Journal of Agriculture and Environment for International Development - JAEID 2018, 112 (1): 101-107
DOI: 10.12895/jaeid.20181.700

Growth performance of crossbred kids (Boer x Indigenous Goat Breeds)

Tsegay Teklebrhan

Haramaya University, School of Animal and Range Sciences, Dire Dawa, Ethiopia

Corresponding author: ttmamy06@gmail.com

Submitted on 2017, 26 October; accepted on 2018, 20 March. Section: Research Paper

Abstract: The study was conducted to evaluate growth performance of crossbred (Boer x Hararaghe Highland and Boer x Short Eared Somali) kids at Haramaya University Goat Farm in Eastern Ethiopia. Breed ($p<0.01$), Birth type, sex ($p<0.05$) and year of birth ($p<0.01$) had effect on weight of crossbred kids. Accordingly, ½BR½SG kids had heaver birth, weaning and six months weights than ½BR½HH kids. Non genetic factors such as single born kids were heavier on weight from birth to six month than twins' birth, male and single born kids had better weight from birth to weaning than female and twin birth. Crossbred kids born in recent years had improved their weight than births in earlier years. Similar post weaning growth rate ($P>0.05$) was obtained between breeds but, ½BR½SG kids had faster growth before weaning as compared to ½BR½HH crossbred kids. The study suggested that crossing Boer with indigenous goats has improved productivity of indigenous goat breeds in Ethiopia.

Keywords: crossbred kids, growth performance, semi-intensive

Introduction

Small ruminants are important livestock for supporting food security for small holder farmers in Ethiopia; because they have high reproductive capacity and require low initial investment as compared to large ruminant. Goats are one of the source of red meat and the most preferred meat than other meat animals (Tsegay, 2013). Productivity of indigenous goats are very low as compared to improved goat genotypes. This might be due to different factors such as poor nutrition, diseases, lack of appropriate breed and breeding strategies. Use of improved exotic breed lines both tropical and temperate are an option to improve the productive performance of indigenous goat to meet the projected demand for red meet in the country and developing world. Boer goat is one of the most desirable goat breeds for meat production in tropics (Lu, 2001). It has gained worldwide recognition for excellent conformation, fast growing rate and its potential for meat yield and it is well adapted to tropical conditions with low quality management. In Ethiopia, this breed has

been used in crossing with the indigenous goat breeds to improve meat production potential of indigenous goats. Among others Haramaya University has been involved in multiplication, distribution and evaluation of the breed using selected indigenous doe lines that are dominate in eastern parts of the country such as indigenous Hararghe Highland and Short Eared Somali Goat breeds with the intention of improving the productivity of local goats. Therefore, the objective of this study was to evaluate the growth performance of crossbred kids in eastern Ethiopia.

Materials and methods

The study was conducted at Haramaya University Goat Farm and it is located 515 km east of Addis Ababa at 9° N and 42° E. The site is situated at 1,950 m above sea level and has a mean annual rainfall of 790 mm and a mean annual temperature of 16 °C. The pattern of rainfall is bimodal, consisting of a short rainy season covering from April to June and main rainy season from July to October, while the remaining months are considered as dry season (Mishira *et al*., 2004).

Animal management

Crossing was done using Boer (Br) buck as a sire breed and indigenous Hararghe Highland (HH), and Short Eared Somali (SG) as dam breeds. The indigenous does were purchased from local markets, bucks were obtained from the farm for mating purposes. Controlled natural mating was employed and three Br sires, one per mating group was stratified randomly. The average ratio of a male to females was 1:30. Does were mated for 30-42 days to kid during the rainy season to take advantage of available grass. Flocks were allowed to graze for 8 h a day in an open natural pasture. The nutritional composition of the grazing pasture, ingredients and compassion of concentrate are described in previous study (Tsegay *et al*., 2014). Flocks were supplemented with 300 g concentrate mix at the morning (8:30 a.m.) and afternoon (2:30 p.m.). New born kids were allowed to suckle with their dams up to 4 months of age, following the practices of the farm according to Tsegay *et al*. (2014). Kids usually started grazing in the age of 2-3 weeks and with little supplementation started at about two months of age. After weaning, lambs constantly leave to the field outside the enclosed area to graze on natural pasture and supplemented with 200 g of concentrate mix daily.

Data collection

The genetic groups consisted of crossbreed of Boer (BR) x Hararghe Highland (HH) [½ $BR^1/_2$ HH] and Boer (BR) x Short Eared Somali (SG) [½$BR^1/_2$SG] kids born

from 2014 to 2016. Non-genetic factors like birth type, sex of kids, and birth date were also collected for the study. Data such as birth weight, weaning weight and six month weight of crossbred kids were recorded according to Tsegay *et al*. (2014)

Data analysis

Data on pre-weaning growth performance were analyzed using the general linear model procedure of SAS (2003). The model considered fixed effects of lamb breed, type of birth, parity, year of birth, season of birth and sex of lambs. Tukey's adjustment was used to compare means.

$$Yijklm = M + Bi + Sj + Dk + Lm + Eijklmn$$

Where:

