Growth performance, feed intake and nutrient digestibility by Western Baggara cattle fed sorghum stover with different levels of concentrate.

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SUMMARY

Twenty-four Western Baggara bulls averaging 313.5± 0.15 Kg were stratified according to body weight into four groups and then allotted randomly to four treatments. Bulls in treatment I were fed *ad libitum* on concentrate mixture (CM) plus 1 kg of sorghum stover. Bulls in treatments 2, 3 and 4 were fed ad *libitum* on sorghum stover plus 75, 65 and 55% of *ad libitum* CM, respectively for 8 weeks. Average daily gain was comparable among treatments (P>0.05). Dry matter intake and feed conversion ratio progressively increased (P<0.05) as the amount of CM offered was decreased. Intakes of dry matter (kg) and feed conversion ratio were 9.5, 8.6; 9.7, 10.8; 10.5, 9.5 and 10.5, 9.5 for bulls given the CM *ad libitum*, 75, 65 and 55% of ad *libitum* CM, respectively. Apparent digestibilities of dry matter, organic matter and protein were greater (P<0.05) for bulls fed *ad libitum* and 75% of ad *libitum* CM.than for those fed 65 and 55% of ad *libitum* CM. Digestibilities of ether extract, acid detergent fibre and gross energy were not significantly affected (P>0.05) by dietary treatments.

INTRODUCTION

In Sudan, animals are finished on purchased feeds, mainly concentrates (sorghum grains and cotton seed cakes). The most important concentrate used in beef cattle finishing diets is sorghum grain (dura) which is the basal diet of most of sudanese peaple and major source of energy- to other mono-gastric animals, particularly poultry. Fortunately, ruminants possess the rumen microbes which enable them to extract energy from fibrous feeds. Therefore, the inclusion of roughages in ruminant diets will spare the cereal grains, the production of which is declining in Sudan, for man and other monogastrics. Hence, attention has been directed towards the use of sorghum stover in finishing diets of beef cattle.

The objectives of this research were to determine the growth responses, dry matter intake and digestibility of nutrients by beef cattle fed sorghum stover with different levels of concentrate mixture.

MATERIALS AND METHODS

Experimental Animals:

The cattle used in the study were entire males ranging from 2 to 5 years **in agQ and belonging to the Western Baggara type of cattle. Twenty four bulls (averaging 313.5±0.15 kg) were involved in the experiment. The cattle were vaccinated before. the beginning of the experiment against anthrax, rinder-pest and black quarter, and were treated against intestinal worms and ticks with Thiabendazole, and Gamatox, respectively On entrance to the feed-lot site, the cattle were**

branded, weighed and divided according to weight into four experimental groups of six animals each. Each group was subdivided into two subgroups of 3 animals. Each subgroup was kept in a pen of 3.8 x 3.2 m.

Feeds and Feeding:

The experimental feeds consist of a concentrate mixture (table 1) and unprocessed sorghum stover. The four groups of animals were assigned randomly to one of the following diet treatments: (1) ***as libitum*** feeding on concentrate mixture (CM) plus 1.0 kg sorghum stover, (2) ad ***libitum*** feeding on sorghum stover plus 75% of *a* ***libitum*** CM (3) ***ad*** *libitjim* feeding on sorghum stover plus 65% of ad *libitum* CM and (4) *ad*, ***libitum*** feeding on sorghum stover plus 55% of *ad libitum* CM. Animals were adapted to feed for 12 days. The experimental feeding period continued for 8 weeks. The feed was offered at 8:00 a.m. Refusals were collected the next morning and daily feed intake recorded. Animals were weighed on weekly basis. Water was available to animals all the time.

Table 1. Chemical composition of concentrate mixture and sorghum stover (%).

Item	Concentrate mixture	Sorghum stover
(a)Composition (as-fed basis)		
Sorghum grains	49.5	
Cottonseed cake	49.5	
Common salt	1.0	
(b)Chemical composition		
Thy matter	96.5	96
Crude protein	25.4	5.7
Ether extract	2.9	1.2
Ash	5.5	10.0
ADF	23.5	43.5
Lignin	5.0	9.3
Gross Energy (Mcal/kg)	4.5	3.4

Table 2. Effect of feeding sorghum stover on performance of bulls.

