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On Station Growth Performance of Crossbred Goats (Boer X Central Highland) at Sirinka, Ethiopia

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ABSTRACT

The study was conducted to evaluate the growth performance of Boer-Central Highland Goats (CHG) cross kids at Sirinka Agriculture Research Center SARC. A total of 510 kids were used for the analysis of least square mean of birth weight, weaning weight, six month weight and yearling weight. The overall least square mean of birth weight, weaning weight, six month weight and yearling weight were 2.68±0.02, 9.82±0.17, 13.54±0.20 and 19.53±0.38 kg, respectively. The body weight gained from birth to weaning, weaning to six month and birth to yearling were 78.67±1.53, 37.27±1.85 and 33.01±0.77 g day^{-1}. Birth type and year of birth of kids have significant effect on birth, weaning, six month and yearling weight. The birth and weaning weight of the present study had have higher than local breed of Abergelle, Central highland goats, Boran Somali and rift valley. When the age advanced to six month and yearling, the weight were comparable to central highland goats and little bit higher than Abergelle and Boran Somali. For future study, it will needs on farm and on station evaluation with better feeding management to see their genetic potential.

Key words: Growth performance, Boer-central highland goat cross, on station

INTRODUCTION

Livestock in Ethiopia is an important and integral component of agriculture and it provides the animal protein for the ever-growing human population. Goats in particular, have a great role in the economy of farming community of Ethiopia. Sale of goats and goat products (meat, skin and milk) by farming communities is the major source of cash and they are raised mostly to safeguard against crop failure and unfavorable crop prices in intensive cropping areas (Legesse, 2008).

Small ruminants are particularly vital livestock for supporting food security because of their high reproductive capacity and low initial investment suiting them for resource-poor farmers including landless youth and women. Productivity of indigenous goat is very low. This may be due to different factors such as poor nutrition, prevalence of diseases, lack of appropriate breed and breeding strategies. Thus intensification is required. Intensification of livestock production involves keeping small flocks of highly productive animals. In this regard, use of improved exotic breeds is an option advocated for long. There has been a recent introduction of highly productive meat breeds of Boer goat into Ethiopia.

Boer goat is considered to be one of the most desirable goat breeds for meat production (Lu, 2001). It has gained worldwide recognition for excellent body conformation, fast growing rate

and good carcass quality. Boer goats can improve productive performance of many indigenous breeds through cross breeding. Therefore, the objective of this experiment was to evaluate the growth performance of Boer-CHG crosses for improvement of local breed.

MATERIAL AND METHODS

Description of study area: The study was conducted at Sirinka Agricultural Research Center (SARC) which is located 508 km away from Addis Ababa. The site is located at an altitude of 1850 m.a.s.l and at 110°451' 0011" N and 390°361' 3611" E. The rainfall pattern is bimodal, with two-rainfall season, 'belg' (Feb./Mar.- April) and 'meher'(July-Sept.) and the mean annual rainfall amount is on average about 950 mm. The area is a moderate warm temperature zone with mean daily temperature range of 16-21°C.

Animal management: This study was performed in a period of 5 successive years from 2009 and 2013. Eighty nine local CHG were purchased in the nearby local markets and housed in the farm and exposed for two pure Boer bucks in 2008. Until now a total of 345 dams exposed to 7 pure Boer and two 50% Boer x CHG bucks and found a total of 510 kids. Natural controlled mating was used. Herding is based on age, sex and breeding groups.

The flocks were grazed in the farm grazing land for 7 h day^{-1} from 8:00-11:00 in the morning and from 14:00-16:00 in the afternoon. Pregnant does at late gestation, lactating doe's early lactation period and bucks were supplemented with concentrate mixture of 400 g/d/animal and cultivated forages. Newly born kids were kept together for 3-5 days with their mother then after kids were isolated and suckled three times per day at morning, midday and evening until weaning. After weaning male crossbred kids were indoor fed by using chopped grass hay as basal feed and supplemented concentrate mix (Noug cake and wheat bran) 200 g/d/kid and cultivated forages such as vetch and oat hay until they were distributed to farmers. Weaned female kids and non-pregnant does were raised on farm grazing land and crop after math for 7 h. The supplementation of the flock is not regular due to shortage of financial for purchased concentrate in time. During summer period, most of the time all flocks were fed indoor to prevent tick infestation. They had free access to drinking water. All flocks were dewormed and sprayed for internal and external parasites and vaccinated for common disease to the area regularly.

Data collection and statistical analysis: Growth data like Birth Weight (BWT), Weaning Weight (WWT), Six Month Weight (SMWT) and Yearling Weight (YWT) were recorded. Live weight of all kids was taken using the Salter scale capacity 50 kg and 200 g precision.

