

THE BANANA PLANT AS CATTLE FEED: EFFECT OF DIFFERENT LEVELS OF BANANA LEAVES ON VOLUNTARY INTAKE OF-CHOPPED SUGAR CANE STALK¹

Luz Meyreles and T R Prestor²

CEIPICA, CEAGANA, Apartado 1256, Santo Domingo, Dominican Republic

Four Zebu bulls of about 300 kg were used in an experiment of Latin square design to measure the voluntary intake of chopped cane stalk plus different proportions of banana leaves. The banana leaves were rationed at 0, 2.5, 4.0 and 5.5% of animal liveweight. Total try matter intakes were very constant with all treatments at 3.7, 3.6, 4.2 and 3.6 ± 0.41 kg DM/d for the 0 to 5.5% banana leaf treatments respectively.

It is concluded that banana leaf/cane stalk mixtures do not increase total DM intake as do some other cane/forage mixtures, and that the banana leaf DM merely substituted for the cane leaf DM.

Key words: Cattle, sugar cane, banana leaves, voluntary intake

Banana leaves contain about 15% of protein in the dry matter (DM) when harvested by cutting close to the trunk; they have a high digestibility (65%) and are consumed readily by cattle (voluntary consumption index of 2.15 kg/100 kg LW/d; Foulkes and Preston 1978a). When fed as the only supplement (plus minerals) to Zebu steers receiving ad libitum molasses/ urea, liveweight gains were between 500 and 750 g/d (Rowe and Preston 1978).

In the light of these encouraging findings, it was thought that banana leaves might be a useful source of protein in diets based on sugar cane, as has been shown to be the case for another highly digestible forage, namely sweet potato (Foulkes et al 1978; Meyreles and Preston 1978).

Materials and Methods

Treatments and Design: The treatments consisted of four levels of banana leaves equivalent to 0, 2.5, 4.0 and 5.5% of liveweight daily (fresh basis) in a 4 x 4 Latin square design. The experimental periods were for 21 days, considering the first 14 days as adaptation and recording measurements during the last 7 days.

¹ The experiment was financed partially with funds from the OEA Project Fondo Mar del Plato

² Consultant to OEA for the above project

Animals and Diets: Four Zebu bulls in the liveweight range 264-366 kg were tied in individual stalls, The sugar cane used was the variety 980, Only the stalk of the sugar cane was used, with a mean content of DM of $26.7 \pm .67\%$, a Brix reading of $14.5 \pm .55$ and a pH of $4.9 \pm .12$ (mean values with SE; $n=4$). The banana leaves comprised the lamina and central vein and were severed at the point where they were attached to the trunk. They were taken from plants from which the fruit had recently been harvested. The average DM content was $15.5 \pm 2.38\%$.

Procedure: Each morning the chopped sugar cane stalk was given as the first feed and to this we added a solution of molasses/urea (20% urea w/w) at the rate of 50 g/kg of fresh sugar cane. Immediately afterwards, the corresponding amounts of chopped banana leaves were fed on top of the sugar cane. In addition, each animal received 70 g/d of a mixture of 50% salt and 50% dicalcium phosphate. The banana leaves and sugar cane stalk were chopped separately in a maize harvester (Gehl 600).

Measurements: The animals were weighed at the beginning of the experiment and subsequently every 21 days coinciding with a change of treatment. The fresh matter intake was recorded during the adaptation period, while in the final experimental period both fresh and dry matter intake were measured. The DM of the sugar cane and the banana leaves were determined by conventional procedures, and the Brix of the sugar cane stalk was measured by a hand refractometer.

Results and Discussion

The characteristics of the feeds used in the experiment (Table 1) indicate that the sugar cane was of inferior quality as the average Brix value in the stalk was only 14.5° ; good quality cane would be expected to be in excess of 20° Brix.

Table 1:
Characteristics of the sugar cane stalk and banana- leaves in the different experimental periods

	Experimental periods				X \pm SE _x
	1	2	3	4	
Sugar cane stalk					
DM %	28.0	27.4	25.0	26.2	$26.7 \pm .67$
Brix °	15.9	14.0	13.3	14.6	$14.5 \pm .55$
pH	5.2	4.8	4.7	4.7	$4.9 \pm .12$
Banana leaves					
DM %	13.1	13.6	12.4	13.4	$13.1 \pm .26$

Table 2:
Mean values for intake of sugar cane cane stalk and banana leaves (kg/d)

	Level of banana leaves, % of LW				SE (P) ¹
	0	2.5	4.0	5.5	
Sugar cane stalk	11.3	9.15	9.07	5.92	± .078(.02)
Molasses	.502	.368	.365	.237	-
Urea	.167	.123	.122	.079	-
Banana leaves	-	4.71	8.65	12.3	-
Minerals	.070	.070	.070	.070	-
Total DM	3.73	3.64	4.25	3.65	± .41 (.69)
Consumption ²	1.28	1.26	1.40	1.22	± .121(.73)
Protein from banana leaf, g/d	-	106	195	278	

¹ Standard Error of means and probability of "F" test in analysis of variance

² DM intake (kg)/100 kg liveweight

Table 3:
Mean values of voluntary intake of both fresh and dry matter during the experimental periods

	Level of banana leaves, % of LW				SE (P) ¹
	0	2.5	4.0	5.5	
Intake, kg/d					
Total fresh material	12.2	15.3	18.7	19.2	±1.17(.02)
Total DM	3.73	3.64	4.25	3.65	±0.41(.69)
Sugar cane (fresh weight)	11.3	9.14	9.08	5.92	±0.78(.02)
Cane DM : Banana DM	100:0	80:20	68:32	50:50	
Consumption Index ²					
Total	1.28	1.26	1.40	1.22	±0.121(.73)
Sugar cane	1.03	0.853	0.812	0.532	±0.077(.02)

