molasses solution was used (283 g urea, 300 g water, 817 g final molasses) in the ratio 45 ml/kg fresh cane. In both experiments, minerals were given (47% rock phosphate, 3% trace minerals, 50% common salt) at the rate of 60 g/d per animal.

Measurements:

Experiment 1: The cattle were weighed individually at 14 day intervals and records kept daily of feed consumed.

Experiment 2: Samples of rumen fluid were taken at intervals during the last 5 days of the experimental period. pH was determined immediately and samples stored using a 25% (w/v) solution of $HgCl_2$ as a preservative at the rate of 4 g per 100 ml ruminal fluid. The VFA proportions in these samples were determined later by the technique described by Valdez et al (1977). Samples for pH were taken over a period of 8 hr and for VFA at 9 am, 10 am and 5 pm.

Results and Discussion

The significant increase in rate of live weight gain with 1000 compared with 500 g/d of rice polishings is in agreement with previously cited experiments (Preston et al 1976; Lopez et al 1976); the better performance was associated with significantly higher DM intakes and together these two effects resulted in a considerable improvement in feed conversion (from 14.3 to 8.52). There were no effects on performance which could be attributed to the method of giving the rice polishings.

Table 1:
Effect of level of rice polishings, and method of giving it, on animal performance (analysis for main effects).

	Level, g/d		Method		
	500	1000	Mixed	Separately	SEx
Live weight, kg					
Initial	207	208	208	206	
Final	256	247	243	240	
Daily gain	.421	.559	.519	.462	±.047
Feed intake, kg/d					
Fresh sugar cane	12.4	13.2	13.2	12.6	
Total DM	4.00	4.72	4.42	4.30	±.18
Consumption index[1]	1.80	2.05	1.95	1.90	
Conversion[2]	14.3	8.52	10.8	12.0	±.72

[1] Daily DM intake (kg)/100 kg live weight
[2] DM intake/gain in live weight.

In the study of rumen fermentation, there was an indication of apparently lower values for pH in the latter part of the sampling period (from 11am to 5 pm), when the rice polishings were given as a separate meal. This could be interpreted as an increase in the proportion of rice polishings that was being fermented in the rumen. However, this cannot be substantiated without data on relative passage of the rice polishings out of the rumen, according to the method of feeding.

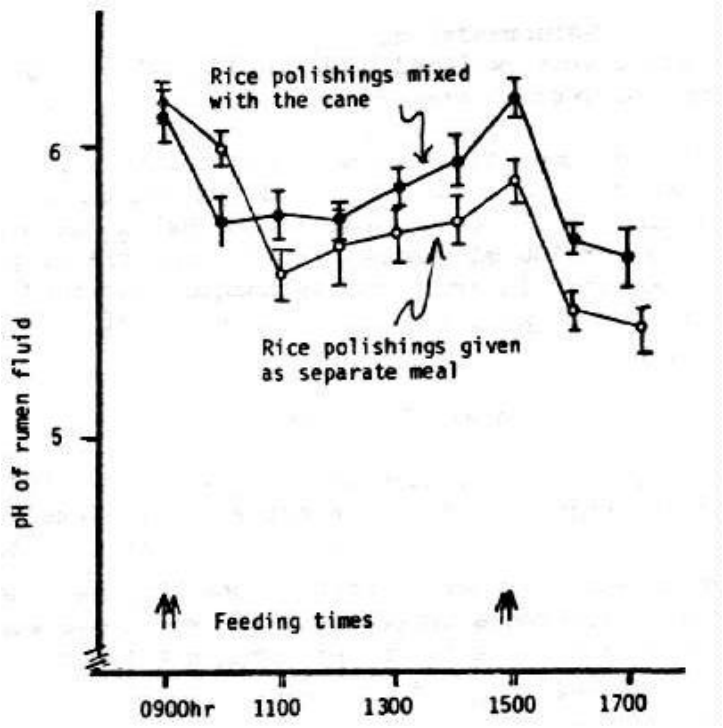

Figure 1:
pH of rumen fluid during the day (means and SE for 3 animals per treatment)

Table 2:
Molar proportions of VFA (means and SE for 3 animals)

	Rice Polishings	
	Mixed[2]	Separate feed[1]
Acetic		
9.00 hr	65± 4	65± 4
10.00	63±14	62± 3
17.00	47± 7	50± 3
Propionic		
9.00 hr	17±2	18± 2
10.00	19±7	19± 3
17.00	33±7	29± 3
Butyric		
9.00 hr	18±4	16± 2
10.00	18±6	18± 3
17.00	20±2	18± 4

[1] Rice polishings give at 09.00 hr; sugar cane at 10.00; first rumen fluid sample taken immediately before giving the rice polishings
[2] Mixed sugar cane/urea and rice polishings given at 9.00 hr after taking first rumen sample.

There were no effects of the feeding method on the VFA molar proportions (Table 2), which agrees with the conclusions of Minor et al (1977) that it is difficult to change the pattern of rumen fermentation by manipulating the concentrate supplement, due to the dominating role on digestion end products in the rumen, of the basal ration of sugar cane. There were changes in the pattern of fermentation during the day, presumably due to the effect of feeding. Molar proportions of acetate decreased and propionate increased with little change in butyrate. Similar findings have been reported previously in sugar cane based diets (Montpellier et al 1977, Meyreles et al 1977; Priego and Sutherland 1977; Silvestre et al 1977).

The results of this experiment confirm that the effect of rice polishings on animal performance on sugar cane diets is related to the amount given, and show that the effectiveness of the supplement does not seem to be altered by giving it separately or thoroughly mixed with the sugar cane. Based on the hypothesis (Leng and Preston 1976; Valdez et al 1977) that the value of rice polishings lies in the fact that it provides essential nutrients for digestion beyond the rumen, then it would appear that the degree to which it by-passes the rumen was not affected by the feeding procedures adapted in this experiment.

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