GENETIC PARAMETERS ESTIMATION OF GROWTH AND LITTER TRAITS OF CROSSBRED GOATS IN SURKHET DISTRICT OF KARNALI PROVINCE, NEPAL

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ABSTRACT

Genetic parameters of litter traits of kids are important for increased production and productivity of goats. The main aim of the study was to determine production performance and to estimate genetic parameters for growth traits of indigenous and Boer crossbred kids of goats in field conditions. Result indicated that the heritability estimates of litter weight at different ages ranges from 0.42 ± 0.05 (at birth) to 0.73 ± 0.14 (at twelve months). Similarly, phenotypic association among litter weight and size at birth and weaning were high whereas genetic correlations among the traits were higher than the phenotypic correlation. Moderate to high heritability suggested that the genetic variance is higher relative to phenotypic variance and thus high potentiality for estimating growth of kids through intense selection. Similarly, strong positive genetic and phenotypic association between the litter weight and size at birth and weaning indicated that these traits could be the most important and effective selection criteria for achieving higher growth at later stage of life.

Keywords: *genetic correlation, heritability, phenotypic correlation, selection*

INTRODUCTION

Goat is an important commodity and an popular enterprise in livestock farming adopted by the farmers irrespective to their caste, ethnicity, religion and economy for family income and nutritional security. Goats contributes about 11.9% to the total livestock production and 20.7% to the total meat production in Nepal ranking second position after buffalo with annual increment of 4.4% (MOAD, 2019). Here, goat alone contributes 4% in agriculture GDP and it comes in third position in livestock GDP sharing after buffalo and cattle (DLS, 2019). Khari is native breed available across hill from east to west and share 56% in total population (Kharel & Neopane, 1997 and Bhattarai, 2017). Khari is said to be the most productive breed of goats (Kharel & Neopane, 1997; Neopane, 1997; Kunwar, 2000; Kolachhapati, 2006 and Parajuli, 2012). This breed is one of the well adapted having best indigenous genetic resources of goat in Nepal with higher prolificacy, multiple kidding abilities and carcass quality (Neopane, 1997; Kunwar, 2000; Kunwar & Shrestha 2001). But, such valuable genetic resource of Khari has given low value by the farmers due to the large and attractive body size of exotic pure breeds and their crossbred kids of goats (Kolachhapati, 2006). Despite some better characters of indigenous Khari breed, it has lower body weight. Sapkota (2007) reported the adult weight of Khari goat was 26.07±0.30 kg. Similar result of body weight was reported by Parajuli (2012). Even after continual growth of goat population, the demand of its meat is yet not fulfilled by domestic production and the nation has to import with average annual number of 412034 since last 11 years (CAQO,

2017). In another study by Rajwar (2012), the import from India alone was estimated to be US$ 37.5 million as per the market price of that time sharing 15% of goat meat market. Similarly, per capita consumption of meat is 12 kg and still we are far a way to meet the recommendation (DLS, 2019).

To fulfill the domestic requirements of goat meat and to check the import of goats, the indigenous goat breed should be upgraded through selection or cross breeding. Now a day, Boer could be choice of breeds to improve the productive performance of indigenous goat breed through two-way cross. Boer goats have recognized worldwide as the goat having excellent body conformation, faster growth rate, good carcass quality, heavier body weight, higher prolificacy with not less than 2 litters size and able to improve productive performance of indigenous breeds through cross breeding (Lu, 2001). Few researches have been conducted in the performance evaluation of F1 crossbred with Boer at Goat Research Station (GRS) Bandipur, Tanhun and whatever the researches have been conducted are target oriented rather than real problem based. These are conducted in research station rather than in farmer's fields. This research was aimed at estimating genetic parameters of growth traits of indigenous and Boer crossbred kids in under farmers managed condition.

MATERIALS AND METHODS

The study was carried out from October 2016 till September 2018 at two specific sites of Surkhet, Birendranagar Municipality-16 and Lekbesi Municipality-10, respectively at a height of 1170 to 1650 masl. Similarly, Lekbesi Municipality- 3,4 and 6 at a height of 450 to 750 masl.

Purposive sampling techniques were used where altogether 901 crossbred kids born from 446 does mated from 100% pure breeding Boer buck were considered for estimating the heritability (h^2) of litter weight at birth, litter weight at weaning, litter size at birth, litter size at weaning, heritability of kid's weight at different age. Locally available dams such as Khari, Jamunapari cross and Sirohi cross reared under stall feeding as well as grazing systems were used. Primary data were collected from individual household, herd register provided to breeder and multiplier herd. For this purpose, a data collection sheet was developed to collect necessary information by direct conversation with farmers and monthly weighing and measurements of kids of respective goats. Litter traits of 50% crossbred Boer kids were recorded and analysed. The data were analyzed by Mixed Model Least-square and Maximum Likelihood Computer Program PC-2 statistical package (Harvey, 1990) developed by Walter R. Harvey. Heritability estimate of some major economically important production traits was determined using the random effect (sire) model.

$$Y_{ij} = \mu + S_i + e_{ij}$$

Where, μ is the overall mean

S_i is the effect of i^{th} sire

e_{ij} is the random element assumed (error mean) to be normally and independently distributed among the sampled population.

