

## Research Article

# NON-GENETIC EFFECT ON BODY WEIGHT AND BODY MEASUREMENT OF INDIGENOUS GOATS AT DIFFERENT STAGES OF GROWTH IN NORTH CENTRAL PLATEAU CLIMATIC ZONE OF ODISHA, INDIA

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**ABSTRACT:** The effect of season of birth, type of birth, sex and parity on body weight of indigenous goats under field condition in north central plateau agro-climatic zone of Odisha was studied. Data from 622 kids revealed that the overall body weights were  $1.02 \pm 0.01$ ,  $4.27 \pm 0.03$ ,  $7.29 \pm 0.05$ ,  $9.42 \pm 0.08$  and  $12.09 \pm 0.12$  kg at birth, 3 month, 6 month, 9 month and 12 month of age, respectively. Multiple births in the population were 72.3%. Significant difference was observed between male and female goats with respect to body weight in all stages of growth. Multiple births had significant effect on body weights of kids till 6 month of age. Season of birth had significant effect on body weight of kids only at birth and 3 month of age but parity did not show any significant effect on body weight at any studied stages.

**Key words:** Indigenous goat, Non genetic effect, Body growth, Body measurement.

## INTRODUCTION

Goats are important livestock species in Odisha as they contribute significantly to the agrarian economy, especially in resource poor farmers. The small size, early maturity, low capital investment and above all the simplicity of this animal suit them to the needs of limited resource producers. Growth potential of kids is

one of the most important traits in genetic improvement schemes for chevon production as genotype has significant influence on the growth rate of kids (Dhanda *et al.*, 2003). But a number of non-genetic factors affects growth traits and directly obscures recognition of genetic potential (Thiruvankadan *et al.*, 2009). Most of the environmental factors (period,

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parity, season, type of birth and sex of the kid) had significant effects on body weights at different ages. These factors were also proven to be important in other studies on kids of different breeds (Bobhate *et al.*, 2003). Hence, the performance records of an animal should be corrected for classifiable non-genetic sources of variation, which is essential for obtaining precise estimates of genetic parameters and breeding values so that breeding animals with the potential genetic merit can be identified and selected for further genetic improvement. Further, the potentiality of any livestock population need to be evaluated under prevailing management practices. Hence, this study was conducted to estimate the non-genetic factors that influence body weight of local goats under prevailing natural and ecological conditions at different stages of growth in central plateau agro-climatic zone of Odisha.

## MATERIALS AND METHODS

Data were recorded from 622 kids of indigenous goats (from birth to twelve months of age) during the year 2014-15 from 12 randomly selected villages of 3 blocks from Keonjhar district (north central plateau agro-climatic zone) of Odisha for the present study. The goats were reared under extensive system with no concentrate supplementation. The data collected were analyzed for significance of parity, season and sex. For parity, the data were divided into 3 parity groups as parity-1 (first parturition), parity-2 (second to fourth parturition) and parity-3 (more than fourth parturition). Similarly, for season, the divisions were season-1 (Summer- March to June), season-2 (Rainy- July to October) and season-3 (Winter- November to February) and different sexes were grouped as male and female.

Kidding of more than one progeny in a single pregnancy was considered as multiple births. Body weights were recorded at birth, 3 months, 6 months, 9 months and 12 months of age. Body weight was recorded in morning hours before the animals were taken for grazing with the help of a weighing balance. The body measurements *viz.* body length, chest girth, paunch girth, and height of 60 randomly selected goats were recorded with a standard measuring tape of 5 m with accuracy of 1mm after the animals were allowed to stand squarely on an even ground with its head a little high (erect). The number of kids decreased over the period due to death or sale of the animals, resulting in 481 heads at the end of 12 month of age. The data were subjected to least square analysis using Model Least-Square and Maximum Likelihood Program (Harvey 1990) for estimation of means along with standard errors and analysis of variance.

