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Feedlot Performance and Carcass Characteristics of Nilotic Male Kids Fed on Two Different Diets

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Abstract: Feedlot performance and carcass characteristics of 13 Nilotic male kids fed for 9 weeks on sorghum and molasses-based diets were investigated. Analysis of covariance revealed no differences ($p>0.05$) in the final scapuloischial length (47.33±2.07 and 48.86±3.76 cm); final HW (56.17±1.33 and 55.57±2.94 cm) and final HG (55.00±2.45 and 54.86±2.29 cm) for the sorghum-and molasses-based dietary groups, respectively. The type of diet also had no effect in the final BW (16.36 and 17.37 kg); daily WG (60.88 and 54.39 g day^{-1}; DM (461.62 and 464.62 g day^{-1}); CP (93.62 and 92.43 g day^{-1}) and ME (5.00 and 5.62 MJ day^{-1}) intakes. However, feeding sorghum-based diet improved ($p<0.05$) the FCR (5.87±1.00) in comparison to feeding molasses-based diet (10.74±2.59). The carcass characteristics were not affected by the type of diet ($p>0.05$) where the hot carcass weights were 7.85 and 7.21 kg; cold carcasses weights were 7.40 and 7.12 kg; dressing out percentages of hot carcasses were 48.20 and 44.73%; dressing out percentages of cold carcasses were 54.00 and 57.40% and carcass shrinkage were 9.60 and 6.83%. The type of diet did not affect the cuts ($p>0.05$) where the neck and chump were 05.60±0.98 and 05.29±1.38%; rack and shoulder were 16.20±1.10 and 14.86±5.96%; lion were 4.60±1.14 and 4.86±0.90%, hind leg were 15.60±1.14 and 16.43±1.72%. It is concluded that Nilotic male kids posses good potentials for small carcass of high dressing percentage and that feeding molasses-based diet would produce similar carcass characteristics and should be preferred over the sorghum-based diet since this would reduce man-animal competition for cereals.

Key words: Carcass, dressing percentage, feedlot performance, molasses, Nilotic, sorghum

INTRODUCTION

Goats in Sudan play an important role in the life of many Sudanese families as a favorite household's dual purpose animal. Four local breeds of goats exist in the Sudan: Nubian, Desert, Nilotic and Mountain goats. Nilotic goats are distributed in a large area of natural and political condition that prohibited the availability of information about their production potentials. However, the few available reports (El-Mahi, 1979; Tilmat *et al*., 1983) revealed that this type of goats has good reproductive potentials but with poor growth rate and higher mortality rate of young due to their harsh environment and poor husbandry.

Under improved feeding conditions this breed can be speculated to reflect some potentiality as meat producers. With peace now prevailing in the country, the time is ripe to collect some basic information on the overall performance and systems of management and feeding of these animals in their area of origin and compiled them with in station intensive management studies to characterize these animals into distinct genetic groups/breeds/strains and to determine their actual potentials. The strategy for alleviating food shortage is aimed primary at reducing or eliminating man-animal competition for the already inadequate agricultural products, through the development of novel feed material unsuitable for human use and fed exclusively to livestock. The challenges facing the developing regions are to overcome political, economic and ecological constraints in basic animal production to apply appropriate technology in food production, to improve and maintain the nutritive status of food.

These developments should centre around local customs in order to avoid the pitfalls and detrimental effects of foreign influences. In Sudan the conventional diet for feedlots consisted mainly of sorghum grains and cotton seed cake in the ratio of 1:1. Such ratio is relatively expensive and would place ruminant in direct competition for food with man and poultry. These facts highlight the need to design diverse strategies in animal nutrition to utilize alternative sources of nutrients and decrease

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cereals use. The industrial byproducts of crop residues supplemented with deficient nutrients such as energy and protein can provide alternative animal feed sources with reasonable cost. El-Khidir and Ahmed (1998) reported that molasses which represent one of those abundant by-products might be considered as a good source of energy for ruminant feeding and a complete substitute for sorghum. The objective of this study was to examine the effect of feeding sorghum and molasses-based diets on the Feedlot performance and Carcass characteristics of Nilotic male kids.

MATERIALS AND METHODS

Area of study: This experiment was conducted in Kadaru area, Khartoum North at latitude 15°30'N, longitude 32° 33' E and altitude 380 m above sea level during the period from August 2007 to April 2008.

