



## Morphometric characteristics of Shahabadi lambs at birth under field conditions\*

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The performance of breeds under farmers' management is required to be evaluated to improve the productivity of indigenous breeds. Shahabadi sheep one of the 44 well-recognized breeds of Indian sheep, is distributed in southern Gangetic plains of Bihar state. The breed plays a key role in the livelihood of sheep farmers in Buxar, Bhojpur, Patna, Rohtas, Aurangabad, Kaimur, Gaya and Jehanabad districts of Bihar. However, no work has been carried out in the last 3 decades to study the morphometric characteristics of Shahabadi lambs and the effect of non-genetic factors on these traits. Keeping these in view, the present study was undertaken to evaluate the morphometric characteristics of Shahabadi lambs at birth under different non-genetic factors.

A detailed survey was undertaken from June 2011 to September 2012 in Buxar, Itahri and Rajpur blocks of Buxar, Bihiya block of Bhojpur and Bikramganj block of Rohtas districts of Bihar in which 105 flocks (60 from Buxar, 15 from Bhojpur and 30 from Rohtas districts) were selected randomly to assess morphometric traits of Shahabadi lambs at birth. A total of 336 Shahabadi lambs at birth were used for studying the morphometric traits which included body length (cm), height at withers (cm), chest girth (cm), face length (cm), ear length (cm) and tail length (cm). The collected data were sorted using Microsoft Excel Starter 2010.

Further, these data were analysed for the effects of various non-genetic factors including sex (male and female), season (Winter - November to February; Summer - March to June and Rainy - July to October), type of birth (single and twins), flock size (small - less than 51 sheep; medium - 51 to 100 sheep and large - more than 100 sheep) and location (Buxar, Itahri and Rajpur blocks in Buxar district, Bihiya block in Bhojpur district and Bikramganj block in Rohtas district of Bihar) using the linear statistical model. Duncan's Multiple Range Test as modified by Kramer

(1957) was used for testing differences among least square means (using the inverse coefficient matrix).

*Shahabadi sheep in the breeding tract:* The breeding tract of Shahabadi breed falls under Bihar agro climatic zone IIIB, which is a southwest alluvial plain of the state and adjacent to southern bank of the river Ganges. The breed is medium in size, possesses long tail and known for marginal twinning percentage. The lambs are generally light grey in colour with sporadic dark patches and fully covered by coarse wool.

The overall least squares means of body length, height at withers, chest girth, face length, ear length and tail length at birth pooled over sexes were found to be  $26.21 \pm 0.12$  cm,  $34.08 \pm 0.11$  cm,  $33.62 \pm 0.12$  cm,  $8.16 \pm 0.08$  cm,  $9.01 \pm 0.08$  cm and  $17.29 \pm 0.12$  cm, respectively in Shahabadi lambs.

Similar body length of  $29.30 \pm 0.20$  cm was also reported in Mecheri breed of sheep by Karunanithiet *et al.* (2005). Besides, Ravimurugan *et al.* (2007) reported the chest girth of  $34.81 \pm 0.50$  cm in Vembur sheep and Mandal *et al.* (2008) found the chest girth in Muzaffarnagari sheep to be  $34.61 \pm 0.07$  cm, which are close to the findings of the present study. Further, Mehta *et al.* (1995) in Malpura sheep, Mandal *et al.* (2008) in Muzaffarnagari sheep and Tailor and Yadav (2011) in Sonadi sheep found higher values for pooled body lengths as 31.5 cm,  $33.65 \pm 0.08$  cm and  $32.86 \pm 0.84$  cm, respectively whereas Ravimurugan *et al.* (2007) observed slightly lower value for the same trait in Vembur lambs as  $23.68 \pm 0.34$  cm at birth. Similarly, for height at withers, Ravimurugan *et al.* (2007) in Vembur and Dass (2008) in Pugal sheep reported the values as high as  $38.00 \pm 0.30$  cm and  $40.56 \pm 0.19$  cm, respectively. Broader chest girths than the one reported in the present study were also noticed by Dass (2008) in Pugal and Tailor and Yadav (2011) in Sonadi sheep as  $36.84 \pm 0.19$  cm and  $35.87 \pm 0.85$  cm, respectively. The values of body length, height at withers and chest girth obtained in the present study are comparable to the values reported for the lambs of indigenous medium sized sheep breeds found in India. Besides, variations found in the morphometric characteristics of lambs of different breeds at birth may be attributed to different genotypes of the breed along with the effects of environment and genotype  $\times$  environment interactions.

