LEUCAENA LEUCOCEPHALA AS PROTEIN SUPPLEMENT FOR DUAL PURPOSE MILK AND WEANED CALF PRODUCTION ON SUGAR CANE BASED RATIONS

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Summary

18 crossbred Swiss/Zebu cows (60 to 80% Zebu breeding) between 4 and 6 months of lactation were fed a basal ration of chopped whole sugar cane, molasses/urea (100 g urea/kg) and minerals. The treatments were supplements of : (A) 2 kg/d rice polishings (control) ; (B) 1 kg/d rice polishings and restricting grazing for 3 hr on Leucaena leucocephala; (C) only restricting grazing on Leucaena. The cows were machine milked, the calf being allowed to suck for a few seconds prior to milking to stimulate let down and then for 30 minutes after the machine was removed. The rest of the day, the calves were separated in a pen where they received chopped whole sugar cane, molasses with 10% urea, rice polishings and minerals all on a free choice basis. Milk production was 4 kg/d for treatments A and B and was significantly less (3.2 kg/d) on the group C receiving Leucaena. Calf growth rate averaged 600 g/d and milk consumed by the calf was in the range of 1.4 to 1.9 kg/d with a tendency to be less for the group C calves. Consumption of sugar cane (14.5% DM and 9.4° Brix) was highest for the control;least for group which did not receive rice polishings. Estimated intakes of Leucaena were 9 kg/d equivalent to a protein consumption of about 400 g/d. The poor results on the use of Leucaena as the only supplement attributed to a depressing effect on total DM intake.

Key words: Sugarcane, leucaena, milk production

Introduction

The justification for developing integrated milk/beef production systems with dual purpose cattle for tropical conditions has been discussed by Preston (1976). While details of the general procedure to be adopted, and some preliminary findings under tropical conditions in the Dominican Republic, have been described by MacLeod et al (1976)

The objectives of the experiment described here were to obtain preliminary information on cow and calf performance in such a dual purpose production system, and more specifically to investigate the use of restricted grazing of the woody legume Leucaena leucocephala as a protein source to supplement the basis ration of sugar cane and urea.

Materials and Methods

Treatments and Design:

The three treatments consisted of variations in the protein component of the ration namely: (A) 2 kg/d of rice polishings, (B) 1 kg/d of rice polishings and restricted grazing for 3 hr on a pure stand of Leucaena leucocephala, and (C) only restricted grazing on Leucaena leucocephala. There were 3 groups each of 6 cows and their calves on the respective treatments. The data were analysed as a random block with three treatments and six replications.

Animals:

The cows were commercial crossbreds with different proportions of Brown Swiss or Holstein, and Zebu. It was estimated that the Zebu component was between 60 and 80% on average. Most of the European "blood" was Brown Swiss which is the predominant crossing breed used in the tropical regions in southern Mexico . The calves were by a variety of sires, of the three breeds already mentioned. The cows were arranged in the treatment groups according to their previous production, genetic makeup and stage of lactation. Almost all the cows had lactated from 4 to 6 months before the experiment began. All had received a sugar cane based ration for at least the previous three months. They were housed in open sided pens with a cement floor and a palm roof for shade. The area per cow was 11.5 m^2. Milking was once daily at 6 a.m. by machine (Alfa Laval) in an abreast pipeline parlour. The calf was allowed to suck each teat for a few seconds to stimulate letdown, and was then tied at the head of the cow, When machine milking was completed (no stripping was practised), the calves were suckled for a 30 minute period. At this point, cows and calves were separated to their respective pens until milking the following morning.

Diets:

The basic ration was chopped whole sugar cane given ad libitum in one feed trough, and a solution of urea/molasses (100 g urea/kg of mixture) in another,

also provided on a free choice basis. All animals received a mixture of salt, rock phosphate and trace minerals. The rice polishings were given as the first feed in the morning before offering the sugar cane. The cows on the grazing treatments were on the pasture from 8 to 11 a.m. each day, immediately following milking. The calves were managed as one group and had free access to chopped whole sugar cane, molasses with 10% urea, rice polishings and minerals.

Approximately 1 hectare of Leucaena leucocephala was available. It had been sown 8 months previously at row spacings of 1.6 m . It was fertilized at sowing with 250 kg triple super phosphate/ha. The area was divided into 4 paddocks so as to enable a form of rotational grazing to be practised. The first rotation lasted 55 days 23, 10, 7 and 15 days respectively in the four paddocks. The area in each was not the same, nor was the stand of the legume, which explains the different times spent in each. In the second rotation, there was insufficient regrowth, and after a further 15 days grazing the trial had to be suspended. It lasted in total for 70 days.

