Global Veterinaria 17 (3): 265-270, 2016
ISSN 1992-6197
© IDOSI Publications, 2016
DOI: 10.5829/idosi.gv.2016.17.03.10568

Phenotypic Characterization of Black Head Somali Sheep in Gode and Adadile Districts, Ethiopia

[1]Wendimu Bireda, [2]Kefelegn Kebede, [3]Yoseph Mekashaw and [1]Shibabaw Bejano

[1]Department of Animal science, Assosa University, P.O.Box 18, Asosa, Ethiopia
[2]School of Animal and Range Science, Haromaya University, P.O.Box 138.Diredawa, Ethiopia.
[3]International Livestock Research Institute (ILRI), P.O.Box 5689. Addis Ababa, Ethiopia

Abstract: The study was conducted on black head Somali sheep on Gode and Adadile with aim to analyze the phenotypic characteristics of the sheep breed. The study was conducted on field measurements and observation. Purposive sampling was used to select the study sampled sheep's. Field measurements and observation were taken for quantitative and qualitative traits respectively from 600 sheep of both sexes. Qualitative data were analyzed using chi-square test and General Linear Model procedure of SAS was employed to analyze quantitative variables using the Tukey Kramers test. Pearson's correlation coefficient between bodies measurements under consideration were computed within each sex. Majority of the sheep in this study had patchy coat color pattern, fat rumped tail type, white body with black head coat color type; wattle was present in majority of the sheep; flat and concave were mostly observed head profile; ear was dropping down ward and ruff and horn were not observed in this study. Sex of animals had significant effect on body weight and most of the body measurements ($P<0.05$); body weight values in rams and ewes were 28.3kg and 26.7kg, respectively. Age groups significantly affect ($P<0.05$) body weight and most of the body measurements. The trend in most of the body measurements except cannon bone circumference increased with increase in dentition class up to the third dentition. The interaction between sex and age group significantly affect body weight and all of the body measurements except EL and cannon bone of male ($P<0.05$). Body weight and most of body measurements were correlated positively and the higher correlation coefficient of body weight was obtained with heart girth, indicating it can be used to estimate the body weight of BHS sheep.

Key words: Body measurement · Qualitative trait · Quantitative Trait

NTRODUCTION

Sheep population is found widely distributed across the diverse agro-ecological zones of Ethiopia. Approximately 75% of the sheep population is kept in small scale mixed farms in the highland regions while the remaining 25% are found in the lowlands [1]. Among indigenous sheep breeds, Black Head Somali sheep are the most promising for their better adaptability under low input extensive production systems in their production environment, where scarcity of feed and water are the two major constraints [2].

In Ethiopia there is inadequate breed level characterization information, although the country is widely known to possess a large population of sheep with enormous diversity in specific attributes [3].

The Black Head Somali sheep comprise most of the sheep population of Gode area and forms the greater proportion of the small ruminant population in the area and contributes a great deal to the national economy as it has special merits in the Middle East and Arabian countries. It is, nevertheless, raised by pastoralists and agro-pastoralists under harsh environmental conditions, with seasonal under-nourishment, long watering intervals, long walks, heat stress and little or no protection against diseases.

An in-depth phenotypic characterization work has not been carried out on this breed in the study area which is very far from central part of the country. Furthermore, updating of the previous results is vital since genetic resources and production systems are not static. Therefore, the current study was carried out to

Corresponding Author: Wendimu Bireda, Department of Animal science, Assosa University, P.O. Box 18, Asosa, Ethiopia.

characterize Black head Somali sheep in Gode and Adadile districts by using linear body measurement and qualitative physical character on- farm condition.