## RESULTS AND DISCUSSION

The least squares means for body measurements and body weights at different stages of growth along with standard errors for two sexes are presented in Table 1 and Table 2, respectively. It was observed that all the body measurements of males were significantly ( $P<0.05$ ) higher than those of females. All the body measurements increased with increase in live weight and age. Patro and Mishra (1987) found similar trend in Ganjam goats in which the body measurements increased with increasing body weight and age. As regards to the body measurement values, there was significant ( $P<0.05$ ) difference observed between male and female goats. Verma and Dixit (2005) and Deokar *et al.* (2007) reported significantly higher body length in males than

**Table 1. Body measurements (cm) sex wise at different stages of growth.**

Age	Sex	Height	Length	Chest Girth	Punch Girth
Birth	F	23.63 <sup>b</sup> ±0.22	22.71 <sup>b</sup> ±0.26	23.12 <sup>b</sup> ±0.27	23.18 <sup>b</sup> ±0.21
	M	24.95 <sup>a</sup> ±0.32	23.62 <sup>a</sup> ±0.30	24.12 <sup>a</sup> ±0.29	24.04 <sup>a</sup> ±0.34
3month	F	34.34 <sup>b</sup> ±0.42	32.23 <sup>b</sup> ±0.36	38.68 <sup>b</sup> ±0.24	40.52 <sup>b</sup> ±0.28
	M	35.30 <sup>a</sup> ±0.39	34.33 <sup>a</sup> ±0.40	40.66 <sup>a</sup> ±0.46	43.12 <sup>a</sup> ±0.48
6month	F	40.23 <sup>b</sup> ±0.55	37.34 <sup>b</sup> ±0.58	47.24 <sup>b</sup> ±0.54	51.45 <sup>b</sup> ±0.63
	M	42.46 <sup>a</sup> ±0.55	39.43 <sup>a</sup> ±0.58	49.13 <sup>a</sup> ±0.54	53.43 <sup>a</sup> ±0.63
9month	F	44.89 <sup>b</sup> ±0.24	41.72 <sup>b</sup> ±0.41	52.14 <sup>b</sup> ±0.44	55.06 <sup>b</sup> ±0.75
	M	46.42 <sup>a</sup> ±0.46	43.56 <sup>a</sup> ±0.43	53.82 <sup>a</sup> ±0.57	56.79 <sup>a</sup> ±0.54
12month	F	49.26 <sup>b</sup> ±0.36	46.11 <sup>b</sup> ±0.42	54.43 <sup>b</sup> ±0.57	58.42 <sup>b</sup> ±0.65
	M	51.23 <sup>a</sup> ±0.54	48.23 <sup>a</sup> ±0.58	56.24 <sup>a</sup> ±0.52	60.32 <sup>a</sup> ±0.57

Means with different superscripts in a column at birth, 3 month, 6 month, 9 month and 12 month between male and female differed significantly ( $P < 0.05$ ) (n = 60 of each sex).

in females. It can be concluded from the observations that the differences in the body weight for different breeds of kids was also reflected in the body measurements as well, since the body measurements have a direct correlation with body weights.

The data revealed that the average birth weight of male kids was significantly ( $P < 0.05$ ) higher than those of female kids. Higher birth weight of male kids than that of female kids were reported by many workers in different breeds in different places of study. Rao and Patro, (2004) reported for Black Bengal goats, Bariah *et al.* (2008) for Keonjhar goats, Rao *et al.* (2009) for Ganjam goats, Deshpande *et al.* (2009) reported for Sruti goats. For Kalahandi goats, the birth weights of male and female kids were reported as  $1.81 \pm 0.34$  and  $1.70 \pm 0.03$  kg, respectively (Mohanty *et al.*, 2004) which were found to be higher than the birth weights of Local goats observed in the present study. The lower body weight observed

in the local goats than that of other breeds could be due to difference in genetic constitution, plane of nutrition and other management practices followed by the farmers (Ekambaram *et al.*, 2010). The present findings were also found to be in accordance with the Dhanda *et al.* (2003) who stated that the goat genotype had a significant influence on the growth rate of kids. Males were found to be heavier than contemporary females at all stages from birth to 12 month of age, showing significant effect of sex on body weight in the goats under study. The yearling weight of males and females were recorded as  $12.68 \pm 0.19$  and  $11.65 \pm 0.11$  kg, respectively. Similar observations were also reported by Bhoite *et al.* (1994) and Deokar *et al.* (2007). The weight of males and females at 9 months of age were recorded as  $9.58 \pm 0.08$  and  $9.26 \pm 0.07$  kg, respectively, which is lower than the findings of Das *et al.* (2015) and Mishra *et al.* (2015) in their studies with indigenous goats in western Odisha.

