FEEDLOT PERFORMANCE AND CARCASS CHARACTERISTICS OF ZEBU CATTLE IN THE MALI SAHEL ZONE II. EFFECT OF UTILIZATION OF SUGARCANE TOPS (*Saccharum officinarum*) AS BASAL DIET

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ABSTRACT

A feeding trial to evaluate the performance of finishing steers fed mainly on sugarcane tops with or without cottonseed and molasses was conducted in Niono, Mali during the dry season. 96 Zebu steers, weighing between 220 and 250kg were randomly allotted to four groups of twenty-four steers each.

The performance parameters compared were: feed intake, rate of gain, feed conversion and carcass characteristics. The differences observed for feed intake, rate of gain and feed conversion appear to be more related to roughage level rather than source. There were no nutritional disorders. Results from this initial feeding trial indicate that a sugarcane — derived feedstuffs can be used to constitute a major component of finishing steer rations particularly in the dry areas of the tropics where sugarcane tops are regarded as wastes.

INTRODUCTION

The need to produce beef cattle at a faster rate than hitherto and the necessity to become less dependent on importation of beef in the Mali has become very obvious. The belief that the local breeds of beef cattle are slow growing and late maturing is no longer auspicious. The pattern of beef cattle management in Mali

is based mainly on natural vegetation with nomadism as a system of management. However, the main problem of utilizing the natural pasture lies in its insufficiency because of the prolonged hot, dry season. Under this system it is not uncommon to get a weight gain of less than 40g/day throughout a whole year for the cattle (Legel and Dobel, 1977).

The cultivation of fodder in the Sahel zone of Mali is low and increased beef production must be accompanied by improved pasture. Radau (1972) enumerated the possibilities of increased forage production. Some quantity of agro-industrial byproducts and farm wastes are available. These include milling products of rice, sugarcane and cottonseed. The cattle, sheep and goats of the nomadic herds-men and some settled farmers with a small number of ruminant animals generally feed on some of these byproducts particularly of the agricultural farms. However, there is a dearth of knowledge as to the utilization of sugarcane tops which are available in large quantities after processing in the Sahel zone of Mali. Although sugarcane (*Saccharum officinarum*) can produce the greatest yield of readily available energy per hectare, its use as a crop is generally restricted to sucrose production for

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human consumption. Independent of applying carbohydrate for human diet, sugarcane offers an alternative crop for animal feed production in the tropics and subtropics, due to the remarkable photosynthetic ability of the plant. A major limitation in using the energy-rich mature cane or the tops for animal feeding is the heavily lignified rind layer, the presence of which lowers the nutritive value of the remainder of the plant.

This paper therefore highlights the possibilities of intensive feeding of beef cattle using sugarcane tops as roughage in addition to rice bran, rice meal, cottonseed and molasses which are all available in Mali.

MATERIALS AND METHODS

Animals and their management:

96 Zebu steers of the Maure and Peulh breeds with ages between 48 and 50 months weighing between 220 and 250 kg were used for the experiment which took place between the months of December and June. The animals were selected on the basis of uniformity in age and weight from the Station d'Elevage et de Recherches

Zootechnique du Sahel, Niono in the Dougabougous Region of Mali. The research Station lies between latitude 12°N and 13°N and longitude 7°E and 8°E at the altitude of about 300 metres above sea level. It is within the Sahel zone with an average annual rainfall of 900 mm. Rainy season extends from June to September with a mean maximum temperature ranging between 30°C in July to 40°C in May. During the preliminary period of four weeks, all animals were allowed to get used to their environment and feeding regime.

Diets and Plan of Experiment:

24 steers (12 each from Maure and Peulh) were allocated to each of the diets (table 1). The basic fodder (18 kg of sugarcane tops per animal) was the same for all groups. However, the additional by-products were different for all the groups. The ration was given twice per day. The remainder was weighed back daily. For this experiment, Diet D was used as the control since a few farmers in the country have started to use the diet during the dry season. Water was also supplied *ad libitum*.

TABLE 1.

