PJN
ISSN 1680-5194

PAKISTAN JOURNAL OF NUTRITION

ANSInet
308 Lasani Town, Sargodha Road, Faisalabad - Pakistan
Mob: +92 300 3008585, Fax: +92 41 8815544
E-mail: editorpjn@gmail.com

Pakistan Journal of Nutrition 8 (4): 384-387, 2009
ISSN 1680-5194

Feedlot Performance of Sudan Baggara Bulls Fed Pelleted and Unpelleted Baggase Based Diets

Izeldin Adam Babiker[1], Amir M.S. Mukhtar[2] and Omer A. El Khidir[3]
[1]Department of Animal Production, Faculty of Agriculture, University of Zalingei, P.O. Box 6, Sudan
[2]Department of Animal Nutrition, Faculty of Animal Production,
University of Khartoum, Postal Code 13314, P.O. Box 32, Khartoum, Sodan
[3]Animal Production Research Centre, Hillat Kuku, Animal Resources Research Corporation (ARRC), Sudan

Abstract: The present study was conducted to evaluate the effect of physical form of the diet, use of sugarcane baggase as basal roughage in complete diet system and the joint effect of dietary energy and protein on Sudan Baggara bulls performance. Two experimental baggase based diets(BBD) were used in feeding 18 entire Sudan Baggara bulls (1.5 year old and at average weight 200±7.56 kg). These bulls were randomly divided into 2 treatment groups of nine animals each. Further, each group blocked into three subgroups of three animals. Following an adaptation period of 3 weeks, 2 experimental diets of the same ingredients, metabolizable energy and CP content (but differed physically were diet A is unpelleted and diet B is pelleted were used. The experiment in this study showed variable results between the two treatment groups due to the difference in the physical form of the diets, but no significant differences ($p>0.05$) between the two treatment groups in many parameters, these are, the Average Daily Gain (ADG), daily DMI, total DMI, feed intake as percent of the body weight and, ME intake and the period of feeding. Feed Conversion Ratio (FCR) was significantly ($p<0.05$) influenced by the physical nature of the diet by being improved in bulls fed pelleted diet (B) as (5.7) over these fed the unpelleted diet (A).

Key words: Pellets, complete diet, feedlot performance, baggase, Baggara Bulls

INTRODUCTION

In Sudan agro-industrial byproducts were commonly used as roughage source for ruminants especially at periods of green forage shortage due to their seasonality. The scarcity and resultant high prices of cereal grains have revived interest in finishing beef cattle on Sugarcane Baggase (SCB), as SCB is one of the available and cheap agro-industrial byproduct in the Sudan. Finishing Sudan Baggara bulls on Sugarcane Baggase (SCB), reduces the competition between man and animals for cereal grains. In Sudan beef production depends mainly on the nomadic range system. Beef cattle have been the main concern of the country due to their contribution to the national economy. Sudan Baggara cattle are numerically the most important beef cattle in Sudan, raised by nomads in the Baggara belt that comprises southern Darfur, Southern Kordofan and White Nile State (El-Khalifa *et al*., 1985). Livestock fattening in Sudan is based on sorghum grains and oil seed cakes at ratio of 50% each Eltayeb *et al*., 1990; Mustafa *et al*., 1990). Other researchers (El-Hag and George, 1981, El-Khidir, 1984, 1995; Tibin and Ahmed 1997a, b) sighted the use of agricultural and agro-industrial byproducts in livestock fattening in Sudan. Traditionally cattle destined for slaughter are directed drawn from pasture, subjected to short-term feeding period to reach the market weight and improve meat quality. The nutritive value of (SCB) is very poor due to its' high fibre content, low digestibility of DM (only 25%) and extremely low TDN ranging from 20-35% as reported by Ensminger *et al*. (1990). Abu Swar and Darag (2002) reported 47.9% CF and 1.72 MJ/kg DM metabolizable energy (ME) value for SCB in Sudan. To improve the nutritive value of SCB, pelleting was used for one of the diets based on SCB as a complete diet. Ensminger *et al*. (1990) and Reddy (2004), reported that, pelleting poor quality roughage will markedly increase the consumption of roughage, but in palletizing complete feeds incorporation of concentrate mixture at 30% level appear to be the upper limited for optimizing the feed intake, otherwise feed intake is deceased.