Data on growth performance was analyzed using the General Linear Model Procedures of Statistical Analysis System (SAS., 1999). The dependent growth variables; birth weight, weight at different age and growth rate were analyzed. The Least-Squares Means (LSM) and Standard Errors (SE) for growth traits in each level of the fixed factors were analyzed. Least square mean separation was done using Duncan.

The following model equation was used for statistical analysis:

$$Yijklm = \mu+YBi+Sj+BTk+EBl+eijklm$$

Where:

Yijklmn = The weights and ADG of the nth kid

μ = Overall mean

YB_{zi} = Effect of the ith year of kid birth (fixed effect)
Sj = Effect of the jth sex (fixed effect)
BTK = Effect of the kth kid birth type (fixed effect)
EBl = Effect of the lth kids exotic blood level (fixed effect)
eijklmn = Residual error

RESULT AND DISCUSSION

The overall least-squares mean of birth weight and weaning weight of 50 and 75% Boer X CHG kids were 2.68 and 9.82 kg, respectively as shown in Table 1. Birth type, sex and year of birth had a significant effect ($p<0.01$) on birth weight and weaning weight. Single born kids were, relatively heavier at birth and weaning than twins. There was significant difference ($p<0.05$) between male and female kids in weight from birth to weaning. However, males had higher body growth than females. The observed mean birth weight for crossbred kids in the present study was higher than 2.32 kg reported by Tesfaye *et al*. (2006) and 2.01±0.03 kg reported by Deribe and Taye (2013a) for Central Highland kids. It was also higher than reported value (2.34 kg) for Boran Somali and higher than the value of 1.5 kg for Mid Rift Valley kids (Tucho *et al*., 2000). The mean weaning weight of crossbred kids was higher than the value of 6.32 kg reported for Mid Rift Valley kids by Tucho *et al*. (2000), Abergelle kids (6.8 kg) by Deribe and Taye (2013a), Arsi Bale (8.4 kg) (Woldu *et al*., 2005), Boran Somali kids (7.2 kg) by Tucho *et al*. (2000) and Central Highland kids (9.02 and 6.72 kg) reported by Deribe and Taye (2013a) and Tesfaye *et al*. (2006).

Kids born in 2009 and 2011 have lower birth weight and weaning weight as shown in Table 1. This difference might be due to younger dams in 2009 and a critical feed shortage at the farm in 2011 which might have caused nutritional stress during late gestation period that might have resulted in loss of dams' body weight, induced retardation of fetal growth and reduced birth weight.

The overall least square mean of six month weight and yearling weight of Boer-CHG cross goats were 13.54±0.02 and 19.53±0.38 kg, respectively as shown the Table 2. Birth type and year of birth had significant effect ($p<0.001$) on six month weight and yearling weight. The least square mean weight of six month and yearling in the present study were comparable with 13.82±0.39 and 20.69±0.74 kg of central highland goats reported by Deribe and Taye (2013b) and 13.61±0.40 and

Table 1: Least square mean and standard error of birth weight and weaning weight of cross kids at Sirinka breeding evaluation and distribution site

Classes	No.	BW (kg) LSM±SE	No.	WWT (kg) LSM±SE
Over all	510	2.68±0.02	364	9.82±0.17
Birth type		***		***
Single	168	2.93±0.04[a]	126	11.40±0.26[a]
Twin	342	2.52±0.03[b]	238	8.59±0.22[b]
Sex		***		*
Female	278	2.65±0.03[b]	205	9.65±0.22[b]
Male	232	2.80±0.03[a]	159	10.34±0.24[a]
Blood level		ns		*
50	382	2.78±0.03	276	10.50±0.21[a]
75	128	2.67±0.05	88	9.48±0.35[b]
Year		***		***
2009	98	2.53±0.06[b]	82	8.99±0.38[b]
2010	122	2.84±0.05[a]	101	10.76±0.35[a]
2011	96	2.54±0.05[b]	60	8.15±0.37[b]
2012	85	2.91±0.05[a]	63	11.50±0.35[a]
2013	109	2.80±0.05[a]	58	10.56±0.39[a]

***: $p<0.001$, **: $p<0.01$, *: $p<0.05$, ns: Not significant, BW: Birth weight, WWT: Weaning weight, LSM: Least square mean and SE: Standard error

Table 2: Least square mean and standard error of six month weight and yearling weight of Boer X CHG goat cross at Sirinka site

