Volume-3, Issue-7, July-2014 • ISSN No 2277 - 8160

Research Paper | Meat Science

The Effects of Using Groundnut Hay and Concentrates on Performance and Physical Measurements of Post-Weaned Desert Lambs (Tribal Subtypes Hamari and Kabashi) in Kordofan Region, Sudan

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ABSTRACT

Twenty Kabashi weaned male lambs (4 months old and average live weight 25.25 Kg) and similar number of Hamari lambs were used for growth performance and different body measurements for a post-weaning period (60 days). Ten lambs, five from each subtype, were left free grazing. Similar numbers of animals were kept on experimental diet. Body weights and physical measurements were recorded weekly for eight weeks. Pen fed lambs had higher body gains, food conversion ratios (FCR) and increased physical measurements compared to free grazing ones. Pen fed Hamari lambs recorded higher length of the legs whereas Kabashi had better values for heart girth and pelvic cavity. The latter subtype also had higher daily gains (0.152 Vs 0.144 Kg) and total gains (9.10 Vs 8.64 Kg) as well as better FCR (6.88 Vs 7.53). The study also concluded that groundnut hay can be used successfully as basal feed for fattening lambs in Sudan.

KEYWORDS : ***Post-weaning, groundnut, heart girth, feed conversion ratio***

Introduction:

Sheep are regarded as very important farm animals in Kordofan region because they achieve the economic and social needs of the producers. The majority of sheep in the region belong to Kababish breed which is considered as model of Sudanese Desert sheep. It is deep bodied, haired, with strong and heavy bones. The breed is further classified into tribal subtypes, Hamari, Kabashi, and Shanbali in West and North Kordofan States (Mukhtar, 1985 and El-Hag *et al*., 2001). The classification is mainly based on coat colours which are mostly variable and are mostly tribal trade mark. These animals are raised principally for meat or lambs and milk. In Sudan, Kordofan region comes at the top for producing sheep both for local consumption and export mostly of the Kababish and Hamari subtypes. The region holds about 8.89 million heads of sheep estimated as 41.97% of the total animals in the region and 19.84% of national sheep (MAR, 2001). Traditional sheep production system in the region is faced by numerous constrains such as poor feeding, spread of diseases, management and marketing. The problem regarding sheep nutrition under rangelands in the region is that of feed shortage and nutrient deficiencies especially during the dry season (Nov.-June), when grazing animals commonly pass through periods of live weight loss and this is reflected in seasonality of reproduction, high mortality rates, late puberty and hence low reproductive performance of the flock. Therefore feed may be considered an important deterrent to sheep production in these areas (LADCO, 1999). However, weaned lambs may be exposed to the long dry period (winter and summer) where agricultural by-products and residues, especially groundnut hay, are widely used by sheep owners. Kordofan is the most famous region in the cultivation of groundnut and as a result large quantities of residues and by-products will be available and can play an important role in animal feeding. This work was designed to study the effects of using groundnut hay and concentrates on morphological traits and performance of Sudan Desert lambs (tribal subtypes Kabashi and Hamari) during the post-weaning period.

Materials and Methods:

Study area:

The study was conducted in El-Khowai area, West Kordofan State, Sudan. Latitudes 11° 5′ - 13° 75′ N and Longitudes 27° -29° 5′ E about 900 Km west of Khartoum. The area lies within the poor savannah belt. The rainy season extends from July to October, with a peak in August and the average annual rain fall is about 300 mm in the north and about 400 mm in the southern parts. Average maximum temperature is 24° -39° C during most of the year, with peaks above 36° C during April-June (El-Nuhood Meteorological Station, 2000). The soil is generally of a smoothly undulating sandy plain "Goz" dissected by batches of loamy sands "gardud or gurraba" in the southern parts. The major ecological zones in the area are mainly determined by rain fall and the subdivisions are mostly dependent on soil type and vegetation. The dominant vegetation is a variable mixture of grasses, herbs, shrubs and trees interspersed with bare areas.