MATERIALS AND METHODS

Description of the Study Area: The study was conducted at Adadille and Gode districts, Shebelle zone, Somali regional state. Gode is located 1225 km where as Adadille is located 1243 km from Addis Ababa, the capital city of the country. The altitude of Gode and Adadile district is 320 and 300-500 meter above sea level respectively. They have an average temperature of 31°C and 33°C respectively. Rainfall pattern is characterized by bimodal rainy seasons and two dry seasons in both districts. The main rainy season extends from April to June and the short rainy season stretches from October to December. The mean annual rainfall of the area ranges from 170 to 350 mm in Gode and 150 to 300 mm in Adadile [4].

Sampling and Data Collection Procedures: Gode and Adadile districts were selected based on, pastoral settlements and concentration of sheep population from the zone. Three hundred black head Somali sheep's were selected randomly from each district, with a total number of 600 Black Head Somali sheep for the study. Data were collected by employing field measurement to record the quantitative traits of the sampled sheep's and observation for qualitative characters on sampled sheep. The standard breed descriptor list for the sheep developed by FAO [5] was closely followed in selecting morphological variables. The quantitative traits including body weight, body length, height at wither, pelvis width, heart girth, tail length, rump height, scrotal circumference and ear length. Whereas the qualitative traits include coat color type, coat color pattern, hair type, tail type, head profile, wattle and ruff.

Quantitative traits including body length, height at wither, pelvis width, heart girth, tail length, rump height, scrotal circumference and ear length were measured using measuring tape, while body weight was measured using portable weighing scale. Adult sheep were classified into four age groups; 1PPI (one pair of permanent incisor), 2 PPI, 3 PPI and 4 PPI to represent age of 1-1½ years, 1½-2years, 2½-3 years and more than three years, respectively [6].

Data Management and Analysis: All the data's obtained by field measurement and observations were recorded in excel and analyzed using SAS version [9]. Qualitative data from individual observation were analyzed following the frequency procedures of SAS and the chi-square test was employed to test the assumption of equal proportion between the qualitative characters of the sheep's. The General Linear Model (GLM) procedure of SAS was employed to analyze quantitative variables to determine effects of class variables (districts, sex, age and sex by age interaction) using the Tukey Kramers test. The effects of class variables and their interaction were expressed as Least Square Means (LSM) ± SE. District, sex and dentition were fitted as fixed factors. Pearson's correlation coefficient between bodies measurements under consideration were computed within each sex.

The model employed for analyses of body weight and other linear body measurements was:

$$Y_{ijk} = \mu + Ai + L_k + Dj + Ai*Dj + e_{ijk,}$$

where: Y_{ijk} = the observed k (body weight or linear body measurements)
μ =overall mean,
A_i = the effect of i^{th} age group (1, 2, 3 and 4),
L_k =the effect of k^{th} district (Gode and Adadille)
D_j = the effect of j^{th} Sex (female and male)
Ai*Dj = age group by sex interaction and
eijk= random residual error.

RESULTS AND DISCUSSION

Qualitative Traits of Black Head Somali Sheep: Majority of the sheep in both districts had plain coat color pattern although it turned out to be none significant between the two districts. White body and black head is the major observed coat color type on sampled sheep in Gode and Adadile districts and it was not significantly different between the districts. Head profile was flat (57.67%) and concave (42.33%) in Gode district; where as it was flat (46%), concave (49.67%) and convex (4.33%) in Adadile district and this was found to be significant ($p<0.05$) between the two districts. Wattle is present in almost all sampled sheep in both districts. Muzzle is present (55.67%) and absent (44.33%) in Gode and it is present (48.67%) and absent (51.33%) in Adadile district.