Parameter	CM (% ad libitum)					
	100	75	65	55	SE	Level of significance
Initial body wt, kg	313.8	313.2	313.2	313.8	0.15	NS
Final body wt, kg	375.4	363.6	374.8	375.8	3.0	
Finishing period (week)	8.0	8.0	8.0	8.0	-	
Daily gain (kg)	1.1	0.9	1.1	1.1	0.1	NS
Daily feed DM intake (kg)	9.5[a]	9.7[a]	10.5[b]	10.5[b]		
Daily stover DM intake, Kg	1.0a	3.5	.1	6.2[d]	0.5	
Feed conversion ratio (kg DM,/kg gain)	8.6[a]	10.8[b]	9.5[c]	9.5[c]	0.3	

Means in the same row with different superscripts are diferent ($P < 0.05$)

Digestibility Trial:

Twelve **bulls three out of each** diet treatment were utilized in digestibility trials to determine digestibilities of diets used in the feeding trial. Each bull was placed in a separate pen. The pen's floor was made of concrete and levelled in such a way to make urine pass without contaminating the faeces. Because animals were involved in the feeding trail, only three days were allowed for adjustment to diets. This adjustment period was followed by 5 days collection period.

***Chemical** A nalysis:*

Feed and faecal samples were analysed for dry matter (DM) crude protein (CP), ether extract (EE) and ash according to AOAC 1980). Acid detergent fibre (ADF) and lignin were determined by Goering and

Van Soest (1970). Nutrient apparent digestion coefficients were determined by the whole collection method (Mc Donald *et al.* 1980). Gross energy was determined using a bomb calorimenter (Parr Instrument Co., Moline, IL. 61265, USA)

Statistical Analysis:

All data were analysed statistically by ANOVA for a randomized complete-block design (Steel and Torrie, 1980). Differences between sets of treatment means were assessed by the least significant difference method (Steel and Torrie, 1980).

RESULTS

Animal Performance:

Animal performance data are presented in Table 2. Dry matter intake progressively increased ($P<0.05$) as the amount of CM offered was decreased. Final body weight was comparable among dietary treatments. There were no differences ($P>0.05$) among treatment groups in average daily gain. The feed conversion ratio was significantly lower ($P<0.05$) for bulls offered the CM *ad libitum* than for bulls offered the other treatments. Bulls given the CM at the 65 and 55% level showed significantly better ($P<0.05$) feed conversion efficiency than those given the CM at the 75% level.

Apparent Digestibility:

Digestion coefficients for DM, OM and CP were highest on diet treatment (1), and tended to decline as the proportion of concentrate in

the diet decreased from 100% concentrate to 55% of *ca iibitum* roughage intake (P<0.05). Digestion coefficients for EE, ADF and energy were not significantly different in the four diet treatments (P>0.05).

Table 3. Effect of feeding sorghum stover on apparent digestion coefficients of nutrients.

Parameter	CM (% *ad libitum*)					
	100	75	65	55	SE	Level of Significance.
Digestibility, %						
Dry matter	78.4[a]	73.4[a]	63.9[b]	63.9[b]	3.9	*
Organic matter	80.1[a]	752[a]	65A[b]	65.0[b]	4.1	*
Crude protein	80.8[a]	73.9[b]	60.8[c]	58.6[c]	42	*
Ether extract	82.0	78.6	73	68	3.7	NS
ADF	62.8	59.3	55.4	50.7	6.6	NS
Energy	78.2	71.7	65.3	66.9	4.0	NS

Table 4. Prices of ingredients of the experimental diets.

Ingredients	Cost (Ls/ton)	Re..duction in cost of diets (%)0
Sorghum grain	880.0	
Cotton seed cake	404.2	
Common salt	100.0	
Cost of mixing	15.0	
Sorghum stover	210.0	
E rimental diets:		
Al -concentrate diet	645.2	
25% Stover based diet	536.2	16.8
35% Stover based diet	492.9	23.6
45% Stover based diet	384.7	40.3

@ Reductions in **cost of** diets were calcualted for sorghum stover baseci diets in comparison to the all-concentrate diet.

