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Effect of Season on the 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 twining 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: 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. For study on effect of season on the semen qualities, twelve ejaculates from each buck were collected, six ejaculates between the month of July to August (season 1) and six ejaculates during October to November (Season 2).

Result: The scrotal length, scrotal width, scrotal circumference have highly significant positive degree of association with Flehmen's reaction and Libido score and all the parameters exhibited highly significant negative degree of association with reaction time. Moreover, the scrotal length, scrotal width and scrotal circumference had significantly higher positive degree of association with colour, volume of the semen and negative degree of association with MBRT. Further, the sperm concentration revealed a highly significant degree of association with scrotal length, scrotal width, scrotal circumference, livability % and acrosome integrity and a significant degree of association with mass activity. Livability % of the semen samples of the six bucks revealed a highly significant degree of association with scrotal length, scrotal width, scrotal circumference, sperm concentration and acrosome integrity.

Key words: Cold shock, Ganjam buck, Scrotum, Season, 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 20th 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. So, the present study was undertaken on the seasonal 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.

MATERIALS AND METHODS

A total of 120 Ganjam bucks of different age groups reared by the local farmers of Rambha, Khalikote and Chhatrapur

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areas of Ganjam district were used for the present study during 2022 to 2023 at the Department of ARGO, CVSc. and A.H., OUAT, Bhubaneswar. 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. The 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 in the month of July to August (season 1) and October to November (Season 2). For study on effect of season on the semen qualities, twelve ejaculates from each buck were collected, six ejaculates between the month of July to August (Season 1) and six ejaculates during October to November (Season 2). The total of 72 ejaculates were evaluated for the study of seminal and biochemical characteristics.

All the data generated in the above experiments were statistically analyzed using SPSS (1996) computer package.

RESULTS AND DISCUSSION

Seasonalvariation of scrotal parameters of Ganjam bucks

The mean scrotal length (cm) in the present investigation for the two season groups were 13.59±0.26 and 15.13±0.24, respectively with an overall mean of 14.36±0.19. The mean value of scrotal length of the bucks of season 2 was significantly higher ($p<0.01$) as compared to that of season 1. 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 scrotal width (cm) of the Ganjam bucks was observed to have an overall mean of 10.02±0.17. The mean value of scrotal width of the buck of season 1 and season 2 were 9.19±0.22 and 10.85± 0.19, respectively. The bucks of season 2 showed a significantly higher ($p<0.01$) mean value of scrotal width compared to that of season 1. The present findings were in agreement to the observations of Kaymakci *et al.* (1988).

The overall average value of scrotal circumference (cm) estimated for the experimental animals of Ganjam bucks was 24.33±0.23. The mean scrotal circumference of the bucks of season 1and season 2 were 23.11±0.27 and 25.56±0.22, respectively. The mean value of scrotal circumference of the bucks of season 2 was significantly higher ($p<0.01$) as compared to that of season 1. The present findings were in line with the findings of Pandey *et al*. (1985) and Noran *et al*. (1998).

Seasonal variation of sexual behavior of Ganjam bucks

The overall mean value of reaction time, Flehmen's reaction and libido, recorded for the experimental animals of Ganjam bucks were 10.93±0.15, 5.21±0.22 and 5.40±0.32, respectively. The mean value of reaction time in season 1 was 12.03±0.12 whereas, in case of season 2, it was 9.83±0.97. The mean Flehmen's reaction was 3.50±0.11 and 6.92±0.16 in case of season1 and season 2, respectively. Similarly, the corresponding figures for mean value of libido were recorded to be 2.86±0.13 and 7.94 ±0.14.

The mean value of reaction time, Flehmen's reaction and libido of the buck of season 2 was significantly higher ($p<0.01$) than that of season 1. The present findings were in agreement to the observations of Kerketta *et al*. (2013).

