International Journal of Agriculture and Environmental Research

ISSN: 2455-6939

Volume:02, Issue:02

COMPARATIVE POST WEANING GROWTH PERFORMANCE AND SEXUAL BEHAVIOR TRAIT EVALUATION OF CROSSBRED SHEEP UNDER DIFFERENT NUTRITIONAL MANAGEMENT

Genet Berhe[1], Yoseph Mekasha[2], Mengistu Urge[3]

[1,3] School of Animal and Range Sciences, Haramaya University, Ethiopia
[2] International Livestock Research Institute Directorate, Hawassa Ethiopia

ABSTRACT

An experiment was conducted to compare post-weaning growth performance and sexual behavioral traits of two crossbred female sheep at different nutritional management (grazing + concentrate supplementation at 0.9% of body weight [N1] and grazing + concentrate supplementation at 1.5% body weight [N2])). Concentrate mixture was prepared from wheat bran and noug seed cake at a ratio of 2:1. The experiment was laid out similarly as 2×2 factorial arrangement using Completely Randomized Design(CRD). The number of animals included in the experiment was twenty four. The mean initial body weight for Black Head Ogaden*Dorper and Hararghe Highland*Dorper sheep was 20.60±2.76kg (mean±se), and 19.14±0.62kg (mean ±se), respectively. From this research the following results was found. Nutrition has a significant effect on average daily body weight gain($p<0.01$). Crossbred sheep fed N2 had significantly higher value of average daily body weight gain 81.6 ±4.27) than N1 (66.66 ±3.14). Breed had a significant effect on Body condition(BC), Heart Girth(HG) and Body weight(BW) of sheep ($P<0.05$). BHO*Dorper sheep had higher BC (3.5±0.1), HG (71.73±0.7) and BW (29.3±0.7) than HH*Dorper sheep BC(3.1±0.1), HG(69.04±0.8) and BW(27.0±0.8). Correlation coefficients(r) between body weight and other linear body measurements (r=0.93) for Black Head Ogaden*Dorper and (r=0.91) for Hararghe Highland*Dorper sheep. To predict body weight from other linear body measurements, heart girth was found to be the best predictor. Nutrition had a significant effect on percent of sniffing ($p < 0.05$). But, the other remaining traits of sexual behavior between genotypes were not significantly different ($p> 0.05$). Crossbred sheep which had been fed high level of nutrition had high value of % sniffing than low level of

ISSN: 2455-6939

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nutrition. This may be due to the growth of sex hormones that stimulates sexual behavior of the experimental animals.

Keywords: body condition, body weight, , heart girth, performance, weight gain

INTRODUCTION

Most of the developing countries of the world are found in the tropics (Balls, 2003). These countries are currently experiencing high increase in human population, dramatic urbanization, moniterization of economics and income change (Winrock, 1992; Peters, 1992). Thus, the major issues to be addressed for these countries include reduction of under nutrition, enhancing food security, combating poverty and achieving agricultural growth that would contribute to overall economic development and environmental protection (FAO, 1995; Pelant *et al*, 1999). Tropical areas are endowed with a wide variety of indigenous small ruminant breeds that have evolved to adapt to the prevailing harsh environmental conditions and traditional husbandry systems (Baker and Rege, 1994; Lebbie and Ramsay, 1999). However, indigenous tropical small ruminants have low genetic potential for functional traits. Due to this reason tropical countries devised strategies to improve the productivity of indigenous small ruminants, especially sheep which crossbreeding with improved genotype had been recommended (Kiwuwa, 1992; Baker and Gray, 2003). Thus, crossbreeds are expected to have higher vigor and better performance compared to local breeds. On-station research conducted on crossbreeding of indigenous sheep with improved exotic genotype revealed increased body weight (Sisay *et al*., 1989; Demeke *et al*., 1995; Solomon, 2002). Consequently, Ethiopia had imported few improved temperate breeds such as Awassi, Hampshire, Corriedale and Dorper for crossbreeding with indigenous breeds. Even though, the performance of F1 crossbreds was high under on-station improved management, they were as good as purebreds under low-input conditions (Ayalew, 2000; Hassen *et al*., 2002). Among these, the Dorper is able to withstand dehydration and quickly replenish body weight losses when water becomes available (Degen and Kam, 1992). This capacity of Dorper sheep enables it to adapt to drier regions where the availability of water proves to be a limitation. The breed also adapts to temperate regions, and has been extensively used in accelerated mating systems (Basson *et al*., 1969; Manyuchi *et al*., 1991; Schoeman and Burger, 1992). Dorper and Dorper crossbreds are present in all the above average sheep farms in Zambia (Stafford and Hansson, 1991). Dorper sheep, which is widely distributed in African countries and well recognized as meat type, has been selected and imported for crossbreeding endeavors. It is believed that such kind of technological interventions become effective if supported with appropriate management and provided as a package (Singh and Acharya, 1981). *Therefore, the current objective of this study was to evaluate post-weaning growth performance and traits of sexual behaviour of*

