LEUCAENA LEUCOCEPHALA AS A SUPPLEMENT FOR MILK PRODUCTION ON TROPICAL PASTURES WITH DUAL PURPOSE CATTLE

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Forty-eix crossbred (Brown Swiss and Holstein/Zebu) cows in early lactation were used to evaluate restricted grazing (6 hr/d) on leucaena forage grown as a pure stand. The trial lasted 136 dand was carried out during the wet season (May-September) 1979. The animals were divided into two groups, one of which received grazing only on Bermuda Cross 1 pasture, while the other group had access to the leucaena after the morning milking. Milking was twice daily and the calf was used to stimulate let-down and to consume residual milk by restricted suckling. Saleable milk wee higher for the leucaena treatment (7.15 vs 6.54 litres/t) and more milk wee consumed by the calves suckling the cows on this treatment (3.48 vs 2.63) giving 17% greater total milk yield for the leucaena treatment. Cows grazing leucaena gained more weight (242 vs 104 g/d) and there was an indication of better growth rate in the calves (632 vs 563 g/d). It is concluded that restricted grazing of leucaena forage offers considerable possibilities for increasing milk production on tropical pasture.

Key words: Cattle, crossbreeding, European/Zebu leucaena forage, dual purpose, tropical pastures

Traditional cattle production systems in tropical regions are characterised by extensive use of introduced or native pastures, utilized by direct grazing. Rate of productivity in these systems is relatively low per animal and per unit area.

For much of the year, tropical pastures are considered to be deficient in protein, the main result of which is a low voluntary intake. The use of supplements which provide protein and even energy at the post ruminal level has a particular significance as a means of increasing animal production on tropical pastures (Kempton et al 1977). The effect of bypass protein is to increase the voluntary intake of the basic forage and this has been interpreted as a catalytic effect in increasing the overall utilization of the basal diet (Preston and Leng 1979).

The important stage in the productive cycle for such supplementation is likely to be in late pregnancy and early lactation, when it has been shown that metabolic requirements for both protein and glucose are at the maximum. Bypass supplements are considered to be the most effective way of increasing the availability of both these nutrients to the animal (Preston & Leng 1979).

Most studies with protein supplements have related to the use of byproducts from cereal and oil seed processing. However, these products are becoming increasingly difficult to acquire and their cost in many cases makes it uneconomical to use them in other than minimum quantities.

The use of tropical legumes has,been proposed as one way of substituting for the more conventional protein supplements. Of these, perhaps the species with the

greatest potential appears to be the leguminous tree *Leucaena leucocephala*. This plant is perennial is well adapted to tropical conditions, has a relatively high protein content (about 20% of the DM) and is palatable to cattle (Jones 1979). Grown as a pure stand in compact areas, it offers considerable potential as a means of making available a high quality protein to the animal; also there are the beneficial effects that it has on soil fertility and in preventing erosion.

It has been used successfully a supplement for sugar cane diets (Alvarez & Preston (1976), for molasses based diets (Hulman et al 1978; Alvarez et al 1977) and for milking animals on pasture (Flores-Ramos 1979).

The objective of the trial described here was to evaluate the use of leucaena in a restricted grazing scheme as a supplement to pure grass pastures for dual purpose cattle in tropical Mexico.

Materials and Methods

Location: The location and climatic characteristics where the centre is situated were described by Alvarez et al (1980), The experiment was carried out between May and September 1979, during the rainy season.

Pastures: The pastures were almost pure stands of Bermuda Cross 1 (*Cynodon pleytostachius*) fertilized with 200 kg N/ha, given as urea distributed in four applications during the year. A number of pastures were available to permit a rotational grazing scheme with rest periods of between three and four weeks, The average stocking rate was the equivalent of three adult animal units/ha (AAU equals liveweight of 400 kg).

The leucaena had been established 18 months previously in continuous rows 90 cm apart (20 kg of seed/ha) using a native variety. The area available was 8 ha and it had previously been grazed by other animals. At the beginning of the trial, it had been rested for 50 days.

Animals: Forty-six crossbred cows (Holstein or Brown-Swiss on Zebu) were used. The range of proportions of "European" genes was between 25 and 75%. At the start of the trial, the animals were between the second and fourth month of lactation; stage of parity wee between the second and fifth lactation.