M	the overall mean
Yijklm	Growth performance traits
Bi	fixed effect of the i^{th} kid breed (i = 1, 2)
Sj	fixed effect of the j^{th} sex of kids (j= male, female)
*D*k	fixed effect of the k^{th} year of bith *(k*=2014…2016)
Lm	fixed effect of the m^{th} birth type (m= single, twin)
Eij_{klmn}	random error

Results and discussion

Effect of Genotype on growth performance of crossbred kids

Breed ($p<0.01$) had influence on weight from birth to six months (Table 1). Accordingly, ½BR½SG kids had heaver birth, weaning and six months weights than ½BR½HH crossbred kids. Birth weight, weaning weight and six month weight of crossbred kids in this study were heavier than previous findings for Boer crossbred kids (Belay *et al*., 2015) and local Ethiopian kids (Awgichew *et al.,* 1989; Tucho *et al.,* 2000; Tesfaye *et al.,* 2006; Deribe and Taye, 2013a; Deribe and Taye, 2013b). However, growth performance of the crossbred kids of this study was lower than the value reported for Boer-Abergelle F1 kids (Shumuye *et al*., 2014). This might be associated with variation in the type of breed used for breeding in the studies.

Consistent to weight of crossbred kids, Pre-weaning Average Daily Gain (PreADG) and Post-weaning Average Daily Gain (PADG) of crossbred kids were also affected by breed, birth type, sex and year of birth as shown in Table 2. ½BR½SG kids had faster growth before weaning as compared to ½BR½HH crossbred kids. The variation in PreADG between breeds is associated with milk production potential of

dams and level of solid feed supplementation for milk fed crossbred kids, while no breed difference (P>0.05) was detected on post-weaning growth rate.

Non genetic factors on growth performance of crossbred kids

Birth type, sex (p<0.05) and year of birth (p<0.01) affected growth performance of crossbred kids (Table1). Single born kids were heavier on weight from birth to six month than twins. It also shows that male kids had higher weight from birth to weaning than female counterparts. In line to this previous findings reported that kids born as single were heavier than twins and triplets (Shumuye *et al*., 2014). Weight of crossbred kids showed an increasing trend from earlier to later parts of the year. This might be due to improvement of management practices of the farms like nutrition, health and house in the resent than earlier kidding years as it has been observed in previous study (Tsegay *et al*., 2014). However, Belay *et al*. (2015) reported a significantly lower weight of kids born in later as compared to earlier years.

Table1 - Effect of breed, birth type, sex and year of birth on birth, weaning and six month weight of crossbred kids

Parameters	Birth weight (kg)	N	Weaning weight (kg)	N	SMW	N
Breed	**		**		**	
½ BRHH	2.5±0.1^{b}	99	10.0±0.3^{b}	99	14.5^{b}	99
½ BRSG	3.0±0.1^{ab}	96	11.0±0.1^{a}	96	15.5^{a}	96
Birth type	*	N	*	N	*	N
Single	3.0±0.0^{a}	179	11.5±1.5^{a}	179	15.6^{a}	179
Twin	2.87±0.24^{b}	16	10.5±0.2^{b}	16	14.1^{b}	16
Sex	*	N	*	N	*	
Male	2.90±0.06^{a}	95	15.7±0.27^{a}	95	14.12^{a}	95
Female	2.75±0.06^{b}	100	10.88±0.33^{b}	100	12.30^{b}	100
Birth year	**	N	**	N	**	N
2014	2.10±0.06 ^{c}	80	10.61±0.34^{c}	80	13.05^{c}	80
2015	2.82±0.07^{bc}	60	11.6±0.27^{b}	60	14.01^{b}	60
2016	3.51±0.09^{a}	55	12.74±0.48^{a}	55	15.6^{a}	55

^{abc} means superscripts within a column are significantly different (P < 0.05);½ BR½HH= Boer Hararghe Highland F1 kids; ½ BR½SG= Boer Somali F1 kids; Number; SMW= six month weight

Pre and post weaning growth rates were also affected by non-genetic factors such as birth type, sex and year of birth as shown in Table 2. Accordingly, Single born crossbred kids had higher growth rate than twin kids during pre and post weaning periods. This variation is evident that single born crossbred kids have an opportunity to get more nutrition during prenatal time and milk during postnatal growth from a dam than twin kids (Deribe and Taye, 2013b; Zeleke, 2007; Tsegay et al., 2014). Moreover, male had superior gain than female crossbred kids, pre and post weaning growth rates were also better in male and cross bred kids born in the recent as compared to earlier years.

