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Original Research Article

Effect of Different Levels of Sorghum Husk on Performance and Carcass Characteristics of Hamari Desert Sheep

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Abstract

The study was carried out to investigate the effect of using different levels of sorghum husk on performance and carcass characteristics of Desert Sheep (Hamari). Twenty-seven male lambs of Hamari, were used at of age (4 – 5 months) and average body weight 11kg. The lambs were randomly divided into three groups (9 lambs) each group were subdivided into three groups, three animals, fed three experimental rations with varying sorghum husk levels 0%, 20% and 30% respectively. Feeding was continued for 60 days. Performance was determined. Three lambs were slaughtered terminally for carcass yield and meat quality assessments. Study results showed that final weight gain, total and daily weight gain, feed conversion ratio and cost of one kg meat were significant difference (P≤0.05) among sorghum husk levels. Ration with level 20% sorghum husk had the highest values for final weight gain. The result indicated that the sorghum husk levels was significantly (P≤0.05) differences for Empty body weight(kg), Ration with 20% had the highest values for Slaughter weight. The study showed no significant (P≥0.05) differences for the dressing percentage on empty body weight basis. The highest values for dressing percent in both slaughter and empty body weight observed in control group, however, the study showed no significant (P≥0.05) differences muscles, fat, bone, and connective tissues. It was concluded that the ration with 20% sorghum husk is better in most parameters and has lowest costs for one kg meat produced. Therefore, sorghum husk can be used up to 20% of the ration for fattening sheep.

Keywords: Sorghum Husk, Performance, Hamari, Carcass and sheep

INTRODUCTION

Sudan, the African's largest country, with nearly one million square miles a area, extending from 4º to 22º north and 22º to 38º east. It has one of the largest livestock populations in the continent, which estimated at about (140.5), of which 41.84, 52.24, 43 and 4.4 million head of cattle, sheep, goats and camels respectively (Hassan, *et al.,* (2013).

Mcleroy, (1961) classified sheep of Sudan into eight distinct ecotypes according to locality, tribe and origin. Of these ecotypes is the Sudan desert sheep which constitute 65% of the sheep population in the country .Jack, (1955) stated that Sudan desert sheep is the best type in the country. They are large legged animals carrying a fine hair coat, the color is commonly light brown, often becomes white on the belly and legs.

Sudan grass and Sudan grass hybrids should probably be the first choice over sorghum-Sudan hybrids for sheep pasteurize. (Brian, 2001). Forage sorghums should be harvested at the mid dough stage of development and stored as silage contains 28 % Dry matter, 52 to 65 %dry matter digestibility, 8 to 12% Crude protein, .8% Ether Extract, Fiber content 34 to 40%.

(Alhag, 2001). However, crop residues have been shown to contain low amounts of digestible nitrogen and energy (Tagel-Din, *et al*., 1989), and dry matter intake is usually low (Dolberg, *et al*., 1981). Animals fed on sorghum straw alone usually result in negative nitrogen balance (Tagel-Din, *et al*., 1989). These negative aspects of cereal straws are believed to result from high neutral detergent fiber (NDF) content (resulting in high cell wall rigidity), and poor nitrogen content. Several treatments have been applied to try to increase intake and digestibility of sorghum stalk and straws; perhaps the most widely used treatments are chopping the stalk and straw, addition of ammonia or urea N (Adu, *et al*., 1990). On the other hand, lamb fattening has widely used to improve meat characteristics. Many studies were conducted (Beshir, *et al*., 2009; Hassan, 2010) on fattening and finishing lamb. The results of these studies indicated the high potentiality in fattening animals and improve the meat characteristics

MATERIALS AND METHODS

Site of study

This study was conducted at the Rural Development and Extension Center (R.D.E.C), Faculty of Animal Production – Almanagil- University of Gezira, 76 kilometres west to Wad Medani, Gezira State, during February-June 2017.

Experimental feed (rations)

The experiment rations A, B and C with different levels of sorghum husk (0 % ,20 % and 30 %) will be experimental group, A (control group), group B feed with ration content 20 % sorghum husk and group C feed with ration content 30 % sorghum husk The three rations formulated to be iso – caloric\ iso – nitro-genous (10.5MJ\ Kg and 14.6 cp) respectively. (Table 1 and 2)

Animals

Twenty-seven male lambs of Sudan desert sheep, Hamari ecotype, (4-5) months age purchased from Kosti. and their average body weight (11 kg). They were transported and kept in Rural Development and Extension Center. The animals were vaccinated against anthrax and hemorrhagic septicemia. One day after, they were ear tagged, drenched with (ELbenazol) and injected with Ivomec against the internal parasites and treated against the external parasites by using acaricides after being cleaned, given prophylactic doses of ox tetracycline.