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Black Head Ogaden×Dorper and Hararghe Highland × Dorper crossbred ewe under different nutritional management.

MATERIALS AND METHODS

The Study Area

The experiment was conducted at Haramaya University Sheep Farm. Haramaya University is located 515 km east of Addis Ababa, at latitude of 9^{o} N and longitude of 42^{o} E. The site is situated at 1950 meter above sea level and has a mean annual rainfall of 790 mm and a mean annual temperature of 16ºC (Mishra *et al.,* 2004).

Experimental animals and management

Before the beginning of the actual experiment, sheep house was cleaned and disinfected. The experimental pens, feeding and watering troughs were also carefully cleaned. Water was provided at all times. Supplementary feed was offered (every day at 04:30 p.m) after grazing throughout the experimental period. The experimental animals were randomly assigned to the two nutritional levels (0.9% and 1.5% of their body weight of concentrate supplementation). The experiment was started in October and lasted in May. All of the animals were routinely checked for any health problems and vaccinated against common diseases as well as dewormed and sprayed against internal and external parasites in the area every month.

Experimental Design, Treatments and Feeding Management

In the study experiments was laid out in 2×2 factorial arrangement (two level of nutrition and two types of breed) using Completely Randomized Design (CRD). The number of animals included was twenty four (four treatment × six animals) with an average age of 6-8 month. The mean initial body weight was 20.60±2.76kg (mean±se), and 19.14±0.62kg (mean ±se) for crossbred of Dorper×Black Head Ogaden and Dorper× Hararghe highland sheep, respectively. The experimental animals were allowed to graze for 8 hours per day. In addition to this, animals were supplemented 0.9% and 1.5% of their body weight concentrate feed (mixture of wheat bran [66%], noug seed cake [33%] and salt [1%]). Concentrate feed offered was adjusted based on live body weight gain at every interval of 10 days. The treatment combination for the experiments was describe in table 1.

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Table .1 Treatment combinations

Breed	Nutrition(Diet)	Breed× Nutrition
BHO* Dorper Crossbred	Concentrate Supp. at 0.9% BW [N1]	T1
BHO*Dorper Crossbred	Concentrate Supp. at 1.5%BW [N2]	T2
HH*Dorper Crossbred	Concentrate Supp. at 0.9%BW [N1]	T3
HH*Dorper Crossbred	Concentrate Supp. at 1.5%BW [N2]	T4

BHO =Black Head Ogaden sheep; HH = Hararghe Highland sheep

Data Collection and Measurements

Post-weaning growth performance of ewes

Live weight of ewe was recorded at 10 days interval, at 8:00 hrs in the morning before feeding throughout the experimental period. Average daily body weight gain (ADG) was calculated as the difference between final live weight and initial live weight divided by the number of days of the feeding trial as described by Malau-Aduli *et al*. (2004).

$$ADG = \frac{(WF\text{-}WI) \times 1000}{D}$$

Where: ADG *g* = Average daily body weight gain (gm); WI *kg* = Initial body weight; WF *kg* = Final body weight and D = number of days from starting to the end of the experiment (190), but if the number of days of the experimental period is long (above 90 days) a regression analysis was used by entering the data from initial until end of the experiment, if the data is available. So, this is done by using regression analysis. Body condition was evaluated subjectively using the five point scale (ranging from 1=very thin, 2=thin, 3=average, 4=fat, 5=very fat/obese) Hassamo *et a*l. (1986). Sets of measurements were taken for the body measurements; Body length (BL), Rump height (RH), Wither height (WH), Heart girth (HG), Chest depth (CD), Forecanone length (FL) and Fore canone circumference (FC).Most of these linear body measurements are measured using tailor measuring tape. Rump height, chest depth and wither height is measured by using a metal measuring tape.

