



# Effect of Age on the Body Parameters, Scrotum, Seminal Characteristics, Spermatozoa Integrity and Sexual Behavior in Ganjam Buck

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## ABSTRACT

**Background:** Bucks raised for breeding purposes receive no special attention and are raised at random without following the correct selection process. Besides, the fertility of the male bucks is never addressed. Goat breeders have noted a sharp decline in the reproductive efficiency of Ganjam goats, associated with a lengthened kidding interval, fewer successful pregnancies and decreased twinning frequency. The measurement of male fertility parameters is crucial for estimating the breeding performance of any species since males contribute 50% of the reproductive efficiency.

**Methods:** Six Ganjam bucks of age 1.5(B1), 2(B2), 2.5(B3), 3.5(B4), 4(B5) and 4.5(B6) years procured after selection on the basis of their body morphometry and sexual behaviour were maintained under optimum management practice. They were trained for semen collection. For study on effect age on the semen qualities, they were classified into two age groups and ejaculates were collected during two phases. Bucks of age below 3 were considered under Age group I and bucks older than 3 years were assigned Age group II. Twelve ejaculates from each buck were collected, six ejaculates between the month of July to August and six ejaculates during October to November. The total of 72 ejaculates was evaluated for the study of seminal characteristics. Besides, the external body parameters, scrotal parameters and sexual behaviour of the bucks were also recorded before each semen collection.

**Result:** The bucks of age group II were found to be having significantly higher ( $p < 0.01$ ) body weight, mean body length and average value of chest girth than age group I bucks in the present study. The mean value of scrotal width of the bucks of age group II was significantly higher ( $p < 0.01$ ) as compared to that of age group I. The mean value of abnormalities of the bucks of age group II was significantly higher ( $p < 0.01$ ) than that of age group I. The mean value of acrosome integrity and MBRT of the bucks of age group II was significantly higher ( $p < 0.05$ ) to that of age group I. The present study will be helpful in the selection of Ganjam buck at appropriate age for breeding purpose basing on their body parameters, scrotum, seminal characteristics, spermatozoa integrity and sexual behavior.

**Key words:** Age, Ganjam buck, HOST, Scrotum, Seminal characteristic, Sexual behavior, Spermatozoa integrity.

## INTRODUCTION

Goat farming is a reliable source of revenue for farmers and serves as an auxiliary to agriculture (Banerjee, 2000; Arrebola and Abecia, 2017). Goats make up 26.40% of the animal population. According to the 20<sup>th</sup> livestock census, there are 148.88 million indigenous goats in India, of which 26.97% are pure breed, 11.77% are graded breed and the remainder 61.26% is non-descript breeds (Chaurasia *et al.*, 2023a). Goat farming provides the sole source of income for 25% of the rural population in the state of Odisha. The Ganjam goat, also known as the lanka, golla, or dalua, is a medium-sized animal that is mostly reared for meat. The medium-sized animal, pendulous ears are drooping and the coat colour is predominantly brown or black (Chaurasia *et al.*, 2023b). The measurement of male fertility parameters is crucial for estimating the breeding performance of any species since males contribute 50% of the reproductive efficiency (Ramachandran and Singh, 2017; Revathy *et al.*, 2022 and Chaurasia *et al.*, 2024). So, the present study was undertaken on the age variation of scrotal parameters, seminal characteristics, spermatozoa integrity and sexual behavior in Ganjam buck that could be correlated with the breeding efficiency of this breed to develop suitable breeding programmes.

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## MATERIALS AND METHODS

A total of 120 Ganjam bucks of different age groups reared by the local farmers of Rambha, Khalikote and Chhatrapur areas of Ganjam district were used for the present study. A total of six healthier bucks of age 1.5(B1), 2(B2), 2.5(B3), 3.5(B4), 4(B5) and 4.5(B6) years were procured from the Farmers for the experimental purpose in collaboration with DST (Odisha) Project on "Selection of Breeding Bucks through Semen Evaluation for improving fertility in Ganjam goats" and maintained by uniform feeding, housing and other management practice. For study on effect age on the semen qualities, they were classified into two age groups and ejaculates were collected during two phases. Bucks of age below 3 were considered under Age group I and bucks older than 3 years were assigned Age group II. Twelve ejaculates from each buck were collected, six ejaculates between the month of July to August, 2022 and six ejaculates during October to November, 2022. The total of 72 ejaculates was evaluated for the study of seminal characteristics. The body parameter, scrotal parameters like scrotal length, scrotal circumference and scrotal diameter; seminal characteristics; sexual behavior such as reaction time, Flehmen's response and libido were studied. All the data generated in the above experiments were statistically analyzed using Statistical Package for the Social Sciences (SPSS) - 1996 version software computer package.