Classes	No.	SMWT (kg) LSM±SE	No.	YWT (kg) LSM±SE
Over all	293	13.54±0.20	162	19.53±0.38
Birth type		***		***
Single	103	14.48±0.33^{a}	55	20.68±0.64^{a}
Twin	190	12.44±0.29^{b}	107	18.60±0.55^{b}
Sex		ns		ns
Female	171	13.20±0.28	116	19.20±0.52
Male	122	13.73±0.32	46	20.08±0.69
Blood level		*		ns
50	236	14.06±0.26^{a}	145	19.93±0.37
75	57	12.86±0.48^{b}	17	19.35±1.01
Year		***		***
2009	78	13.39±0.46^{b}	51	23.54±0.81^{a}
2010	91	13.48±0.44^{b}	57	17.89±0.79^{ab}
2011	37	10.62±0.54^{c}	29	15.77±0.78^{c}
2012	47	15.05±0.45^{a}	25	21.35±0.73^{a}
2013	40	14.76±0.50^{ab}		

***: p<0.001, **: p<0.01, *: p<0.05, SMWT: Six month weight, YWT: Yearling weight, ns: Not significant, LSM: Least square mean and SE: Standard error

Table 3: Least square mean of pre weaning growth rate and post weaning growth rate of Boer X local cross at Sirinka BED site

Classes	No.	PWGR (g day^{-1}) LSM±SE	No.	POWGR (g day^{-1}) LSM±SE	No.	YWGR (g day^{-1}) LSM±SE
Over all	364	78.67	293	37.27	162	33.01
Birth type		***		***		ns
Single	126	93.77±2.76^{a}	103	29.03±2.23^{b}	55	33.69±3.10
Twin	238	66.76±2.33^{b}	190	38.76±1.94^{a}	107	34.27±2.65
Sex		ns		ns		ns
Female	205	77.32±2.35	171	34.20±1.92	116	31.81±2.52
Male	159	83.21±2.62	122	33.59±2.17	46	36.15±3.30
Blood level		*		ns		ns
50	276	85.17±2.26^{a}	236	34.94±1.76	145	31.85±1.79
75	88	75.36±3.79^{b}	57	32.84±3.24	17	36.11±4.86
Year		***		***		***
2009	82	71.59±4.09b^{c}	78	47.62±3.12^{a}	51	57.12±3.92^{a}
2010	101	87.62±3.81^{b}	91	31.03±2.97^{b}	57	24.14±3.79^{c}
2011	60	61.46±4.05^{c}	37	22.45±3.70^{b}	29	25.63±3.73^{c}
2012	63	95.20±3.77^{a}	47	27.40±3.05^{b}	25	29.03±3.49^{b}
2013	58	85.46±4.24^{b}	40	40.99±3.43^{a}		

***: p<0.001, **: p<0.01, *: p<0.05, ns: Not significant, PWGR: Pre weaning growth rate, POWGR: Post weaning growth rate from weaning to six month weight and YWGR: Growth rate from six month to yearling

20.15±0.67 kg reported for the same breed at DebreBerhan area (Tesfaye *et al*., 2006) and larger than that of Mid Rift Valley (7.87±1.62 and 12.85±2.55 kg), Borana Somali goats (9.3 and 13 kg) (Tucho *et al*., 2000), Abergelle goats (9.1 and 14.2 kg) (Deribe and Taye, 2013b) and 11 and 16 kg of Afar goats (Awgichew *et al*., 1989).

The least square mean of birth to weaning, weaning to six month and birth to yearling growth rate of Boer X CHG goats were 78.67±1.53, 37.27±1.85 and 33.01±0.77 g day^{-1}, respectively as shown at Table 3. Birth type and year of birth had effects on pre and post weaning growth rate. Single birth significantly resulted in higher growth rate at pre weaning period but from weaning to six months of age, twin kids have higher growth rate. This effect might be because of nutrition that multiple born kids need to compete for milk consumption from their dam while single born kids are sole users of milk from their dam. This type of effect is reported in the literature (Deribe and Taye, 2013b; Zeleke, 2007). The dependency of kids on their dams gets diminished as age of kid increases from weaning. Das *et al*. (1996) explained that the rate of growth of kids after weaning was partly determined by the genetic potential of the kids and the level of environmental influences.

CONCLUSION

Least square mean of birth weight and weaning weight of cross kids is higher than that of local breeds. Birth type and year of birth have significant effect on birth weight, weaning weight, six month weight and yearling weight and on pre weaning and post weaning growth rate. As the age of the kids advanced the mean weights of six month and yearling were comparable to locals. This might be related to as the animals grow the amount of feed required also increase and the feeding management of the farm is not enough to full fill the requirements even it is sometimes under the farmers management due to limited grazing land and shortage of concentrate for supplementation.

RECOMMENDATION

The present study was conducted with shortage of browsing/grazing and concentrate supplementation due to limitation of grazing land. Therefore, the cross kids were not express their genetic potential. Therefore, for future study it should be needs evaluation with better feeding management both on station and on farm to see their genetic potential.

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