# EFFECT ON ANIMAL PERFORMANCE OF DIFFERENT SOURCES OF FORAGE IN DIETS BASED ON MOLASSES AND UREA

F J Salais[1], T M Sutherland[2] and A Wilson[3]

*Centro de Investigación y Experimentación Ganadera*
*Chetumal, QR, Mexico*

40 Zebu steers of 204 kg initial weight and 20 months of age were used to compare four fibre sources in diets based on free access to molasses as ies containing 3% urea . The treatments were A whole sugar cane; B sugar cane tops: C Bermuda Cross I: and D Bermuda Cross (50%) and Leucaena leucocephala (50%) . Forages were fed at the rate of 3 kg fresh basis per 100 kg jive weight daily the animals I also received 1 kg/day of rice polishings and 70 g of minerals. the animals were given a period of adaptation of 10 days and were 63 days on experiment. Daily live weight gains were significantly affected by diets (P <.001) - the means were .3379[a], 350[a], 577[b] and .618[b] kg per /day on the four treatments. Feed conversion ratios were 9.2, 7.83, 7.6 and 6.45 on the four treatments and were not significantly affected by diets. The most rapid gains were associated with the highest intakes of dry matter (r = .90). . At the beginning of the experiment the whole sugar cane and the sugar cane tops were given finely chopped while the Bermuda grass and the Leucaena leucocephala were cut into pieces of about 20 cm by machete. Growth performance was poor during the first 21 days of the trial for the treatments based on sugar cane. Consequently the cane tops were chopped by machete to the same length as the Bermuda grass and this immediately resulted in improved performance. It was concluded that both fibre and protein content of the forage are important contributory factors in determining the responses to molasses /urea diets .

Key Words: Molasses, urea, forage source, cattle

The necessity of including long fibre roughages in diets based on molasses/urea in order to maintain rumen motility and voluntary intake has been discussed by Preston and Willis (1974) The purpose of this experiment was to compare a traditional source of forage (Bermuda cross one) with whole cane, cane tops and a mixture of Bermuda cross one and Leucaena leucocephala.

## Materials and Methods

*Animals and housing*: 23 Zebu, 8 Brown Swiss, three Brown Swiss/Zebu crosses and 6 Criollo bulls were allocated to treatment groups by a system of heirarchical randomization. The animals were divided into groups of 5 and assigned to 8 partially shaded corrals each 10 by 4 m with concrete floors. Two corrals were assigned to each treatment.

---

[1] In receipt of a fellowship from International Development Research Centre, Canada

[2] On leave from Department of Biochemistry and Nutrition, University of New England, Armidale NSW 2350 Australia

[3] Technical Cooperation Officer Ministry of Overseas Development London

*Treatments and Design*: The treatments were the different forage sources: (a) whole sugar cane; (B) cane tops; © Bermuda cross I; (D) a 50/50 mixture of Bermuda cross II and Leucaena leucocephala. These were all fed at 3% of live weight (fresh basis) . a completely randomised design was used with two replicates (pen of 5 head) of each treatment.

The rest of the ration was: a solution of 91% final molasses, 6% water and 3% urea (fed free choice), 1 kg/d of rice polishings and 60 g/d minerals (50% salt, 45% rock phosphate, 5% trace minerals).

*Procedure*: The molasses/urea was supplied in covered troughs and consumption measured once per week. The rice polishings were given once daily after the collection of feed refusals. The animals were subjected to a 10 day adaptation period before the experiment was started and were weighed once every 14 days. The experimental period was 63 days.

*Statistical Analysis*: Analyses of variance were calculated according to Snedecor and Cochran (1967).

## Results and Discussion

The mean values for feed consumption and animal performance are shown in table 1. There was a significant effect of fibre source on growth rate ($P < .001$), the group of treatments being distinctly dichotomized. Growth rates on the Bermuda cross I treatment and Bermuda cross I plus Leucaena leucocephala treatment were not significantly different from each other, but were very different from the treatments with cane tops and whole cane. Feed intake date showed a similar pattern. Examination of the means for. feed conversion ratio revealed no such distinction, and the effect of fibre source was not significant.

