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Feedlot Performance of Sudan Baggara Bulls Fed Baggase Based Diets (BBD)

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Abstract: Thirty six western Sudan Baggara bulls were purchased at average live weight (200±7.56 kg) and (1.5) year Age and used in a feeding trial for 70 days. At the start of the experiment the bulls were randomly divided into four treatment groups of nine animals each. Each group was subdivided into three subgroups of three animals in a randomized complete block design (RCD). Four baggase based diets (BBD) MM, MSP SM and MSM were formulated in a complete diet system (CDS) with 15% sugarcane baggase (SCB) in each. Then each group fed one of these diets to study the dry matter intake (DMI), feed conversion ratio (FCR), metabolizable energy (ME) intake, crude protein (CP) intake and body weight gain. The objective of this study are to determine the effect of using sugarcane baggase (SCB) as a basal roughage in complete diet system (CDS) for fattening Sudan Baggara bulls. The results obtained showed no significant ($P \geq 0.05$) differences in the average daily gain (ADG) among the treatment groups. The feed intake data among the treatment groups were not influenced ($P > 0.05$) by the dietary treatments. Feed conversion ratio (FCR) was significantly ($P < 0.05$) improved in bulls fed MSP diet (5.7) over the remaining treatment groups.

Keywords: Baggara bulls, Sugarcane baggase(SCB), Feedlot performance, DMI

INTRODUCTION

Cattle in Sudan are raised mainly on open range and pasture that cover about (46%) of the country. In addition to that, agricultural byproducts and agro-industrial byproducts are exclusively used for animal feeding. Cereal grains (mainly sorghum) are also used as sources of energy in some animal diets for various kinds of livestock production. To a lesser extent molasses is used in some fattening units. Beef cattle and sheep are primarily grazing animals. At certain times they are fed mixed diets at the feedlots. Philip (2001) reported that in parts of Africa, cattle contribute to overgrazing and the treading and removal of plant cover in hill regions causing soil erosion. In Sudan the large numbers of cattle (40 million heads) (MOARF, 2006) may impose great pressure on the natural grazing resources and may lead to soil erosion. Around big cities and large towns, feedlots fattening is practiced during summer season, where animals supply is at minimum and animal feeds showed shortage. This fact applies greater importance on finding out some alternative feed sources during period of shortage and scarcity of animal feeds.

Sugarcane baggase (SCB) is a fibrous material left over in sugar factories after extraction of all the juice from sugarcane (Reddy, 2004). It is a cheap agro-industrial byproduct. Ensminger *et al*. (1990) reported that, baggase is high in fiber. It has a low dry matter digestibility – only about 25%. Additionally, its TDN is extremely low, ranging from 20 – 35%. However, baggase has been used effectively as a carrier of molasses, the combination of which yields a relatively high fiber and a high-energy mixture .

Abu Swar and Darag (2002) reported that sugarcane baggase (SCB) forms about 43.4 – 48.7% of the total weight of the refined sugarcane. The chemical analysis of baggase reveals 47.9% CF and 1.72 MJ/kg DM metabolizable energy (ME).There are five sugar factories in Sudan produced about 1,391,600 tons of baggase in 2002-2003 – SCB was considered as a waste before, but nowadays is used in animal feed because it is available in abundance, cheap and provide a source of fibre to ruminants.

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MATERIALS AND METHODS

Thirty six entire Sudan Baggara bulls of 1.5 year old average live body weight (LWT) 200 + 7.56 kg were selected from a commercial herd purchased by Animal Production Research Centre (APRC) at Khartoum North. The animals were trekked to the site of the experiment, on arrival they were dosed against ecto- and endo-parasites ;the animals were then identified and divided according to live weight into four experimental groups of nine animals each. Then subdivided into 3 subgroups of three animals each, penned together in pens equipped with feeding trough and clean fresh water. An adaptation period of three weeks were allowed to subject the animals to a resting period during which they compensate for any possible previous feed restriction and also to adapt the ruminal microflora to the four types of experimental diets.

