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## Non-genetic factors affecting body weight of Malabari goats in Kannur district

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### Abstract

A study was undertaken to assess the effect of non-genetic factors on Malabari goats in their home tract. Data on 316 Malabari goats over a period of 4 years (2014- 2017) were collected from the flocks of 40 farmers in Thalasserry and Thaliparamba, of Kannur district, functioning as field units of ICAR-All India Co-ordinated Research Project on Improvement of goats (Malabari). The significance of non-genetic factors on the body weight of goats was analysed using least-squares mixed models. Least-squares means for body weights at birth, 3, 6, 9 and 12 month of age were  $2.41 \pm 0.01$ ,  $8.0 \pm 0.04$ ,  $14.83 \pm 0.06$ ,  $19.13 \pm 0.10$  and  $23.04 \pm 0.06$  kg, respectively. Sex, year of birth, season, type of birth and age of dam had significant effect on body weight of Malabari goats.

**Keywords:** Malabari goats, body weight, non-genetic factors

### Introduction

Kerala holds a goat population of 12.46 lakh which accounts for 0.92 per cent of total goat population of India. At present India has 34 recognized goat breeds, with two breeds, Malabari and Attappady Black having their origin in Kerala. Malabari goat is a breed renowned for meat production, high prolificacy (Asha and Naicy, 2012) [2] and is well adapted to the tropical climate. The name Malabari (Telicherry) is derived from their area of origin and distribution, Telichery (present Thalassery) in the Malabar coast of Kannur district. Malabari goats inhabit the Calicut, Kannur, Waynad and Malappuram districts of Kerala, India. They are medium to small size animals having varied coat colour ranging from white to admixtures and black. These goats are reared mainly for meat.

The Non-genetic factors like type of birth, season and year of birth, age of dam and sex mask the effect of actual genetic potential of animals and have to be corrected to identify animals with higher genetic merit and to implement further improvement programmes. This study was conducted to estimate the influence of non-genetic factors on growth traits of Malabari goats in their home tract.

### Materials and methods

Data on 316 Malabari goats over a period of 4 years (2014- 2017) were collected from the flocks of 40 farmers in Thalasserry and Thaliparamba, of Kannur district, functioning as field units of ICAR-All India Co-ordinated Research Project on Improvement of goats (Malabari). The average flock size of the farmers was 7.9. Body weight was recorded immediately after birth and thereafter in every three months interval till recorded one year. Data on non-genetic factors like type of birth, season, year of birth, age of dam and sex were also collected. The period of kidding was divided into four years viz. 2014, 2015, 2016, and 2017 and the calendar year was divided into four seasons viz. Pre-monsoon (Mar-May), South-West monsoon (June-Sept), Post-monsoon (Oct-Nov) and Winter (Dec-Feb) (Krishnakumar *et al.*, 2009) [10]. Type of birth was classified into four, single, twins, triplets. Dams were grouped based on of age as 1-2 years, 2-3 years, 3-4 years and above 4 years and kids were classified as male and female based on sex.

The mean and standard error of body weight were estimated using statistical procedures suggested by Snedecor and Cochran (1994) [14]. Analysis of data was carried out by Least-square analysis programme (Harvey, 1990) [6] to study the effects of non-genetic factors on growth traits of Malabari goats. The following mixed model was used:

$$Yijklmn = \mu + ai + bj + ck + dl + em + fn + eijklmn$$

Where, Yijklmn is the growth trait measured on ijklmth animal

$\mu$  - overall mean

ai - fixed effect associated with ith Centre

bj - fixed effect associated with jth year of birth

ck - fixed effect associated with kth season of birth dl - fixed effect associated with lth type of birth

em - fixed effect associated with mth age of dam

fn - fixed effect associated with nth sex eijklmn - random error.

For pair wise comparison of the least square means, Duncan's multiple range test modified by Kramer (1957)<sup>[9]</sup> was used.

**Results and Discussion**

Least-squares means for body weights at birth, 3, 6, 9 and 12 month of age were 2.41 ± 0.01, 8.0 ± 0.04, 14.83 ± 0.06, 19.13 ± 0.10 and 23.04 ± 0.06 kg, respectively. Mean with standard error for the effect of sex, year of birth, season of birth, type of birth and age of dam on birth weight and body weight up to one year of age are given in Tables 1 to 5.