Experimental animals: A total of 13 Nilotic male kids were used in this study. The kids were born in Khartoum from a herd of Nilotic goats bought from the Upper Nile State in 2006 and consigned to Khartoum. After sexual maturity the kids were kept for adaptation period of 2 weeks during which they were treated for internal and external parasite and then individually weighed and subjected to feedlot trial for 9 weeks. The average age at the start of the experiment was 222.85±16.45 days and average initial weight of the kids was 13.3±1.9 kg. The kids were accommodated individually in separate pens and each pen was provided with feeding and watering troughs.

Feeds and feeding: The kids were divided into two feeding groups: sorghum-based diet and molasses-based diet. There were 6 kids in the first group and 7 in the second. The sorghum-based feeding system (Table 1) was composed of two portions: concentrate and roughage portions. The concentrate portion contained crushed sorghum grains as the main source of energy, ground nut cake as the major source of proteinand wheat bran to adapt the required energy and protein level. Sorghum straw was offered separately as a roughage portion. These two portions were given separately at a rate of 1:1 in one morning meal.

The molasses-based feed (Table 2) was a complete pelleted diet. It was composed of molasses and urea as the major sources of energy and protein sources, respectively. Bagasses were included as a source of fiber and wheat bran to adjust the required level of energy and protein. This diet was offered in one morning meal. The calculated Metabolizable Energy (ME) in the concentrate and roughage portions of the sorghum based feeding system was 11.4 and 6.22 MJ Kg^{-1} DM, respectively. On the other hand the calculated ME in the molasses-based diet was 10.5 ME Kg^{-1} DM. Both diets were offered for each buck at a rate that assures 10% weigh back. Fresh alfalfa (*Medicago sativa*) was given weekly as a source of carotene. Clean water and mineral licks were given *ad libidium*.

Table 1: Ingredients percentages of Sorghum-based diet and its chemical composition

Ingredient	Concentrate portion (%)	Roughage portion
Sorghum grain	32	-
Ground nut cake	36	-
Wheat bran	29	-
Lime stone	02	-
Salt	01	-
Total	100	-

Chemical composition (%) (g kg^{-1} DM)	Sorghum grain	Sorghum straw
Dry matter	94.65	93.00
Crude protein	24.80	4.14
Crude fiber	8.05	32.18
Oil	4.61	1.17
Ash	6.61	6.68
Nitrogen free extract	50.27	47.83
*ME Kg^{-1} DM	11.42	6.22

*Metabolizable energy was calculated according to the formula of Sulieman and Abd-Ra-Mabrouk (1999) as follows: Metabolizable Energy (MJ)/DM Kg^{-1} = 0.012 CP+0.031, CF+0.005, EE+0.014 NFE

Table 2: Ingredient percentage of Molasses-based diet and its chemical composition

Ingredient	Percentage
Sorghum	20.0
Ground nut	10.0
Wheat bran	15.0
Molasses	35.0
Urea	1.5
Bagasse	15.0
Lime stone	02.0
Common salt	1.5
Chemical Composition (% g kg^{-1} DM)	
Dry matter	88.6
Crude protein	17.5
Crude fiber	11.9
Ash	11.2
*ME Kg^{-1} DM	10.5

*Metabolizable energy was calculated according to the formula of Sulieman and Abd-Ra-Mabrouk (1999) as follows: Metabolizable Energy (MJ)/DM Kg^{-1} = 0.012 CP+0.031, CF+0.005, EE+0.014 NFE

Live body measurements: Live body measurements were taken according to the procedure described by Brown *et al*. (1973). The animals were restricted to prevent as much movement as possible. Using a measurement tape, Heart Girth (HG), scapuloischial length and Height at Wither (HW) were measured. The body measurements were taken weekly after animal weighing.

Feedlot experiment: The initial live Body Weight (BW) was recorded on the 1st day of the experiment using livestock balance with maximum load of 100 kg. Weekly weighing of all kids was done in the morning before meal after over night fasting except for water. Feed Intake (FI) was the difference between the amount offered and that refused. The feed offered was adjusted weekly to weigh

back 10%. Average daily weight gain (WG, g day^{-1}) was calculated as the differences between final and initial body weights divided by the 63 days of the experiment. Dry Matter (DM) intake was calculated as feed intake per gram multiplied by the proportions of dry matter in the diet according to the chemical analysis. Crude Protein (CP) was computed as feed intake on dry matter basis multiplied by the percentage of crude protein in the diet according to the chemical composition. Metabolizable Energy (ME) was computed as feed intake on dry matter basis multiplied by the metabolizable energy in the diet. Feed Conversion Ratio (FCR) was calculated as the feed intake divided by the body gain during the feedlot experimental period.