**Table 2. Least squares means along with standard error for body weights (kg) at different stages of growth, parity, season and sex.**

Particulars	Birth	3 Months	6 Months	9 Months	12 Months
<b>Overall</b>	1.02±0.01 (622)	4.27±0.03 (590)	7.29±0.05 (572)	9.42±0.08 (568)	12.09±0.12 (481)
<b>Parity-1</b>	1.11 <sup>a</sup> ±0.02 (168)	4.33±0.05 (157)	7.22±0.06 (152)	9.38±0.08 (151)	12.06±0.14 (132)
<b>Parity-2</b>	0.98 <sup>b</sup> ±0.02 (246)	4.13±0.06 (235)	7.27±0.07 (231)	9.40±0.09 (229)	12.09±0.16 (188)
<b>Parity-3</b>	0.99 <sup>b</sup> ±0.02 (208)	4.39±0.07 (198)	7.37±0.09 (189)	9.48±0.10 (188)	12.11±0.18 (161)
<b>Season-1</b>	1.04 <sup>a</sup> ±0.01 (192)	4.48 <sup>a</sup> ±0.07 (187)	7.28 <sup>a</sup> ±0.09 (183)	9.44±0.11 (182)	12.12±0.17 (161)
<b>Season-2</b>	0.96 <sup>b</sup> ±0.01 (226)	4.14 <sup>b</sup> ±0.08 (214)	7.24±0.10 (203)	9.33±0.12 (201)	12.02±0.23 (156)
<b>Season-3</b>	1.07 <sup>a</sup> ±0.01 (204)	4.21 <sup>b</sup> ±0.04 (189)	7.35±0.05 (186)	9.50±0.06 (185)	12.13±0.13 (164)
<b>Female</b>	0.98 <sup>b</sup> ±0.02 (317)	4.11 <sup>b</sup> ±0.05 (299)	7.13 <sup>b</sup> ±0.06 (290)	9.26 <sup>b</sup> ±0.07 (287)	11.65 <sup>b</sup> ±0.11 (276)
<b>Male</b>	1.06 <sup>a</sup> ±0.01 (305)	4.43 <sup>a</sup> ±0.05 (291)	7.45 <sup>a</sup> ±0.06 (282)	9.58 <sup>a</sup> ±0.08 (281)	12.68 <sup>a</sup> ±0.19 (205)

Figures in parenthesis indicate number of observations.

Values bearing different superscripts in a column among parity, season and sex differed significantly ( $P < 0.05$ ).

The birth weight of kids of first parity were found to be significantly higher ( $P < 0.05$ ) than that of second and third parity. But Bharathidhasan *et al.* (2009) reported that the effect of second parity on birth weight of kid was more than first and third parity. Tomar *et al.* (1995) observed that the parity of gestation was found to have significant effect on the trait. Similar, results have been reported by Prakash and Singh (1985) and Pandev and Kanaujia (1988). Except birth weight, parity had no significant effect on the body weight of the kids at any other stage of growth till marketing.

Effect of season of birth of kids had significant ( $P < 0.05$ ) effect on body weight of kids at 3 month of age. This agrees with the findings of Dash *et al.* (2011) and Das *et al.* (2015) on their studies in indigenous goats of Mayurbhanj and Sambalpur districts, respectively in Odisha.

The birth weight of kids during summer ( $1.04 \pm 0.02$  kg) and winter ( $1.07 \pm 0.01$  kg) were significantly higher than those born during rainy season ( $0.96 \pm 0.01$  kg). However, the kids, those born during summer season were the heavier than those born during rainy and winter seasons at 3 months of age. Similarly, earlier reports

stated that the season of weaning age significantly influenced the average daily gain of the Barbari kids (Paul *et al.*, 1990 and Das *et al.*, 1995). The minimal pre weaning gain in rainy season might be due to lower grazing time of the goats because of rain in rainy season and lower day length in winter season.

## CONCLUSION

From this study, it may be concluded that season, parity and sex had significant effect on the birth weight of kids. Results also revealed that body measurements of indigenous goats varied depending upon sex, birth type, parity and season. Parity had no significant effect on body weight from three months till one year of age.

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