Crops in the area are mainly millet, sorghum, watermelons and groundnut. The latter is the main cash crop with large amounts of groundnut hay, which is used in large scale for feeding animals. West Kordofan State holds about 3481 thousands heads of sheep (subtypes Kabashi and Hamari). Most of these animals are herded by nomadic tribes in flocks of about 200 or more heads (MAR, 2000). Natural breeding is usually controlled by the application of the "Kunan" which is formed of a robe looped up around the neck of the scrotum and slipped over the prepuce. All mature intact males are "Kunaned" except during the breeding season when stud rams are freed. The breeding season is regulated from Feb. to March and lambing is usually expected during the rainy season (July-Sept.) when forages are plentiful. Sheep watering frequency is about 3-5 days during the dry season and 7 or 10 days during the wet season, and may reach one

month or more during winter when animals graze succulent plants "Guzu". Water sources, during dry season, are mainly wells and ground tanks. Also watermelon is commonly used as a water source in this season.

Experimental lamb trials:
Twenty weaned male Desert lambs (4 months old, average live weight of 25.25 Kg) ten from each tribal subtype (Kabashi and Hamari), were used in this study. Animals were purchased from LADCO company, where they were raised under traditional system, and on arrival at the experimental site they were ear tagged, weighed, their physical measurements recorded and treated against ecto-and endo-parasites with *Ivermectin* at a rate of 10mg per 50 Kg body weight.

Weights and measurements:
Weights of animals were recorded using 50 Kg- spring balance. 11 body measurements were carried out by means of a tape according to Owen et al., (1977)and include; height at withers, body length, heart girth, pelvic cavity, length of the head, ear length, length of the neck, length of horns, tail length, length of the foreleg and length of the hind leg.

Fattening ration and treatments:
Lambs in each subtype group were further divided into two subgroups each of five animals. Ten lambs (five from each subtype) were left to graze freely to simulate the traditional system of management (control). Daily feed intake from the pasture was estimated for each lamb by weighing the animal every early morning before grazing. Faeces were collected during grazing by polythene bags fitted to the animals. At mid-day, weights of lambs and faeces collected were recorded. Feed intake for this period was calculated by the difference between the two weights and the addition of faecal weight. The same procedure was carried out in the evening at the end of the grazing period, and the overall daily feed intake was calculated. Animals are watered once daily after being weighed in the evening.

The treated lambs (ten animals, five from each subtype) received a fattening ration (groundnut hay plus concentrates). Lambs were individually penned (1X1.5 m.) and allowed an adaptation period of 14 days. Each animal was then fed the experimental ration for 60 days. Concentrates was given as 250 g per head once in the morning. All animals had free access to a basal diet of groundnut hay, and daily feed allowance and refusal were recorded every morning and intake was calculated. Fresh water was also freely available.

Throughout the experimental period all animals were weighed weekly before the morning meal, and change in body weights were recorded. Similarly, physical measurements were recorded. Data were analyzed as a randomized complete block design using a 2X2 Factorial arrangement of treatments (2 sheep subtype, 2 feeding treatments and 5 replications).Duncan multiple range test was used for mean separation (Steel and Torrie, 1980). Simple correlations were calculated. Also regression of body measurements on the age of animal was made.

Results and discussion:
The composition and proximate analysis of the experimental ration is given in table (1). Feedlot performance and body measurements of the experimental animals are presented in tables (2,3,4,5, 6). The initial mean live weights of all animals were almost similar. Lambs fed experimental diet grew better than the free grazing ones and had the highest weight gain ($P<0.01$) at the end of the experimental period. Similarly, the daily and total body gains were higher ($P<0.0001$) for lambs fed the experimental ration compared with the free grazing ones (Table 3). The increase in live weight was expected since lambs on the experimental diet consumed more feed than those on free grazing. It may also be attributed to concentrate supplement. This compared favourably with previous studies (Macit et al., 2002). Who conducted a study on Turkish Awassi lambs which had total and daily gains of 10.9 and 0.155 Kg, respectively, when supplemented with 450 g concentrates per day in addition to daily grazing. Also the difference in growth rates may be due to feeding groundnut hay as basal feed. Formerly, Mansour et al., (1988) conducted that groundnut hay constitutes a potential source of animal feed and could be effectively used in fattening Sudanese Desert lambs. These authors noted that provision of groundnut hay at the rate of 45% induced a growth rate of about 163 g per day. Subtype did not significantly ($P>0.05$) affected the performance of lambs although the total and daily gains were relatively higher in Kabashi subtype (Table 3). This may be explained on the ground that Kabashi lambs consumed significantly ($P<0.05$) more total and daily feed and had higher ($P<0.05$) FCR than Hamari subtype. Table (7) demonstrated that pen fed lambs consumed more feed than the free grazing group with no significant difference ($P>0.05$). Feed conversion ratio (FCR) was very highly significantly ($P<0.0001$) better on feeding experimental diet compared with free grazing (7.82 Vs 18.04).