MATERIALS AND METHODS

For the purpose of this experiment, eighteen entire Sudan Baggara bulls were selected at average live weight 200±7.56 kg and 1.5 year old. The animals were then identified by ear tags and divided into two treatment groups of 9 animals each, each group is subdivided into three subgroups of three bulls each penned together in (4×3 m) pen at the premises of Animal Production Research Centre (APRC) at Hillat Kuku. The pens were equipped with feeding trough, water troughs, with clean fresh water available all over the day and night. The experiment continued for 70 days during July-November 2005. An adaptation period of three weeks was allowed to subject the animal to a resting period during which

they undergo compensation for any possible feed restriction and to adapt the ruminal micro-flora to the experimental diets. Two experimental diets were formulated in a Complete Diet System (CDS), with similar ingredient composition, iso-nitrogenous and iso-caloric but with different formulation method and physical form. Diet (A) was computed by hand and than rechecked by computer in an unpelleted form (mash form). Diet (B) was formulated and processed in a pelleted form by Kenana Sugar Company using animal feed industry. Both diets composed of 15% Sugarcane Baggase (SCB) as the basal roughage component, it was already air dried and ground. Dried green alfalfa was given once a week at a rate of 2 kg/head. The chemical composition of the diets was obtained by using the standard procedure of the official method for analysis of the association of official analytical chemist (AOAC, 2000). The Metabolizable Energy (ME) content of the diet was calculated as described by MAFF (1976).

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

Measurement collected were, weighing of animals which performed weekly, daily feed intake, daily Body Weight Gain (BWG)and Feed Conversion Ratio (FCR) were recorded. Feed intake was determined daily as the differences between feed offered and refusals. Samples for DM determination were taken from feed refusal at weekly interval, live animal weights were recorded to the nearest 5 kg prior to the morning feed using bridge balance of 1500 kg maximum capacity load of 5 kg division. Animals were night fasted and weight was taken in the morning before feeding.

RESULTS

Results obtained in this study showed no significant different ($p>0.05$) in the average initial live weight between the 2 treatment groups. The differences of the Average Daily Gain (ADG) and the total gain were not found to be significant ($p>0.05$) between bulls fed diet (A) and (B). The feed intake data presented in Table 3 showed that, the means of the Dry Matter Intake (DMI) between the treatment groups were not found to be significantly ($p>0.05$) influenced by the dietary treatment but bulls fed the unpelleted diet (A) showed higher total DMI compared to bulls fed the pelleted diet (A). Bulls fed the (A) showed higher average DMI as 8.94 kg/head/day on DM basis over these fed diet (B) as 5.9 kg/head/day. Again the DMI as percentage of body weight was found to be higher in bulls fed diet (A) compared to these fed diet (B) but the difference was not found to be significant ($p>0.05$). Although, the 2 diets composed of the same ME value, but bulls fed diet (A) seemed to score more ME intake values over those fed diet (B). On the other hand the crude protein intake between the treatment groups was almost similar and the difference was not found to be significant ($p>0.05$) (Table 4).

Table 1: Feed ingredients of the experimental diets

Ingredient	Diet A (%) (unpelleted)	Diet B (%) (pelleted)
Molasses	35.0	35.0
Sorghum grains	20.0	20.0
Wheat bran	15.5	15.5
Groundnut cake	10.0	10.0
Baggase	15.0	15.0
Urea	1.5	1.5
Limestone	2.0	2.0
Common salt	1.0	1.0

Table 2: Chemical composition of the experimental diets

Parameter	Diet A (%) (unpelleted)	Diet B (%) (pelleted)
Dry Matter (DM)	81.13	92.61
Crude Protein (CP)	15.70	16.43
Crude Fibre (CF)	9.28	1384.00
Ether Extract (EE)	1.00	1.54
Ash	7.43	8.37
Nitrogen Free Extract (NFE)	48.72	49.72
Metabolizable Energy (ME)	10.40	10.40
Acid, detergent fibre ADF	21.04	22.06
Neutral detergent NDF	35.00	36.50

Table 3: Feedlot performance of Sudan Baggara bulls fed pelleted and unpelleted baggase based diet