Sexual behavior traits of ewe crossbreeds

To observe sexual behaviour of female sheep, rams were introduced to the experimental ewes at the ratio of 1 ram: 24 ewes after covering of the genital part of the body by leather material.

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Ewes and rams were kept together in a paddock for forty minute twice a day during the experimental period (morning at 8:00 O'clock and evening at 11:30). After introduction of the ram, ewes were closely monitored for manifestation of behavioral estrus at least for 30 minute. All the activities of ewes were recorded immediately. Each ewe was considered to be in estrus when she was directly observed to accept a mount from a ram (Romano *et al*. 2000)

Chemical analysis of feeds

Chemical analysis of concentrates and natural pasture were carried out at Haramaya University animal nutrition laboratory. The grasses, mostly dominated by *Hypernia rufa*, were harvested by using 1m×1m quadrant at the ground level. From each quadrant fresh weight of harvested samples was taken immediately by using a sensitive balance. For further chemical analysis, a composite sample was taken from the bulk samples. Part of the sample was dried in a forced draft oven at 105 ^{O}C overnight for dry matter determination. The other part of the samples was dried at 60^{O}C to a constant weight for chemical analysis. Oven dried feed samples were thoroughly mixed by feed type and ground to pass through 1 mm sieve size. The sample of feed offered was analyzed for DM, Ash and nitrogen according to the procedure AOAC (1990). Nitrogen (N) content of the feed was determined by Kjeldahl method and crude protein was estimated as N×6.25. The neutral detergent fiber (NDF), acid detergent fiber (ADF), acid detergent lignin (ADL) contents were analyzed according to the procedure of Van Soest *et al.* (1991)

Statistical Analysis

The experiments on post weaning growth and sexual behavioral traits performance of crossbred sheep were laid out in a 2×2 factorial arrangement with two levels of breed group (BHO*Dorper and HH*Dorper) and two levels of nutrition (concentrate supplementation at 0.9% and 1.5% of the live body weight). These data were analyzed using the General Linear Model (GLM) procedure in Statistical Analysis System (SAS, 2003). The models used for analysis of the data sets are described here under. *Model 1. Postweaning growth performance of females and sexual behavior of female sheep*

$y_{ijkl} = \mu + b_i + f_j + (b \times f)_{ij} + e_{ijk}$

Where:

y_{ijkl} = Body weight and linear body measurements

μ = Overall Mean

b_j = fixed effect of the **j**th breed (i = BHO×Dorper, HH×Dorper)

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f_j = fixed effect of the **j**th level of nutrition (grazing + concentrate supp either at 0.9% or 1.5%)

$(b\times f)_{ij}$= the fixed effect of the interaction of **i**thbreed type and **j**th nutrition

e_{ijk} = random error

RESULTS AND DISCUSSION

Chemical Composition of Experimental Feeds

Chemical composition of the experimental feeds is presented in Table 2. The CP content of noug seed cake to 30.9 and 30.4 reported by Belay (2008) and Temesgen (1995) respectively. The CP content of wheat bran was close to the value of 16.5% reported by Solomon *et al (*2004), 16.4% reported by Tekeba (2005) and 16.7% reported by Zemichael (2007). The CP content of the mixture of noug seed cake and wheat bran was in between the values recorded for noug seed cake and wheat bran. This is comparable to 23.6 % reported by Belay (2008) but higher than 21.95% reported by Tesfaye (2009). The ADF content of noug seed cake was with 29.7% reported by Zewdie (2010). The NDF content of noug seed cake was found to be 34%. This result is comparable with 33.1% reported by Zewdie (2010). The ADL content of the mixture of noug seed cake and wheat bran was 5.48%. This is comparable to 5.8% reported by Tesfaye (2009). The NDF and ADF content of wheat bran was agreement with Fentie (2007) who reported 44.15% and 12.4% of NDF and ADF, respectively. In this study attempt was also made to monitor chemical composition of the natural pasture used for grazing purpose. Thus, during spring (short rainy season) the fiber composition (NDF and ADF) of the pasture was low as compared to the dry season. On the other hand, the composition of crude protein (10%) was higher during the rainy season and lower during the dry spell (6.32%). This shows that the natural pasture used for grazing in the current study is sufficient to maintain body weight of the animals only during the short rainy season. However, to maximize production and exploit the genetic potential of improved genotypes, differential level of supplementation with better nutrients is necessary across the different seasons of the year.