Experimental grouping

The experimental animals were individually weighed by using small ruminants balance (30 Kg capacity), and randomly divided into three groups (A, B and C). (9 animals each), with similar average body weight, then each group was randomly subdivided into three groups (replicates) with similar average body weight (11 kg) and fed with experimental ration. The nine replicates were randomly assigned to the pens.

Adaptation period

During this period, which extended for Two weeks' experimental animals were fed on complementary feed (concentrate and roughages) that contain 14.6% crude protein and 10.50 MJ/Kg metabolism energy for all groups with feeding system, 60% concentrate rations and 40% groundnut hay as roughages which shown in Table 1. The animals were drenched with Albendazole (Bendazole-25, Alpha, Holland) and injected with Ivermectin (Ivomec, Coopers, UK) against both internal and external parasites. Furtherly, external Acarina were treated with a chlorinated hydrocarbon acaricide (Gammatox, Coopers, UK).

Feeding management

During the adaptation period, all of the experimental groups were fed on 60% of the formula feed and 40% groundnut hay (14.6% CP, 10.50 MJ ME /Kg. and made daily every morning at 7:00 am and the refusals were collected next morning and weighed. fe. Clean water and salt licks were available throughout the experimental period which extended for 60 days.

Data collection

Feed intake

The complementary rations were given to the lambs daily every morning at 8:00 am and the refusal part was collected in the next morning at 7:00 am, weighed and subtracted from the daily offered amount to calculate the actual feed intake.

Body weight

The experimental animals were weekly weighed by using small ruminant's balance (kg capacity), following an overnight fasting. The body weights were used to calculate the daily weight gain and feed conversion ratio (F.C.R)

Table 1. Percent experimental ration composition (dry matter basis %)

Ingredients%	Treatment		
	A (0%)	B (20%)	C (30%)
Sorghum husk	0	20	30
Sorghum grain	12.65	7	6
Groundnut Cake	5	4	7
Wheat bran	16	14	6
Groundnut hay	20	0	0
Groundnut hulls	21	31	30
Molasses	20	18	15
Urea	1.35	2	2
Oyster	2	2	2
NaCl	2	2	2
Total	100	100	100

Table 2. Chemical composition of the experimental rations (dry matter basis %)

Ingredients%	Treatment		
	A (0%)	B (20%)	C (30%)
Moisture	9.65	9.75	9.45
Dry matter	90.35	90.25	90.45
Crude protein	16.50	14.95	15.75
Crude fiber	8.70	9.30	9.45
Ether extract	4.55	4.25	4.35
Nitrogen-free extract	54.60	54.25	56.80
Ash	9.15	8.75	9.15

Slaughter procedure and data

Three animals of each treatment were selected for slaughter according to the average body weight of treatment. Slaughter weight was taken after an overnight fasting with access only to water. The animal slaughter followed the local Muslim practice, severing the right and left jugular veins, carotid arteries and the oesophagus by a sharp knife without stunning. After bleeding was complete, the animal was hung from hind legs to permit easy dressing. The head was removed at the occipto-atlantal articulation, and the fore and hind feet were removed at the proximal metacarpal and metatarsal joints, respectively. Appendages (head, tail, skin and feet) were weighed each separately. The animal was then eviscerated on a full *linea alba* incision. Visceral organs, (liver, spleen, kidney, pancreas, intestines, and mesenteric fat, sex organs and testicles) and pluck (heart, lungs, trachea and diaphragm) were separated each and weighed. Kidney and kidney knob channel fat were separated and weighed. The alimentary tract was weighed empty. The fill was subtracted from the slaughter weight to obtain the empty body weight (EBW). Hot carcass weight was determined and then the warm carcass was subjected to further processing.

The fore saddle was separated into four cuts. The neck was removed by cutting off the cervical vertebrae. The shoulder was obtained by cutting between the 5^{th} and 6^{th} rib, in a longitudinal line that removes part of the scapular cartilage, this cut include ventrally part of the arm. The breast includes the ventral part of thoracic ribs set at mid distance. It contains the costal cartilages, breast bone (sternum) and the fore shank. The rack cut constitutes dorsally from in-between the 5^{th} and 6^{th} rib to in-between the 12^{th} and 13^{th} rib and extends downwards to half.

Proximate analysis

Samples of experimental diet were proximately analyzed, on dry-matter basis, for moisture, ash, crude protein, crude fiber, ether extract (fat) and nitrogen free-extract by the procedure described by the Association of Official Agricultural Chemists (AOAC, 1990). however, **s**ample of meat were also subjected to proximate analysis.

Statistical analysis

Data for performance, slaughter and carcass yield were subjected to one-way ANOVA. Mean values were compared using Duncans Multiple range test (SAS, 1997).

