

GENETIC AND NON-GENETIC FACTORS AFFECTING THE BIRTH WEIGHT OF BOER GRADED GOATS AND NON-DESCRIPT GOATS

R. Selvam

Assistant Professor, Department of Animal Genetics and Breeding,
Veterinary College and Research Institute, Tirunelveli-627 358, Tamil Nadu, India
Email: selvam.r@tanuvas.ac.in

Abstract: Body weight is the most economically important and easily measured trait of meat animals. The purpose of this study is to estimate genetic and non-genetic factors affecting the birth weight of goats. Birth weight data on 487 newborn goat kids of two genetic groups viz., non-descript (237) and Boer graded (250) goats were analysed by least-squares analysis using LSMLMW PC-2 program. The study revealed highly significant ($P < 0.01$) effect of sire and sex of kid on birth weight. The regression of birth weight on dams body weight was found to be highly significant ($P < 0.01$). The overall average birth weight was 2.17 ± 0.03 Kg. The male kids (2.26 ± 0.04 Kg) were heavier than the female kids (2.09 ± 0.04 Kg). The kids born during the northeast monsoon were heavier than the kids born in other seasons. The Boer graded kids (2.22 ± 0.06 Kg) were heavier than the non-descript kids (2.13 ± 0.06 Kg) but the difference was non-significant, indicating the uniform managerial practices followed in the farm. The significantly high heritability (0.425 ± 0.156) of birth weight in goat indicates the better scope for improvement of birth weight through individual selection.

Keywords: Birth weight, Boer graded goat, Heritability, Non-genetic factors.

Introduction

Goat is an important multipurpose animal and there are no religious barriers to the consumption of goat meat and skins are very valuable byproduct. In Tamilnadu goats are kept mainly for meat. Body weight is the most economically important and easily measured trait of meat animals. This trait is controlled by polygene and is also affected by feeding and management under farm conditions. Birth weight is positively correlated with growth rate, adult size and kid viability. The diversity in performance traits of goats may be attributed to several genetic and non-genetic factors. Several studies, have shown that birth weight is affected by various nongenetic factors like sex, type of birth, and year / season of kidding [1,2,3] It is therefore imperative to estimate the magnitude of all such factors.

Boer goat is considered to be one of the most desirable goat breeds for meat production. Boer goats are well known for their excellent body conformation, fast growing rate and good carcass quality. Because of their desirable genetic traits for meat production Boer goats can improve productive performance of many indigenous non-descript goats through upgradation

[4]. The purpose of this study was to estimate genetic and non-genetic factors affecting the birth weights of Boer graded and non-descript goats.

Materials and methods

Data on 487 newborn goat kids of two genetic groups viz., non-descript (237 goats) and Boer graded goats (250 goats) born at Goat Breeding Unit, Livestock Research Station, Kattupakkam, Tamilnadu during 1998-2009 were utilized to determine the effect of certain genetic and non-genetic factors on birth weight. All the goats were maintained under intensive system and they were fed with concentrates at the rate of 50 g/kid/day, 100g/young/day and 200g/adult/day, 300 g/buck & pregnant doe/day and 3 to 5 Kg green fodder per animal per day. The information on individual's identity, date of birth, birth weight, sex of kid, sire and type of birth was collected. The data on body weight at birth were analysed by least squares analysis, performed using LSMLMW PC-2 computer program [5].

The mathematical model assumed was: $Y_{ij} = \mu + F_i + a_{ij}$

Where, Y_{ij} = observation on the trait;

μ = population mean;

F_i = effect of all fixed effects (year and season of birth, flock, sex, type of birth) with the restriction that $\sum F_i = 0$;

a_{ij} = random error associated with each observation.

Results and Discussion

The least-squares means of birth weight of goats are presented in Table 1. Least squares mean for birth weight was 2.17 ± 0.03 Kg in the present investigation. The similar birth weight was reported in Tellicherry kids (2.28 ± 0.03 and 2.01 ± 0.03 Kg for male and female respectively) [6]. The birth weight had been reported to be 2.88 ± 0.03 , 2.88 ± 0.06 and 2.05 ± 0.01 Kg in Sirohi, Jamnapari and Cheghu goats, respectively [7,8,9]. In Black Bengal goat a lower birth weight of 1.1 Kg in was reported [3].

Table 1. The least-squares means of birth weight of goats.

| S. No. | Traits | No. of observations | Least-Squares Mean | Error of LS Mean |
|--------|---------------------------|---------------------|--------------------|------------------|
| 1 | Over all Birth Weight | 487 | 2.17 | 0.03 |
| 2 | Season 1 (January-March) | 180 | 2.09 | 0.05 |
| 3 | Season 2 (April-June) | 73 | 2.12 | 0.06 |
| 4 | Season 3 (July-September) | 131 | 2.19 | 0.05 |

| | | | | |
|---|-----------------------------|-----|------|------|
| 5 | Season 4 (October-December) | 103 | 2.30 | 0.05 |
| 6 | Sex - Male | 246 | 2.26 | 0.04 |
| 7 | Sex - Female | 241 | 2.09 | 0.04 |
| 8 | Breed – Boer graded goats | 237 | 2.13 | 0.06 |
| 9 | Breed – Non-descript goats | 250 | 2.22 | 0.06 |

Heritability

The regression of birth weight on dams' body weight was highly significant ($P < 0.01$). The estimate of heritability for birth weight observed in this study was 0.425 ± 0.156 . The lower heritability values of 0.26 and 0.32 were studied in Angora and Boer goat respectively [10, 11]. In another study the heritability value for birth weight in Boer goat from the different models was in the range of 0.162-0.327 [12]. A lower estimate of heritability for birth weight in Tellicherry kids in Tamilnadu (0.091 ± 0.099) was reported [13]. The significantly higher estimate of heritability (0.425 ± 0.156) obtained in the present study indicated the better scope for improvement of birth weight through selection.

