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Concentrated by-products of Sorghum Wet-milling, Starch and Glucose Production as Feed-supplements for Fattening Cattle

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SUMMARY

Sixteen Butana bull calves of 156.6 ± 5.5 kg initial liveweight were used in this experiment . The animals were divided according to live-weight into two equal groups and fattened to a target slaughter weight of 250 kg on either a concentrate supplement of 55% sorghum grain, 25% peanut meal, 19% wheat bran and 1% salt (Control) or semi-solid feed blocks containing on as fed basis 55% concentrated sorghum steep liquor (CSL), 15% glucose mud (GM), 16 wheat bran, 13% peanut hulls and 1% common salt (Treatment) . All animals had free access to a basal diet of chopped sorghum hay . The dry matter intake (DMI) of the concentrate supplement by the control group was regulated at weekly intervals to equalise the ad It intake of the treament animals from the feed blocks .

Feedlot performance and carcass characteristics examined revealed no significant (P > 0.05) differences between the experimental groups . The average daily gain and dressing out percentage of the two groups

were found slightly better than those reported in earlier studies . It was concluded that incorporation of the concentrated by-products of starch and glucose industry, which are considered as waste, in cattle diet will substantially reduce tne cost of supplementary feeds .

INTRODUCTION

In the Sudan feeding of sorghum grains to animals specially ruminants is becoming economically unjustifiable under the present growing demands of grains for human consumption . Hence there are increasing and economically desirable efforts to make better use of agroindustrial by-products as alternative feeds .

This study was carried out to investigate the nutritive value of sorghum concentrated steep liquor (CSL) and glucose mud (GM) which are by-products of starch and glucose production from sorghum grains. These by-products are produced in huge tonnage but they have not been attempted in animal nutrition .

MATERIAL AND METHODS

Livestock :

The experiment involved sixteen Butana bull calves of 156.6 + 5.5 kg liveweight . On arrival at the experimental station the animals were treated for ecto-parasites by "Gamatox" and for endo-parasites by "Thiobenzole". Prophylactic doses of Terramycin were also administered .

Feeds ana Feeding :

For the purpose of the experiment two diets were prepared ; a control concentrate compound and a treatment feed block supplement composed of 55% CSL, 15% GM, 16% wheat bran, 13% peanut hulls and 1% common salt . The blocks were manufactured according to the procedure described by El Khidir et al (1989). During the course of the trial all animals had free access to a basal diet of chopped sorghum hay. Ingredients of the experimental diets, their proximate analysis and estimated nutritive values are given in Table 1.

Table : 1 Ingredients and chemical composition of the experimental diets.

Particular	**Feeds**		**Sorghum hay**	**Steep liquor**	**Glucose mud**
	Control	**Treatment**			
Ingredients (g/kg as fed): *					
Sorghum grains	550	-			
Wheat bran	190	160			
Peanut meal	250	-			
Concentrated steep liquor	-	550			
Glucose mud	-	150			
Peanut hulls	-	130			
Common salt	10	10			
Proximate analysis (%DM):					
Dry matter	92.8	66.7	90.1	40.7	66.4
Ash	5.1	17.9	8.3	26.9	2.9
Crude protein	20.8	15.9	4.7	29.9	29.4
Ether extracts	7.3	5.5	0.7	0.3	25.7
Crude fibre	4.6	11.6	36.5	0.2	2.4
Nitrogen free extracts	70.3	49.1	49.8	42.7	39.6
Digestible crude protein	18.7	15.5	3.8	-	-
ME (MJ/kg DM)	13.7	11.07	8.61	9.67	17.16

* Animals of both groups were offered sorghum hay ad libitum

Experimental :

Initially the bull calves were placed on a ten-day pre-experimental period during which they were group fed *r1 lib* on the chopped sorghum hay. At commencement of the experiment the calves were divided into two similar groups of eight animals each refered to as control or treatment according to the diet-supplement offered. Their respective liveweights were 155.6 ± 7.4 kg and 157.5 ± 8.6 kg. The two groups were further divided on liveweight basis into four sub-groups each (two animals/sub-group) penned and fed separately. Animals of both experimental groups were offered one and the same roughage ad lib (10% weigh back). The treated group was offered feed blocks free access.A11-owances of the concentrate supplement of the control animals were regulated on weekly basis to equalise the DMI of the treated group from the feed blocks. Feeds offered and refused were subsampled regularly for proximate analysis.

All animals were weighed at weekly intervals before the morning meal and until they reach a 250-kg target liveweight.

Energy Determinations :

The digestible organic matter (DOM) and digestible crude protein of the sorghum hay was determined in-vivo by total faecal collection using a group of three sheep. The ME was thereafter calculated according to the following equation;

$$ME\ (_{m}uk_{g}\ Dm) = DOM \times 4.4 \times 4.184 \times 0.82$$

The ME of the feed blocks and the concentrate compound was calculated in accordance with the equation:

$$ME\ (MJ/kg\ DM) = 0.012\ CP + 0.031\ EE + 0.005\ CF + 0.014\ NFE$$

Where analysis are in g/kg DM (M.A.F.F., 1975).