Table 3. Feedlot performances of experimental sheep fed different levels of sorghum husk for 60 days

Items	Treatment			S . L
	A (0%)	B (20%)	C (30%)	
Initial weight (kg)	23.76	23.56	23.69	NS
Final weight (kg)	32.68[b]	33.47[a]	31.88[c]	**
Total weight gain (kg)	8.92[b]	9.91[a]	8.19[c]	**
Daily weight gain (kg)	0.18[b]	0.20[a]	0.17[c]	**
Daily feed intake (kg)	1.19	1.10	1.22	NS
F.C.R	6.52[b]	5.41[a]	7.29[b]	*
Cost of one kg meat	23.47[a]	18.25[c]	21.13[b]	**

In this and subsequent table
L. S = Level of significance
N. S = Not significantly different
* = significantly different at 0.05.
** = significantly different at 0.01.
A 0% = feed with 0 husk B 20% = feed with 20% husk
C 30% = feed with 30% husk

Table 4. Slaughters values (kg) of experimental sheep fed different levels of sorghum husk for 60 days

Items	Treatment			S . L
	A (0%)	B (20%)	C (30%)	
Slaughter weight (kg)	31.00	31.73	31.77	NS
Empty body weight (kg)	24.58[b]	26.35[a]	26.05[a]	*
Skin(kg)	2.33	2.47	2.40	NS
Dark offal (kg)	2.83	2.85	2.75	NS
Liver(kg)	0.47	0.48	0.47	NS
Spleen(kg)	0.10[a]	0.05[b]	0.07[b]	*
lung & trachea(kg)	0.42	0.52	0.47	NS
Heart(kg)	0.23	0.18	0.18	NS
Mesenteric fat (kg)	0.42[c]	0.63[b]	0.73[a]	**
Stomach empty(kg)	1.18[a]	1.13[a]	0.88[b]	*
Intestine empty (kg)	1.23[a]	1.13[ab]	1.02[b]	*
Sex organs(kg)	0.50[a]	0.48[a]	0.42[b]	*

RESULTS AND DISCUSSION

Feedlot performance

Table 3 showed average performance values of experimental sheep fed different levels of sorghum husk for 60 days. Treatment effect was significant difference (p≤0.05) in all parameters except daily feed intake. In this study, initial weight at 4-5 month of age was 23.76,23.56 and 23.69 kg. This higher than the result reported by Hassan, *et al.,* (2013) in desert lamb at the same age (21.47- 21.63kg)

Treatment effect was highly significant difference (p≤0.05) for final weight gain. Group B had the highest value of final weight gain (33.47 kg) followed by group A (32.68) and group C (31.88) in descending order. Final body weight in the present study was lower than the result reported by Mousa, (2011) in Awassi lambs (36.86 – 40.06kg).

Highest value of total weight gain recorded by group C, while control group had the lowest value. There is significant (P<0.05) difference among treatment for Total weight gain. Total weight gain increases as the level of sorghum stalk increased. this finding lower than the result depicted by Beshir, *et al.,* (2009) for desert sheep (9.84-11.49 kg).

Group C had the lowest daily weight gain (.17kg) followed by group A (.18 kg). while the highest value observed in group B (.20kg). Obtained estimates agreed with the findings of Khadem, *et al. (*2007) who found .17-.18kg and Hassan, *et al.,* (2013) who reported 0.19- 0.20 kg day.

Table 4 shows that the level of sorghum husk did not significantly (P>0.05) affected average daily feed intake. Average daily feed intake ranged from 1.10 to 1.22kg/ d. This result was in accordance with those of Mousa, (2011) in Awassi lambs (1.12= 1.18), but lower than that indicated by Hassan, *et al.,* (2013) for desert sheep fed with different levels of sesame cake.

Best feed conversion ratio was observed in group B

Table 5. Weights (kg) of carcass cuts of experimental sheep fed different levels of sorghum husk for 60 days

Items	Sorghum husk levels			L. S.
	A (0%)	B (20%)	C (30%)	
Warm carcass(kg)	16.37[a]	16.27[ab]	15.00[b]	*
Cold carcass (kg)	15.55[a]	15.54[a]	14.35[b]	*
Right side (kg)	8.18[a]	8.28[a]	7.51[b]	*
Left side (kg)	8.20[a]	8.14[a]	7.52[b]	*
Leg(kg)	4.83[a]	4.73[a]	4.30[b]	*
Shoulder(kg)	3.13	3.27	3.30	NS
Lion(kg)	2.03[a]	1.81[b]	1.77[b]	*
Rack(kg)	1.75	1.80	1.73	NS
Breast(kg)	1.73[a]	1.87[a]	1.53[b]	*
Neck(kg)	1.00	1.05	1.00	NS
Tail(kg)	0.71[a]	0.58[ab]	0.47[b]	*

Rows with the same superscript are not significantly different (P >0.05)
L. S= Level of significance
N.S = Not significantly different
* = significantly different at 0.05.
** = significantly different at 0.01.
A = 0% (control) Treatment with 0 sorghum husk ,
B = Treatment with 20% sorghum husk and C = Treatment with 30% sorghum husk