**Table 1:** Sex wise mean monthly body weight ±SE (kg) of Malabari goats from birth to one year

Sex				
Age in Months	Male	Female	Mean	P value
Birth	2.45± 0.02a	2.38±0.02b	2.41± 0.02	0.03
3	8.13± 0.06a	7.87±0.06b	8.00±0.04	0.00
6	15.01± 0.09a	14.66±0.09b	14.83±0.08	0.00
9	20.44±0.12a	19.42±0.16b	19.93±0.10	0.00
12	23.70±0.08a	22.39±0.08b	23.04±0.06	0.00
N	155	160	315	

**Effect of sex on body weight of Malabari kids**

The male kids were significantly heavier ( $P<0.01$ ) than females from birth to 12 months of age. The differences between the two sexes were evident at all ages. The birth weight of Malabari kids in the present study were in consonance with the findings of Ganesh Kumar *et al.* (2005)<sup>[5]</sup>. They reported a birth weight of 2.30±0.05 kg in males and 2.24±0.05 kg in females. Similar effect of sex on body weight of Malabari goats was also reported by Meenakshi Sundaram *et al.* (2012)<sup>[11]</sup>. Higher birth weight in male kids were also

reported by Karna *et al.* (2001)<sup>[8]</sup> and Afzal *et al.* (2004)<sup>[11]</sup> for Chegu and Beetal goats. The birth weight in the present study was also in agreement with the findings of Murali *et al.* (2014)<sup>[13]</sup> and Thiruvankadan *et al.* (2009)<sup>[15]</sup> in Malabari goats. They had observed significance of sex on weaning weight of Malabari goats with males attaining 8.88± 0.15 kg and females 8.27±0.15 kg. Husain *et al.* (1996) also observed the significance of sex on body weights at birth, 3, 6, 9 and 12 months of age in Black Bengal goats reared under extensive system.

**Table 2:** Year wise mean monthly body weight ±SE (kg) of Malabari goats from birth to one year

Year of birth					
Age in Months	2014-2015	2015-2016	2016-2017	Mean	P value
Birth	2.38 ± 0.05	2.42 ± 0.02	2.38 ± 0.10	2.41 ± 0.02	0.60
3	7.62 ± 0.06b	8.11 ± 0.06a	7.59 ± 0.06b	8.00 ± 0.05	0.00
6	14.11 ± 0.06b	15.03 ± 0.08a	14.20 ± 0.06b	14.83 ± 0.07	0.00
9	19.11 ± 0.07b	20.14 ± 0.13a	19.34 ± 0.12ab	19.93 ± 0.11	0.00
12	22.47 ± 0.09b	23.17 ± 0.08a	22.87 ± 0.16ab	23.04 ± 0.07	0.00
N	52	246	17	315	

**Effect of Year of birth on body weight of Malabari kids**

Year of birth significantly ( $P<0.01$ ) affected the body weight of Malabari goats at all ages except birth. Kids born during the year 2015 had higher body weight than those born during 2014 and 2016. Present findings are similar with Tomar *et al.*

(2001)<sup>[16]</sup> in Sirohi goats. The differences in growth due to year of birth could be attributed to the variations in rainfall resulting in changes in fodder availability and also to the changes in management.

**Table 3:** Season wise mean monthly body weight ±SE (kg) of Malabari goats from birth to one year

Season of birth						
Age in Months	Pre- monsoon	South-West monsoon	Post- monsoon	Winter	Mean	P value
Birth	2.37±0.04	2.43±0.03	2.45±0.04	2.42±0.03	2.41±0.02	0.38
3	7.83±0.08b	7.85±0.08b	7.87±0.10b	8.35±0.10a	8.00±0.05	0.00
6	14.85±0.12b	14.45±0.07c	14.52±0.10ab	15.33±0.16a	14.83±0.07	0.00
9	19.71±0.28b	19.57±0.10b	19.59±0.09b	20.64±0.22a	19.93±0.11	0.00
12	22.95±0.12b	22.86±0.09b	22.59±0.10b	23.53±0.16a	23.04±0.07	0.00
N	84	80	55	95	314	

**Effect of season on body weight of Malabari kids**

The variation in body weight due to season of birth was significant ( $P<0.01$ ) at different stages of growth. Winter born kids were heavier than the kids born during all other seasons of the year. But season had no significant ( $P>0.05$ )

effect on birth weight of Malabari kids. Season of birth plays an important role in growth performance indirectly through its influence on the dam's nutrition and hence amount of milk available to the unweaned kids. In the post-weaning period its influence is related to its effect on the quality and quantity of

pasture available to the weaned kids. Thus the differences in growth due to year of birth could be attributed to the

variations in rainfall resulting in changes in fodder availability and also to the changes in management.

