Pre-weaning Body Measurements and Performance of Desert Sheep (Tribal Subtypes Hamari and Kabashi) Lambs of Kordofan Region, Sudan

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Abstract

Hamari (n=20) and Kabashi (n=20) tribal subtype male lambs were used for a study to evaluate the pre-weaning period (4 months) growth performance and body measurements. These parameters were measured soon after birth and every two weeks thereafter. No significant differences (P>0.05) were found in birth weight and body measurements at birth, with the exception of head length between the two subtypes (18.40 vs 19.13 cm for Hamari and Kabashi lambs, respectively). Kabashi lambs had relatively higher birth weight (4.49 vs 4.38 kg), height at withers and heart girth but their heads were significantly longer (19.13 vs 18.40 cm, P<0.05). Hamari lambs were higher for the length of body, ear, neck and tail. Subtype had no significant effect on body weight during the pre-weaning period but Hamari lambs showed higher growth rates during the first two month of age and slight increase in total weight gain (19.95 vs 19.76 kg) and weaning weight (24.33 vs 24.25 kg). All lambs recorded increased body measurements with increasing age and Hamari sheep had higher values for most of the investigated traits than Kabashi sheep. Positive correlations were found between age of lambs, body measurement and body weight. The later parameter was positively correlated with most of the body measurements especially height at weathers. Significant (P<0.05) regression coefficients were recorded between age, body measurements and body weights in the two animal groups.

Key words: lamb growth, body measurements, Sudan Desert sheep

Introduction

Despite its great impact in the economy of the country, most sheep in Sudan are still raised under nomadic conditions with traditional methods of management and natural grazing (Mcleory, 1961; Pollott *et al.,* 1978; Elkhidir *et al*., 1988 and Abdelrahman *et al*., 1988). Many socio-economic factors affect mobility of nomadic flocks including natural pasture and crop residues and nomads are always associated with seasons and availability of grazing and water. Wilson (1991) recorded that Sudanese Desert sheep are distributed north of latitude 10 ° North, extending eastward into Eritrea and westward into Chad. They form more than 65% of sheep found in the country (Sulieman *et al.,* 1990). Desert sheep and together with their crosses form about 80% of sheep population in Sudan (Devendra and Mcleory, 1982). Sudanese Desert sheep comprises of seven breeds of which Kababish (the model of the ecotype) 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 tribal subtype Kabashi is raised in the northern and eastern parts of North Kordofan State while Hamari subtype is found in the western part of Kordofan region with different grades of crosses between these two tribal subtypes in the middle of the region. The main colours of Kabashi are brown, light brown (Ashgur) and spotted black or red and white (Abrug). The dominant colour of Hamari is red. There are a number of similarities between the localities of these subtypes and their management although Kabashi migration routes are longer with more than 643.6 km in one direction. Studies in characterization of local livestock breeds including Sudanese Desert sheep are meagre. However such studies are needed prior to the determination of improvement programs that are badly needed. This work was carried out to study the morphological traits and performance, under field conditions of Sudan Desert lambs (tribal subtypes Kabashi and Hamari) during the pre-weaning period.

Materials and Methods

Study Area

The study was conducted in El-Khowai Area, El-Nuhood locality, West Kordofan State, Sudan. The locality lies within latitudes 11º 5’ - 13º 75’ N and longitudes 27 º - 29 º 5’ E about 900 km west of Khartoum. The area lies within the low rainfall savannah belt. The rainy season extends from July to October, with a peak in August. Average annual rain fall is about 300 mm in the north and about 400 mm in the southern part. Maximum temperatures range from 24 to 39 º C during most of the year, with peaks above 36 ºC during April-June (El-Nuhood Meteorological Station, 2000).The major ecological zones in the area are mainly determined by rainfall 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.

Field crop residues and by-products besides the presence of vast natural pastures gave the locality good potential for animal production especially sheep which is the most important animal species in the area. West Kordofan State holds about 3.48 million head of sheep mostly raised by nomadic tribes (MAR, 2001). Natural breeding is usually controlled by the application of the “kunan” which is a form 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 February to March and lambing is usually expected during the rainy season (July-September) when forages are plentiful and of good nutritive quality. Newly born lambs are usually separated from dams in the early morning and kept in the camp or herders residence “locally called Farig” or grazing around it. Meanwhile flocks are grazed away up to mid-day when they come back to nurse lambs, have a rest and then graze again to sunset. Sometimes lambs may be left to run with dams until weaning at about four mo of age. In this case some ewes’ teats may be sealed using dung or by a traditional instrument made from threads, a process called “Surar that means tie” to prevent nursing and can be milked when needed. Sheep watering frequency is about 3-5 d during the dry season and 7 or 10 d during the wet season, and may reach one mo or more during winter when animals graze succulent plants “Guzu”. Water sources, during dry season, are mainly wells and ground tanks. Watermelon is commonly used as a water source in this season.