All the sampled sheep had smooth hair type, fat rumped tail type in both districts, ruff and horn were absent in sampled sheep in Gode and Adadile districts, ear orientation is dropping down ward in all sampled sheep. This result was in line with the report of Fikrte [2]on black head Somali sheep in Shinile zone. Most of the observed qualitative characters in this study (Table, 1) were not significant between the two districts; it might be

Table 11.: Summary of the qualitative traits of Black Head Somali sheep in the study areas

	Gode		Adadile			
	N	%	N	%	Chi-squarevalue	P-value
Coat color pattern						
Spotty	54	18.00	44	14.67	*3.36*	0.31
Paid	81	27.00	69	23.00		
Plain	165	55.00	187	62.33		
Coat color type						
White body and black head	246	82.00	257	85.67	*8.70*	0.09
Black body	9	3.00	11	3.67		
White body	-	-	2	0.67		
White body and black head with black dominant	37	12.33	19	6.33	*18.69*	0.01
Other (red head)	8	2.67	11	3.67		
Head profile						
Flat	173	57.67	138	46.00		
Concave	127	42.33	149	49.67		
Convex	-		13	4.33		
Wattle						
Present	285	95.00	269	98.67	*6.57*	0.02
Absent	15	5.00	4	1.33		
Muzzle						
Present	167	55.67	146	48.67	*2.95*	0.41
Absent	133	44.33	154	51.33		

due to the same agro-ecological condition, similar type production system and absence of other sheep breeds in the two districts. This result assures divergence in response to ecological variation has been indicated in patterning morphological and color variation [7].

Body Weight and Linear Body Measurements

Sex Effect: Sex of animals had significant effect (P<0.05) on body weight and most of the body measurements; except canonical bone circumference and most of the body measurement are larger in ram than ewe (Table 2).

Body weight of black head Somali rams and ewes in this study was 28.3kg and 26.7kg, respectively. Similarly, in Horro and Menz breeds, males were consistently heavier than females [8].

Differences in live weight and most of the body measurements between sexes observed in present study showed that these parameters are sex dependent. The higher body weight in rams than ewes noted in our study could be due to hormonal differences and different growth rates of the two sexes. Sowande and Sobola [9]reported that ewes have slower rate of growth and reach maturity at smaller size due to the effect of estrogen in restricting the growth of the long bones of the body. Our values for chest girth (70.6 cm) for ram was lower than Bonga ram [85.3cm] [10] and Horro ram [76.1m] [11],but higher than Menz [65.7 cm] and Afar [67.3 cm] rams, respectively [12].

The body length of ewes obtained from this study (65.4 cm) was greater than the values obtained for Afar ewes which had 57cm [13], Washera ewes which had body length of 59.5 cm [14] and western Sudan ewes which had body length of 61.9 cm. This result was in line with the value obtained from Black head Somali ewes which had body length of 63.94 cm [2], Horro ewes which had body length of 67.4 cm [11].

Age Effect: In this study dentition classes significantly affect body weight and most of the body measurements. The trend in most of the body measurements except cannon bone circumference and tail length in this study increased with increase in dentition class. Mekasha [15] reported that the size and shape of the animal increases until the animal reaches its optimum growth point or until maturity. Similar finding was reported by Fasae *et al*. [16] who noted that body weight and body measurements increased with increasing age. This result is in harmony with the report of Bosenu [17] where body weight and most of body measurements are larger in older age of Debre libanos and Wuchale districts. The present finding is also consistent with Fikrte [2] who reported that body weight and most of body measurements are increasing as the sheep get older with slight increment after age group III in black head Somali sheep in Shinille zone.

Table 2: The mean (± SE) of body weight (kg) and LBMs (cm) of BHS sheep by district, sex, age, and age by sex interaction