(5.41) followed by group A (6.52) and the group C is lowest (7.29). There is significantly difference (P<0.05) among treatments. Feed conversion ratio (FCR) is considered important parameter in meat production, for it determines the unit of feed consumed for unit of weight gain. In the present study the F.C.R values is in agreement with the result reported by Mousa, (2011) in Awassi lambs (6.53- 7.37) were better than those reported by Hassan, *et al.,* (2013) who reported 8.13 – 8.17. In this study the results showed a significant difference (P<0.05) among the experimental groups for cost of one kg. lambs that received no sorghum husk (group A) or control group on their ration tended to have high value of price.

Slaughter values

Table 5 showed the slaughter values (kg) of experimental sheep fed by different levels of sorghum husk for 60 days. Treatment effect was not significantly (P>0.05) difference for Slaughter weight. Treatment B recorded the highest and lowest value in C and was as follows (31.00, 31.73, 31.77 kg) and these results are lower than those obtained by (Hassan, *et al*., 2013). The highest value of total weight gain recorded in treatment B, followed by A and then C, was as follows (24.58, 26.35, 26.05 kg) where a significant difference between the factors (P <0.05) showed this result higher than that depicted by (K.M. El amin, *et al*., 2012) for desert sheep Which was as follows (22.75, 23.46, 23.90 kg). As for me, the weight of the skin, head, legs, and liver, as there were no significant differences between treatments, where their results were less than that obtained by Hassan, *et al*., (2013). Group A had the highest weight for spleen followed by A Then B and it was as follows (0.07, 0.05, 0.1 kg) and these are less than the results obtained by Asma and yagob, (2016). Which was as follows (0.19, 0.16, 0.22 kg). As for the lung and heart, there are no significant (P>0.05) differences between the treatments, and this is consistent with the results depicted by Elamin, *et al*., 2012 for the desert sheep Group A had the highest value for me mesenteric fat, followed by group B Then C, which was as follows (0.73,0.63, 0.41 kg), where significant differences were explained between the treatments (P ≤ 0.05). The value of fats increases with the increase in corn grains. These results are higher than the results obtained by Abdelgadeem (2018), which were as follows (0.33, 0.38, 0.39 kg) The weight of the empty stomach, the empty intestine, and the sex organs was the highest in Group C, followed by Group B, and then A, where significant differences between the treatments were explained ((P <0.05) and this was more likely to be the amount of the sorghum husk.

Carcass values

Table 5 showed the weights (kg) of carcass cuts of experimental sheep fed different levels of sorghum husk for 60 days. The effect of the treatments was significant differences for all parts of the carcass except shoulder, rack and neck. cold and warm carcass affect significantly by treatment P≤0.05 where group A and B had the highest values, while group C recorded the lowest values. The current results are consistent with the result reported

by Mousa, (2011) in Awassi lamb.and lower than the results obtained by Elmiin shawi and Hadi, (2015). There was significant difference between treatment and right and left side, the highest values obtained by group A and B Then C, where the results were as follows for the right side (8.18, 8.28, 7.51 kg), and the left side (8.20, 8.14, 7.52 kg) where differences were clarified.

The proportion of lean meat in the carcass is of importance since this is the prim determinate of yield and commercial value. The most important whole sale cuts per kilogram of the experimental lambs are Leg, The treatment affect significantly for leg their value decreased by increasing sorghum husk levels, group A had the highest values followed by the group B then C and these results are higher than that results reported by Abdelgadeem, (2018). There was no significant difference between the treatments and shoulder. for lion, the results showed a significant difference, group A had the highest values, followed by group B and then C, where it became clear that there was no significant difference between B and C, while group A differed from B and C and the results were as follows (2.03 1.81 1.77 kg) respectively, and these results are higher than the results found by Elias, *et al.,* 2015. for the weight of the rack in the transactions 0%, 20% and 30%, there was no significant difference. While the treatment affects significantly for the breast. Group, A and B had the highest value, which was as follows (1.73. 1.87 kg), these results are higher than that of Abdelgadeem, (2018). there was no significant difference between treatment and neck, this study showed a significant difference (p <0. 05) between the treatment and tails where group A recorded the highest value while group Recorded the lowest value.

CONCLUSIONS AND RECOMMENDATIONS

The inclusion of 20% husk gave the highest value in the final weight Total weight gain, daily weight gain, also, it is characterized by the best feed conversion rate and the lowest value per kilogram of meat produced, as well as the highest value in the weight of the empty body and the lowest amount of fat in relation to the weight of the body.

The following recommendations are suggested

- Inclusion of 20 % Sorghum husk is recommended to feed desert sheep for high performance, carcass characteristics and meat production to reduce costs,

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