Experimental Animals

Forty male Desert lambs, 20 from each tribal subtype of Kabashi and Hamari, were used in this study. The lambs were selected from single births of dams with three pairs of permanent incisors to eliminate dam age effect. Birth weight and body measurements of lambs were recorded soon after birth and every two wk during the study period of four mo. Lambs were identified and ear tagged. Weight was recorded using a 50-kg spring balance. Physical measurements were carried out by means of a tape according to Owen *et al*. (1977), and included: height at withers, body length, heart girth, pelvic cavity and length of the head, ear, neck, tail, horn, fore and hind limbs. The experimental lambs were given special attention at birth and during the pre-weaning period. The dams and their lambs were treated twice against ecto- and endo-parasites with *Ivermectin* at a rate of 10 mg per 50 kg body weight. Lambs suckled their dams freely and were under traditional management till weaning.

Statistical Analysis

Data were analyzed using t test for comparison between the two lamb subtypes. Pearson correlation was performed among age, body weight and body measurements and regression analyses were carried out for all one-predictor variable models on body weight.

Results and Discussion

In the current study mean birth weight of Hamari and Kabashi subtypes were 4.38 and 4.49 kg, respectively with no significant ($P>0.05$) difference between subtypes (Table 1). However, Kabashi lambs were relatively heavier at birth and this might be attributed to relatively large body size of Kabashi ewes compared with Hamari. Sulieman *et al*. (1990) explained the difference in birth weight as related to weight at parturition and more specifically to the changing conditions of the ewe in the immediate pre-partum period. Furthermore, Nawaz *et al.* (1999) stated that birth weight of lambs was affected by breed, birth rank, gender and dam age. In the current study mean birth weight was not far from the findings of El-Hag *et al.*(2001) for the sheep of North Kordofan (4.08 kg), but were higher than that reported by Sulieman *et al.* (1990) in El-Huda, Sudan, whose studies showed significant differences in birth weight between Shugor (3.62 kg), Dubasi (3.47 kg) and Watish (3.17 kg) sub-types. The results of the present study substantiated that Hamari and Kabashi sheep can be considered as related to the breed Kababish which was used as a prototype for Desert sheep.

Table 1. Pre-weaning body weights of Hamari and Kabashi Desert lambs

	Hamari	Kabashi
Weight at day		
Birth	4.38±0.20	4.49± 0.20
30 d	11.73±0.30	11.39± 0.39
60 d	18.41± 0.54	17.55± 0.60
90 d	21.28± 0.58	21.55± 0.72
120 d	24.33± 0.74	24.25± 0.61
Mean daily gain		
Birth – 30d	0.247[a]	0.208[b]
Birth – 60 d	0.243	0.218
Birth – 90 d	0.191	0.209
Birth – 129 d	0.165	0.165
Total weight change	19.95	19.76

[ab]Means within same row with different superscripts differ at $P < 0.05$

Subtypes did not significantly (P>0.05) affect lamb weights at birth, 30, 60, 90 and 120 d of age (Table 2). The daily weight gain of Hamari lambs was significantly higher (P<0.05) in the first mo of age than Kabashi lambs. Average daily gain of lambs from birth to weaning (20 d) were similar in the two subtypes, except there was slight increase in the total gain of Hamari (19.95 vs 19.76 kg). As reported in the current study the mean weight of Hamari and Kabashi lambs at 30 and 60 d of age and their overall mean daily gain in addition to their overall weight at weaning were higher than the values reported by Sulieman *et al.* (1990) for Shugor, Dubasi and Watish and also was higher than those reported by Nawaz *et al.* (1985) in Pakistan (20.30 kg). This might indicate that Kababish breed is genetically superior than the other Desert sheep breeds in Sudan. Weaning at 120 d had resulted in mean weight of 24.33 and 24.25 kg for Hamari and Kabashi subtypes, respectively. The relative increase in pre-weaning weight of Hamari lambs might be explained through higher milk yield and superior mothering ability of Hamari ewes compared Kabashi ewes. This is in line with Singh and Moore (1982) who reported that the mothering ability and milk yield of ewes determine the environment in which the lambs are reared.