Measurements

Milk production by the machine was recorded daily while on one day of each week milk consumed by the calves was determined by weighing before and after suckling. Feed intakes were recorded daily. Estimations were made at 14 days intervals of the amount of Leucaena consumed. The cows in each group were weighed before and after grazing and the increase in live weight assumed to represent total intake of fresh forage as Leucaena.

In addition, determinations were made at intervals of the Brix of the sugar cane juice, and the dry matter content of both the sugar cane and the Leucaena leucocephala.

Results and Discussion

Mean intakes of the different ration components during the 70 day trial are set out in table 1, including the estimate of Leucaena leucocephala consumption. Table 2 gives the production data for both the cows and calves, while in table 3 the relationships within these parameters are presented in the form of linear regression equations. Changes in live weight of the cows during the 70 day trial are show in figure 1.

An outstanding feature of the results was the very high intake of sugar cane particularly by the control group receiving 2 kg/d of rice polishings. This could be explained in part by the very low dry matter content of the sugar cane (14.5%) and the low Brix value (9.36), both factors indicating that the sugar cane was very immature, and therefore of low feeding value according to the findings of Alvarez and Preston (1976) . The lowest intake of dry matter was by the group which received no rice polishings, while the highest was on the combined treatment.

Table 1:
Mean values for feed intake of cows, kg/d

	Rice polishings	Leucaena R. polishings	Leucaena
Sugarcane	40.9	33.8	27.2
Molasses	2.45	3.17	2.39
Urea	306	.396	.299
Rice polishings	2.0	1.0	-
Leucaena	-	9.6 ±1.5	8.6 ±.5
Minerals	.08	.076	.084
Total DR	10.1	11.4	8.70

The production data, showing saleable milk yields ranging from 3 to 4 kg/d is reasonable, in view of the type of animal used, and their being in the middle to end of lactation phase. The average calf growth rate of 600 g/d is extremely satisfactory and more than comparable with what can be expected from calves in single suckling management systems in the tropics.

When saleable milk yield was expressed in terms of persistency (yield during the experimental period as a function of yield prior to experiment), there was a significant difference in favour of the groups receiving rice polishings alone, or rice polishings plus Leucaena. However, there were no differences in growth rate between groups of calves on these treatments, despite the fact that the calves on the cows which did not receive rice polishings consumed less milk than the other two groups ($P < .22$). Total milk yield at 6 kg/d for the two best groups is very acceptable under the particular conditions of the experiment.

Table 2:
Milk production and live weight changes in cows and calves d uring:ng 70 day trial period

	Rice polishings	Leucaena R.polishings	Leucaena	SE_x	Level of significance (P<)
Saleable milk, kg/d					
Pre-experimental (p)[1]	4.14	4.02	4.08	±.53	.99
Experimental (e) [2]	3.97	4.16	3.20	±.46	.34
Persistency (e/p)	.96[a]	1.06[a]	.80[b]	±.069	.05
Milk intake by calf, kg/d	1.95	2.02	1.43	± .25	.22
Total milk (Saleable + calf)kg/d	5.92	6.19	4.63	± .56	.15
Calf growth					
rate, g/d	599	576	634	± 84	.99
Live weight change					
in cows, kg/d	.34[a]	.32[a]	-.23[b]	±.13	.01
Live weight persistency[3]	l.05	1.09	.97	±.30	.03

[1] During 7 days prior to start of trial
[2] During 70 day trial
[3] Final Lw/initial LW
ab Means without common superscipt differ at P<.05

There were significant differences in weight change of the cows. Both groups receiving rice polishings gained in live weight at approximately 300 g/d , however the group which only received Leucaena as supplement had an overall loss of weight of 230 g/d, significantly different from the other two groups

Table 3:
Relationship betweeen production parameters

Y	X	Equation	r^2	Sb	Syx
Milk intake by calf, kg/d	Milk sold, kg/d	1.37 + 17X	.10	± .14	.62
Calf growth rate, g/d	Milk intake by calf, kg/d	881 - 155X	.26	±68	173
Calf growth rate, g/d	Milk sold, kg/d	775 - 45.7X	.07	±42	193
Calf growth rate, g/d	Total milk, kg/d	917 - 56,5X	.18	±31	181
Milk persistency[1], %	LW persistency[2], %	-45.1 + 1.34X	.37	±.46	16.1

[1] Saleable daily milk for 7 day pre-experimental period
Saleable daily milk during 70 day experimental period

[2] Final LW/initial LW

In fact that calf growth rate was similar on all treatments, despite the significantly lower milk yield of the cows supplemented with only Leucaena grazing, indicate that the contribution of milk to the overall diet of the calf was not a critical factor in determining its growth rate . It is probable that the supplementation, which was common to all calves, helped to compensate for the differences in milk intake. This suggestion is supported by examination of the relationships between the different production parameters (table 3). As would be expected, the best relationship was between calf growth rate and milk consumed, but even here the milk intake only explained 26% of the total variability in live weight gain.