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In case of minor morphometric traits, Mehta *et al.* (1995) in Malpura and Dass (2008) in Pugal sheep reported the pooled ear lengths to be as low as 3.0 cm and  $6.38 \pm 0.08$  cm respectively whereas Karunanithi *et al.* (2005) in Mecheri found pooled ear length to be as high as  $11.1 \pm 0.1$  cm at birth. In case of tail length, Mehta *et al.* (1995) in Malpura, Karunanithi *et al.* (2005) in Mecheri and Dass (2008) in Pugal observed the tail lengths of lambs pooled over sexes at birth as low as  $13.00 \pm 0.00$  cm,  $6.60 \pm 0.10$  cm and  $12.78 \pm 0.11$  cm, respectively. The tail lengths are generally shorter or short to medium in length for most of the Indian sheep breeds except few breeds found in northwestern parts of India. The long tail found in the present study may be considered as one of the unique characteristics of the breed.

**Effect of sex:** Least squares means of morphometric traits in male and female lambs of Shahabadi sheep indicated that male lambs at birth were significantly ( $P < 0.01$ ) superior than females by 1.16 cm, 1.04 cm, 1.05 cm, 0.31 cm, 0.71 cm and 0.37 cm in body length, height at withers, chest girth, face length, ear length and tail length, respectively. Ravimurugan *et al.* (2007) in Vembur breed of sheep found significantly ( $P < 0.01$ ) higher body length, height at withers and chest girth in male lambs than the females at birth which are similar to the findings of the present study. However, Tailor and Yadav (2011) in Sonadi sheep found no significant differences between male and female lambs at birth with respect to these traits though males had higher value in each trait. The reasons for superiority of male lambs at birth might be attributed to differences in the endocrine profiles, especially role of testosterone, faster growth of male foetus during prenatal development, various gene combinations and their differential expressions in both the sexes. Hafez (1962) suggested higher growth in prenatal stage under the influence of male sex hormone with anabolic effect which might also be the reason for higher morphometric characteristics at birth in male lambs.

**Effect of season:** Season had highly significant ( $P < 0.01$ ) effect on the morphometric traits of Shahabadi lambs at birth. Least squares means of different conformation traits at birth in Shahabadi lambs under various seasons showed that the winter born lambs were significantly ( $P < 0.01$ ) superior to summer and rainy season born lambs by 1.07 cm and 1.87 cm in body length, 0.91 cm and 1.88 cm in height at withers, 1.21 cm and 1.94 cm in chest girth, 1.29 cm and 1.75 cm in face length, 1.28 cm and 1.77 cm in ear length and 0.78 cm and 1.85 cm in tail length, respectively. Further, there were no significant differences between summer and rainy season born lambs in body length, height at withers, face length and ear length. However, summer born lambs were significantly ( $P < 0.01$ ) superior by 0.73 cm in chest girth and 1.07 cm in tail length than rainy season born lambs.

Ravimurugan *et al.* (2007) in Vembur lambs observed significantly lower body length and chest girth at birth for rainy season born lambs and significantly ( $P < 0.01$ ) higher height at withers in winter born lambs which are similar to the findings of the present study. Higher values of

morphometric characteristics at birth in winter season born Shahabadi lambs might be attributed to larger growth of foetus because of availability of plenty of fodder and grasses for the ewes during gestation period which coincides with rainy season.

**Effect of type of birth:** Effect of type of birth on major morphometric traits studied in Shahabadi lambs at birth was highly significant ( $P < 0.01$ ). The least squares analysis of morphometric traits indicated that single born lambs had significantly ( $P < 0.01$ ) longer body length, height at withers, chest girth, face length, ear length and tail length by 2.84 cm, 2.82 cm, 3.78 cm, 0.67 cm, 0.33 cm and 1.09 cm, respectively than twin born lambs. Mandal *et al.* (2003) in Muzaffarnagari and Narula *et al.* (2010) in Marwari sheep reported highly significant ( $P < 0.01$ ) differences between body weights of single and twin born Shahabadi lambs at birth. Gootwine *et al.* (2006) suggested that placental insufficiency causes lower birth weights in case of increased number of foetuses within the uterus in sheep. Significantly ( $P < 0.01$ ) lower values for morphometric characteristics in twin born lambs obtained in the present study might also be due to placental insufficiency or increased uterine competition among twin born lambs when compared to single born lambs.