DISCUSSION

In this study, the incorporation of sorghum stover in beef cattle diets up to 45% had no undersirable effects (P>0.05) on average daily gain. With respect to this parameter, bulls given the all-concentrate diet and those given the sorghum stover up to 45% were comparable. In contrast to this work, Devendra and Raghavan (1978) presented data which indicated that cereal straws in fattening diets should not exceed 20 to 30%. However, this discrepancy may be due mainly to the quality of the crop residue used in the two studies. Another factor which may have contributed to the better performance of the bulls used in this study was the relatively high levels of protein in the diets.

Bulls offered **the sorghum stover in their diets consumed significantly greater (P <0.05) dry matter per day than those offered the all-concentrate diet. The sorghum stover consumption was significantly increased (P<0.05) when the proportion of the concentrate** mixture **in the diet decreased. This agrees with previous studies (Levy *Cl* *al.* 1975; Horten and Holmes, 1976; Lofgreen *et al.* 1981) which have demonstrated, from studies with beef cattle, that dry matter consumption increased as a result of decreasing concentrate allowance.**

The inclusion of unprocessed sorghum stover in the diets had significant (P<0.05) effect on feed utilization. The feed conversion ratio was significantly lower (P<0.05) for bulls offered the highest level of concentrate mixture. This agrees with Wise *flat.*, (1968) and El Hag and Mukhtar (1978) who observed improved feed utilization as the level of concentrate in the diet was replaced with roughage. In the present study, the higher feed conversion ratio for bulls fed the 75%

concentrate mixture was unexpected. However, this was due to the slightly lower growth rates exhibited by bulls given that diet compared with bulls given the latter diets.

Table 5. Reductions in cost of finishing as a result of inclusion of sorghum stover in the diet.

Item	Sorghum stover level (%)			
	0	25	35	45
Feed conversion (kg feed/kg gain)	8.5	10.8	9.5	9.5
Cost Ls/kg gain	5.5	5.8	4.7	3.6
Reduction in cost of finishing (%)@	-	-	14.5	34.5

@ Reduction in cost of finishing were calculated for sorghum stover fed bulls in comparison to all - concentrate fed ones.

Incorporation of sorghum stover in finishing diets resulted in a reduction ($P<0.05$) in digestibility of dry matter, organic matter and crude protein. The significant reduction in the digestion coefficients of these parameters may be due to low content of protein in the diets, leading to decreased activity of microflora. This is in agreement with Lyons gt *al.* (1970) who showed that an increase in the crude protein level of the diet resulted in an increase of digestibility of organic matter and crude protein. More over, McDonald *Et al* (1980) have shown that the digestibility of crude protein is particularly dependent upon the proportion of protein in the diet. Also, another factor which may have resulted in the observed reduction of digestibility of diets containing the sorghum stover could be related to the level of feed consumption which was highest ($P<0.05$) for bulls fed the 65 and 55% of the concentrate mixture *ad libitum.*

It is interesting to note that, in Sudan, the sorghum stover is fairly cheap compared to concentrate feed stuffs (sorghum grains and cotton seed cake). The prices of ingredients of the experimental diets and cost of finishing beef cattle are given in Tables 4 and 5, respectively. The increase in the price of the concentrate diet was due to the high cost per ton of the sorghum grains. The inclusion of the sorghum stover in the diets reduced their cost. The percentages reduction were 16.8, 23.6 and 40.3 when the sorghum stover constituted 25,35, and 45% of the diet. Incorporation of sorghum stover in the diet at the high levels (35 and 45%) reduced the cost of finishing when compared to the all-concentrate and the low level sorghum stover feeding. Similarly, Mohamed Salih (1986) and El Hzg and Kurdi (1986) have demonstrated, with beef cattle similar to those used in this study, a reduction in cost of finishing as a result of sorghum stover **incorporation in the diet.**

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