**Table 4:** Type of birth wise mean monthly body weight  $\pm$ SE (kg) of Malabari goats from birth to one year

Age in Months	Type of birth			Mean	P value
	Single	Twins	Triplets		
Birth	2.48 $\pm$ 0.02a	2.42 $\pm$ 0.02a	1.89 $\pm$ 0.09b	2.41 $\pm$ 0.02	0.00
3	8.05 $\pm$ 0.06	7.96 $\pm$ 0.08	7.83 $\pm$ 0.15	8.00 $\pm$ 0.05	0.42
6	14.87 $\pm$ 0.09	14.82 $\pm$ 0.11	14.60 $\pm$ 0.25	14.83 $\pm$ 0.07	0.56
9	19.88 $\pm$ 0.16	19.99 $\pm$ 0.14	19.91 $\pm$ 0.40	19.93 $\pm$ 0.11	0.88
12	23.03 $\pm$ 0.09	23.03 $\pm$ 0.11	23.16 $\pm$ 0.27	23.04 $\pm$ 0.07	0.87
N	173	118	24	315	

**Effect of type of birth on body weight of Malabari goats**

Type of birth significantly ( $P < 0.01$ ) affected the birth weight of Malabari goats. Singles and twins had higher birth weight when compared to triplets. The reason is that singles and to an extent, twins doesn't have to share the uterine environment and nutrients with littermates as in case of multiples. But the effect was not persistent as it was reported by Hussain *et al.*

(1996) [7] in Black Bengal goats. Multiples could make up their body weight during the pre-weaning period. Ebozoje *et al.* (1995) [4] also observed non-significant effect of litter size on growth in West African Dwarf goats. They reported that artificial rearing of kids tend to remove differences in growth between singles and multiples.

**Table 5:** Age of dam wise mean monthly body weight  $\pm$ SE (kg) of Malabari goats from birth to one year

Age in Months	Age of dam				Mean	P value
	1-2 years	2-3 years	3-4 years	Above 4years		
Birth	2.47 $\pm$ 0.02a	2.38 $\pm$ 0.04ab	2.33 $\pm$ 0.06b	2.31 $\pm$ 0.08b	2.41 $\pm$ 0.02	0.00
3	8.01 $\pm$ 0.07	8.09 $\pm$ 0.11	7.83 $\pm$ 0.11	7.89 $\pm$ 0.14	8.00 $\pm$ 0.05	0.35
6	14.87 $\pm$ 0.09	15.04 $\pm$ 0.15	14.47 $\pm$ 0.13	14.54 $\pm$ 0.16	14.83 $\pm$ 0.07	0.06
9	19.89 $\pm$ 0.17	20.23 $\pm$ 0.19	19.57 $\pm$ 0.17	19.76 $\pm$ 0.24	19.93 $\pm$ 0.11	0.27
12	23.06 $\pm$ 0.10	23.14 $\pm$ 0.14	22.90 $\pm$ 0.15	22.79 $\pm$ 0.18	23.04 $\pm$ 0.07	0.50
N	163	82	43	27	315	

**Effect of age of dam on body weight of Malabari goats**

Birth weight significantly ( $P < 0.01$ ) differed between kids born to dams of different age groups. The highest birth weight was observed in kids born to dams of age group 1 to 2 years (2.47 kg) followed by 2 to 3 years (2.38kg). The difference was non-significant between dams of 3 to 4 years (2.33kg) and above 4 years (2.31kg). The effect was seen nullified in the subsequent pre and post weaning periods. The reason could be attributed to the considerable increase in the amount of milk produced by does with increase in parity. The present result is in agreement with Moulick and Syrstad (1970) [12] in Black Bengal goats. They also observed that heavier kids were born to younger dams. The amount of fleshing and fattening in the body of older does were considered as a factor causing hindrance for the proper prenatal growth leading to reduced birth weight. Primiparous does usually produce single off-springs that lead to increased birth weight. The subsequent increase in rate of multiple births with advancement of age of dam may have a negative effect on body weights of individual kids as reported by Awemu *et al.* (1999) [3] in Red Sokoto goats.

**Conclusion**

The trends in the present study revealed that sex, year of birth, season, type of birth, and age of dam had a significant effect on birth weight and growth of goats in their home tract.

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