**Effect of flock size:** The least squares means of all morphometric traits at birth in small ( $< 51$ ), medium (51–100) and large ( $> 100$ ) flocks revealed that Shahabadi lambs reared in small flocks were significantly ( $P < 0.01$ ) superior than the lambs reared in medium and large sized flocks by 0.85 cm and 0.86 cm in body length, 0.80 cm and 0.86 cm in height at withers, 0.37 cm and 0.42 cm in face length and 0.62 cm and 0.76 cm in tail length, respectively. Besides, there was no significant difference between the lambs reared in medium and large flocks in these traits. In case of chest girth and ear length, the lambs reared in small flocks had significantly ( $P < 0.01$ ) 0.65 cm and 0.79 cm, and 0.23 cm and 0.43 cm higher values than the lambs reared in medium and large sized flocks at birth. Besides, the lambs reared in medium flocks also had significantly ( $P < 0.01$ ) broader chest girth by 0.14 cm and longer ear length by 0.20 cm than the lambs reared in large flocks. Higher values of morphometric traits in small flocks might be attributed to better care and management provided by the farmers who reared small flocks as livelihood of small sheep farmers solely depended on sheep rearing.

**Effect of location:** Location had highly significant ( $P < 0.01$ ) effect on the morphometric characteristics of Shahabadi lambs at birth. The least squares means of these traits in Shahabadi lambs studied at five locations indicated that the lambs born at Buxar were found significantly ( $P < 0.01$ ) superior to the lambs born at Itahri, Rajpur and Bikramganj blocks by 2.88 cm, 4.80 cm and 4.23 cm in body length, 3.17 cm, 5.15 cm and 4.46 cm in heights at withers and 3.31 cm, 4.94 cm and 4.67 cm in chest girth respectively. Similarly, the lambs born at Bihiya were also significantly ( $P < 0.01$ ) superior by 2.13 cm, 4.05 cm and 3.48 cm in body length, 2.34 cm, 4.32 cm and 3.63 cm in

height at withers and 2.17 cm, 3.80 cm and 3.53 cm in chest girth to the lambs born at Itahri, Rajpur and Bikramganj blocks respectively. Further, no significant differences could be obtained between the lambs born at Buxar and Bihiya blocks with respect to the major morphometric traits studied.

Tailor and Yadav (2011) found the effects of locations on the morphometric characteristics of lambs at birth to be non-significant in Sonadi sheep. Variations in the morphometric traits of lambs at different locations might be ascribed to variation in growth rate of dams as a result of differential level of feeding, various management practices adopted by the farmers and other environmental factors in the breeding tract.

The present study revealed that the Shahabadi lambs possess the conformation similar to the lambs of medium sized sheep breeds of India. The breed also possesses very long tail, a special characteristic being enjoyed by very few sheep breeds in India. The effect of all the non-genetic factors studied in the present study was highly significant ( $P < 0.01$ ). Huge variations as showed by the breed at birth in the breeding tract could be utilized as an aid in future selection and breeding programme.

#### SUMMARY

A survey was undertaken in 105 flocks of Shahabadi sheep reared in Buxar, Bhojpur and Rohtas districts of Bihar to study the morphometric traits of lambs at birth. The traits included in the present study were body length, height at withers, chest girth, face length, ear length and tail length. The effect of non-genetic factors such as sex, season, type of birth, flock size and location on the morphometric traits were studied using simple linear statistical model. The least squares means of body length, height at withers, chest girth, face length, ear length and tail length at birth pooled over sexes were found to be  $26.21 \pm 0.12$  cm,  $34.08 \pm 0.11$  cm,  $33.62 \pm 0.12$  cm,  $8.16 \pm 0.08$  cm,  $9.01 \pm 0.08$  cm and  $17.29 \pm 0.12$  cm, respectively. The effect of all the non-genetic factors considered in the present study had highly significant ( $P < 0.01$ ) effect on all the morphometric traits studied.

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