Slaughter procedure and slaughter data: The 13 kids were slaughtered at the end of the experiment. The kids were fasted for 12 h with free access to water before they were weighed to obtain slaughter weight. The animals were bled by severing both the carotid arteries and jugular veins on both sides as well as trachea using a sharp knife without stunning. After slaughter and complete bleeding, the head was removed at allantoccipital joints. All abdominal and thoracic organs except the kidneys were removed and weighed. The stomach and intestine were weighed fulland then cleaned off content and reweighed. The full weight was subtracted from the slaughter weight to obtain the empty body weight to the nearest grams. The warm carcass weight was recorded immediately after complete dressing and evisceration. About 20 h were allowed for the carcass to shrink at 4°C after which chilled carcass weight was taken.

Carcass data: The cold carcass was weighed and then prepared for dissection by removing the tail at its articulation as well as the kidney and kidney fat. The carcass was splitted along the vertebral column into left and right sides. The left side was then cut according to the M.L.C. (1976) method into six wholesale cuts: leg and chump, rack and shoulder, shank, loin, hind leg and flank.

Statistical analysis: Analysis of covariance (ANCOVA) was conducted to examine the effect of diet on feedlot performance and carcass characteristics. The age of kids was taken as a covariate. The data was analyzed using the Statistical computer Package for Social Science (SPSS) software.

RESULTS AND DISCUSSION

Live body measurements: As shown in Table 3 there were no significant differences ($p \geq 0.05$) between the two feeding groups in the initial scapuloischial length (44.50±1.64 and 44.57±2.64 cm); initial HW (51.00±1.79 and 50.57±2.15 cm); initial HG measurement (49.83±0.32 and 49.14±2.12 cm); final scapuloischial length (47.33±2.07 and 48.86±3.76 cm); final HW (56.17±1.33 and 55.57±2.94 cm) and final HG (55.00±2.45 and 54.86±2.29 cm) for the sorghum-and molasses-diet groups, respectively.

Table 3: Live body measurements of Nilotic male kids fed on sorghum and molasses-based diets

	Type of diet		
Body measurement (cm)	Sorghum-based (N = 6)	(Molasses-based (N = 7)	LS
Initial body measurement			
Scapuloischial length	44.50±1.64	44.57±2.64	NS
Height at wither	51.00±1.79	50.57±2.15	NS
Heart girth	49.83±2.32	49.14±2.12	NS
Final body measurement			
Scapuloischial length	47.33±2.07	48.86±3.76	NS
Height at wither	56.17±1.33	55.57±2.94	NS
Heart girth	55.00±2.45	54.86±2.29	NS

LS: Level of Significance. Values (mean±SD) with NS indicates no significant difference ($p>0.05$), N = Number of animals

Table 4: Feedlot performance of male Nilotic Kids fed on sorghum and molasses-based diets

	Type of diet		
Parameters	Sorghum-based (N = 6)	Molasses-based (N = 7)	LS
Initial body weight (kg)	12.42±0.75	14.06±0.71	NS
Final body weight (kg)	16.36±1.09	17.37±1.01	NS
Weight gain (g day^{-1})	60.88±7.86	54.39±7.27	NS
Feed conversion ratio (g intake g^{-1} gain)	5.87±1.00	10.74±2.59	*
Dry matter intake (g day^{-1})	461.62±39.49	464.62±36.55	NS
Crude protein intake (g day^{-1})	93.62±8.17	92.43±7.56	NS
Metabolizable energy intake (MJ day^{-1})	5.00±0.41	5.62±0.38	NS

LS: Level of Significance. Values (mean±SD) with *indicates significant difference at ($p<0.05$), NS: no significant difference, N = Number of animals

Feed lot performance results: As shown in Table 4, there were no significant differences ($p>0.05$) between the two dietary groups in the initial BW (12.42 and 14.06 kg); final BW (16.36 and 17.37 kg); daily WG (60.88 and 54.39 g day^{-1}); daily DM (461.62 and 464.62 g day^{-1}); CP (93.62 and 92.43 g day^{-1}) and ME (5.00 and 5.62 MJ day^{-1}) intakes. However, kids fed on sorghum-based diet had an improved ($p<0.05$) FCR (5.87±1.00) in comparison to those fed on molasses-based diet (10.74±2.59).