Slaughter and and Carcass Preparation:

The fist animal to reach the target liveweight of 250 kg from every subgroup was slaughterd and prepared according to the method described by Gaili and Nour (1980). The warm carcass and offals were weighed immediately, and the carcass was then refrigerated at 0 to 4 C for 24 hours. Then the left half of the carcass was dissected into muscles, bones, intermuscular fat, subcutaneous fat and connective tissues.

Statistical Analysis:

Differences between the two groups in the feedlot performance and carcass characteristics were examined for significance by student t-test (Snedecor and Cochran, 1967). Subgroups were considered as experimental units for analysis of intake data whereas other measurements were taken on individual animal basis.

RESULTS AND DISCUSSION

Feeding the blocks of sorghum steep liquor and glucose mud during the course of this study did not induce any adverse effects on the treated bull calves. Table 2 shows the feedlot performance of the control and treatment groups. No significant ($P > 0.05$) differences were observed between the two groups in all parameters studied. The average total daily DM1 was found to be 3.1% and 3.2% of the mean liveweight of the control and treatment calves respectively. However calves of the latter group had 6.7% lower intake of roughage than the former. This

was mainly attributed to the 11.2% higher intake of the blocks which contained greater percentage of crude fibre compared with the concentrate mixture. It is noteworthy that the daily DMI and feed conversion efficiency observed here were 17% higher and 15% lower, respectively, than those reported by El Khidir et al (1988) for the same parameters. This could be ascribed to the heavier liveweight of the animals used in this experiment. In an earlier study El Shafei (1966) fattened a group of Zebu cattle from a liveweight of 141 to 245 kg and reported an average daily DMI and feed conversion efficiency similar to that observed in this study. More recently El Shafei et al (1876) fattened a group of Western Baggara cattle from 132.4 to 222.8 kg liveweight on diets of 11.6 to 14.8% crude protein content and found a feed conversion efficiency (6.8 kg/kg gain) higher than that reported here (Table 2)

Table 2 : Feedlot of the experimental animals

	Croup		
Particular	**Control**	**Treatment**	**S.E.**
Number of animals	8	8	—
Feedlot duration (days)	85.5	88.4	7.6 NS
Initial L.Wt. (kg)	155.6	157.5	5.7 NS
Final L.Wt. (kg)	251.0	250.4	0.3 NS
Average daily L.Wt. gain (kg)	1.16	1.04	0.03 NS
Average DMI of roughage (kg/day)	2.365	2.207	0.16 NS
Average DM! of supplement (kg/day)	4.046	4.499	0.18 NS
Total DMI (kg/day)	6.411	6.706	0.26
DCP (g/day)	846	759	33 NS
ME (MJ/day)	75.76	68.79	2.73 NS
Kg DMI/kg L.Wt. gain	5.65	6.45	0.22 NS

N.13. Intake values were means of four replicates.

Animals of the treatment group fed on the feed-blocks reached the target slaughter weight in a slightly longer period than the control group. The average daily live-weight gain of the experimental animals was comparable to that reported earlier by El Khidir et al (1988) for Kenana bull calves fattened from a liveweight of 68.9 to 153.9 kg on a diet similar to the control supplement . However the observed daily live-weight gain of the control and treated bull calves in relation to the ME was found 15.8% and 8.8% respectively lower than expected gain according to the M.A.F.F. (1975). It may be argued that this lower gain was attributed to greater activity than allowed for in the M.A.F.F. (1975).

Results of the carcass composition are presented in Table 3. No.

Table 3 : Carcass characteristics of the experimental animals

	Croup		
Particular	**Control**	**Treatment**	**S.E.**
Number of animals	4	4	-
Slaughter Wt. (kg)	251.0	250.4	5.7 NS
Gut fill (% of slaughter Wt.)	10.2	**12.9**	1.1 NS
Warm carcass Wt. (kg)	129.7	129.5	1.5 NS
Cold carcass Wt. (kg)	127.1	126.9	1.6 NS
Dressing percentage	51.7	51.6	0.6 NS
Muscles (%)	68.1	64.6	0.7 NS
Bone (%)	18.3	18.6	0.4 NS
Subcutaneous fat (%)	5.7	6.7	0.5 NS
Intermuscular fat (%)	4.9	6.7	0.4 NS
Connective tissues (%)	2.9	3.5	0.4 NS

N.B. Tissues are percentages of cold carcass weight.

significant differences were observed between the two experimental **groups in all parameters measured. However the gut** fill of the treatment

group was 26.5% heavier than that of its control counter part. This could be attributed to the high percentage of minerals in the feed-blocks. Similar results were reported by El Khidir et al 1989_a and 1989b when feeding sheep on molasses urea blocks of high ash content. Also the feed-blocks used in this experiment induced 26.3% higher total deposited fat in the carcass of the treatment group compared with the animals fed the concentrate mixture.

To conclude, this study has vividly elucidated the usefullness of the liquid by-products of sorghum wet-milling as feed ingredients in the diet of cattle. The feed blocks of 55% CSL and 15% GM with other structural materials induced similar fattening performance observed when a concentrate compound containing 55% sorghum grain and 25% peanut meal was offered to a comparable control group of calves i.e. reduced cost of meat production.

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