Parameter	Diet A	Diet B	±SEM	Sig.
Number	9	9	-	-
Initial weight (kg)	215	212	6.4	ns
Final weight (kg)	276	276	0.87	ns
Total gain (kg)	64.0	61.0	6.2	ns
Total DMI (kg/head)	472.03	369.34	59.5	ns
Average daily gain (g/day)	1.263	1.233	0.1202	ns
FCR (kg feed/kg weight)	7.592	5.724	0.418	**
Period (days)	54	61	8.42	ns

±SEM: Standard error of means; ns: Not significant, **Significant ($p<0.01$), Sig.= Significance

Calculations of the ratio between the crude protein intake and the metabolizable energy intake revealed higher ratio in bulls fed the unpelleted diet (A) over bulls fed the pelleted diet (B). The feed conversion ratio between the 2 treatment groups was significantly ($p>0.05$) improved. This was obviously seen in bulls fed the pelleted diet (B) over those fed the unpelleted diet (A). Bulls fed the unpelleted diet (A) reached finishing target weight earlier than those fed the pelleted diet (B) but the difference was not significant ($p>0.05$).

DISCUSSION

The feedlot performance data presented in Table 3 showed no significance ($p>0.05$) difference in the initial and final body weights, the Average Daily Gain (ADG) and the total gain. Bulls fed diet (B) ate less amount of feed than those fed diet (A) (Table 3 and 4) even though the 2 diets were similar in feed ingredients composition and (ME) content, but the difference was not found to be significant ($p>0.05$). This might be attributed to the physical nature of the two diets as diet (A) is in mash (unpelleted) form and diet B is pelleted. This fact also

Table 4: Feedlot performance of Sudan Baggara bulls fed pelleted and unpelleted baggase based diet

Parameter	Diet A	Diet B	±SEM	Significance
Average DMI (kg) kg/head/day	894.00	5.90	0.0224	ns
DMI (% body weight)	3.60	2.40	0.0210	ns
Metabolizable energy intake (MJ/day)	84.04	81.36	8.0200	ns
CP intake (g/kg)	2.10	1.90	0.0020	ns
CP (g)/ME MJ	1.50	1.90	0.0340	ns

±SEM: Standard error of Mean;, ns: Not significant

could be attributed to the lowered CF content of diet B (9.28) compared to the synonymous diet A (13.84). Lowered CF content might have reduced the sensitivity of the rumen receptors to stretch or touch and hence the DMI as reported by Forbes (1986). Another possible factor was the animal behavior and or individually as reported by Huntington and Burns (2007) that reduced DMI was attributed in part to animal behavior. For Sudan Baggara bulls, pellets were new type of feed and animal often exhibit reluctance to accept a new feed as reported by Cheeke (2005) and Chapple *et al.* (1987). Similarly, Baker *et al.* (1955), Hale *et al.* (1969) and Church and Kellems (1998) reported that while pelleting high concentrate ration might markedly improve feed efficiency, gain was usually reduced due to the lowered feed intake. The reason for this is unknown but may be due to shift in Volatile Fatty Acids (VFA) production and this is found to be inline with Illius and Jessop (1996).

Earlier studies of Weir *et al.* (1959), Beardsley *et al.* (1959), Church and Fox (1959) and McCroskey *et al.* (1961) showed more variable results and depressed feed intake in cattle fed pelleted rations. Bulls fed the pelleted diet (B) spent more time chewing and secreted more saliva before swallowing the bolus. This might be related to the particle size, of the pellet (9 mm) or to the increased (NDF) of diet B which might lead to toughness of the pellet (Table 2). This observation agreed with the findings of many researchers (Sudweeks *et al.*, 1981; Beauchemin and Buchanan-Smith, 1996; Loginbuhl *et al.*, 2000) who reported that chewing time/kg of DMI decreased as DMI increased and vice versa. Other workers (Kellems and Church, 1998; Beardsley, 1964; Reddy, 2004) stated that feed intake, daily gain and FCR of cattle and sheep were increased when the roughage was pelleted.

Ensminger *et al.* (1990) reported that pelleting diets low in forage has no adverse effect on rations containing a low level of CF and there was no advantage in pelleting feed for beef and swines. This discrepancy with the former studies could be attributed to the fact that DMI could be influenced by many possible parameters such as textural characteristics of the feedstuffs which determine its degree of acceptance, initial body weight feeding period, environmental conditions, metabolic body size, crude fibre content and rumination time. These parameters might impose individual or additive effect.