Carcass characteristics of Nilotic goat kids: As shows in Table 5, the type of diet did not affect ($p>0.05$) the hot carcass weight (7.85 kg and 7.21 kg); cold carcasses weight (7.40 and 7.12); hot dressing out (48.20 and 44.73%) and cold dressing out (54.00 and 57.40%) calculated on slaughter weights for the sorghum and molasses-based groups, respectively. The difference was also not significant between the diet groups in the carcass shrinkage rates (9.60 and 6.83%).

Table 5: Carcass characteristics of Nilotic male Kids fed on sorghum and molasses-based diets

Parameters	Type of diet: Sorghum-based (N = 6)	Type of diet: Molasses-based (N = 7)	LS
Hot carcass weight (kg)	7.83±0.52	7.21±2.17	NS
Cold carcass weight (kg)	7.40±0.63	7.12±2.12	NS
Hot dressing out (%) (on slaughter weight)	48.20±1.65	44.73±5.49	NS
Cold dressing out (%) (on slaughter weight)	54.00±6.2	57.40±3.58	NS
Hot dressing out (%) (on empty body basis)	57.16±3.46	53.91±6.3	NS
Cold dressing out(%) (on empty body basis)	53.07±2.29	51.69±5.96	NS
Carcass shrinkage (%)	9.60±0.65	6.83±4.41	NS

LS: Level of Significance. Values (mean±SD) with NS indicates not significant difference (p>0.05), N = Number of Animals

Table 6: Yield of whole cuts sale from carcass left side of Nilotic male kids fed on Sorghum-and Molasses-based diets (% of cold carcass weight)

Carcass cuts (%)	Type of diet: Sorghum-based (N = 6)	Type of diet: Molasses-based (N = 7)	LS
Neck and chump	5.70±0.98	6.29±1.38	NS
Rack and shoulder	16.40±1.10	15.86±5.96	NS
Shank	3.80±0.45	02.97±0.52	*
Flank	3.37±1.12	3.34±1.22	NS
Loin	4.70±1.14	4.86±0.90	NS
Hind leg	15.64±1.14	16.43±1.72	NS

LS: Level of significance. Values (mean±SD) with * indicates significant difference at (p<0.05), NS: Not Significant difference, N = No. of animals

Yield of whole sale cuts: Table 6 shows that the wholesale cuts from the left side of Nilotic kids carcasses were not affected by the type of diet where the neck and chump cut were 05.60±0.98 and 05.29±1.38%; rack and shoulder were 16.20±1.10 and 14.86±5.96%; lion were 4.60±1.14 and 4.86±0.90%, hind leg were 15.60±1.14 and 16.43±1.72% for the sorghum-and molasses-based fed groups, respectively. However, the shank cut in the sorghum-based (02.80±0.45) was significant higher (p<0.05) than that in the molasses-based (02.67±0.52) fed kids.

Muscle/bone ratio: In this study, there were no significant differences (p>0.05) in the muscle/bone ratio between the two feeding groups in the entire cuts. As shown in Table 7, the muscle/bone ratios in the neck cut were 3.41±0.65 and 3.28±0.42; flank were 2.04±3.00 and 1.17±1.42; rack were 3.93±0.65 and 4.44±0.25; shank were 5.17±1.80 and 6.00±2.65; lion wee 9.05±3.46 and 4.74±1.39 and hind leg cuts were 5.80±1.07 and 5.98±0.91 for the sorghum-and molasses-based group, respectively.

The value of body measurements in animal production comes from the high association of body dimensions with growth rate and body weight. Many investigators used the high phenotypic correlation between body weight and different linear body measurement in various fields of animal production. Devendra and Burns used the height at wither as

Table 7: Muscle to bone ratio from left side of Nilotic male kid's carcasses fed on sorghum- and molasses-based diets

Parameter	Type of diet: Sorghum-based N = 5	Type of diet: Molasses-based N = 7	LS
Neck	3.28±0.42	3.41±0.65	NS
Rack	4.44±0.25	3.93±0.65	NS
Shank	6.00±2.65	5.17±1.80	NS
Flank	1.17±1.42	2.04±3.00	NS
Loin	4.74±1.39	9.05±3.46	NS
Hind leg	5.98±0.91	5.80±1.07	NS

LS: Level of Significance. Values (mean±SD) with NS indicates not significant difference (p>0.05), N = Number of carcasses

criterion for classifying goats into three groups. (Large breeds over 65 cm, small breeds 51-65 cm and Dwarf breeds less than 50 cm height at wither). Accordingly, the Nilotic goats can be classified as small breeds with an average height at wither of their male kids between 55.57 and 56.17 cm.