Body measurements of lambs throughout the study period are shown in tables (3,4,5,6). Although the necks of pen fed lambs were significantly ($P<0.0001$) longer at 30 and 60 days of age, but the total and daily changes were not significantly ($P>0.05$) different from that of lambs on free grazing (Table 5). Other body measurements of pen fed animals had a steady increase in total and daily body measurements values without significant ($P>0.05$) difference compared with those on free grazing (Tables 4 and 5), with the top ranking value being for heart girth. This increase may be account for the superior growth in pen fed animals. Most body measurements were not significantly ($P>0.05$) affected by subtype except the fore and hind legs which were highest ($P<0.01$ and $P<0.05$, respectively) in Hamari lambs for the total and daily changes (Table 6), whereas Kabashi lambs were the best, with no significant difference ($P>0.05$), for heart girth, horns and pelvic cavity. This could be attributed to genetic factors. Whereas the growth rates of the head, ear and tail were higher in Hamari lambs with no significant ($P>0.05$) difference compared with the other subtype. Total changes in body length, height at withers and length of the neck were slightly higher in Kabashi lambs. The study concluded that Hamari and Kabashi subtypes seem to have good potentials as meat producing animals. Also groundnut residues (hay) produced in large quantities in the region could be used successfully in sheep nutrition. In addition, the limited amount of concentrates used in the current study (250 g/head/day) was low and is probably well within the financial capabilities of sheep producers and hence can be used in fattening sheep in the region.

Table 1. Ingredients and proximate analysis of the experimental diet

Ingredients (as fed):	%
Sorghum grains (dura)	48
Groundnut cake	35
Grinded groundnut hulls (bran)	14
Shell	2
Common salt	1
Proximate analysis (%) on dry matter basis :	
Crude protein (CP)	23.4
Crude fibre (CF)	16.32
Ether extract (EE)	4.84
Nitrogen- free extract (NFE)	5.00
Ash	5.44

Table 2. Mean performance (±SD) of Hamari and Kabashi lambs during the fattening period in West Kordofan

	Pen fed		Free grazing	
Parameter	Kabashi	Hamari	Hamari	Kabashi
Number of animals	5	5	5	5
Days on feed	60	60	60	60
Initial body weight (Kg)	25.3± 1.99	23.96± 2.38	25.62± 1.63	26.14± 1.46
Final body weight (Kg)	34.4± 1.67	32.60± 2.53	29.52± 1.79	29.16± 1.18
Total body gain (Kg)	9.10± 1.24	8.64± 0.76	3.90± 0.88	3.02± 0.61
Mean daily gain (Kg)	0.152± 0.02	0.144± 0.01	0.065± 0.02	0.05± 0.01
Total feed intake (Kg)	62.65± 7.15	65.08± 5.10	64.00± 6.60	60.82± 2.83
Mean daily feed intake (Kg)	1.04±0.12	1.08± 0.28	1.07± 0.11	1.01± 0.05
Feed conversion ratio (FCR, Kg feed / Kg gain)	6.88± 1.82	7.53± 0.96	16.41± 2.57	20.14± 3.19

Table 3. Effects of ration and subtype on mean performance and body measurements of Hamari and Kabashi lambs in West Kordofan

	Mean			weigh	T (Kg) And body			measurement		For period		(days)			
		Weight				body	length				Height	At	Withers		
Parameter	Initial wt.	30-day wt.	60-day wt.	Total chan.	Daily chan.	Initial leng.	30-day leng.	60-day leng.	Total chan.	Daily chan.	Initial ht.	30-day ht.	60-day ht.	Total chan.	Daily chan.
Ration:															
1	24.63	28.89	32.80	8.17	0.136	58.11	60.21	64.09	5.98	0.10	68.35	70.70	73.73	5.38	0.090
2	25.88	27.75	29.34	3.46	0.058	59.62	61.05	61.40	1.78	0.03	70.20	71.29	72.23	2.03	0.034
SE (ration)	0.6278	0.7189	0.6659	0.3213	0.0054	0.8852	0.9057	0.8773	0.5741	0.0095	0.8646	0.8305	0.7847	0.397	0.5021
	NS	NS	**	****	****	NS	NS	*	***	***	NS	NS	NS	***	NS
Sheep subtype:															
Hamari	25.05	27.94	30.58	5.53	0.092	58.39	60.21	62.20	3.81	0.063	68.75	70.20	72.23	3.48	0.058
Kabashi	25.46	28.70	31.56	6.10	0.102	59.34	61.05	63.29	3.95	0.066	69.80	71.79	73.73	3.93	0.066
1.SE (subtype)	0.6278	0.7189	0.6659	0.3213	0.0054	0.8852	0.9057	0.8773	0.5741	0.0095	0.8646	0.8305	0.7847	0.3957	0.5021
11.SE (interaction)	0.8878	1.0167	0.9417	0.4544	0.0076	1.2519	1.2809	1.2407	0.8120	0.0134	1.2227	1..1745	1.1098	0.5596	0.7101