Effects and level	N	BW LSM	BL LSM	HG LSM	WH LSM	TL LSM	PW LSM	EL LSM
Overall	600	27.2	65.6	69.5	57.7	18.2	18.4	9.2
District								
Gode	300	27.8^{a}	66.4^{a}	70.6^{a}	57.8^{a}	18.3^{a}	18.7^{a}	9.26^{a}
Adadile	300	28.1^{a}	66.3^{a}	70.0^{b}	58.6^{a}	18.4^{a}	19.0±^{b}	9.3^{a}
P		0.07	0.7	0.02	0.08	0.06	0.04	0.12
Sex								
Female	406	26.7^{a}	65.4^{a}	69.1±^{a}	57.3^{a}	18.3^{a}	18.4^{a}	9.3^{a}
Male	194	28.3^{b}	67.2^{b}	70.5^{b}	59.1^{b}	18.3^{a}	19.4^{b}	9.2^{a}
P		0.02	0.01	0.03	0.04	0.21	0.02	0.03
Age								
1 PPI	199	25.7^{a}	63.6^{a}	67.8^{a}	56.3^{a}	17.5^{b}	17.4^{a}	8.9^{b}
2 PPI	145	27.2^{b}	65.7^{b}	69.4^{b}	57.6^{b}	18.2^{b}	18.3^{b}	9.3^{a}
3 PPI	119	28.4^{c}	67.1^{c}	71.8^{c}	58.9^{c}	18.4^{b}	18.9^{c}	9.3^{a}
≥4 PPI	137	30.5^{d}	68.9^{d}	72.8^{d}	60.1^{d}	19.2^{a}	20.9^{d}	9.5^{a}
P		0.01	0.001	0.002	0.003	0.04	0.02	0.05
Age sex								
1PPI*f	118	24.7^{e}	62.2^{e}	66.7^{e}	55.3^{d}	17.6^{cd}	17.1^{c}	8.9^{b}
2PPI*f	90	25.9^{d}	65.4^{d}	68.2^{d}	56.6^{c}	18.1^{bcd}	18.3^{d}	9.3^{a}
3PPI*f	84	28.0^{b}	66.7^{c}	70.4^{c}	58.5^{b}	18.4^{b}	18.7^{cd}	9.3^{a}
4PPI*f	114	28.4^{b}	67.4^{b}	71.1^{bc}	58.9^{b}	19.2^{a}	19.4^{b}	9.4^{a}
1PPI*m	81	26.7^{c}	64.9^{c}	68.9^{d}	57.6^{c}	17.4^{d}	17.6^{c}	9.1^{ab}
2PPI*m	55	28.5^{b}	66.0^{bc}	70.7^{bc}	58.5^{b}	18.2^{bcd}	18.3^{d}	9.3^{a}
3PPI*m	35	28.8^{b}	67.5^{b}	71.9^{b}	59.4^{b}	18.4^{abc}	19.1^{bc}	9.3^{a}
4PPI*m	23	32.5^{e}	70.3^{a}	74.7^{a}	61.3^{a}	19.1^{ab}	22.4^{a}	9.6^{a}
P		0.03	0.02	0.01	0.04	0.03	0.02	0.05

N= Number of observations; Means with different superscript letters within the same column and class are statistically different; NS = Non -significant; *=Significant at p <0.05; PPI = Pair of permanent incisors f=female; m=male, BW is measured in kg and other linear body measurements in cm

Sex by Age Group: The interaction between sex and age group is significantly ($p<0.05$) affected body weight and most of the body measurements of Black head Somali sheep. The same result was reported by Wossenie [18] on Harerge high land sheep. The value of body weight for female at age group III and age group IV was similar with male of age group II and age group III. This indicates that males are larger in body weight and other body measurements than female of similar age group. In males body weight and most of the body measurements increase from age group I to age group IV. Rams in age group I (1PPI), age group II (2PPI), age group III (3PPI) and age group IV (4PPI) were heavier ($p <0.05$) than ewes in the same age groups. Body weight of rams in age group I (26.7kg) in the current study was higher than body weight of Dawuro and Konta rams (21.4 kg) in the same age group and body weight value of ewes in age group I of current study (24.7 kg) is higher than body weight values of Dawuro and Konta ewes in the same age group [19] and the same age group reported by Tesfaye [12] for Menz ewes (19.1 kg). Body weight of ewes in age group II (25.9 kg) age group III (28.0 kg) and age group IV (28.4 kg) in the current study is lower than body weight of Kaffa and Benchmaji ewes in age group II (29.3 kg) age group III (30.3 kg) and age group IV (33.3 kg) [20].