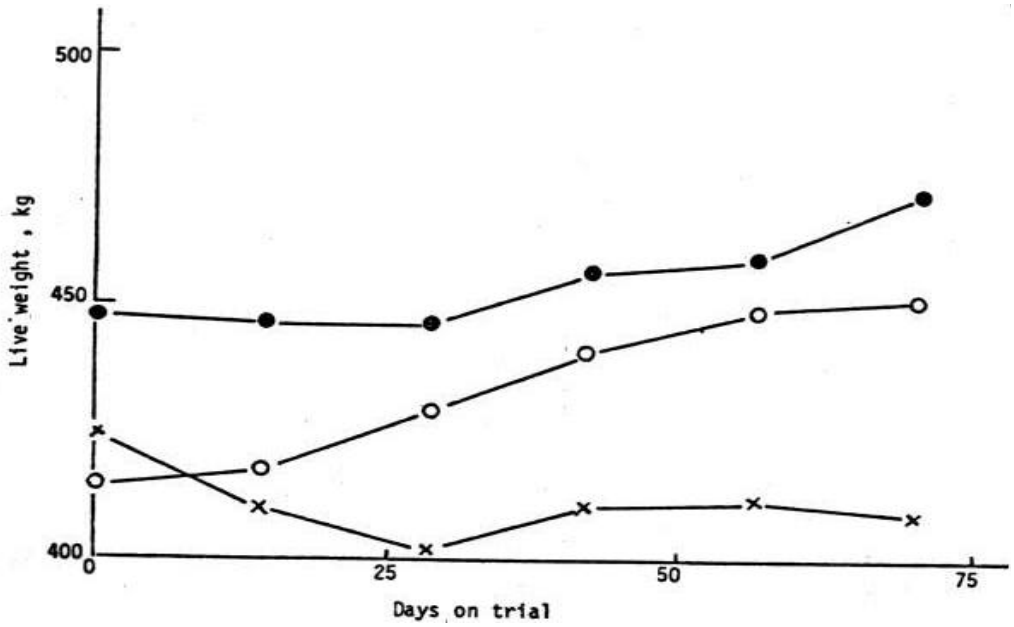
Yield persistency and live weight persistency were also positively related, supporting the belief that in dual purpose cows the partition of nutrients above maintenance, is divided) fairly equally between milk production and body weight gain.

Examination of figure 1 which gives live weight changes of cows during the experiment shows that those which were deprived of the rice polishings supplements and had to rely only on Leucaena as the protein supplement

showed a loss in live weight during the first 30 days of the experiment during which time the ether two groups continued to maintain or even to gain live weight, Subsequently, there was some recovery on the Leucaena group, but even after 70 days on experiment they weighed some 50 kg less than the others. Moreover, they seemed to be able only to maintain their weight at this point, while the other treatment groups showed steady increases.

The poorer performance on the Leucaena only group is probably due mainly to their lower overall intake of DM, since this parameter was highly correlated with total milk yield (r = .94). In contrast, supplementary true protein was not related to yield (r = .06), protein intake being lowest on the 2 kg/d rice polishings group (240 g/d) and twice as high as this for the Leucaena1 only treatment (480 g/d), which nevertheless gave least milk.

Figure 1:
Changes in live weight of milking cows fed sugar cane, molasses/urea and either 2 kg/d rice polishings (•), 1 kg/d rice polishings and 3 hr/d grazing on Leucaena leucocephala (◦) or only 3 hr/d grazing Leucaena (x)



[1] The samples of Leucaena, approximating to what the cattle were observed to consume, were found to contain 27.3% DM with 20% protein in the DM.

In other experiments with weaned calves (Alvarez F J 1976, unpublished data), there is evidence that Leucaena given as the sole protein supplement depressed intakes, while the addition of small amounts of rice polishings helped to alleviate this effect. The possibility that this intake depressing factor in Leucaena is related to its mimosine content merits investigation.

Conclusions

Bearing in mind the preliminary nature of the observations, it nevertheless appears that a mean production of approximately 4 ta/d of saleable milk can be obtained by once daily milking of dual purpose crossbred Zebu cows and that, providing there is adequate supplementation, calf growth rate will be at;least; comparable with that expected normally on a single suckling system where the cows are not milked. Assuming that sugar cane/urea is to be the basic feed, i.e. in the dry season when pasture supplies are scarce,then it should be supplemented with either 2 kg/d daily of rice polishings or comparable protein source or a combination of this and restricted grazing on Leucaena leucocephala. The use of Leucaena alone, as the only supplement is not recommended at this stage

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