NS = not significant (P>0.05) * = significant (P<0.05) ** = highly significant (P<0.01) * = very highly significant (P<0.001)**
****** = very highly significant (P<0.0001) 1, 11 = all means are not significant (P>0.05)**

Table 4. Effects of ration and subtype on mean body measurements of Hamari and Kabashi lambs in West Kordofan

	Mean			body	measurement		Ts (cm)	For period		(days)					
		Heart	Girth				head	Leng.				Ear	Leng.		
Parameter	Initial leng.	30-day leng.	60-day leng.	Total chan.	Daily chan.	Initial leng.	30-day leng.	60-day leng.	Total chan.	Daily chan.	Initial leng.	30-day leng.	60-day leng.	Total chan.	Daily chan.
Ration:															
1	71.88	74.32	77.55	5.67	0.095	27.25	28.46	29.52	2.27	0.037	18.70	19.04	19.43	0.730	0.014
2	71.70	73.48	74.14	2.44	0.041	27.25	28.40	28.70	1.45	0.026	18.00	18.25	18.58	0.580	0.011
SE (ration)	0.6723	0.6595	0.621	0.3851	0.0065	0.2586	0.0276	0.2728	0.2880	0.0048	0.4688	0.4996	0.510	0.1026	0.0022
	NS	NS	**	****	****	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sheep subtype:															
Hamari	71.65	73.74	75.61	3.96	0.066	27.05	28.35	29.11	2.06	0.034	18.85	19.14	19.61	0.760	0.013
Kabashi	71.93	74.06	76.08	4.15	0.069	27.45	28.51	29.11	1.66	0.028	17.85	18.15	18.40	0.550	0.009
1.SE (subtype)	0.6723	0.6595	0.6206	0.3851	0.0065	0.2586	0.2758	0.2728	0.2880	0.0048	0.4688	0.4996	0.510	0.1026	0.0022
11.SE (interaction)	0.9507	0.9326	0.8776	0.5446	0.0092	0.3657	0.390	0.3857	0.4073	0.0068	0.663	0.7066	0.7212	0.1450	0.0031

NS = not significant (P>0.05) * = significant (P<0.05) ** = highly significant (P<0.01) ** = very highly significant (P<0.001)**

Table 5. Effects of ration and subtype on mean body measurements of Hamari and Kabashi lambs in West Kordofan

			Mean	body	measurement		Ts (cm)	For period		(days)					
		Neck	Leng.				Tail	Leng.				Horn	Leng.		
Parameter	Initial leng.	30-day leng.	60-day leng.	Total chan.	Daily chan.	Initial leng.	30-day leng.	60-day leng.	Total chan.	Daily chan.	Initial leng.	30-day leng.	60-day leng.	Total chan.	Daily chan.
Ration:															
1	32.40	34.34	36.21	4.31	0.072	51.00	51.44	52.50	1.50	0.025	1.55	1.955	2.30	0.75	0.013
2	29.47	32.17	33.50	4.03	0.067	51.68	52.40	52.79	1.11	0.019	2.40	2.80	3.05	0.65	0.011
SE (ration)	0.4105	0.254	0.3560	0.4436	0.0062	0.7275	0.0788	0.8245	0.2729	0.0043	0.3728	0.4559	0.5317	0.2227	0.0042
	***	****	****	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Sheep subtype:															
Hamari	31.40	33.34	35.56	4.16	0.069	51.87	52.49	53.45	1.58	0.026	2.45	2.71	2.95	0.50	0.008
Kabashi	30.47	33.17	34.65	4.18	0.070	50.81	51.35	51.84	1.03	0.017	1.50	2.05	2.40	0.90	0.015
1.SE (subtype)	0.4105	0.254	0.3560	0.4436	0.0062	0.7875	0.7884	0.8245	0.2729	0.0043	0.3728	0.9559	0.5317	0.2227	0.0042
11.SE (interaction)	0.5206	0.3592	0.5034	0.6273	0.0087	1.1138	1.1150	1.1660	0.3860	0.006	0.5272	0.6448	0.7519	0.3149	0.006