Table.2. Chemical Composition of the experimental feeds

Item (DM%)	**Agro-industrialbyproducts**			**Pasture harvested at different seasons**		
	WB	NSC	WB + NSC	Earl dry season	Dry season	Short rainy season
DM	91	94	92.2	92	91.5	92
ASH	4.6	9	8.5	11.1	8.7	8.6
ADF	14	28	20.4	51.5	54	47.8
NDF	44	34.5	39	82.5	83	78.5

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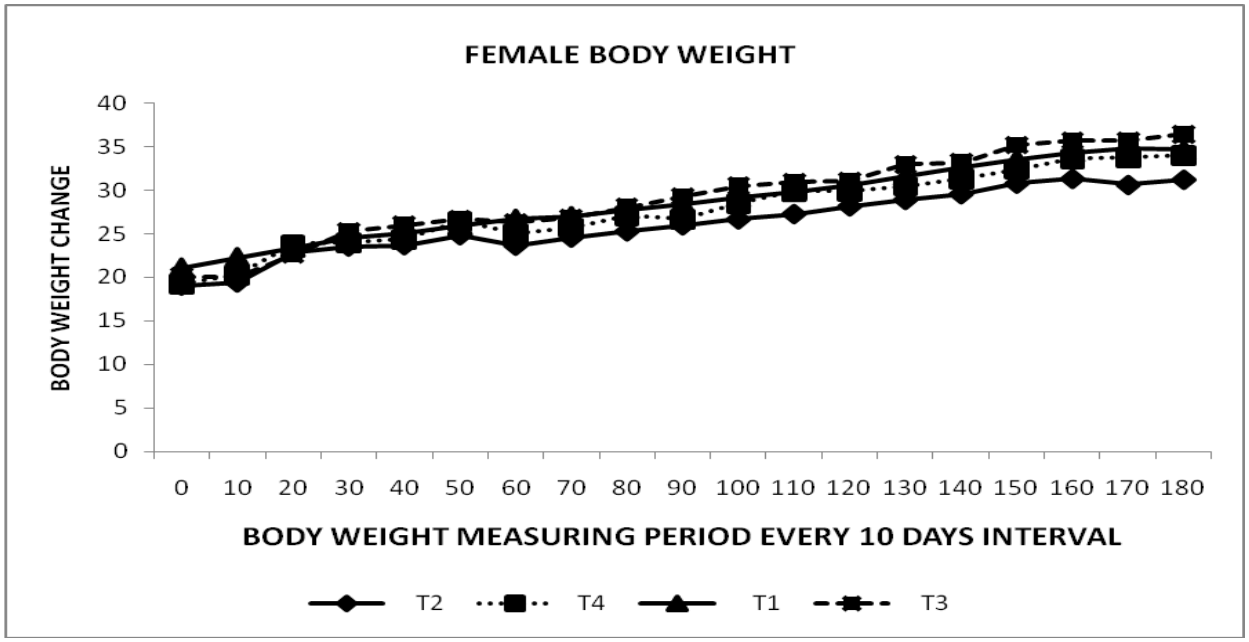
ADL	4	10.4	5.8	9	9.6	8.5
CP	16.9	29.6	23.5	5.4	6.3	10

DM=dry matter, ADF= acid detergent fiber, NDF= neutral detergent lignin, ADL=acid detergent lignin, CP= crude protein, NSC= Nouge Seed Cake, WB=Wheat Bran

Post weaning growth performance of crossbred sheep

Post- weaning average daily weight gain

Mean initial and final body weight and average daily body weight gain of Dorper*HH and Dorper*BHO sheep is presented in Table 2. Nutrition had a significant effect ($p<0.01$) on average daily weight gain of male and female crossbred sheep. Thus, animals, which were supplemented high level of nutrition had significantly higher value of average daily body weight gain (81.6 ±4.27) than animals maintained on low level of nutrition (66.66 ±3.14). Abule *et al*. (1998) reported that native goats supplemented with concentrate mixture (comprising of 69% wheat bran, 30% noug Cake and 1% salt) were able to grow by 71.8 g/d. Further, as expected, in this study ADg reported was larger than what has been reported for indigenous Menz (60.7±1.5 g/day) and Horro (60.3 ± 1.9 g/day) sheep grazing on native pasture and supplemented with concentrate at 150-200 g/d (Ewnetu, 1999). Body weight change of female crossbred sheep is shown in Figures 1. Body weight increased as feeding period advanced for all breed and nutrition combinations.



