

Study on Certain Non-Genetic Factors Affecting Birth Weight of Attappady Black Goats

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Abstract: A study was undertaken to assess the effect of various non-genetic factors on the birth weight of Attappady Black, the native goat breed of Kerala State, India. Information on 150 kids born during 2001 to 2003 in the home tract of the breed was utilized for the study. Least squares analysis of variance was performed to study the effect of non-genetic factors and Duncon's multiple range test was used to study the significant difference among different group means. The overall average birth weight of the kids was found to be 1.69 kg which was lower than the reported average birth weight of the other indigenous breeds of goats. Among the various factors studied the sex of kid and centre of birth significantly altered the birth weight of kids while the season and year of birth did not have significant effect. It was found that male kids were heavier than the female kids and the kids born in Agali Centre were heavier than the Sholayur and Pudur Centres. The lower body weight obtained in the present study warrants the need of a breed improvement programme for increasing the birth weight of kids as it directly affect the growth rate and body weight at later stages of life.

Key words: Attappady Black goats, birth weight, least squares analysis, non-genetic factors, kids

INTRODUCTION

Attappady Black is one among the two native goat breeds of Kerala State, India utilized mainly for meat and manure since a long time. These indigenous stocks are not only able to thrive under harsh climatic conditions and a very low input system but also produce albeit at subsistence level. The home tract of this breed is Attappady, a high range hilly area that lies between the Nilgiris hills and Muthikulam hills of the Western Ghats. This breed is named as Attappady Black goats after their place of origin, Attappady and their black body colour. This breed have been developed and reared mainly by the three tribal communities of the region viz., Irulas, Kurumbas and Mudukas. The breed improvement programs for increasing the chevon production is mainly based on the genetic improvement of body weight and growth rate at different ages. The birth weight of kids is one among the most important economic traits which has direct bearing on subsequent growth rate and reproduction. Farrel (1993) suggested that birth weight lower than the optimum is associated with reduced energy reserves, lowered thermoregulatory capability and also related to low rates of growth after birth and decreased mature size. Hence, it is imperative to study the birth weight of the goats and the factors affecting it so as to formulate an efficient breed improvement program. In view of the above facts, the present study was conducted to

assess the influence of certain environmental factors viz., season of birth, year of birth, centre and sex of kids on the birth weight of Attappady Black goats.

MATERIALS AND METHODS

The study was conducted at the Attappady block which is the home tract of the breed. The goats are mainly maintained on extensive community grazing under zero input system. The birth weights of kids in the flocks maintained by the farmers in three centres (Agali, Pudur and Sholayur) were recorded within 12 h following birth and data on normal birth and normal kids were only considered for the study. Finally, information on date of birth, sex of kid, centre and birth weight were collected for 150 kidding occurred in 3 years (2001 to 2003) were used for analysis. To study the effect of season of kidding on birth weight the calendar year was divided into four seasons as South West monsoon (June to September), North East monsoon (October to November), Winter (December to February) and Summer (March to May). Mixed Model Least Squares and Maximum Likelihood computer program as described by Harvey (1990) was used to study the effect of various non-genetic factors on birth weight of kids and the statistical model used for the study is as follows:

$$X_{ijklm} = \mu + S_i + Y_j + C_k + D_l + e_{ijklm}$$

Where:

X_{ijklm} = m th observation corresponding to the i th season, j th year, k th centre and l th sex

μ = General mean

S_i = Effect of i th season

Y_j = Effect of j th year

C_k = Effect of k th centre

D_l = Effect of l th sex

e_{ijklm} = Random error associated with the X_{ijklm} and is assumed to be distributed normally with mean zero and constant variance

Duncan's multiple range test as modified by Kramer (1957) was used for testing the differences among least squares means (using the inverse covariance matrix).

RESULTS AND DISCUSSION

The least squares mean for birth weight of Attappady Black goat was found to be 1.69 ± 0.05 kg which is comparable to the birth weight of 1.66 kg in Teddy goats of Pakistan reported by Kuthu *et al.* (2013). However, the estimated obtained in the present study is lower than the values in other indigenous breeds of goats reported by Thiruvankadan *et al.* (2010) in Tellicherry goats (2.17); Banerjee and Jana (2010) in Sirohi goats (>2.42); Harikrishna *et al.* (2013) in Osmanabadi goats (2.48); Soundararajan and Sivakumar (2011) in Tellicherry goats (1.88). The comparatively lower birth weight of the Attappady Black goats obtained in the present study might be due to the breed differences in addition to the other environmental factors which warrant the need for the genetic improvement program in this breed as no program was implemented so far for increasing the body weight and growth rate of these goats.