Breed

The breed of kids was not a significant source of variation affecting this trait. The Boer graded kids (2.22 ± 0.06) were heavier than the non-descript kids (2.13 ± 0.06) but the difference was not statistically significant indicating the uniform managerial practices followed in the farm.

Season of birth

The season of kidding had significant effect ($P < 0.05$) on birth weight. The kids born during the Season 4 (October-December) were heavier than the kids born in other seasons. Favorable environmental conditions with good availability of the fodder during the gestation period which might have been contributed to higher body weight at birth. In Beetal goats the maximum kidding (78.2%) was found in spring season but in autumn season only 21.8% [14]. The season had highly significant ($P < 0.01$) effect on birth weight was reported in Mecheri lambs in Tamilnadu [6]. The lambs born during September to February were having higher birth weight than those born during March to August.

Sex

The effect of the sire and sex of kid on birth weight was found to be study revealed highly significant ($P < 0.01$). The male kids (2.26 ± 0.04 Kg) were heavier than the female kids (2.09 ± 0.04 Kg). It may be due to the fact that the gestation period of does carrying male kids is

usually slightly longer (1-2.5 days) than those carrying female. High birth weight of male kids and significant effect of sex was also reported [13]. In Cheghu kids, sire and sex of kid exerted a significant effect on birth weight [9]. Relatively higher birth weight of male kid was observed in Black Bengal goats [3]. The results are also agreed with the finding in Anglo-Nubian, Alpine, Toggenburg and Saanen goats [15]. Higher birth weight in male may be attributed to the anabolic effect of male sex hormones.

High heritability of birth weight in goats as revealed by our study indicate selection must be based on genotypic superiority rather than environmental superiority in order to improve breeding value. Thus variation due to definable environmental effects must be removed by use of suitable adjustment factors. The overall impact of any selection programme will depend on the direct and correlated responses that result from selection on the selection criterion. These responses can be predicted by using estimates of genetic and phenotypic relationships between all traits of economic importance. It is necessary that all known sources of variation influencing the traits of importance be included in the model of analysis. Based on the above results, it is concluded that the effect of environmental factors should be taken care off while formulating the selection and breeding program for increasing the birth weight in goats.

References

- [1] Dudhe SD, Yadav SBS, Nagda RK, Urmila Pannu, Gahlot G.C. Genetic and non-genetic factors affecting morphometry of Sirohi goats. *Veterinary World*. 2015, 8, 1356-1363.
- [2] Bharathidhasan A, Rita Narayanan, Gopu P, Subramanian A, Prabakaran R, Rajendran R. Effect of Nongenetic Factors on Birth Weight, Weaning Weight and Preweaning Gain of Barbari Goat. *Tamilnadu J. Veterinary & Animal Sciences*. 2009, 5, 99-103.
- [3] Zinat Mahal MA, Khandoker MY, Haque MN. Effect of non genetic factors on productive traits of Black Bengal goats. *J. Bangladesh Agril. Univ*. 2013, 11, 79–86.
- [4] Cameron MR, Luo J, Sahlu T, Halt, SP, Coleman SW, Goetsch, AL. Growth and slaughter traits of Boer x Spanish, Boer x Angora and Spanish goats consuming a concentrate-based diet. *J. Anim. Sci*. 2001, 79, 1423-1430.
- [5] Harvey WR. User's Guide for LSMLMW (PC version) Mixed Model Least Squares and Maximum Likelihood Computer Program, The Ohio State University, Ohio, USA. 1990.
- [6] Thiruvankadan AK, Chinnamani K, Muralidharan J, Karunanithi K. Effect of non-genetic factors on birth weight of Mecheri sheep of India. *Livestock Research for Rural Development*. 2008, 20, 6.

- [7] Roy R, Saxena VK, Singh SK, Khan BU. Genetic analysis of body weight at different ages in Jamnapari goats. *Indian J. Anim. Sci.* 1997, 67, 337-339.
- [8] Hossain SMJ, Sultana N, Alam MR, Hasnath MR. Reproductive and productive performance of Black Bengal goat under semi-intensive management. *J. Biol. Sci.* 2004, 4, 537-541.
- [9] Karna DK, Koul GL, Bisht, GS. Birth weight, morphometry and relative gain in body weight of Cheghu kids. *Indian J. Anim. Sci.* 2001, 71, 180-182.
- [10] Taddeo HR, Allain D, Mueller J, Rochambeau H, Manfredi E. Genetic parameter estimates of production traits of Angora goats in Argentina. *Small Rumin. Res.* 1998, 28, 217-213.
- [11] Schoeman JF, Niekerk MM. Variance component of early growth traits in Boer goat. *Small Rumin. Res.* 1997, 26, 15-20.
- [12] Niekerk MM, Schoeman SJ, Botha, ME, Casey N. Heritability estimates for pre-weaning growth traits in the Adelaide Boer goat flock. *South African J. of Anim. Sci.* 1996, 26, 6.
- [13] Thiruvankadan AK, Chinnamani K, Muralidharan.J, Karunanithi K. Factors affecting birth weight of Tellicherry kids. *The Indian J. Small Rumin.* 2008, 14, 255-258.
- [14] Afzal M, Javed, K, Shafiq M. Environmental effects on birth weight in Beetal goat kids. *Pakistan Vet. J.* 2004, 24, 104.
- [15] Castillo J, Garcia O, Verde SO, Peraza, F. Growth of kids of four imported goat breed. *Merori Association Latino americana de production Animal.* 1976, 11, 29-30.