RESULTS AND DISCUSSION

Litter size and weight at birth

Result of the present study indicated that the heritability of litter size and weight at birth was 0.23±0.02 and 0.53±0.12 respectively. The phenotypic and genotypic correlation between litter size and weight at birth were high significant (Table 1). Bhattarai et al. (2017) reported similar heritability value (0.52±016) for litter weight at birth whereas Neupane (1997) reported slightly lower heritability estimates. Similarly, Alade et. al. (2010) supported the present findings. In contrast, significantly lower value of heritability estimates was reported by various authors (Haque et al., 2013 and Tesfaye et al., 2012). This indicates that litter weight at birth would be strong tool for increasing production and productivity of goats.

Table 1. Heritability (Mean±SE; across the diagonal), genetic (above diagonal) and phenotypic (below diagonal) correlation of litter size and weight at birth of 50% Boer kids

	Litter size at birth	Litter weight at birth
Litter size at birth	0.23±0.02	0.916***
Litter weight at birth	0.810***	0.53±0.28

*Note: ***: Significant at 0.1% level (i.e. p<0.001)*

Litter size and weight at weaning

The result of the current study revealed that the heritability of litter size was low whereas heritability of weight at weaning was high. In a study conducted at Nawalparasi district of Nepal, Bhattarai et al. (2015) reported that the heritability of litter weight at weaning was high and was similar to the current study. Similarly, Table 2 suggested that the genetic and phenotypic correlation of the litter size and weight at weaning of Boer kids at corresponding age were highly significant. Bhattarai et al. (2015) reported that the heritability of litter weight at weaning was 0.56±0.17 and reported strong positive phenotypic correlation (0.91) as well as the strong genetic correlation (0.95). Similar result of strong genetic correlation between litter weight at birth and at weaning was reported by (Neopane, 1997). In contrast, Shrestha (2002) reported lower heritability estimates for weight at birth and weaning of Barbari to be 0.05±0.121 and 0.1±0.145. Result indicated that if we select the kids with higher litter size may also have higher litter weight at weaning and later on as well. Also higher heritability might be related to the reason that Boer bucks were introduced recently and the growth rates of crossbred kids were higher in earlier years of crossing.

Table 2. Heritability (Mean±SE; across the diagonal), genetic (above diagonal) and phenotypic (below diagonal), correlation of litter size and weight at weaning of Boer 50% kids

	Litter size at weaning	Litter weight at weaning
Litter size at weaning	0.23±0.01	0.881***
Litter weight at weaning	0.781***	0.54±0.03

*Note***: Significant at 0.1% level (i.e. p<0.001*

Heritability of kid's weight at different ages

Finding revealed that the heritability estimate of kids was moderate to high at different ages. Heritability estimated at 12 months was highest (0.73±0.14) which was 57.5% higher than the weight at birth. The result present study was supported by (Gautam, 2017). In a similar study on Khari goats in Nawalparasi district of Nepal, Bhattarai (2017) and Parajuli (2012), reported that the heritability estimates at different age was moderate. In contrast, Roy et al. (2008) reported that the heritability estimates for weight at birth, weaning, six and nine months were lower than the heritability estimates of present study. Ballal et al, (2008) reported that the heritability estimates of body weight gained at 150 days was 0.86±1.57. When heritability was medium to high, the improvement of goats through selection is appropriate. In early age the heritability was medium while heritability of body weight in later age was high, indicated that the effect environment was low and genetic effect was domination.

Table 4. Heritability of kid's weight at different ages

S.N.	Age	Heritability Estimates ± Standard error
1	At birth	0.42±0.05
2	2 months	0.52±0.07
3	4 months	0.43±0.09
4	6 months	0.47±0.08
5	9 months	0.58±0.12
6	12 months	0.73±0.14

CONCLUSION

There is strong positive genetic and phenotypic correlation between litter size at birth and litter weight at weaning which suggested that these traits could be the effective criteria for selection of the crossed bred kids for better performance. The higher to moderate heritability estimates suggested that selection of kids for growth performance could be done on the basis of weaning weight. It can be concluded that, the growth can be estimated from litter weight at birth and weaning in Nepalese hill crossbred goats.

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