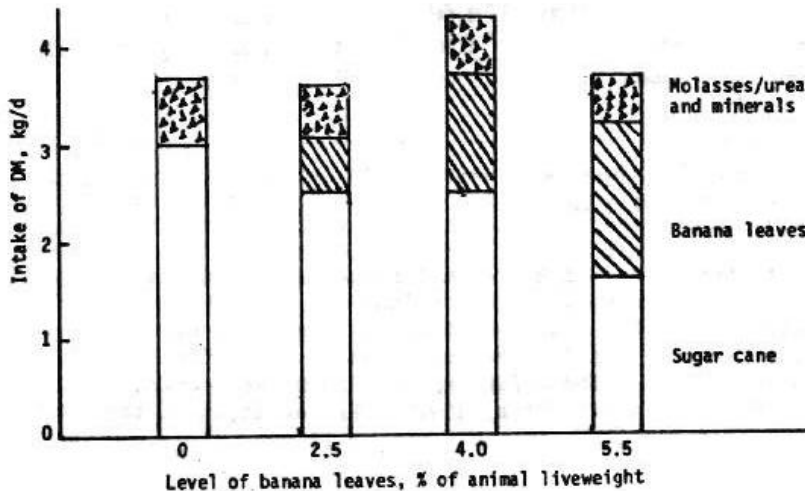
¹ Standard Error of means and probability of "F" test in analysis of variance

² DM intake (kg)/100 kg liveweight

The data for feed intake are summarised in Tables 2 and 3 and in Figure 1, The results show quite conclusively that the effect of adding banana leaves to the basal diet of chopped sugar cane stalk was one of substitution, so that total DM consumed was not significantly different on any of the treatments. These findings are in marked contrast with those reported by Ffoulkes and Preston (1978b) when addition of the

chopped whole banana plant to chopped whole sugar cane (to give a DM ratio of 67 sugar cane : 33 banana forage) led to highly significant increases in voluntary intake and digestibility. The level used by Ffoulkes and Preston (1978b) were similar to the 4% of body weight feeding level in this experiment (equivalent to 68:32 DM proportions of sugar cane to banana leaf), and it is perhaps of some interest that this was the only treatment which gave any indication of raising total DM intake and of not depressing the intake of sugar cane (Figure 1).

Figure 1:
Components of the daily voluntary intake by Zebu bulls of sugar cane stalk, banana leaves and molasses/urea



There were important differences in the procedure adopted in this trial and that used by Ffoulkes and Preston (1978b). The latter used whole sugar cane and the whole banana plant (80% stalk:20% leaves on a fresh matter basis), which is in contrast to the sugar cane stalk and banana leaves used here. The differences in the two sets of results could be reconciled if it was found that the banana stalk per se provided important properties which stimulated voluntary intake on a sugar cane based diet. There are some grounds for believing this on the basis of an experiment presently in progress in which banana stalk appears to be having a greater stimulatory effect on total voluntary intake of sugar cane than banana leaves or a mixture of the two (Ffoulkes and Preston 1978; unpublished data).

It is important to note that in the present experiment, the values recorded for voluntary intake were generally of a very low order (the highest value for voluntary consumption index was 1.4 and normally acceptable levels would be in the region of 2.2 to 2.5). The estimated amounts of protein provided by the banana leaves are given in Table 2. The amounts are not insignificant, especially at the higher level which could be taken as an indication that this protein is not being used efficiently as a by-pass protein when the basal diet is sugar cane stalk. Such a result is also in marked contrast with the data reported for banana leaves added to a basal diet of molasses/urea, when animal performance was a direct function of the amount of protein provided by the banana leaves (Rowe and Preston 1978).

Conclusions

It appears that banana leaves behave similarly to cassava forage in sugar cane diets, in not stimulating total voluntary intake. They are therefore inferior to sweet potato forage which in two experiments led to increases of over 30% in voluntary DM intake, without depressing intake of sugar cane (Ffoulkes and Preston 1978a; Meyreles and Preston 1978).

Our grateful thanks go to Fernando Gonzalez Segura and his assistants, Amado Peralta, Sergio Medina, Martin Contreras and Mariano Hernandez, for their care of the animals during the experiment. We are indebted to Major David Carrasco for the use of his banana plantation for this experiment.

References

- Ffoulkes D & Preston T R 1978a The banana plant as cattle feed: digestibility and voluntary intake of different proportions of leaf and pseudostem *Tropical Animal Production* 3:114-117
- Ffoulkes D & Preston T R 1978b The banana plant as cattle feed: digestibility and voluntary intake of mixtures of sugar cane and banana forage *Tropical Animal Production* 3:125-127
- Ffoulkes D, Hovell F D DeB & Preston T R 1978 Sweet potato forage as cattle feed: voluntary intake and digestibility of mixtures of sweet potato forage and sugar cane *Tropical Animal Production* 3:140-144
- Meyreles L & Preston T R 1978a Sweet potato forage as cattle feed: effect on voluntary intake of different amounts added to a basal diet of chopped sugar cane stalk *Tropical Animal Production* 3: 224-228
- Rove J B & Preston T R 1978 The banana plant as cattle feed: growth of animals given different proportions of banana tops and sugar cane with molasses ad libitum *Tropical Animal Production* 3: 193-199

Received 8 December 1978