Seasonal variation of macroscopic seminal characteristics of Ganjam bucks

In the present investigation, the mean value of colour, volume, consistency and pH estimated on bucks semen were 1.00±0.00, 0.42±0.01, 1.00 ± 0.00 and 6.33±0.02, respectively in season 1 and 1.75±0.07, 0.77±0.01, 1.00±0.00 and 6.34±0.1, respectively in season 2 with an overall mean 1.37±0.06, 0.59±0.02, 1.00±0.00 and 6.33±0.01, respectively. The present findings were similar to the reports given by Chemineau (1987) and Pattanaik *et al*. (1991).

The mean value of colour and volume of the bucks of season 2 was significantly higher ($p<0.01$) than that of season 1 and other macroscopic seminal parameters like consistency and pH did not reveal any significant difference between the two seasons.

Seasonal variation of microscopic seminal characteristics of Ganjam bucks

The mean value of mass activity, individual motility, concentration, live and abnormalities, estimated for buck semen were 3.64±0.05, 79.36±0.62, 2.57±17.47 84.36±0.39 and 6.3±0.21, respectively in season 1 and the corresponding values in season 2 were 3.84±0.04, 80.86±0.50, 3.74±28.53, 86.42±0.37 and 6.08±0.19, respectively with an overall mean 3.74±0.04, 80.11±0.41, 3.15±71.49, 83.39± 0.29 and 6.22±0.15, respectively. The present findings were in agreement to the observations of Biswas *et al*. (2002).

Statistical analysis of the data revealed that there was non-significant difference inindividual motility and abnormalities between season 1 and season 2. But, in case of mean of mass activity, concentration and live, there was significant higher ($p<0.01$) in the season 2 than season 1.

Seasonal variation of acrosome integrity, MBRT and HOST of Ganjam buck semen

The overall mean value of acrosome integrity, MBRT and HOST, recorded for the experimental animals of Ganjam bucks semen were 73.00±0.19, 4.08±0.07 and 56.18±0.33, respectively. The mean value of acrosome integrity, MBRT and HOST in season 1 were 72.25±0.26, 4.54±0.07 and 54.89±0.37, respectively whereas in case of season 2 corresponding values were 73.75±0.23, 3.64±0.06 and 57.47±0.47, respectively. The mean value of acrosome integrity, MBRT and HOST there was significant higher

($p<0.01$) in the season 2 than that of season 1. The present findings were similar to the observations of Kaymakci *et al.* (1988); Khalili *et al*. (2009) and Sundararaman *et al*. (2016).

Effect of cold shock on spermatozoa of Ganjam buck in different seasons

The motility per cent of spermatozoa for the ejaculates in season 1 and 2 before exposure to cold shock were 77.41±1.42% and 81.30±1.20, respectively. The corresponding values after cold shock were 13.81±1.53 and 19.78±1.72, respectively.

Similarly, the per cent of live spermatozoa in season 1 and 2 were 81.27±0.83 and 84.65±0.97 before cold shock and 15.83±0.84 and 18.81±0.96% after cold shock exposure. The motility and livability values were recorded to be significantly higher ($p<0.01$) for Season 2 compared to season 1.

The overall motility and livability % were 79.35±0.69 and 82.89±0.59, respectively before cold shock and reduced to 16.79±1.01 and 17.32±0.52, respectively after cold shock.

In the present investigation, it was concluded that Ganjam bucks exhibited seasonal variations of breeding activity showing a significantly higher degree of scrotal parameters, sexual behavior, semen volume, sperm concentration, MBRT demonstrated in the month of October to November compared to the other seasons. Body parameters, scrotal width, sexual behavior, colour, volume, mass activity, concentration, live %, acrosome integrity, MBRT, HOST were reported to be higher in bucks of age more than 3 year. Significant degree of association between the scrotal parameters, sexual behaviour, volume, colour, concentration, livability, acrosomal integrity were recorded on the basis of which bucks may be selected for breeding purpose.

Variation of testosterone concentration of Ganjam buck semen with season

In the present experiment, the overall average value of TT is 4.96±0.03. The mean value of TT in season 1 was 4.91±0.03, whereas in case of season 2 it was 5.02±0.04. Statistical analysis of the data revealed that there was significant difference in mean of hormone concentrations of TT between the two seasons. The higher TT concentration in the semen of the bucks in the month of October to November than season 1 might be due to the better development of scrotum and testicles leading to the increased activity of the interstitial cells of Leydig resulting in higher level of secretion of testosterone from these cells into the semen of the bucks in the month of October to November.