Energy supplies represent the most expensive dietary component and the main limiting factor for goat production as with other ruminant species. It is therefore necessary to determine the requirements for energy and its allowances (Sauvant, 1981). According to Potchobba and Sahlu (1987) the total requirement of ME for maintenance and growth in young goats was around 837 KJ ME Kg $W^{0.75}$ day^{-1}. In the present study, the ME for maintenance and growth of Nilotic male kids calculated on the basis of their metabolic body weight ranged between 615 and 661 KJ ME Kg $W^{0.75}$.

There were no significant differences, between molasses- and the sorghum-based dietsin most of the feedlot parameters attested in this study. Therefore, feeding molasses-based diet would produce a marked feeding cost reduction with comparable fattening performance and similar carcass characteristics to that produced by sorghum-based diet. The current price of 1 kg of sorghum-based and molasses diets were 75 and 50 Sudanese piaster respectivelyand the price of 1 kg of sorghum straw was 75 Sudanese piaster. The computed cost of daily feed intake per animal would be about 82.5 and 37.5 Sudanese piaster for sorghum and molasses fed kids, respectively. Thus feeding molasses based diet reduced the feeding cost by more than 50% and should be preferred over the sorghum-based diet since this would reduce or eliminate man-animal competition for cereals.

The significance of dressing percentage to both consumer and producer is that it defines the saleable part of the animal. Dressing out percentage may be calculated on full or empty body mass basis. It's more accurate to quote dressing out percentage on the bases of empty body weight mass in order to eliminate the

variationcaused by the contents of alimentary tract which exert a considerable effect on dressing percentage and form as much as 29% of the live weight (Owen and Norman, 1977).

The result obtained in this study for the dressing out percentage calculated on empty body bases were 57.16 and 53.91% (hot) and 53.07 and 51.69% (cold), respectively. According to these findings, the carcasses from Nilotic male kids were found to be small but with high dressing percentages. Ibrahim (1996) finished goats with different dietary energy levelsand found dressing percentage on hot carcass basis of 50.42, 48.8 and 44.16% for kids fed on high, medium and low dietary energy levels.

On the other hand, the values in this study were higher than those reported by El-Bukhary (1998) who gave a dressing percentage of 40.7% for Mountain male kids (Taggar). The discrepancy in the dressing out percentages may be attributed to the variation in genetic make-up of the animals involved in each study as well as the age and weight at slaughter.

Goat carcasses have a higher muscle to bone ratio than is deceptively reflected in their conformation. A greater carcass and leg length results in a less compact carcass which may be interpreted erroneously as signifying poor muscling (Naude and Hofmeyr, 1981). The mean muscle to bone ratio of male Boer goat kids slaughtered between 10 and 41 kg alive mass was 4.7 compared with 4.4 of SA Mutton Merino, 4.3 of Merino and 4.8 of Dorper sheep (Casey, 1982). The ratio of these goats are similar to the finding in the present study but considerably higher than those values obtained in milk, 2, 4 and 6-tooth indigenous male castrates from Botswanawhich ranged from 2.6-3.0 (Owen *et al*., 1978). Fully mature goats had a ratio of 3:1. Differences may be ascribed to better nutrition.

CONCLUSION

It can be concluded that the Nilotic goat breeds are small size bodied with early maturing male kids that posses good potentials for meat production mainly to satisfy the demands for small carcass of high dressing percentage.

Feeding molasses-based diet would produce a marked feeding cost reduction with comparable fattening performance and similar carcass characteristics and should be preferred over the sorghum-based diet since this would reduce or eliminate man-animal competition for cereals.

RECOMMENDATIONS

Continued and increased research is required in production efficiency (reproduction, growth, nutrition, performance testing) and in meat quality characteristics of the Nilotic goats to characterize these animals into distinct genetic groups/breeds/ strains and to determine their actual potentials.

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