The effect of the fibre sources appears to have due to two distinct but confounded factors. First, it is apparent that in the treatments with Bermuda cross I and Bermuda cross I + Leucaena leucocephala, the content of nitrogen in the dry matter was much higher than in the treatments based on cane. In addition, considerably less of the total nitrogen was in the form of urea. It appears reasonable to conclude that protein was an important contributory factor to the superiority of the diets based on Bermuda grass.

The second factor concerns the nature of the fibre. An examination of the data in figure 1 and table 2 shows a distinct change in growth rate after 21 days. At this point the mode of presentation of the cane tops and whole cane was changed. During the first 21 days of the trial the cane tops were passed through a grinder to produce a fine product (consisting of frangements of 10mm in length). It was noted that the animals on the diets in which cane tops was a component appeared to be lacking in gut fill.

*Table 1:*
*Effect on animal performance of different sources of fibre in diets based on molasses/urea (10 animals per treatment for 63 days)*

| | Whole Sugar Cane | Sugar Cane Tops | Bermuda Cross 1 | Bermuda cross 1 + Leucaena leucocephala |
|---|---|---|---|---|
| Live weight, kg | | | | |
| Initial | 203 | 206 | 202 | 202 |
| Final | 227 | 228 | 238 | 241 |
| Gain/day | .377[a] | .350[a] | . 577[b] | .618[b] |
| Feed consumption, kg/day | | | | |
| Whole sugar cane | 6.184 | - | - | - |
| Cane tops | - | | | 6.290 |
| Bermuda cross 1 | - | - | 6.364 | - |
| Bermuda cross 1 + Leucaena | - | - | - | 6.406 |
| Rice polishings | 1.0 | 1.0 | 1.0 | 1.0 |
| Molasses | 3.470 | 3.524 | 4.289 | 4.161 |
| Urea | .114 | .116 | .141 | .137 |
| Total DM | 4,132 | 4.040 | 5.012 | 4.981 |
| Consumption index [1] | 1.943 | 1.883 | 2.309 | 2.299 |
| N as urea (%) | 58.2 | 58.8 | 52.9 | 45.1 |
| Conversion [2] | 9.21 | 7.83 | 7.63 | 6.45 |

[1] $\frac{\text{kg DM/day}}{\text{100 kg liveweight}}$ [2] kg DM/kg gain

[abc] Means without superscript in common differ at P <.05

Consequently, the method of presentation of the cane tops was changed and it was chopped by machete into much larger fragments, about 20 cm long. It appears that this change was responsible for the marked improvement in animal performance on both diets which contained cane tops. The method of processing the cane stalks was not changed.

Montpellier and Preston (1977) found no difference in digestibility or feed intake when sugar cane was ground by machine or chopped by machete, however, recent data obtained by Salais (1977 unpublished data) suggest some advantage in terms of digestibility in chopping cane tops with a machete as opposed to grinding by machine. Since the forage in the treatments involving Bermuda grass was chopped by machete throughout the experiment, it seems reasonable to conclude that the change in performance on the treatments based on cane tops can be attributed to the effect of changing fibre length on rumen motility and intake. Cole et al (1976) found similar

results on grain diets and emphasized the importance of roughage level in the diet. In their experiment more microbial protein was synthesized in response to increasing roughage level and more total protein reached the small intestine. However, what remains to be quantified in these diets is the interrelationships between protein in the diet, fibre in the-diet and the amount of protein arriving at the small intestine.

*Table 2 :*
*Regression equations relating live weight (Y) with days on trial (X) for the first (0-21 days) and second phases (21-63 days)*

| | Period of trial | | | |
|---|---|---|---|---|
| | 0-21 days | | 21-63 days | |
| Treatment | Regression equation | $r^2$ | Regression equation | $r^2$ |
| Sugar cane stalk & tops | Y =203+.092X | .96 | Y =193 +.53X | .99 |
| Sugar cane tops | Y=204 +.092X | .14 | Y =199 +.49X | .96 |
| Bermuda cross 1 | Y =200 +.43X | .75 | Y =196 +.70X | .99 |
| Bermuda & leucaena | Y =200 +.34X | .62 | Y =191 +.80X | .99 |

Figure 2 show the relationship between gain/day and consumption index. As might be expected there is a strong relationship.