## RESULTS AND DISCUSSION

### (i) Variation of body parameters of Ganjam bucks

The mean body weights in the present investigation for the two age groups were  $32.81 \pm 0.69$  and  $42.42 \pm 0.37$  kg, respectively with an overall mean of  $37.61 \pm 0.69$  kg. The bucks of age group II were found to be significantly heavier than age group I bucks in the present study. The average value of body weight of the bucks of age group II was significantly higher ( $p < 0.01$ ) as compared to that of age group I.

The overall mean value of body length (cm) recorded for the experimental animals of Ganjam bucks was  $56.47 \pm 0.62$ . The bucks of age group I were recorded to have significantly lower ( $p > 0.01$ ) mean body length ( $54.67 \pm 0.43$ ) than that of age group II ( $58.28 \pm 1.07$ ).

The chest girth of the Ganjam bucks was observed to have an overall mean of  $79.44 \pm 0.55$  across the two age groups (Table 1). The bucks of age group II showed a significantly higher ( $p < 0.01$ ) average value of chest girth ( $82.44 \pm 0.33$ ) compared to that of age group I ( $76.44 \pm 0.79$ ).

### (ii) Variation of scrotal parameters of Ganjam bucks with age

The overall mean value of scrotal length (cm) estimated for the experimental animals of Ganjam bucks was  $14.36 \pm 0.19$ . The mean value of scrotal length of the bucks of age group I and age group II were  $14.389 \pm 0.29$  and  $14.33 \pm 0.27$ , respectively. There was no significant difference between two age groups with respect to scrotal length. The present findings were similar to the reports given by Webb *et al.* (2004), Kamal *et al.* (2005), Barkawi *et al.* (2006) and Chentouf *et al.* (2011).

The mean scrotal widths (cm) in the present investigation for two age groups were  $9.50 \pm 0.27$  and  $10.54 \pm 0.18$ , respectively with an overall mean of  $10.02 \pm 0.17$ . The mean value of scrotal width of the bucks of age group II was significantly higher ( $p < 0.01$ ) as compared to that of age group I. The present findings were in agreement to the observations of Kaymakci *et al.* (1988).

The scrotal circumference (cm) of the Ganjam bucks was observed to have an overall mean of  $24.33 \pm 0.23$ . The mean value of scrotal circumference of the buck of age group I and age group II were  $24.00 \pm 0.35$  and  $24.67 \pm 0.29$ , respectively (Table 2). There was no any significant difference between two age groups with respect to scrotal circumference. The present findings were in line with the findings of Pandey *et al.* (1985) and Noran *et al.* (1998).

**Table 1:** Variation of body measurements of Ganjam bucks with age.

Parameters	Overall (72)	Age Gr-I (36)	Age Gr-II (36)	p value
Body weight	$37.61 \pm 0.69$	$32.81^a \pm 0.69$	$42.42^b \pm 0.37$	$< 0.001$
Body length	$56.47 \pm 0.62$	$54.67^a \pm 0.43$	$58.28^b \pm 1.07$	0.003
Chest girth	$79.44 \pm 0.55$	$76.44^a \pm 0.79$	$82.44^b \pm 0.33$	$< 0.001$

Figures in parentheses are number of observations.

<sup>a,b</sup>Means with different superscripts differ significantly.

**Table 2:** Variation of Scrotal parameters of Ganjam bucks with age.

Parameters	Overall (72)	Age Gr-I (36)	Age Gr-II (36)	p value
Scrotal length	$14.36 \pm 0.19$	$14.38 \pm 0.29$	$14.33 \pm 0.27$	0.890
Scrotal width	$10.02 \pm 0.17$	$9.50^a \pm 0.27$	$10.54^b \pm 0.18$	0.002
Scrotal circumference	$24.33 \pm 0.23$	$24.00 \pm 0.35$	$24.67 \pm 0.29$	0.143

Figures in parentheses are number of observations.