Correlation Between Body Weight and Body Measurements: The correlation coefficient among body weight and body measurement is presented in the Table 3. The strong correlation between heart girth and body weight were observed on black head Somali sheep in female (0.91) and in male (0.88). Moderate correlation of body weight was observed with wither height and body length in male and female black head Somali sheep. Scrotal circumference, rump height, tail length and pelvic width have mild correlation with body weight. The correlation among different body measurement was significant ($P<0.05$) except the correlation of pelvic width and tail length in males. The strong correlation of heart girth with body weight than other body measurements agree with the report of Fikrte [2], Tesfaye [12] and Bosenu [17] and it indicates that chest girth is the best variable for predicting live weight than other measurements. In present study the correlation coefficient of wither

Table 3: Pearson's correlation coefficients of quantitative traits of females (above) and males (bellow) the diagonal

Variables	BW	BL	HG	WH	PW	TL	RH	SC
BW		1	0.51*	0.91*	0.64*	0.24*	0.12*	0.19*
BL	0.55*	1		0.52*	0.52*	0.29*	0.19*	0.47*
HG	0.88*	0.53*	1	0.59*	0.25*	0.17*	0.28*	
WH	0.51*	0.40*	0.45*	1	0.33*	0.15*	0.43*	
PW	0.38*	0.37*	0.35*	0.21*	1	0.07*	0.27*	
TL	0.31*	0.37*	0.38*	0.27*	0.17 ns	1	0.16*	
RH	0.25*	0.45*	0.33	0.41*	0.37*	0.22*	1	
SC	0.42*	0.15*	0.24*	0.39*	0.02*	0.28*	0.13*	1

NS= Non-significant (P<0.05); * significant at 0.05 level BW= Body weight; BL=Body Length; HG= Heart girth; WH= Wither height; PW=pelvic width; TL= Tail Length, RH=rump height and SC=scrotal circumference

height (0.64) in female, (0.51) in male and body length (0.51) in female and (0.55) in male black head Somali sheep were the body measurements next to chest girth to estimate the live weight of this sheep.

CONCLUSION

Majority of the sheep had patchy coat color pattern, fat rumped tail type, white body with black head coat color type; wattle was present in majority of the sheep; flat and concave were mostly observed head profile. Sex of animals had significant effect on body weight and most of the body measurements (P<0.05). Most of the body measurements are larger in ram than ewe. The trend in most of the body measurements increased with increase in dentition class up to the third dentition then after shows slight increment or remains as it is. Body weight of BHS sheep is highly correlated with chest girth in female and in male. Most of the body measurement and body weight are correlated significantly except the pelvic width and tail length. Genetic and molecular characterization of this sheep breed should be investigated to evaluate their adaptation traits in the harsh environmental condition, feed shortage and watering problem of the study area.

ACKNOWLEDGMENTS

The authors would like to thank sheep owners in Gode and Adadile district for on condition that they are participated while the data are collected. We would also like to appreciate the study communities, district experts and zone experts, who have participated while the data are collected in the study area.