## Conclusion

It appears that both fibre length and protein content of the forage are important factors in determining the response to molasses/urea diets. Bermuda cross I and particularly Bermuda cross I plus Leucaena leucocephala are superior sources of fibre to cane based alternatives even when these are chopped by machete instead of by machine.

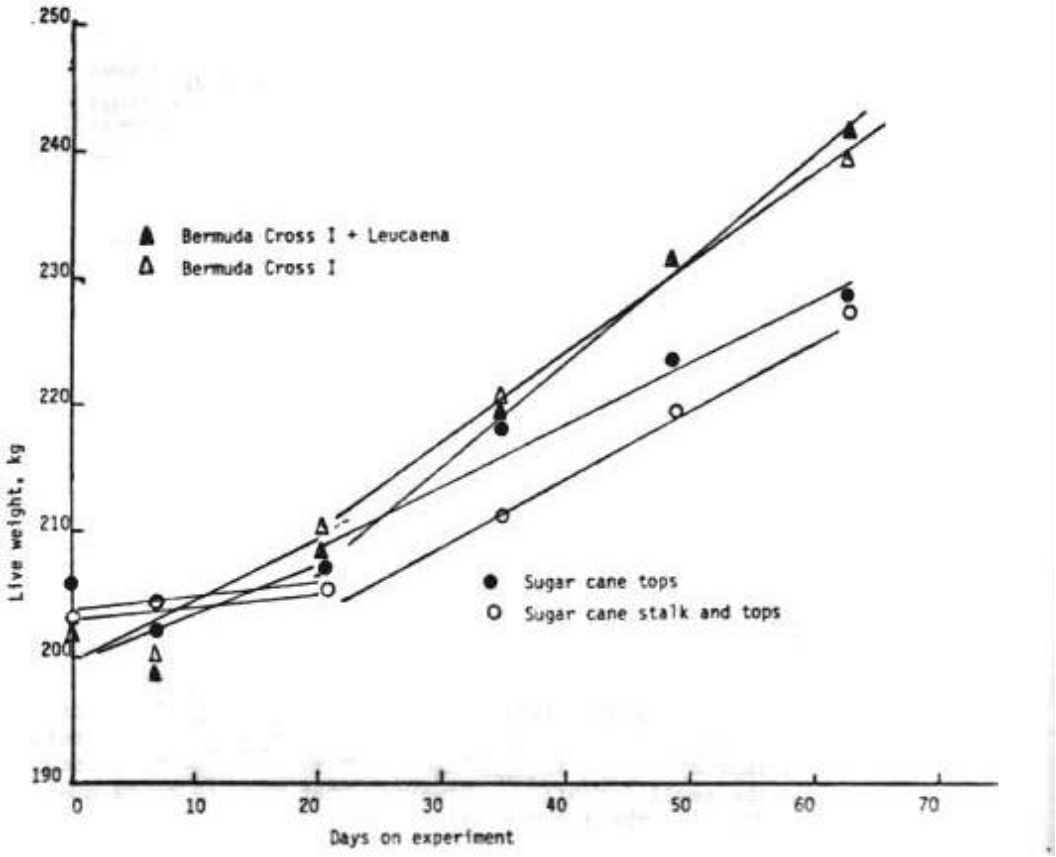


*Figure 1:*
*Changes in live weight on the different experiments during the coarse of the trial*

## References

Cole N a, Johnson R R, Owens F N & Males J R 1976 Influence of roughage level and corn processing method on microbial protein synthesis by beef steers J Anim Sci 43: 497-503

Montpellier F a & Preston T R 1977 Digestibility and voluntary intake on sugar diets: effects of chopping the cane stalk in particles of different sizes Trop Anim Prod 2: 40-43

Preston T R & Willis M B 1974 intensive beef production (2nd ed) Pergamon Press: Oxford

Salais F 1977 Unpublished data

Snedecor G & C Cochran W G Statistical Methods Iowa State University Press: Iowa

*Received 20 March 1977*