The results of the combined least squares analysis of variance to study the effect of various factors on birth weight are shown in Table 1. The study showed that the sex of kid had highly significant ($p < 0.01$) effect on birth weight while the centre had significant effect ($p < 0.05$). Similar to the present findings Afzal *et al.* (2004) in Beetal goats; Kuthu *et al.* (2013) in Teddy goats reported significant effect of sex and centre on birth weight. The results of the study also revealed that season and year of birth did not affect the birth weight of Attappady Black goats which shows that the goats are well adapted to the climatic variations of the region and can tolerate the variations. Moreover, community grazing is normally practiced in the region and the goats are maintained solely on the grazing with Zero Input System which might have resulted in uniform management over the years of study. The kids born during Northeast monsoon (1.78 kg) weighing heavier followed by Southwest monsoon (1.76 kg), Winter (1.65 kg) and Summer

Table 1: Combined least squares analysis of variance for birth weight of Attappady Black goats

Sources	df	Sum of squares	Mean sum of squares	F-value
Season of birth	3	0.400169	0.133390	1.211
Year of birth	2	0.037687	0.018844	0.171
Centre	2	0.805677	0.402838	3.659*
Sex of kid	1	0.977171	0.977171	8.875**
Remainder	141	15.525329	0.110109	-
Total	149	17.882400	-	-

*Significant at 5% level ($p < 0.05$), **Significant at 1% level ($p < 0.01$)

Table 2: Least squares means and standard errors of birth weight of Attappady Black goats grouped for various factors

Factors	No. of observations	Least squares mean	Standard error
Overall	150	1.692	0.048
Season			
South West Monsoon (June to September)	37	1.759	0.082
North East Monsoon (October and November)	30	1.784	0.079
Winter (December to February)	59	1.650	0.053
Summer (March to May)	24	1.577	0.095
Year			
2001	9	1.704	0.123
2002	78	1.709	0.046
2003	63	1.664	0.054
Centre			
Agali	31	1.797 ^a	0.078
Pudur	62	1.594 ^b	0.056
Sholayur	57	1.686 ^c	0.063
Sex			
Male	78	1.794 ^a	0.053
Female	72	1.591 ^b	0.064

Means bearing different superscript for each factor differ significantly

(1.58 kg) even though the difference was not statistically significant. These differences could be due to change in the quality and quantity of grazing. Similar trend on the birth weight of Tellicherry goats at various seasons were reported by Soundararajan and Sivakumar (2011) who explained that the availability of better nutrition (grass and tree loppings) in the later stage of pregnancy, i.e., during South West monsoon. The lowest birth weight during Summer season may be due to poor availability of pastures to the doe.

It was also found that maximum kidding was recorded during Winter season (39.33%) followed by South West monsoon (24.67%), North East monsoon (20.00%) and lowest was noticed during Summer season (16.00%).

The male kids were heavier (1.79) than the female kids (1.59) which confirms the results obtained by earlier researchers (Soundararajan and Sivakumar, 2011; Afzal *et al.*, 2004; Kuthu *et al.*, 2013; Raza *et al.*, 1998; Harikrishna *et al.*, 2013). This variation might be due to the fact that the male foetus grows faster during prenatal development than the female kids as reported by Soundararajan and Sivakumar (2011). Afzal *et al.* (2004) also explained that the gestation period of does carrying male kids is slightly longer (1-2 days) than those carrying female (Table 2).

The study also revealed that the location of the flock (centre) affected the birth weight of kids. The kids born in Agali Centre had the highest birth weight of 1.80 kg followed by the kids born in Sholayur (1.69 kg) and Pudur centre (1.59). This variation can be due to the difference in the availability of grazing land and duration of grazing and other managerial practices followed by the goat farmers of different centres.

CONCLUSION

The present study on the effect of environmental factors on the birth weight of Attappady Black goats revealed that the sex of kid and the centres were the major factors which altered the birth weight of significantly. The season and year of birth did not affect the birth weight of goats. The average birth weight of 1.69 kg obtained in the present study was lower than the average reported for majority of the other indigenous breeds of goats which promises the scope for the genetic improvement of the trait.

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