Feeds and Feedings:

For the purpose of this study four experimental complete baggase based diet (BBD) were used (Table 1). The four diets were formulated to be isonitrogenous with different energy levels. All diets were composed of an equal amount of sugarcane baggase (SCB) (15% of each). The (SCB) was already air dried and ground by Kenana Sugar Factory (KSC). On arrival to the site of the experiment was kept in bags in a good ventilated store. Dried green alfa alfa was given once a week at a rate of 2 kg/head to avoid vitamin A deficiency. Mineral block was available through the experiment period as one block for each pen.

Table 1: Ingredients composition of experimental baggase based diets

Ingredient	MM%	MSM%	MSP%	SM%
Molasses	52	35	35	-
Sorghum grain	-	20	20	45
Wheat bran	24	15.5	15.5	14
Groundnut cake	05	10	10	25
Baggase	15	15	15	15
Urea	3	1.5	1.5	-
Limestone	-	2	2	-
Common salt	1	1	1	1

MSM: Molasses + sorghum grains diet (Mash)
SM: Sorghum diet (Mash).
MSP: Molasses + sorghum grains diet (Pelleted)
MM: Molasses diet (Mash)

Sorghum grains, groundnut cakes were milled to facilitate their mixing with each other and the other ingredients. Molasses and urea were added to the ration at each meal preparation (every 3 days) after dissolving urea in water in order to reduce urea accumulation in animal rumen which could lead to urea toxicity. The MSP diet and MSM diet have the same composition of ingredients but physically different where MSP was pelleted and MSM was mash (Table 1).The chemical composition of the four experimental diets was obtained by using standard procedure of the official method for analysis of the association of official analytical chemist AOAC (2000) (Table 2). The (ME) content of the diet was calculated as described by MAFF (1976):

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

Table 2: Chemical composition of experimental baggase based diets.

Parameter	MM%	MSM%	MSP%	SM%
Dry matter (DM)	79.39	81.13	92.61	92.61
Crude protein (CP)	16.98	14.7	16.43	16.45
Crude fiber (CF)	16.64	9.28	13.84	10.75
Ether extract (EE)	6.59	1.00	1.54	4.16
Ash	6.32	7.43	8.37	5.86
Nitrogen Free extract (NFE)	32.86	48.72	49.72	55.39
Metabolizable energy ME/kg/DM	9.5	10.4	10.4	11.6
Acid detergent fiber (ADF)	12.00	21.04	22.06	17.17
Neutral detergent fiber (NDF)	33.00	35.00	36.50	30.14

MSM: Molasses +sorghum grain diet (Mash).
SM: Sorghum diet (Mash).
MSP: Molasses +Sorghum grain diet (Pelleted).
MM: Molasses diet (Mash)

Where crude protein (CP) and the other components of the equation were expressed as g/kg DM. Throughout the experimental period, daily feed allowance were offered to each group ad-libitum (10% weight back) in one meal at 8:00 a.m.

The feeding period was extended for 70 days during which different measurements were conducted. These include; weighing of animals (performed weekly). Daily feed intake, daily body weight gain and feed conversion ratio (FCR) were recorded. Feed intake was determined daily as the differences between feed offered and refusals. Samples for dry matter (DM) determination were taken from feed refusal at weekly intervals. Live animal weights were recorded to the nearest 5 kg prior to the morning feed using weighing bridge balance of 1500 kg maximum capacity load and of 5 kg division. Animals were night fasted and weight was taken in the morning before feeding.

RESULTS AND DISCUSSION

Results:

The analysis of the feedlot performance of Sudan Baggara bulls fed baggase based diets (BBD) are presented in table (3). The average initial and final live weights were almost separately the same. The average daily gain ADG and the total live weight gain of the treatment groups were not found to be significantly ($P > 0.05$) affected by dietary treatments. The feed intake data for the treatment groups are presented in table (4). Means of the DMI among the treatment groups were not found to be significantly ($P \geq 0.05$) influenced by dietary treatments. Bulls fed MM complete diet reached total DMI of 557.6 kg as the highest value while bulls fed MSP diet showed the least value (39.34). Bulls fed MSM and SM diets showed almost similar values of DMI as 472.03 and 485.0 kg, respectively.