<sup>a,b</sup>Means with different superscripts differ significantly.

**(iii) Variation of sexual behavior of Ganjam bucks with age**

The overall mean value of reaction time, Flehmen's reaction and libido, recorded for the experimental animals of Ganjam bucks were  $10.93 \pm 0.15$  sec,  $5.21 \pm 0.22$  and  $5.40 \pm 0.32$ , respectively. The mean value of reaction time in age group I was  $10.85 \pm 0.22$  whereas, in case of age group II, it was  $11.01 \pm 0.21$ . The mean Flehmen's reaction was  $5.28 \pm 0.33$  and  $5.14 \pm 0.30$  in case of age group I and age group II, respectively. Similarly, the corresponding figures for mean value of libido were recorded to be  $5.19 \pm 0.44$  and  $5.61 \pm 0.46$  (Table 3). Statistical analysis of the data did not reveal any significant difference in any parameter with respect to sexual behaviour viz. reaction time, Flehmen's reaction and libido between the two groups. The present findings were in agreement to the observations of Kerketta *et al.* (2013).

**(iv) Variation of macroscopic seminal characteristics of Ganjam bucks with age**

In the present investigation, the mean value of colour, volume, consistency and pH estimated on bucks semen were  $1.33 \pm 0.08$ ,  $0.60 \pm 0.03$ ,  $1.00 \pm 0.00$  and  $6.33 \pm 0.01$ , respectively in age group I and  $1.42 \pm 0.08$ ,  $0.59 \pm 0.03$ ,  $1.00 \pm 0.00$  and  $6.33 \pm 0.02$ , respectively in age group II with an overall mean  $1.38 \pm 0.06$ ,  $0.59 \pm 0.02$ ,  $1.00 \pm 0.00$  and  $6.33 \pm 0.01$ , respectively (Table 4). The mean of macroscopic

seminal characteristics did not show any significant difference between two age groups. The present findings were similar to the reports given by Chemineau (1987) and Pattanaik *et al.* (1991).

**(v) Variation of microscopic seminal characteristics of Ganjam bucks with age**

The overall mean value of mass activity, individual motility, concentration, live and abnormalities, recorded for the experimental animals of Ganjam bucks semen were  $3.74 \pm 0.04$ ,  $80.11 \pm 0.41$ ,  $3.15 \pm 71.50$ ,  $85.39 \pm 0.29$  and  $6.21 \pm 0.15$ , respectively. The mean value of mass activity, individual motility and concentration in age group I were  $3.79 \pm 0.04$ ,  $80.34 \pm 0.47$  and  $3.05 \pm 94.81$ , respectively whereas in case of age group II corresponding values were  $3.69 \pm 0.06$ ,  $79.83 \pm 0.67$  and  $3.26 \pm 1.05$ , respectively. The mean of live and abnormalities were  $85.25 \pm 0.44$  and  $5.75 \pm 0.22$ , respectively in case of age group I and  $85.52 \pm 0.39$  and  $6.68 \pm 0.16$ , respectively in case of age group II (Table 5). The present findings were in agreement to the observations of Biswas *et al.* (2002).

The mean value of abnormalities of the bucks of age group II was significantly higher ( $p < 0.01$ ) than that of age group I, but mean value of mass activity, individual motility concentration and live did not reveal any significant difference between the two age groups.

**Table 3:** Variation of sexual behavior of Ganjam bucks with age.

Parameters	Overall (72)	Age Gr-I (36)	Age Gr-II (36)	p value
Reaction time	$10.93 \pm 0.15$	$10.85 \pm 0.22$	$11.01 \pm 0.21$	0.586
Flehmen's reaction	$5.21 \pm 0.22$	$5.28 \pm 0.33$	$5.14 \pm 0.30$	0.759
Libido	$5.40 \pm 0.32$	$5.19 \pm 0.44$	$5.61 \pm 0.46$	0.515

Figures in parentheses are number of observations.