Components of experimental finishing rations fed to Zebu steers

Ingredients (kg/head/day)	A	B	C	D
Sugarcane tops	18	18	18	18
Rice bran/meal	4	—	4	4
Cottonseed	—	2.5	2	—
Molasses	—	1.0	—	1
* <i>Piszeolus lathyroides</i>	3	—	—	—
Calculated ME (MJ/kgDM)	9.2	11.2	10.1	9.2
Calculated DCP (g/kgDM)	40.8	45.1	48.2	31.5

* *Piszeolus lathyroides*, herbaceous, annual, erectly branched plant with leaves trifoliate, leaflets ovate or lanceolate. Legel (1983) obtained a 19.2% crude protein at 4 months with 15–26 g/kg dry matter intake per day for 100 kg.

ME = Metabolizable Energy.

DCP = Digestible Crude Protein.

The feeding trial was conducted for about 25 weeks and dry matter (DM) intake was daily recorded.

Liveweight changes:

Weights of three consecutive days were taken prior to the first day of trial followed by monthly weighings. Weights were obtained in the morning before feeding and watering.

Carcass evaluation:

At the end of the feeding trial, ten (10) steers per group were transported by road to the slaughter-house at Bamako (9 hours journey). Slaughtering was 24 hours after the last feeding.

Analytical Procedure:

The rations and ingredients were analysed for proximate analysis using the AOAC (1975) methods. Results were statistically evaluated by analysis of variance (Steel and Torrie, 1960) and the Duncan multiple-range test was used to detect differences among means.

RESULTS AND DISCUSSION

Nutritive value of the diets:

The chemical composition and feeding value of the four diets and their components are shown in table 2. As shown by the proximate analy-

sis, the crude protein and crude fibre values of the Mali ingredients are similar to those obtained in Nigeria (Adebowale, 1985). However, the ME values obtained are higher than those normally obtained in many parts of Nigeria.

Diets A – D are isonitrogenous and except for Diet D isocaloric. Crude fibre values also vary between 29.5% and 35%.

Feedlot Performance:

Feed intake and animal performance data are presented in table 3.

Analyses involving liveweight alone were conducted on a per animal basis while those involving feed were on a per group basis, since animals were weighed individually but feed consumption was measured per group.

Average DM intake was higher in the control diet (115.5g/W^{0.75}) than in the test diets and significantly higher ($P < 0.05$) than Diet B (98.9g/W^{0.75}) which had cottonseed and molasses. That is, the animals consumed greater quantities of diet of higher roughage. This observation is most likely as a result of reduced digestible energy (DE) intake from the high roughage diet. It is well known that cattle on *ad libitum* feeding will attempt to equalise their

TABLE 2.

Chemical composition of some agro-industrial by-products and their compounded rations fed Zebu steers in Mali.

Byproduct/ration	Dry Matter %	Crude Protein %	Crude fibre %	Nitrogen free-extract %	Metabolizable Energy (MJ/kgDM)	Digestible Crude Protein (g/kgDM)
Sugarcane tops	25.8	4.2	32.7	47.8	9.0	17.0
Cottonseed	98.1	17.4	30.0	27.8	14.9	113.0
Ricebran/meal	93.6	7.4	14.5	52.4	9.5	41.5
Molasses	83.3	4.1	*	87.5	11.8	12.0
<i>Phaseolus lathyroides</i>	19.4	13.6	35.3	41.7	8.2	90.0
A	26.8	5.8	30.9	47.8	9.2	27.2
B	36.3	5.7	30.1	55.1	10.9	27.8
C	42.1	5.8	29.5	46.9	9.9	30.5
D	39.6	5.3	34.8	50.3	7.4	22.8

* not analysed.

TABLE 3.

Feedlot performance of finishing Zebu steers

Parameter	A	B	C	D	SEM and significance of difference.
No. of steers	24.00	24.00	24.00	24.00	
Days of experiment	180.00	180.00	180.00	180.00	
Average initial weight (kg)	224.00	235.1	240.70	232.20	
Average final weight (kg)	288.90	317.4	336.40	299.00	
DM intake (g/W ^{0.75} /d)	104.6ab	98.9c	101.4abc	115.5a	3.65*
Avg. daily gain (kg/day)	0.37b	0.46ab	0.55a	0.41ab	0.039*
Cool.	0.50abc	0.43c	0.59a	0.52ab	0.034
**Hot, dry season	0.24	0.48	0.50	0.30	0.065NS
DM intake/kg gain	18.60	14.60	13.40	20.50	1.67NS
Efficiency of feed utilization (%)	5.40	6.9	7.50	4.90	0.61NS

*a, b, c. Different letters within the same row are significantly ($P < 0.05$) different

NS Not significant

SEM Standard error of mean

* Cool, dry season - temp. between 17° and 36°C with 250mm annual rainfall

** Hot, dry season - temp. between 24° and 40°C with rainfall below 1000mm.

DE consumption (Montgomery and Baumgardt, 1965). The intake of the slightly higher roughage ration did suggest that on high roughage rations, rumen capacity may restrict the animals' ability to maximise its digestible energy intake.