Table 3: Feedlot performance of Sudan Baggara bulls fed baggase based diet.

Item	MM	MSP	SM	MSM	±SEM	Level of significant
Initial weight (kg)	204	212	209	215	7.56	NS
Final weight (g)	275	276	276	276	0.87	NS
Average daily gain (g/day)	1.062	1.016	1.068	1.2043	0.07	NS
Total gain (kg)	71.0	64.0	67.0	61.0	7.41	NS
Total DMI (kg/head)	557.6	369.34	485.00	472.03	59.32	NS
FCR (kg feed/kg)	8.120^{a}	5.724^{b}	7.16^{a}	7.592^{a}	0.42	**
SEM	Standard error of the means from ANOVA					
N.S.	Not significant ($P > 0.05$)					
S	Significant ($P \leq 0.05$)					
a b	Value in the same row with different superscripts are significantly different, ($P \leq 0.05$)					
MM	Molasses based completed diet (mash)					
MSP	Molasses sorghum complete diet (pelleted)					
SM	Sorghum complete diet (mash)					
MSM	Molasses sorghum complete diet (mash)					

Table 4: Feed intake of Sudan Baggara bulls fed baggase based diets.

Item	MM	MSP	SM	MSM	±SEM	Level of significant
Average feed intake DM1 (Kg/head/day)	8.5	5.9	7.6	8.94	0.0224	NS
DMI % body wt	3.5	2.4	3.1	3.6	0.021	NS
Metabolizable energy intake(MJ/day)	80.75	61.36	88.16	84.04	8.02	NS
CP intake g/Kg	2.4	1.9	2.0	2.1	.002	NS
ME ($MJ/kg^{0.75}$)	1.3	1.0	1.4	1.4	0.023	NS
CP g/ME MJ	1.8	1.9	1.4	1.5	0.034	NS
SEM	Standard error of the means from ANVA					
N.S.	Not significant ($P > 0.05$)					
	Significant at 5% ($P \leq 0.05$)					
ab	Value in the same row with different superscripts are significantly different,					

Bulls fed on (SM) appeared to have the highest metabolizable energy intake (88.16 MJ/day) while bulls fed on MSP showed the least metabolizable energy intake 61.36 MJ/day). However the differences among the treatment groups were found to be not significant ($P > 0.05$). Crude protein (CP) intake (g/kg) and metabolizable energy intake ($MJ/kg^{0.75}$) showed no significant ($P > 0.05$) differences among the treatment group although bull fed SM and MSM diet showed higher ME intake Table (4). Feed conversion ratio (FCR) among the treatment groups was improved ($P \leq 0.05$).This was obviously seen in bulls fed MSP diet, while improved efficiency (5.72) over the remaining groups(Figure 1).

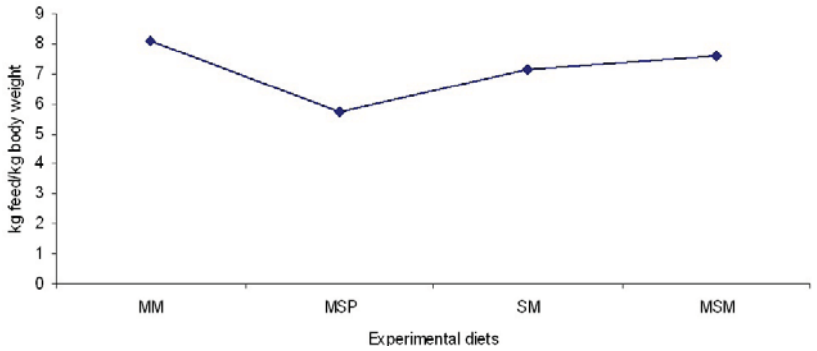

Fig. 1: Feed conversion ratio of Sudan Baggara bulls fed Baggase based diets.