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T1=BHO*Dorper + Concentrate Supp at 0.9% BW; T2= BHO*Dorper + Concentrate supplementation at 1.5% BW; T3=HH*Dorper + concentrate supplementation at 0.9% BW; T4=HH*Dorper+concentrate supplementation at 1.5% BW

Figure1. Body weight change of female BHO*Dorper and HH*Dorper supplemented with concentrate at either 0.9% or 1.5% of body weight.

Table.3.Effect of breed, nutrition and their interaction on body weight change of ewes

N1=low level of nutrition, N2=high level of nutritionT1=Black head ogaden *Dorper fed low level of nutrition,

T2=Hararghe highland fed low level of nutrition, T3=Black head ogaden*Dorper fed high level of nutrition

Variables	IWT (Means ± se)	FWT (Means ±se)	ADG (Means ±se)
BREED	Ns	Ns	Ns
BHO*Dorper	20.60 ±2.76	35.53 ± 0.86	79.36 ± 4.20
HH*Dorper	19.14 ± 0.62	32.65 ± 1.09	70.38 ±4.11
NUTRITION	Ns	Ns	*
N1(low)	19.91±0.49	32.63 ±0.92	66.66^{b} ±3.14
N2(high)	19.58 ±0.95	35.06±1.18	81.6^{a} ±4.27
BREED*NUTRT(T)	Ns	Ns	Ns
T1(BHO*Dorper on N1)	21.10 ± 0.60	34.60± 0.75	69.5 ±4.44
T2(HH*Dorper on N1)	19.07 ± 0.57	31.22±1.28	64.66 ±4.26
T3(BHO*Dorper on N2)	20.10 ±1.72	36.46 ± 1.53	89.27 ± 5.60
T4(HH*Dorper on N2)	19.21 ± 1.17	34.07± 1.70	76.1±6.17

T4=Hararghe highland *Dorper fed high level of nutrition, N1=low level of nutrition, N2=high level of nutrition, B=Black Head Ogaden *Dorper, H=Hararghe highland *Dorper

Live body weight, body condition and linear Measurements

The body weight and linear body measurements of Hararghe Highland*Dorper and Black Head Ogaden*Dorper sheep at different nutritional level are presented in Table 4. Breed had also a significant effect ($p<0.05$) on body condition, body weight and heart girth. Black Head Ogaden*Dorper sheep had significantly higher value of body condition, heart girth and body weight than crossbred of Hararghe Highland*Dorper sheep. The two crossbreeds did not differ significantly ($p>0.05$) in other linear body measurements except the traits mentioned above.

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Table.4. Effect of breed and nutrition on body weight and other linear body measurements of crossbred ewes

Variables	PARAMETERS									
	BW	BL	BC	HG	HAT	CD	RH	HIW	FC	FL
BREED	*	**Ns**	*	*	Ns	Ns	Ns	**	ns	ns
B	29.3[a]±0.7	62.78±0.54	3.5[a] ±0.1	71.73[a]±0.7	55.98±0.20	24.4±0.3	59±0.5	11.27±0.2[a]	7.31±0.1	11.9±0.09
H	27.0[b] ±0.8	61.09±0.61	3.1[b]±0.1	69.04[b]±0.8	55.29±0.14	23.8±0.3	58.7±0.4	10.54±0.1[b]	7.08±0.1	11.9±0.07
NUT	**Ns**	**Ns**	**Ns**	Ns	Ns	Ns		Ns	ns	ns
N1	27.06±0.8	61.9±0.8	3.3±0.12	70.18±1.1	55.1±0.6	24±0.3	58.5±0.5	10.8±0.22	7.18±0.1	11.9±0.09
N2	28.72±0.8	61.7±0.5	3.3±0.12	70.14±0.8	56.2±0.4	24±0.3	59.1±0.3	10.8±0.17	7.17±0.1	12.02±0.07
BRE*NUT	**Ns**	**Ns**	**Ns**	Ns	Ns	Ns	Ns	Ns	ns	Ns
T1	28.98±0.5	63.5±0.6	3.58 ±0.14	72.67±0.7	56±1	24.8±0.3	59.18±0.92	11.3±0.3	7.4±0.11	11.9±0.16
T2	25.46±1.1	60.5±1.1	3.13±0.16	68.11±1.5	54.3±0.6	23.4±0.5	57.91±0.71	10.3±0.2	7.19±0.15	11.8±0.1
T3	29.61±1.5	62±0.7	3.51±0.18	70.79±1.2	55.9±0.5	24.06±0.4	58.87±0.65	11.1±0.3	6.98±0.09	11.9±0.11
T4	28.15±1.0	61.5±0.6	3.16±0.14	69.74±1	56.4±0.6	24.1±0.4	59.33±0.38	10.6±0.1	7.15±0.15	12.04±0.09