NS = not significant (P>0.05) * =very highly significant (P<0.001) **** = very highly significant (P<0.0001) 1.11 = all means are not significant (P>0.05)**

Table 6. Effects of ration and subtype on mean body measurements of Hamari and Kabashi lambs in West Kordofan

			Mean	body	measurement		Ts (cm)	For	peri-od	(days)					
		Foreleg	Leng.				Hind	Leg	Leng.			Pelvic	cavity		
Parameter	Initial leng.	30-day leng.	60-day leng.	Total chan.	Daily chan.	Initial leng.	30-day leng.	60-day leng.	Total chan.	Daily chan.	Initial leng.	30-day leng.	60-day leng.	Total chan.	Daily chan.
Ration:															
1	62.20	63.45	65.94	3.74	0.063	70.40	71.84	74.06	3.66	0.061	20.81	23.05	24.96	4.15	0.069
2	61.20	63.17	63.70	2.50	0.042	71.37	71.99	72.45	1.08	0.018	20.17	21.18	21.68	1.51	0.025
SE (ration)	0.5121 NS	0.5190 NS	0.4446 **	0.2392 **	0.0042 **	1.3311 NS	0.0444 NS	0.4722 *	0.2616 **	0.0045 **	0.3099 NS	0.3647 **	0.3045 ****	0.1722 ****	0.0032 ****
Sheep subtype:															
Hamari	61.85	63.62	65.52	3.67	0.061	70.40	72.01	73.72	3.32	0.055	20.60	21.89	23.32	2.72	0.045
Kabashi	61.55	63.00	64.12	2.57	0.043	71.37	71.82	72.79	1.42	0.024	20.38	22.34	23.32	2.44	0.049
SE (subtype)	0.5121 NS	0.5190 NS	0.4446 *	0.2392 **	0.0042 **	0.3311 NS	0.494 NS	0.4722 NS	0.2616 *	0.0045 *	0.3099 NS	0.3647 NS	0.3045 NS	0.1722 NS	0.0032 NS
SE (interaction)	0.7243**	0.7340 *	0.6287 **	0.3383 NS	0.0059 NS	0.8824 NS	0.6986 NS	0.6677 NS	0.370 NS	0.0063 NS	0.4383 NS	0.5158 NS	0.4307 NS	0.2435 NS	0.0045 NS

NS = not significant (P>0.05) * = significant (P<0.05) ** = highly significant (P<0.01) * = very highly significant (P<0.001) **** = very highly significant (P<0.0001)**

Table 7. Effects of rations and subtype on mean performance of Hamari and Kabashi lambs, during fattening period in West Kordofan

	Mean	Weight (Kg)	And feed	In take (Kg)			
Factor	Initial wt.	Final wt.	Total gain	Mean daily gain	Total feed intake	Feed intake / day	FCR
Ration:							
1	24.63	32.80	8.17	0.136	63.865	1.064	7.82
2	25.88	29.34	3.46	0.058	62.410	1.040	18.038
SE (ration)	0.6278 NS	0.6659 **	0.3213 ****	0.005 ****	1.8971 NS	0.0314 NS	0.7872****
Sheep subtype:							
Hamari	25.05	30.58	5.53	0.092	62.951	1.049	11.384
Kabashi	25.46	31.56	6.10	0.102	63.325	1.055	10.381
SE (subtype)	0.6278 NS	0.6659 NS	0.3213 NS	0.005	1.8971 *	0.0314 *	0.7872 *
SE (interaction)	0.8878 NS	0.9417 NS	0.4544 NS	0.0076	2.6829	0.0444 NS	1.1133 NS

NS = not significant (P>0.05) * = significant (P<0.05) ** = highly significant (P<0.01) ** = very highly significant (P<0.0001) FCR = feed conversion ratio**

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