Discussion:

Table (3) and (4) described the data used to evaluate the feedlot performance of Sudan Baggara bulls in this study. The total dry matter intake (DMI) was higher for bulls fed MM diet compared to the remaining groups. This trend was similar for the average daily DMI and DMI as percentage of the live weight. This finding could be attributed to the lower energy concentration (ME/kg DM) of the MM diet (9.5 MJ/kg DM) compared to the remaining diets (Table 2). These results were similar to those reported by Owen and Geay, (1992); McDonald *et al*. (2002); Ketelaars and Tolkamp (1999); Mertens (1985) and Merchen *et al*. (1987) who concluded that, ruminants eat that amount of feed which gives the optimum yield of net energy (NE) per unit of oxygen consumed i.e. feed intake increased as the concentration of energy in the diet deceased. This because of the fact that animals eat until satisfying their energy needs. For the same breed, similar results were obtained by Mohamed (1999) and he concluded that cattle receiving low energy diets consumed significantly more feed than those receiving high energy diets. In this study the reported value for DMI for Sudan Baggara bulls fed MSP diet, were similar to these reported for the same breed by Guma 1996; and Itidal, 2004. Similarly, the reported DMI for bulls fed MM, MSM and SM diets were in line with those reported by Elshafie and Mcleroy (1964); El Hag and George (1981); Eltahir (1994); Abdalgalil (1997); Mohamed (1999); and Intesar (2002). Again the DMI reported these bulls in this study were slightly lower than those reported by Eltayeb (1990); Mustafa (1990) and slightly higher than those reported for the same breed by Gaili and Osman (1979); Guma (1996); Suliman (2004).The ME intake of Sudan Baggara bulls fed these experimental (BBD) were presented in (Table 4). These values were slightly higher than those reported by Levy *et al*. (1980) as 82.1 MJ/day when bulls fed a diet coating 11.5 MJ/kg metabolizable energy and found to be similar to those reported by Intesar (2002) for bulls fed different protein sources. The (CP) intake g/kg calculated in this study were slightly higher than the values reported by Itidal (2004) and similar to those reported by Mohamed (1999). These differences might be attributed to the variation in CP content of the diets, DMI and duration of feeding.

The FCR reported in this study was improved for bulls fed the MSP diet which were found to be significantly ($P< 0.05$) efficient in feed utilization (FCR= 5.72 kg DM/kg mass gain). This figure agreed with that reported by Reyneke (1996) and Thiessen *et al*. (1984) who concluded that bulls required 5.14 kg DM per kilogram live mass gains. Similarly for the same breed these results were in line with those reported by Guma (1996) who reported 5.1 and 5.8 (FCR) while Itidal (2004) reported 5.15, 5.02 FCR for bulls fed 10 and 20% levels of sugar cane baggase(SCB) respectively. On the other hand, the FCR values for the remaining groups MM, SM and MSM were 8.12, 7.16 and 7.95 respectively were found to be similar to those reported by many other authors (Elshafie and Mcleroy 1964, Gaili and Osman, 1979, EL Hag and George, 1981; Mustafa *et al*., 1990; Eltayeb *et al*., 1990; Mohamed, 1999; Intesar, 2002).

This improvement in the FCR might be attributed in part to absence of selective feeding behavior of the cattle due to the complete diet system CDS used in formulating the diet specially the MSP which is pelleted and of high CP content (16%) which agreed with Cobic *et al*. (1980) who reported that, the FCR was more efficient in animals fed the highest CP level (14.3-16.6%) in DM of the ration.

Conclusion:

From this study it could be concluded that complete diet system (CDS) could be used satisfactorily in fattening beef cattle in feedlots around towns and big cities in Sudan, especially during periods of feed

shortage. Sugarcane baggase (SCB) could be used efficiently as basal roughage portion in complete diets for fattening beef cattle to decrease the cost of feeding and making fattening business more profitable as (SCB) is available in Sudan as cheap feed ingredients. The results of using (SCB) as the main roughage in fattening diets either in pelleted or mash form, were similar to those obtained when using more expensive and nutritive other traditional roughage.

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