T1=Black head ogaden *Dorper sheep fed low level of nutrition, T2=Hararghe highland fed low level of nutrition, T3= Black head ogaden *Dorper sheep fed high level of nutrition, T4=Hararghe highland *Dorper fed high level of nutrition, N1=low level of nutrition, N2=high level of nutrition, B=black head ogaden*Dorper,HH=Hararghehighland*Dorper,NUT=nutrition

Relationship between body weight and other body measurements

Correlation coefficients (r) obtained among live weight and other body measurements of Black Head Ogaden*Dorper and Hararghe Highland *Dorper sheep is presented in Table 5. Correlation coefficients between body weight and other body measurements estimated for crossbreds of Black Head Ogaden and Hararghe Highland sheep were positive and highly significant ($p<0.001$). This result is comparable with the result of Khan *et al*., 20006; Solomon, 2008; the high correlation coefficient among different body measurements and body weight would imply that these measurements can be used as indirect selection criteria to improve live weight. The high correlation coefficient recorded for body weight and other body measurements in the present study suggests that either of these variables or their combination could provide a good estimate for predicting live weight of Black Head Ogaden*Dorper and Hararghe

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Highland*Dorper sheep. The two Crossbreed sheep body weight can be estimated from heart girth (Black Head Ogaden*Dorper, r=0.93 and Hararghe*Dorper, r=0.91) but numerically correlation coefficient in Black Head Ogaden*Dorper is higher than Hararghe Highland*Dorper. Generally heart girth had consistently showed the highest correlation coefficient with body weight (r=0.93) crossbreds of Black Head Ogaden with Dorper sheep. The highest association between heart girth and body weight compared to other linear measurements was in agreement with earlier findings (Atta and EL Khidir, 2004; Thiruvenkanadan,2005; Afloyan, *et al*., 2006; Fassae *et al*., 2006; Solomon, 2008). This would imply that heart girth is the best variable for predicting live weight than other measurements.

Table.5. Correlation coefficients of body weight and linear body measurements for crossbreds of HH*Dorper (bellow diagonal) and BHO*Dorper (above diagonal)

B(F)	BW	BL	BC	HG	HAT	CD	RH	HIW	FC	FL
H(F)		***	***	***	***	***	***	***	***	***
W		0.88	0.6	0.93	0.75	0.86	0.76	0.74	0.84	0.64
BL	0.85		0.46	0.88	0.75	0.87	0.77	0.66	0.86	0.68
BC	0.49	0.36		0.6	0.43	0.52	0.39	0.46	0.47	0.34
HG	0.91	0.87	0.5		0.78	0.89	0.79	0.75	0.88	0.65
HAT	0.81	0.82	0.32	0.83		0.86	0.94	0.39	0.81	0.77
CD	0.87	0.8	0.39	0.92	0.86		0.85	0.56	0.87	0.73
RH	0.83	0.87	0.34	0.85	0.92	0.86		0.42	0.82	0.76
HIW	0.82	0.79	0.49	0.83	0.75	0.76	0.8		0.58	0.35
FC	0.76	0.7	0.46	0.72	0.66	0.69	0.68	0.65		0.72
FL	0.79	0.78	0.24	0.8	0.83	0.79	0.88	0.73	0.65	

B=BHO*Dorper, H=HH*Dorper, BC=body condition, HG=heart girth, BL=body length, HAT=wither height, CD= chest depth, RH=rump height, W=body weight, HIW= hip width, FC= fore canone circumference, FL=fore canone length

