SHORT COMMUNICATION

Seminal Attributes and their Correlations in Surti Bucks

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Abstract

The present work was carried out to study seminal attributes of fresh ejaculates of Surti bucks and their correlations. Four healthy mature Surti bucks (aged >2 years) were selected. Fresh semen was collected twice a week for 8 weeks from each buck, i.e., 64 ejaculates (16 from each buck). Fresh semen was analyzed for color, pH, volume, density, mass activity/motility, sperm concentration/mL, and total sperm count/ejaculate. Fresh semen was pale yellow in color and its pH ranged from 6.7 to 6.9. The overall mean values of semen volume, density, mass activity/motility, sperm concentration, and total sperm count recorded were 0.47 ± 0.02 mL, 3.31 ± 0.08, 3.39 ± 0.08, 3932.81 ± 43.25 million/mL, and 1839.69±72.75 million, respectively. The ejaculate volume and sperm concentration/mL only varied significantly among bucks. Ejaculate volume was negatively correlated with sperm concentration/mL (r = -0.302), and positively with total sperm output/ejaculate (r = 0.961) and density score (r = 0.604), while the latter two were significantly interrelated (r = 0.605). The study established the normal values of fresh semen quality parameters of Surti bucks and their interrelations.

Keywords: Correlations, Seminal Attributes, Surti bucks.

Ind J Vet Sci and Biotech (2022): 10.21887/ijvsbt.18.1.24

Introduction

Goat (*Capra hircus)* is an important livestock species in India and other developing countries. As it is a good source of meat, milk, fiber and skin it is popularly known as the "poor man's cow" (MacHugh and Bradley, 2001). Goat milk and its products are essential nutritional supplements to humans, especially for children. Due to this, the demand for milk and chevon has surged both in India and international markets, which is generally hindered by poor production potential. Production is invariably an outcome of successful reproduction that also is pivotal in any breed improvement. Natural service or artificial insemination from superior bucks is a key for genetic gain in production. This revolves around the semen characteristics that are critical for semen preservation and in improving the germplasm of that particular breed. Surti breed of goat is native to Gujarat and more specifically to regions around Surat and Navsari in coastal south Gujarat. Studies on the semen quality of Surti bucks from South Gujarat are scarce (Atara *et al.,* 2019; Patel *et al.,* 2020). Hence, the present study was conducted to study the seminal attributes of fresh ejaculates of Surti bucks and their correlation.

Materials and Methods

The study was conducted on four apparently healthy mature Surti bucks above two years of age maintained under the All India Coordinated Research Project (AICRP) on Surti Goat at Livestock Research Station, Navsari Agricultural University Navsari. Selected bucks were housed in a commonly covered pen separated from females. They were allowed to graze during afternoon hours from 2:30 PM to 4:30 PM and fed with good quality fodder *ad libitum* along with 500 gm of concentrate per animal per day. They were dewormed four times in a year and regularly vaccinated against common diseases, *viz.,* Peste des Petits Ruminants (PPR) and Foot and Mouth Disease (FMD). Before the actual study, the bucks were trained for five weeks to ejaculate semen in artificial vagina using a female (doe) as a dummy. The semen was collected regularly twice a week from each buck for 8 weeks. Total 64 semen ejaculates (16 from each buck) were collected. Immediately after collection, the semen samples were evaluated for various parameters, *viz.,* semen volume, color, pH, density, mass activity/motility, sperm concentration/mL, and total sperm output/ejaculate following standard methods in practice.

Statistical analysis was carried out using a Software Statistical Package for Social Sciences (SPSS) version 16.0. Descriptive statistics was used to calculate means ± SEs.

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How to cite this article: Kumar, D., Khasatiya, C.T., Chaudhari, N.F., Modi, L.C., Singh, V.K. (2022). Seminal Attributes and their Correlations in Surti Bucks. Ind J Vet Sci and Biotech. 18(1), 113-115.

Source of support: Nil

Conflict of interest: None.

Submitted: 16/06/2021 **Accepted:** 21/11/2021 **Published:** 10/01/2022

Finally, the Pearson's correlation coefficients among all the parameters were worked out at 5 and 1% level of significance.

Results and Discussion

Seminal Attributes

The results for seminal attributes of Surti buck under study are depicted in Table 1. In the present study, the semen color was pale yellow in the ejaculates of Surti bucks, which compared well with the earlier studies of Dias *et al.* (2017) in Alpine goats; Kumbhar *et al.* (2019) in Osmanabadi goats, and Sharma and Sood (2019) in Chegu goats, wherein they reported that ejaculate color of buck semen varied from white-yellowish, yellowish-white and creamy white to yellowish, respectively. In fact, color varies between bucks and between ejaculates from the same buck.