Determination of correlation between body measurements in sheep may help to provide tools for predicting characters which are not usually measured in the field. In the current study ten basic physical measurements were taken with the purpose to provide a comparative description of the two groups of animals under investigation. The values of pre-weaning physical measurements of lambs are shown in Table 2. Length of head at birth of Kabashi lambs was significantly longer (P<0.05) compared to Hamari lambs. There was no other significant difference between the two subtypes in body measurement at birth. However, body length, ear length, length of the neck and tail were relatively higher in Hamari than Kabashi subtype. On the other hand, height at withers and heart girth were relatively higher in Kabashi than Hamari lambs. As in the case of birth weight, this pattern in body measurements might be due to the relatively larger body size of Kabashi compared to Hamari ewes. Most of the linear measurements demonstrated progressive growth in the two groups of lambs with increasing age. However, different parts of the animal did not increase at the same rate. With the exception of some fluctuations in height at withers and body length, Hamari lambs were highest for all physical measurements during the pre-weaning period. This could be attributed to the superiority for mothering ability and milk yield of Hamari over Kabashi ewes. Maglad *et al*. (1986) found a strong relationship within flocks between milk yield and early lamb growth. At weaning (120 d old), the height at withers and body length were 67.56 and 57.11 cm for Hamari lambs and were 68.47 and 57.15 cm for Kabashi lambs, respectively. Babiker and Mohamed, (1990) found that the height was 84 cm and the body length was 74 cm for adult Hamari sheep. These values were substantially higher than those recorded by Sulieman *et al*. (1990) for adult Shugor, Dubasi and Watish sub-types. These variations may be due to genetic factors and it confirms the perception that Kababish Desert sheep is better for both meat and milk production (Mcleory, 1961).

Table 2. Pre-weaning means (±SD) of body measurements (cm) for Hamari and Kabashi lambs

	Mean±SD for weight for age in days, kg					Daily gain (g/d)
Parameter	Birth	30 d	60d	90 d	120 d	Birth-120 d
Height at withers (cm)						
Hamari	43.70± 0.84	52.93± 0.85	59.05± 0.63	64.98^{a}± 0.59	67.56± 0.69	0.199
Kabashi	45.50± 0.97	52.18± 0.98	59.30± 0.68	62.83^{b}± 0.67	68.47± 0.59	0.192
Length of body (cm)						
Hamari	33.75± 0.74	43.43± 0.70	47.85± 0.69	55.60^{a}± 0.73	57.11± 0.74	0.195
Kabashi	33.70± 0.83	41.70± 1.17	46.70± 0.96	51.30^{b}± 0.92	57.15± 0.69	0.195
Heart girth (cm)						
Hamari	40.90± 0.90	51.45± 0.63	59.50± 0.75	64.55± 0.82	71.56± 0.84	0.255
Kabashi	41.00± 0.99	51.28± 0.78	58.15± 0.72	64.00± 0.68	70.72± 0.85	0.248
Head length (cm)						
Hamari	18.40^{a}± 0.32	22.38± 0.20	25.05^{a}± 0.38	26.18^{a}± 0.20	26.85± 0.18	0.070^{a}
Kabashi	19.13^{b}± 0.41	22.08± 0.42	23.78^{b}± 0.27	25.36^{b}± 0.27	26.58± 0.18	0.062^{b}

Table 2. Pre-weaning means (±SD) of body measurements (cm) for Hamari and Kabashi lambs (continued)