Prediction of body weight from other body measurements

In order to predict body weight from linear measurements, stepwise multiple regressions was carried out where other body measurements were added, one at time, to heart girth. In estimation of body weight from body measurements in female sheep nine body measurements were utilized. The independent parameters or regressors were body length, wither height, heart girth, rump height, chest depth, canone circumfrence, canone length, hip width, body condition. The coefficient of determination (R^2) indicated that heart girth succeeded in describing more variation in body weight than other linear body measurements in both crossbreds of BHO and HH with Dorper sheep. It was more important than other linear body measurements to predict body weight. Therefore, in both of the two breeds, live body weight could be fairly estimated from heart girth measurements. In both breeds, second to heart girth, body length was more

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precisely predicted body weight. The better association of body weight with heart girth was possibly due to relatively larger contribution to body weight of heart girth which consists of bones, muscles and viscera (Thiruvenkadan, 2005). To predict body weight using heart girth, the following regression equations were suggested for each breed For female crossbred of Black Head Ogaden and Dorper sheep,

$$y = -47.67 + 1.07x$$

For female crossbreds of Hararghe Highland and Dorper sheep,

$$y = -38.25 + 0.95x$$

Where y and x are body weight and heart girth, respectively.

Table.6 .Prediction of body weight from other linear body measurements crossbred (HH* Dorper) sheep

Equation BHO*Dorper	Inter	Parameter										
a + βx	A	β_1	β_2	β_3	β_4	β_5	β_6	β_7	β_8	β_9	R^2	MSE
HG	-47.67	1.07									0.80	2.19
HG+BL	-49.2	0.78	0.35								0.81	2.1
HG+ BL+HAT	-52.38	0.71	0.3	0.19							0.82	2.08
HG +BL+HAT+CD	-51.99	0.71	0.3	0.18	0.04						0.82	2.09
HG +BL+HAT+CD +RH	-51.95	0.71	0.3	0.19	0.04	-0.02					0.82	2.1
HG +BL+HAT+CD +RH + HIW	-53.8	0.41	0.23	0.31	0.20	0.04	1.24				0.83	2.01
HG +BL+HAT+CD +RH + HIW +FC	-55.32	0.49	0.28	0.35	0.22	0.05	1.17	-1.42			0.84	1.99
HG +BL+HAT+CD +RH + HIW +FC + FL	-55.24	0.49	0.28	0.35	0.22	0.05	1.17	-1.41	-0.02		0.84	2
Female HH*Dorper												
HG	-38.25	0.95									0.84	1.91
HG+BL	-40.59	0.76	0.24								0.85	1.85
HG+ BL+HAT	-43.65	0.71	0.19	0.18							0.86	1.83
HG +BL+HAT+CD	-43.64	0.61	0.17	0.07	0.127						0.86	1.83
HG +BL+HAT+CD +RH	-44.91	0.7	0.16	0.08	-0.02	0.16					0.86	1.83
HG +BL+HAT+CD +RH + HIW	-43.19	0.6	0.13	0.08	0.10	0.08	0.84				0.86	1.80
HG +BL+HAT+CD +RH + HIW +FC	-44.76	0.53	0.07	0.07	0.13	0.06	0.76	1.67			0.87	1.71

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HG +BL+HAT+CD +RH + HIW +FC + FL	-45.81	0.51	0.07	0.05	0.13	0.02	0.77	1.63	0.70		0.88	1.7

Animal production depends on superior females and males whose andrological normality will have a major impact on the fertility of the flock (Mekasha et al., 2007). The result of sexual behavior of female BHO and Haraghe highland*Dorper sheep is shown in Table7. Nutrition had a significant effect on one of the sexual behaviors; sniffing ($p< 0.05$).Crossbred sheep which had been fed high level of nutrition had high value of % sniffing than low level of nutrition. This may be due to the growth of sex hormones that stimulates sexual behavior of the experimental animals. But, sexual behavior between genotypes were not significantly different ($p> 0.05$).

Table. 7.Effect of breed and nutrition on sexual behavior of female crossbred (BHO*Dorper and HH*Dorper) sheep