Treatments and design: The cows were divided into two treatments, according to their previous milk production, stage of lactation and breed. The treatments were: (a) The control treatment grazing only on grass pasture; (b) The same grass pasture grazing but with an additional period of 6 hr/d grazing the leucaena. All animals had free access to mineral salt and water,

Procedure: The cows were milked mechanically twice daily allowing the calf to suck each teat for a few seconds before putting on the machine, in order to stimulate let-down. The animals were then milked by machine and the calf allowed to suck the residual milk for a period of about 30 minutes after the end of milking. Cows and calves were then separated. The experimental animals grazed the leucaena pasture immediately following the milking in the morning. After the afternoon milking both groups of cows grazed together on-the same pasture until the milking on the following morning.

The calves of both groups of cows received the same treatment, which consisted of the residual milk by suckling, grazing on grass pastures during the morning and in the afternoon and evening in confinement with free access to a mixture of molasses containing 2.5% urea with a supplement of 600 g/d of rice polishings or coconut meal.

Measurements: Milk production was measured at each milking; milk consumed by the calf was estimated once per month by weighing the calf before and after suckling. Liveweight of cows and calves was recorded monthly. Daily liveweight gains were determined by linear regression of liveweight on time. Data for milk production, persistency, consumption of milk by the calf and changes in liveweight were analysed by analysis of variance. The experiment lasted 134 d.

Results and Discussion

During the period from calving to the start of the experiment, the cattle on both treatments were losing weight in the range -274 to -579 g/d, indicating a considerable imbalance between the nutritive value of the pasture and the cows' requirements for the recorded milk production of 10 to 12 litres/d.

There was a tendency for saleable milk yield to be higher on the leucaena treatment (P=.11) while persistency (yield during the experiment expressed as a fraction of the average yield during the 30 d of the pre-experimental period) was significantly better (P=.04). The consumption of milk by the calves was significantly higher on leucaena (P=.01); total milk production was increased by 17% over the control treatment (P=.001) (Table 1).

Table 1:
Milk production from crossbred cows on tropical pasture supplemented with leucaena forage.

	Pasture only	Pasture + leucaena	SEx (Prob)[5]
No of cows	22	24	
Saleable milk, kg/d			
Pre-experimental[1]	8.68	8.59	.33
Experimental[2]	6.54	7.15	.27(.11)
Persistency[3]	.68	.79	.036(.04)
Milk consumed by calf, kg/d			
Morning	1.32	1.53	.14
Afternoon	1.31	1.95	.19(.10)
Total	2.63	.3.48	.21(.01)
Total milk[4], kg/d	9.19	10.75	.28(.001)

[1] For 30d prior to starting the trial
[2] For 106 d of the trial
[3] Experimental/pre-experimental milk yield
[4] Saleable plus milk taken by the calf
[5] Probability according to F test in analysis of variance

The cows consuming leucaena gained significantly more weight (P=.01) than the controls and there was an indication of slightly better growth in the calves (632 vs 563) although the effect was not significant (Table 2). The average interval between calving and conception was 104 d and did not differ between treatments. There was no indication of milk taint nor any symptom of toxicity, due to mimosine.

Table 2:
Mean values for changes in liveweight of cows and calves when the cows grazed grass pasture alone or plus 6 r/d on leucaena forage

	Pasture only	Pasture + leucaena	SEx (Prob)[1]
Liveweight of cows, kg			
Initial	446	458	
Final	465	489	
Daily gains	0.104	0.242	.035(.01)
Liveweight of calves, kg			
Initial	60	64	
Final	121	130	
Daily gain	.563	. 632	.034(.45)

1 Probability according to F test in analysis of variance

The beneficial effects of leucaena in the present experiment are in agreement with the report of Flores-Ramos (1979) who compared similar) treatments in a grazing trial with milking cows in Queensland, Australia. The degree of improvement in their work (5%) was less than in the present experiment. Henke et al (1950) in Hawaii reported a 15% increase in milk yield when cows had access to leucaena grazing as well as grass pasture compared with the control treatment, which received concentrates and pasture.

Conclusions

Restricted grazing (6 hr/d) on leucaena grown as a pure stand can be recommended as a means of increasing both milk production and cow liveweight when the basal diet is free grazing on tropical grasses such as Bermuda Cross

The economic benefit of the better performance from leucaena grazing cannot be assessed from the results of this trial. It is more costly than traditional pastures in the early months of establishment, but subsequently should have a lower maintenance cost. This is an area which merits more detailed study.

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