In this study, the reported values for DMI for Sudan Baggara bulls fed diet (B) were similar to those reported for the same breeds by Itidal (2004). Similarly the reported DMI for the other group fed diet A were in line with those reported by Eltahir (1994); Mohamed (1999) and Intesar (2002).

The average daily gain (ADG) reported for Sudan Baggara bulls in this study were higher than those reported by Mohamed (1999); Intesar (2002) and Itidal (2004) and were in line with ADG for Sudan Baggara bulls reported by many other researches.

The Feed Conversion Ratio (FCR) value decrease when it indicates efficient feed utilization. This was clear in bulls fed the pelleted diet B (Table 3) where bulls fed this diet efficiently ($p<0.05$) utilized feed (FCR = 5.72 g/DM/kg mass gain) compared to bulls fed diet A. This improvement in FCR might be attributed in part to the absence of selective feeding behavior of bulls fed the pelleted diet (B) as pelleting markedly improve feed efficiency (Church and Kellems, 1998; Beardsley, 1964; Baker *et al.*, 1995). This finding could be attributed in part to the high protein content of the diet (16.43%) which agreed with Cobic *et al.* (1980) who reported that FCR was most efficient in animal fed the highest CP level (14.3-16.6%) in DM of the ration. Bulls fed diet (A) reached the finishing target weight earlier than those fed diet B (Table 3) but ate more feed than bulls fed diet (B).

REFERENCES

AOAC, 2000. Official Methods of Analysis, 17th ed. Association official of analytical chemists. Washington .DC.

Baker, F.H., E.F. Smith, R.F. Cox and D. Richardson, 1955. Kansans Agric. Expt. Sta. Cir, pp: 320.

Beardsley, D.W., 1964. Symposium of forage utilization: nutritive value of forage as affected by physical form. Part 2. Beef cattle and sheep studies. J. Anim. Sci., 23: 239.

Beardsley, D.W., W.C. McCormick and B.L. Southwell, 1959. Steer performance and rumen effects of different concentrate roughage ratios in pelleted and unpelleted mixed fattening rations. J. Anim. Sci. 18: 1507.

Beauchemin, K.A. and J.G. Buchanan-Smith, 1996. Effects of fiber source and method of feeding on chewing activities, digestive function and productivity of diary cow. J. Dairy Sci., 73: 749-762.

Cobic, T., Bac Vanski and S. Vucetic, 1980. The influence of protein levels on growth rate and feed efficiency. Ann. Zootch., 29: 251-259.

Chapple, R.S., M. Wodzicka-Tomaszeweska and J.J. Lynch, 1987. The learning behavior of sheep when introduced to wheat. II. Social transmission of wheat feeding and the role of the senses. Applied Anim. Behav. Sci., 18: 163-172.

Cheeke, P.R., 2005. Applied Animal Nutrition: Feeds and Feeding. 3rd Edn. Upper Saddle River, New Jersey, USA.

Church, D.C. and C.W. Fox, 1959. Effect of pellet size and roughage grind on performance of lambs. J. Anim. Sci., 18: 1168.

Church, D.C. and R.O. Kellems, 1998. High Energy Feedstuffs. In Kellems, R.O. and D.C. Church (Eds.). Livestock Feeds and Feeding. 4th Edn. Prentice Hall, New Jersey, USA.

El-Hag, G.A. and A.E. George, 1981. Performance of Western Baggara bulls fed on rations containing high levels of poor quality agro-industrial byproducts. East Afr. Agric. For. J., 47: 43-48.

El-Khalifa, M.D., F. Richard and M.M. Khogali, 1985. Sudan's southern stock route. Khartoum and Worcester, Massachusetts.

El-Khidir, O.A., El Khidir, I.A. and S.E. Ibrahim, 1995. Cattle fattening in the Sudan 1: Baggara cattle. Tech. Bulletin Anim. Prod. Cent. Res. State, Kuku, Sudan, pp: 38.