Variables	**Sexual Traits in Females**					
	NFS%	ANS%	TF%	FS%	SOL%	MO%
BREED	Ns	Ns	Ns	Ns	Ns	Ns
B	4.25±0.49	17.73 ±1.57	7.03±1.06	4.17±0.59	1.13 ±0.34	0.69 ± 0.4
H	4.89 ±0.58	18.75 ±2.14	5.7±1	3.66±0.81	1.92±0.31	1.55±0.34
NUTRITION	Ns	*	Ns	Ns	Ns	Ns
N1	4.99 ±0.67	15.06^{b}±1.69	7.16 ±1.16	4.41±0.94	1.3±0.36	0.94±0.31
N2	4.26 ± 0.42	21.59^{a}±1.80	5.35 ± 0.85	3.33±0.45	1.88 ±0.31	1.44±0.44
BREED*NUT(T)	Ns	Ns	Ns	Ns	Ns	Ns
T1(BN1)	4.51 ±0.88	16.86±2.71	7.29 ±1.61	4.51 ± 1	1.04 ± 0.63	0.17±0.17
T2(HN1)	5.33± 1.01	13.78±2.19	7.07 ±1.73	4.34±1.53	1.48 ± 0.45	1.48±0.45
T3(BN2)	3.99 ±0.52	18.6 ±1.83	6.77 ±1.56	3.8 ± 0.7	1.21 ± 0.34	1.21±0.75
T4(HN2)	4.46 ±0.64	23.72±2.61	4.34 ±0.85	2.97±0.59	2.35 ± 0.41	1.61±0.58

NSF= nonfirm standing, ANS=anogenital sniffing, TF=tail flapping, FS=firm standing, SOL=soliciting, MO=mounting of other animals, N1=low level of nutrition, N2=high level of nutrition, B=BHO*Dorper ,H=HH *dorper , NUT=nutrition,T1=BHO *Dorper fed low level of nutrition, T2=Hararghe highland fed low level of nutrition, T3= BHO*Dorper fed high level of nutrition, T4=Hararghe highland *Dorper fed high level of nutrition

CONCLUSION

This study was evaluated the effect of breed and nutrition on post weaning growth performance and sexual behaviour trait evaluation of crossbreed (BHO*Dorper and HH*Dorper) sheep. The two nutritional levels included supplementation with concentrate either at 0.9% or 1.5% of their body weight. Concentrates were composed of wheat bran and noug seed cake at a ratio of 2:1.

ISSN: 2455-6939

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The experiment were laid out in 2×2 factorial arrangement (two breeds of sheep and two levels of nutrition) using Completely Randomized Design (CRD). The number of animals included were twenty four (four treatment ×six replication). The mean initial body weight of the crossbred sheep was 20.60 ±2.76 kg (mean ± se) and 19.14±0.62 kg (mean±se) for Black Head Ogaden ×Dorper and Dorper×Hararghe highland sheep, respectively. The age of the animals ranges from 6-8 month. Evaluation of the post weaning growth performance of crossbred sheep showed that breed, nutrition and their interaction had no significant effect ($p > 0.05$) on initial and final body weight in both male and female crossbred sheep. Nutrition, however, had a significant effect ($p<0.05$) on ADg of crossbred sheep. Thus, crossbred sheep, which were supplemented with concentrate at 1.5% body weight had significantly higher ADg of 81.6±4.27 g/d, respectively, compared to their contemporaries supplemented with concentrate at 0.9% body weight (66.66±3.14). Breed had a significant effect on body weight, body condition and heart girth. Black head Ogaden*Dorper sheep had higher body condition (3.5 ±0.1) than Hararghe highland*Dorper sheep (3.1±0.1). The two breeds did not differ significantly ($p > 0.05$) in the other linear body measurements except measurements discussed above. Correlation coefficients between body weight and other measurements estimated for Black head Ogaden and Hararghe highland*Dorper sheep were positive and highly significant ($P<0.001$). Heart girth had consistently showed the highest correlation coefficient ($r=0.93$) for BHO*Dorper and for HH*Dorper ($r=0.91$) crossbreds. Based on this study, body weight could be better predicted using heart girth than other linear measurements as follows: $y= -47.67+1.07x$ for BHO*Dorper and $y= -38.25 + 0.95x$ for HH*Dorper sheep, where y and x are body weight and heart girth, respectively. Breed had a significant effect ($p<0.01$) on semen volume. In conclusion, this study demonstrated that Hararghe Highland*Dorper sheep showed better reproductive performance (in response of sexual behavior) than crossbreds of Black Head Ogaden *Dorper sheep. However, Black head Ogaden*Dorper sheep performed better in body weight, heart girth and body condition. Thus, it can be recommended that crossbred animals should be supplemented with concentrate at higher level of nutrition (1.5% of body weight) to exploit the genetic potential of the genotype and thereby target export market. However, under small holder farming system supplementation with 0.9% of the body weight could be used for moderate gain provided that the quality and biomass yield of the grazing pasture would be optimum.

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