	Mean±SD for weight for age in days, kg					Daily gain (g/d)
Parameter	Birth	30 d	60d	90 d	120 d	Birth-120 d
<u>Ear length</u> (cm)						
Hamari	14.35±2.05	15.42±0.27	26.55^{a}±0.33	28.00^{a}±0.27	29.60^{a}±0.35	0.033
Kabashi	11.48±0.58	14.72±0.27	23.42^{b}±0.39	26.20^{b}±0.25	27.96^{b}±0.30	0.049
<u>Neck length</u> (cm)						
Hamari	15.40±0.47	21.00±0.49	44.45^{a}±0.74	47.70^{a}±0.92	50.09±0.58	0.118
Kabashi	15.08±0.45	20.03±0.39	40.60^{b}±0.79	44.60^{b}±0.83	49.23±0.70	0.107
<u>Tail length</u> (cm)						
Hamari	28.63±0.82	39.55^{a}±0.79	0.33^{a}±0.12	0.95±0.26	2.30^{a}±0.38	0.179
Kabashi	28.40±0.8	36.75^{b}±0.5	0.05^{b}±0.03	0.425±0.13	1.00^{b}±0.19	0.174
<u>Horn length</u> (cm)						
Hamari	-	-	54.88±0.57	59.25^{a}±0.62	61.33^{a}±0.54	0.019^{a}
Kabashi	-	-	54.00±0.56	57.25^{b}±0.57	59.95^{b}±0.51	0.008^{b}
<u>Foreleg length</u> (cm)						
Hamari	42.50±0.55	50.93±0.51	62.95^{a}±0.52	67.00±0.67	69.05±0.68	0.157
Kabashi	42.15±0.78	51.03±0.58	61.35^{b}±0.60	65.60±0.59	68.79±0.47	0.148
<u>Hind leg length</u> (cm)						
Hamari	47.55±0.70	62.95^{a}±0.52				0.180
Kabashi	47.00±0.73	61.35^{b}±0.60				0.182

^{ab}Means within column with different superscripts differ at P<0.05

Correlation coefficients between age, body weight and different body measurements of Kabashi and Hamari lambs are shown in Tables 3 and 4. The ages of the two groups of lambs was positively correlated with body weight (r =0.985, P<0.05 and r =0.982, P<0.05), respectively. Also the age of the two groups of lambs was consistently and positively correlated with other physical measurements (r =0.805-0.990 for Kabashi and r =0.875 - 0.982 for Hamari) with the exception of the length of neck in the two subtypes and the hind leg in Hamari. This results agreed those of Suleiman *et al.* (1990) who found strong relationship between age and body measurements, with the exception of ear length, for Shugor, Dubasi and Watish.The strongest correlation in Kabashi lambs was between age and height at withers (r =0.990, P<0.05) and that of Hamari lambs was between age and heart girth (r =0.979, P<0.05). Suleiman *et al.* (1990) recorded high relationship between age and chest depth for Shugor and Dubasi sheep followed by heart girth, body length and height at withers. Physical measurements of Kabashi lambs, with the exception of the neck, showed positive correlations with body weight (r =0.876 - 0.996). Height at withers showed high relationship with body weight (0.996, P<0.05). Also body weights of Hamari lambs showed positive correlations with other physical measurements (r =0.913 - 0.992), with the exception of the neck and hind legs. Low relationship was noticed between the length of the neck and body weight of Kabashi sheep. The same trend was observed between the length of the hind leg and body weight of Hamari sheep The highest relationship was observed between body weight and both heart girth and height at withers (r =0.992, P<0.05). These findings agree with Tolera (1998) who observed a high positive correlation between body weight and heart girth. Also Sulieman *et al*. (1990) concluded that heart girth was the most variable live measurement since it reflects the condition of the animal, whereas chest depth, body length and height at withers are skeletal measurements and are less variable than heart girth. Among the different traits, Kabashi lambs showed the highest relationship between heart girth and body length (r =0.999, P<0.05) while in Hamari lambs was between heart girth and height at withers (r =0.994, P<0.05). Hibret *et al*. (2001) studied the physical measurements in mature Ethiopian "Menz" rams and showed the highest correlation was between body length and height at withers. Among the traits, the highest relationship was obtained between body condition score and body length. Also Tolera (1998) found a high positive correlation between body weight and heart girth and body condition score and body length.

The results of regressing age and physical measurements on body weight are presented in Table 4. There was highly significant (P<0.05) regression coefficients between the age, body measurements and body weight in the two groups of lambs. The length of the neck showed to be the best predictor of body weight of Hamari lambs (R^2 = 0.99). While in Kabashi lambs the best prediction equation of body weight included the predictors: heart girth, head length and height at withers (R^2 =0.99). Ear length and age of the animal showed a low relationship (Sulieman *et al.*, 1990). However, there were highly significant regression coefficients for heart girth, body length, and wither height and age in three subtypes of Desert sheep: Shugor, Dubasi and Watish. In Shugor and Dubasi sheep, the chest depth showed the best predictor of age while in Watish sheep the measurements of heart girth, chest depth, body length and wither height were ranked in descending order as best predictors of age.