The rates of gain for all groups have been separated into hot, dry season when temperature ranged between 24° and 40°C with almost no rainfall and cool, dry season with temperature ranging between 17° and 36°C and about 250mm annual rainfall. Live-weight gains obtained during the hot, dry season were significantly lower ($P < 0.05$) than the cool dry season. No differences were recorded between the treatments during the hot, dry season. However, during the cool, dry season, animals on diet C had the fastest growth rate of 0.59kg/day which was significantly higher than Diet C (0.43kg/day). Generally, the rates of gain for all groups over the 25 week-trial were generally slow ranging between 0.37kg/day (Diet A) to 0.55kg/day (Diet C). The inclusion of cottonseed and/or molasses in the diets seemed to have contributed to a faster growth rate for Diets B and C although the high ambient tempera-

ture seemed to have blurred these differences slightly during the hot, dry season. It should be noted that the protein level of the diets were generally low even for finishing steers. Protein supply is particularly critical with sugarcane-based rations as the cane contributes negligible amounts of protein (Donefer *et al.*, 1973). In a similar experiment by Donefer *et al.* (1973), maize supplementation resulted in significantly greater gains than molasses indicating that some supplemental energy in the form of starch might be preferable to the predominant sugars in the sugarcane tops/molasses combination. Again, the slow rate of gains might be due to the fact that the animals were under a serious stress as is expected at Niono during this period of the year.

The amount of feed required per unit of gains (feed conversion) increased particularly with increasing levels of roughage in the diet. This ranges between 13.4 (Diet C) to 20.5kg DM intake/kg gain for the control diet. However, there were no significant differences between the treatments. The efficiency of feed utilization was very poor for all the diets. This may be because of the high

roughage content of all diets since sugarcane tops formed the major component of the diets. It could also be due to the age of the animals (48 – 50 months) although the mature age of this breed of animals could be above 60 months.

Carcass Characteristics:

Results of the carcass parameters studied are shown in table 4. However, unlike the feedlot performance characteristics which appear to be more related to the level of roughage, the mean carcass weight and dressing percentage did not show similar relationship. There were also no differences between the liveweight lost after transportation and fasting showing that the composition of the diets had no effect on loss in weight. However, the tendency of heavier animals to have higher losses during fasting was preponderant. The dressing percentage was generally between

51% (Diet B) to 54.9% (Diet A) which is a little lower than those obtained under European conditions (Legel and Dobel, 1977).

It is pertinent to note that throughout this trial, there were no nutritional disorders recorded. Also, since the differences observed for the parameters studied were not affected by nutritional levels, it could be reasonably stated that the sugarcane tops could be satisfactorily used in the finishing ration of steers or maintaining the weight of steers during the dry season when pastures are not available. Finally, it is of course assumed that the use of a particular feeding programme (in this instance sugarcane tops/molasses/ cottonseed without maize) in any area is not only dependent on animal response but also on cost analysis of all inputs, outputs, alternatives and most importantly availability.

TABLE 4.

Carcass characteristics of finishing steers

Parameter	A	B	C	D	SEM and difference	Significance of
No. of steers	10	10	10	10		
Avg. liveweight (kg)	288.9	317.4	336.4	299.0		
Liveweight after transportation and fasting (kg)	280.1	291.7	307.8	278.2		
Shrinkage (%)	3.1	8.1	8.5	7.0	1.23NS	
Avg. carcass weight (hot) (kg)	156.9	152.7	169.9	150.8		
Cooling loss after 24hrs. (%)	2.1ab	2.4a	1.9b	2.3ab	0.11*	
Dressing %	54.9a	51.1b	54.1ab	53.0ab	0.82*	

*a, b, c. Different letters within the same row are significantly ($P < 0.05$) different

NS Not significant

SEM: Standard error of mean.

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