Table 2 - Effect of breed, birth type and year of birth on pre and post weaning gain of crossbred kids

Parame-ters	Birth weight (kg)	N	Weaning weight (kg)	N	SMW	N
Breed	**		**		**	
½ BRHH	2.5±0.1^{b}	99	10.0±0.3^{b}	99	14.5^{b}	99
½ BRSG	3.0±0.1^{ab}	96	11.0±0.1^{a}	96	15.5^{a}	96
Birth type	*	N	*	N	*	N
Single	3.0±0.0^{a}	179	11.5±1.5^{a}	179	15.6^{a}	179
Twin	2.87±0.24^{b}	16	10.5±0.2^{b}	16	14.1^{b}	16
Sex	*	N	*	N	*	
Male	2.90±0.06^{a}	95	15.7±0.27^{a}	95	14.12^{a}	95
Female	2.75±0.06^{b}	100	10.88±0.33^{b}	100	12.30^{b}	100
Birth year	**	N	**	N	**	N
2014	2.10±0.06 ^{c}	80	10.61±0.34^{c}	80	13.05^{c}	80
2015	2.82±0.07^{bc}	60	11.6±0.27^{b}	60	14.01^{b}	60
2016	3.51±0.09^{a}	55	12.74±0.48^{a}	55	15.6^{a}	55

^{abc} means superscripts within a column are significantly different ($P < 0.05$);½ BR½HH= Boer Hararghe Highland F1 kids; ½ BR½SG= Boer Somali F1 kids; PreADG= pre-weaning average daily gain; PADG= post-weaning average daily gain

Conclusion

Boer inherited Somali have superior weight and growth rate in pre and post weaning periods than did Boer inherited Hararaghe Highland kids. The study ensured that single born male Boer crossed kids improved pre-weaning and post-weaning weights

and their respective weight gains than twin born female kids. The study suggested that crossing Boer with local (Short eared Somali and Hararghe Highland) does has been improved pre and post weaning performance of local goat breeds in Eastern Ethiopia.

Acknowledgment : The authors are highly grateful for Ethiopian Institute Agricultural Research (EIAR) for financial support of the project. Goat farm workers of Haramaya University are also duly acknowledged for their support during breeding and data collection throughout the research periods.

References

Awgichew K., Yacob Y. and Fletcher I., 1989. Productivity of Purebred Adal and Quarter Bred Saanen x Adal Goats in Ethiopia. In: African Small Ruminant Research and Development, Wilson, R.T. and A. Melaku (Eds.). International Livestock Centre for Africa, Addis Ababa, Ethiopia, pp: 510-523.

Belay Deribe, Mokonen Tilahun, Mesfin Lakew, Nigus Belayneh, Asres Zegeye, Misganaw Walle, Desalegn Ayichew, Solomon Tiruneh Ali and Solomon Abriham, 2015. Asian Journal of Animal Sciences 6: 454-459

Deribe B. and Taye M., 2013a. Evaluation of growth performance of abergele goats under traditional management systems in sekota district, Ethiopia. Pakistan Journal Biological Science 16: 692-696.

Deribe B. and Taye M., 2013b. Growth performance and carcass characteristics of Central Highland goats in Sekota district, Ethiopia. Agric. Adv. 2: 250-258.

Lu C.D., 2001. Boer goat production: Progress and perspective. Proceedings of the 2001 International Conference on Boer Goats in China, Ocotber 21-24, 2001, Guizhou, China.

Mishira B., Hiluf G., Kibret M., Assen and Eshetu B., 2004. Soil and land resources inventory at Alemaya University Research farm with reference to land evaluation for sustainable agricultural management and production. Synthesis of working papers, soil sciences Bulletein Number 1, pp. 123. Alemaya University, Ethiopia

SAS, 2003. SAS (version 9, third ed.). SAS Inst. Inc. Cary, NC

Shumuye Belay, Gebreslassie Gebru, Guesh Godifey, Minister Brhane, Mulalem Zenebe, Hailay Hagos and Tsegay Teame (2014). Reproductive performance of Abergelle goats and growth rate of their crosses with Boer goats. Livestock Research for Rural Development 26 (1) 2014.

Tesfaye G., Sisay L., Dereje T., Abebe M. and Solomon G., 2006. Growth and reproductive performance of central highland goats in North Shoa and

South Wollo. Proceeding of the 1st Annual Conference on Completed Livestock Research Activity, August 14-17, 2006, Amhara Region Agriculture Research Institute, Bhar Dar, Ethiopia.

Tsegay Teklebrhan, Mengistu Urge, Yhseph Mekasha and Merga Baissa, 2014. Pre-weaning growth performance of crossbred lambs (Dorper x indigenous sheep breeds) under semi-intensive management in eastern Ethiopia

Tsegay Teklebrhan, 2013. Consumer perceptions and preferences of meat types in Harar and Haramaya towns, Ethiopia Journal of Microbiology Biotechnology and *Tsegay 2013: 2 (3) 959-969* Food Sciences.

Tucho T.A., Regassa A. and Fita L., 2000. Preliminary Production and Reproduction Performance Evaluation of Mid Rift Valley and Borana Somali Goats. In: The Opportunities and Challenges of Enhancing Goat Production in East Africa, Merkel, R.C., G. Abebe and A.L. Goetsch (Eds.). Debub University, Awassa, Ethiopia.

Zeleke Z.M., 2007. Environmental influences on pre-weaning growth performances and mortality rates of extensively managed Somali goats in Eastern Ethiopia. Livestock Res. Rural Dev., Vol. 19.