**Table 4:** Variation of macroscopic seminal characteristics of Ganjam bucks with age.

Parameters	Overall (72)	Age Gr-I (36)	Age Gr-II (36)	p value
Colour	$1.38 \pm 0.06$	$1.33 \pm 0.08$	$1.42 \pm 0.08$	0.472
Volume	$0.59 \pm 0.02$	$0.60 \pm 0.03$	$0.59 \pm 0.03$	0.903
Consistency	$1.00 \pm 0.00$	$1.00 \pm 0.00$	$1.00 \pm 0.00$	-
pH	$6.33 \pm 0.01$	$6.33 \pm 0.01$	$6.33 \pm 0.02$	1.000

Figures in parentheses are number of observations.

**Table 5:** Variation of microscopic seminal characteristics of Ganjam bucks with age.

Parameters	Overall (72)	Age Gr-I (36)	Age Gr-II (36)	p value
Mass activity	$3.74 \pm 0.04$	$3.79 \pm 0.04$	$3.69 \pm 0.06$	0.216
Individual motility %	$80.11 \pm 0.41$	$80.34 \pm 0.47$	$79.83 \pm 0.67$	0.498
Concentration ( $10^9$ /ml)	$3.15 \pm 71.50$	$3.05 \pm 94.81$	$3.26 \pm 1.05$	0.145
Live %	$85.39 \pm 0.29$	$85.25 \pm 0.44$	$85.52 \pm 0.39$	0.642
Abnormalities %	$6.21 \pm 0.15$	$5.75 \pm 0.22$	$6.68 \pm 0.16$	0.001

Figures in parentheses are number of observations.

<sup>a,b</sup>Means with different superscripts differ significantly.

**Table 6:** Variation of acrosome integrity, MBRT and HOST of Ganjam buck semen with age.

Parameters	Overall (72)	Age Gr-I (36)	Age Gr-II (36)	p value
Acrosome integrity (%)	73.00±0.19	72.53±0.26	73.47 <sup>b</sup> ±0.26	0.013
MBRT (min)	4.08±0.07	4.23 <sup>a</sup> ±0.11	3.94 <sup>b</sup> ±0.08	0.043
HOST (sec)	56.18±0.34	55.92±0.40	56.44±0.54	0.436

Figures in parentheses are number of observations.

<sup>a,b</sup>Means with different superscripts differ significantly.

#### (vi) Variation of acrosome integrity, MBRT and HOST of Ganjam buck semen with age

The mean value of acrosome integrity, MBRT and HOST, estimated for buck semen were 72.53±0.26, 4.23±0.11 and 55.92±0.40, respectively in age group I and the corresponding values in age group II were 73.47±0.26, 3.94±0.08 and 56.44±0.54, respectively with an overall mean 73.00±0.19, 4.08±0.07 and 56.18±0.34, respectively (Table 6).

The mean value of acrosome integrity and MBRT of the bucks of age group II was significantly higher ( $p<0.05$ ) to that of age group I. Mean HOST did not reveal any significant difference between the two age groups. The present findings were similar to the observations of (Kaymakci *et al.*, 1988; Khalili *et al.*, 2009 and Sundararaman *et al.*, 2016).

## CONCLUSION

The bucks of age group II were found to be having significantly higher ( $p<0.01$ ) body weight, mean body length and average value of chest girth than age group I bucks in the present study. There was no significant difference between two age groups with respect to scrotal length and scrotal circumference. The mean value of scrotal width of the bucks of age group II was significantly higher ( $p<0.01$ ) as compared to that of age group I. Statistical analysis of the data did not reveal any significant difference in any parameter with respect to sexual behaviour *viz.* reaction time, Flehmen's reaction and libido between the two groups. The mean of macroscopic seminal characteristics did not show any significant difference between two age groups. The mean value of abnormalities of the bucks of age group II was significantly higher ( $p<0.01$ ) than that of age group I, but the mean value of mass activity, individual motility concentration and live did not reveal any significant difference between the two age groups. The mean value of acrosome integrity and MBRT of the bucks of age group II was significantly higher ( $p<0.05$ ) to that of age group I. Mean HOST did not reveal any significant difference between the two age groups.

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## Conflict of interest

The authors declare no conflict of interest among them.

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