Table 3. Correlation coefficients between age (days), weight (kg) and different body measurements (cm) of Kabashi and Hamari lambs

	Body weight (BW)	Body height (BH)	Body length (BL)	Heart girth (HG)	Head length (HL)	Ear length (EL)	Neck length (NL)	Tail length (TL)	Fore leg length (FLL)	Hind leg length (HLL)
Kabashi										
Age	0.985*	0.990*	0.983*	0.984*	0.981*	0.921*	0.027	0.971*	0.961*	0.805*
BW		0.996*	0.989*	0.993*	0.995*	0.968*	0.015	0.988*	0.988*	0.876*
BL			0.994*	0.996*	0.991*	0.958*	0.069	0.989*	0.981*	0.836*
HG				0.999*	0.990*	0.964*	0.098	0.997*	0.984*	0.823*
HL					0.994*	0.968*	0.087	0.997*	0.987*	0.830*
EL						0.975*	0.023	0.993*	0.992*	0.863*
NL							0.128	0.979*	0.991*	0.895*
TL								0.113	0.066	0.218
FLL									0.992*	0.838*
HLL										0.889*
Hamari										
Age	0.982*	0.978*	0.965*	0.979*	0.951*	0.875*	0.333	0.930*	0.957*	0.094
BW		0.992*	0.978*	0.992*	0.985*	0.913*	0.376	0.965*	0.985*	0.038
BL			0.991*	0.994*	0.985*	0.908*	0.418	0.970*	0.987*	0.007
HG				0.985*	0.978*	0.923*	0.467	0.977*	0.987*	0.037
HL					0.986*	0.924*	*	0.978*	0.989*	0.022
EL						0.925*	0.432	0.987*	0.990*	0.055
NL							0.439	0.948*	0.939*	0.126
TL							0.515	0.500*	0.442	0.112
FLL							*		0.987*	0.099
HLL										0.022

* Significant (P<0.05)

Table 4. Regression coefficients for age and body measurements on body weights of Hamari and Kabashi lambs

Predictor Variables	Regression coefficients for sub-type Hamari	Kabashi	Combined
N	9	9	18
Age (days)			
Intercept	6.37	6.24	6.30
b	0.164	0.162	0.163
R^2	0.96	0.97	0.96
Height at wither (cm)			
Intercept	-31.12	-35.17	-32.94
B	0.812	0.884	0.844
R^2	0.98	0.99	0.98

Table 4. Regression coefficients for age and body measurements on body weights of Hamari and Kabashi lambs (continued)

Predictor Variables	Regression coefficients for sub-type Hamari	Kabashi	Combined
Body length (cm)			
Intercept	-22.46	-26.48	-23.80
b	0.805	0.913	0.842
R^2	0.96	0.98	0.96
Heart girth (cm)			
Intercept	-23.40	-24.98	-24.06
b	0.681	0.716	0.696
R^2	0.98	0.99	0.98
Head length (cm)			
Intercept	-40.41	-49.47	-43.64
b	0.2.366	2.792	2.522
R^2	0.97	0.99	0.96
Ear length (cm)			
Intercept	-55.64	-17.61	-38.50
b	4.358	3.496	3.431
R^2	0.97	0.97	0.91
Neck length (cm)			
Intercept	-16.12	15.71	8.47
b	1.330	0.013	0.358
R^2	0.99	0.015	0.14
Tail length (cm)			
Intercept	-25.47	-25.88	-24.12
b	0.975	1.041	0.969
R^2	0.97	0.98	0.93
Foreleg length (cm)			
Intercept	-42.80	-45.36	-43.48
b	1.086	1.153	1.108
R^2	0.98	0.98	0.97
Hind leg length			
Intercept	16.36	-39.34	16.14
b	0.000	0.937	0.000
R^2	-0.062	0.77	-0.038
Horn length (cm)			
Intercept	11.99	12.05	12.72
b	6.781	14.341	7.520
R^2	0.805	0.79	0.73

Conclusion

Although both tribal subtypes had similar birth weight, Hamari sheep lambs showed higher values for most of the investigated traits than Kabashi sheep lambs. Since the two subtypes are fattened and exported, it is recommended that Hamari lambs be taken for that purpose.

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