El-Khidir, O.A., A.M. Khafalla, A.Y. Guma and O.K. Osman, 1984. High levels of molasses and peanut hulls with urea supplemented diet for sheep fattening. World, Rev. Anim. Prod., 20: 72-77.

Eltahir, I.E., 1994. Beef production potentials of western Baggara and 50% Friesian crossbred. M.Sc. Thesis, University of Khartoum.

Eltayeb, A.E., T.A. Mohammed and H.K. Mohammed, 1990. Growth performance, feed intake and nutritive digestibility of western Baggara cattle fed sorghum Stover with different levels of concentrate. Sudan J. Anim. Prod., 3: 69-79.

Ensminger, M.E., J.E. Oldfield and W.W. Heinemann, 1990. Feeds and Nutrition. 2nd Edn. Ensminger Publishing Company. California, USA, pp: 319.

Forbes, J.M., 1986. The voluntary food intake of farm animals. London, Butterworth.

Hale, W.H. and C.B. Therurer, J.C. Parrott and B. Taylor, 1969. Feed preparation and processing, in digestive physiology and nutrition of ruminants. Practical Nutrition, D.C. church. Published by D.C. Church. Corvallis Oregon 97331. USA, Vol. 3.

Huntington, G.B. and J.C. Burns, 2007. Afternoon harvest increases readily fermentable carbohydrate concentration and voluntary intakes of gamagrass and switch grass balege by beef steers. J. Anim. Sci., 85: 2376-284.

Illius, A.W. and N.S. Jessop, 1996. Metabolic constraints on voluntary intake in ruminants. J. Anim. Sci., 74: 3052-3062.

Intesar, Y.T., 2002. The effect of different dietary protein sources on performance and characteristics of western Baggara cattle. Ph.D Thesis, University of Khartoum.

Itidal, A.E., 2004. Utilization of sugarcane baggase for fattening cattle. Ph.D Thesis, University of Khartoum.

Kellems, R.O. and D.C. Church, 1998. Livestock Feeds and Feeding. 3rd and 4th Edn. Revised edition of Livestock feed and feeding D.C. Church New Jersey, USA.

Loginbuhl, J.M., K.R. Pond, J.C. Burns and D.S. Fisher, 2000. Intake and chewing behavior of steers consuming switch grass preserved as hay or silage. J. Anim. Sci., 78: 1983-1989.

MAFF, 1976. Ministry of Agriculture. Fisheries and Food. Department of Agriculture and Fisheries for Scotland, Department for northern Ireland. Energy Allowances and Feeding Systems for Ruminants. Technical Bulletin, 33: 3.

McCroskey, J.E., L.S. Pope, G.S. Stevens and W.C. Weir, 1961. Effect of pelleting steer-fattening rations of different concentrate to roughage ratios. J. Anim. Sci., 20: 42.

Mohamed, H.K., 1999. The effect of different dietary energy levels on performance, carcass characteristics and meat quality of Sudan Baggara cattle. Ph.D. University of Khartoum.

Mustafa, A.F., T.A. Mohamed and A.E. El Tayeb, 1990. Effect of feeding millet sorghum Stover in a conventional concentrate diet on performance of Sudan Baggara cattle. Sudan J. Anim. Prod., 3: 57-67.

Reddy, D.V., 2004. Principles of animal nutrition and feed technology. Oxford and IBH Publishing Co. PVT. LTD, New Delhi, India.

Sudweeks, E.M., L.O. Ely, D.R. Mertens and L.R. Sisk, 1981. Assessing minimum amounts and forms of roughage in ruminant diet. Roughage value index system. J. Anim. Sci., 53: 1406.

Tibin, I.M. and D.E. Ahmed, 1997a. Feeding sorghum grains substituted with molasses to desert lambs. Effect on feedlot performance, carcass and non-carcass characteristics. Sudan J. Vet. Sci. Anim. Husb., 36: 1-7.

Tibin, I.M. and D.E. Ahmed, 1997b. Feeding sorghum grains substituted with molasses to desert lambs. Effect on meat chemical composition and quality attributes. Sudan J. Vet. Sci. Anim. Husb., 36: 10-15.

Weir, W.C., J.H. Meyer, W.N. Carret, G.P. Lofgreen and N.R. Ittner, 1959. Pelleted rations compared to similar rations fed chopped or ground for steers and lambs.