REFERENCES

1. Markos, T., 2006. Productivity and health of indigenous sheep breeds and crossbreds in the central Ethiopian highlands. PhD Thesis, Swedish University, Uppsala, Sweden, pp: 150.
2. Fikrte, F., 2008. On-farm characterization of Blackhead Somali sheep breed and its production system in Shinile and Erer districts of Shinile zone. MSc Thesis, Haramaya University, Dire Dawa, Ethiopia, pp: 40-45.
3. Workneh, A. and J. Rowlands, 2004. Design, excuetion and analysis of livestock breed survey in Oromia Regional state, Ethiopia. International Livestock Research Institute (ILRI). Nairobi, Kenya, pp: 260.
4. CSA, 2011. (Central Statistical Authority). Agricultural Sample Survey, Statistical Bulletin, Addis Ababa, Ethiopia.
5. FAO, 2011. (Food and Agricultural Organization of United Nation). Draft guidelines on phenotypic characterization of Animal genetic Resources. Commission on Genetic Resources for Food and Agriculture the Tenth Regular Session, pp: 59.
6. Wilson, R.T. and J.W. Durkin, 1984. Age at permanent incisor eruption in indigenous goats and sheep in semi-arid Africa. Journal of Livestock Production Science, 11(4): 451-455.
7. Gubitz, T., R.S. Thorpe and A. Malhotra, 2000. Phylogeographic and natural selection in the Tenerife gecko Tarentola delalandii: testing historical and adaptive hypotheses. Molecular Ecology, 9(1): 213-221.
8. Markos, T., A. Workeneh, A. Kassahun, E. Ewnetu and J.E.O. Rege, 2004. On-station characterization of indigenous Menz and Horro sheep breeds in the central highlands of Ethiopia. AGRI, 35: 61-74.
9. Sowande, O.S. and O.S. Sobola, 2007. Body measurements of West African dwarf sheep as parameters for estimation of live weight. Tropical Animal Health Production. DOI, 10.1007.
10. Solomon, A., 2004. Bonga Sheep: A strain of Horro sheep or a different breed (Short Communication). Ethiopian Journal of Animal Production, 4(1): 89-92.

11. Zewdu, E., 2008. Characterization of Bonga and Horro Indigenous Sheep Breeds of Smallholders for Designing Community Based Breeding Strategies in Ethiopia. An M.Sc. Thesis submitted to the School of Graduate Studies of Haramaya University, Dire MSc Thesis, Haramaya University, Dire Dawa, Ethiopia. pp: 50-70.
12. Tesfaye, G., 2008. Characterization of Menz and Afar Indigenous Sheep Breeds of Smallholders and Pastoralists for Designing Community-Based Breeding Strategies in Ethiopia. MSc Thesis, Haramaya University, Dire Dawa, Ethiopia, pp: 65-66.
13. Sisay, L., 2002. Phenotypic classification and description of indigenous sheep types in the Amhara national regional state of Ethiopia. MSc Thesis, University of Natal, Pietermaritzburg, South Africa. pp: 104.
14. Mengistie, T., 2008. On-farm performances of Washera sheep at Yilmanadensa and Quarit districts of the Amhara National Regional State. MSc Thesis, Hawssa University, Ethiopia. pp: 62.
15. Mekasha, Y., 2007. Reproductive traits in Ethiopian male goats, with special reference to breed and nutrition. PhD Thesis, Swedish University, Uppsala, Sweden, pp: 70.
16. Fasae, O.A., A.C. Chineke and J.A. Alokan, 2006. Relationship between some Physical Parameters of Grazing Yankasa Ewes in the Humid Zone of Nigeria. MSc Thesis, Abeokuta University, Nigeria, pp: 105.
17. Bosenu, A., 2012. On-Farm Phenotypic Characterization of Indigenous Sheep and Husbandry Practices in Selale Area, Oromia Regional State, Ethiopia. MSc Thesis, Haramaya University, Dire Dawa, Ethiopia, pp: 44-50.
18. Wossenie, S., 2012. On-Farm Phenotypic Characterization of Hararghe Highland Sheep and Their Production Practices in Eastern Hararghe, Ethiopia. MSc Thesis, Haramaya University, Dire Dawa, Ethiopia, pp: 47.
19. Amelmal, A., 2011. Phenotypic Characterization of Indigenous Sheep Types of Dawuro Zone and Konta Special Woreda of SNNPR, Ethiopia. MSc Thesis, Haramaya University, Dire Dawa, Ethiopia, pp: 34-39.
20. Dejene, A., 2010. Phenotypic characterization of indigenous sheep types in Kaffa and Bench-Maji zones of Southern Nations Nationalities and Peoples Region. MSc Thesis, Haramaya University, Dire Dawa, Ethiopia, pp; 44-50.