Correlation between scrotal parameters and Sexual behavior indicators of Ganjam buck

The study of Correlation among the scrotal parameters with the sexual behaviour revealed that scrotal length, scrotal width, scrotal circumference have highly significant positive degree of association with Flehmen's reaction and Libido score and all the parameters exhibited highly significant negative degree of association with reaction time (Table 1).

Correlation between scrotal parameters and macroscopic seminal characteristics, MBRT and HOST of Ganjam buck

Study of correlation revealed that the scrotal length, scrotal width and scrotal circumference had significantly higher positive degree of association with colour, volume and negative degree of association with MBRT. It was also observed that there was no significant degree of association of these parameters with pH. Scrotal length recorded a significant ($p<0.05$) degree of association with HOST (Table 2).

Correlation between scrotal parameters and microscopic seminal characteristics of Ganjam buck

In the present study, scrotal length exhibited a highly significant degree of association with scrotal width, scrotal circumference, sperm concentration, livability % and significantly correlated with acrosome integrity. Scrotal width and scrotal circumference revealed a higher degree of association with sperm concentration, livability and acrosome integrity. Mass activity of the semen samples of the six bucks revealed a significant degree of association with individual motility, sperm concentration and highly significant negative degree of association with abnormality per cent of spermatozoa. Individual motility exhibited a significant degree of association with live per cent of spermatozoa.

Sperm concentration revealed a highly significant degree of association with scrotal length, scrotal width,

Table 1: Correlation between scrotal parameters and sexual behavior indicators of Ganjam buck.

	Scrotal length	Scrotal width	Scrotal circumference	Reaction time	Flehmen's reaction	Libido
Scrotal length	1					
Scrotal width	0.691**	1				
Scrotal circumference	0.806**	0.866**	1			
Reaction time	-0.417**	-0.490**	-0.594**	1		
Flehmen's reaction	0.484**	0.504**	0.615**	-0.774**	1	
Libido	0.457**	0.589**	0.639**	-0.785**	0.866**	1

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

Table 2: Correlation between scrotal parameters and macroscopic seminal characteristics, MBRT and HOST of Ganjam buck.

	SL	SW	S C	Colour	Volume	P H	M B R T	HOST
SL	1							
SW	0.691**	1						
SC	0.806**	0.866**	1					
Colour	0.331**	0.408**	0.443**	1				
Volume	0.403**	0.528**	0.584**	0.766**	1			
pH	0.034	-0.015	-0.039	0.000	-0.032	1		
MBRT	-0.418**	-0.630**	-0.587**	-0.637**	-0.704**	0.023	1	
HOST	0.292*	0.391**	0.355**	0.326**	0.387**	0.025	-0.414**	1

**Correlation is significant at the 0.01 level (2-tailed).

*Correlation is significant at the 0.05 level (2-tailed).

scrotal circumference, livability % and acrosome integrity and a significant degree of association with mass activity. Livability % of the semen samples of the six bucks revealed a highly significant degree of association with scrotal length, scrotal width, scrotal circumference, sperm concentration and acrosome integrity.

CONCLUSION

The scrotal length, scrotal width, scrotal circumference have highly significant positive degree of association with Flehmen's reaction and Libido score and all the parameters exhibited highly significant negative degree of association with reaction time. Moreover, the scrotal length, scrotal width and scrotal circumference had significantly higher positive degree of association with colour, volume of the semen and negative degree of association with MBRT. Further, the sperm concentration revealed a highly significant degree of association with scrotal length, scrotal width, scrotal circumference, livability % and acrosome integrity and a significant degree of association with mass activity. Livability % of the semen samples of the six bucks revealed a highly significant degree of association with scrotal length, scrotal width, scrotal circumference, sperm concentration and acrosome integrity.

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Conflict of interest

There is no conflict of interest among the authors.

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