The ejaculate volume observed among bucks under study varied significantly with an overall mean of 0.47 ± 0.02 mL, which was slightly higher than 0.39 ± 0.01 mL observed by Deori *et al.* (2018) in Assam hill goat and slightly lower than 0.61 ± 0.01 and 0.66 ± 0.04 ml observed by Patel *et al.* (2020) in Surti bucks and Sharma and Sood (2021) in Gaddi goats, respectively. The variations in the ejaculate volume reported in different studies could be due to buck age, breed, testicular size, atmospheric temperature, managemental conditions, method of semen collection, apart from the nutritional status of animals (Narwade *et al.,* 2018).

The pH of semen collected from Surti bucks varied from 6.7 to 6.9. Farshad *et al.* (2012), in an earlier study, reported the mean pH of semen in Markhoz bucks as 6.81 ± 0.03 in the breeding season and 6.96 ± 0.02 in the non-breeding season. The overall mean density score of Surti buck semen was 3.31 ± 0.08, which did not vary among bucks. Results for density corroborated with mean semen density of 3.10 ± 0.05 reported by Kumbhar *et al.* (2019) in Osmanabadi bucks. However, a slightly higher mean semen density of 3.83 ± 0.03 was observed by Atara *et al.* (2019) in Surti bucks during dry season.

The mean mass activity score of semen in the present study was 3.39 ± 0.08, which did not vary significantly between bucks. It corroborated well with the score of 3.29 ± 0.03 reported by Narwade *et al.* (2018) in Alpine x Beetal crossbred bucks and 3.45 ± 1.15 observed by Kumbhar *et al.* (2019) in Osmanabadi bucks.

Our observation on mean sperm concentration of Surti bucks semen (3932.81 ± 43.25 million/mL), and its significant variation among individuals corroborated with mean sperm concentration of 3870.00 ± 0.02 and 3676.04 ± 65.13 million/mL reported by Narwade *et al.* (2018) in Alpine×Beetal crossbred bucks and Patel *et al.* (2020) in Surti bucks. However, Sharma and Sood (2021) recorded a slightly lower mean sperm concentration of 3401.00 ± 247.20 million/mL in Gaddi goats. The differences in the sperm concentration recorded in different studies may be due to factors like age, nutrition, breed, collection method, season, the technique of assessment of sperm concentration, and frequency of collection (Narwade *et al.,* 2018).

However, the overall mean total sperm count/ejaculate (1839.69 ± 72.75 million) in the present study did not vary among the four bucks studied. These values more or less corroborated with the mean total sperm count of 1722.24 ± 91.49 million reported by Atara *et al.* (2019) and 1887.16 ± 44.99 million reported by Patel *et al.* (2020) in Surti bucks.

Comparison of seminal attributes for individual variation revealed that there were significant differences between bucks in ejaculate volume, mass motility, and sperm concentration. The buck ejaculates with higher volume had more mass motility but lower sperm concentration. However, there was no significant difference in the parameters of density and total sperm concentration.

Correlations among Various Seminal Attributes

The correlation coefficients (r) observed between various fresh Surti buck semen parameters under study are presented in Table 2. The results revealed that the semen volume had significant ($p < 0.05$) negative correlation with sperm concentration ($r = -0.302$) and significant ($p < 0.01$) positive correlations with total sperm count ($r = 0.961$) and semen density ($r = 0.604$). In accordance with the present findings, Catunda *et al.* (2011) recorded a negative (r = -0.21) correlation

Table 1: Seminal attributes (Mean ±SE) of fresh ejaculates of Surti bucks

Sr. No.	*Buck No.*	*N*	*Volume (mL)*	*Density*	*Mass motility*	*Sperm concentration ($\times 10^6$/mL)*	*Total sperm count ($\times 10^6$)*
1	50/18	16	0.56 ± 0.05^{a}	3.56 ± 0.13	3.62 ± 0.13	3637.50 ± 47.32^{c}	2048.12 ± 172.23
2	37/18	16	0.44 ± 0.03^{b}	3.12 ±0.20	3.31 ± 0.20	3962.50 ± 82.10^{b}	1711.88 ± 112.39
3	56/18	16	0.48 ± 0.04^{ab}	3.31 ± 0.15	3.50 ± 0.13	3806.25 ± 54.37^{b}	1813.75 ± 146.18
4	47/18	16	0.41 ± 0.03^{b}	3.25 ± 0.17	3.12 ± 0.18	4325.00 ± 47.87^{a}	1785.00 ± 145.01
Pooled		64	0.47 ± 0.02	3.31 ± 0.08	3.39 ± 0.08	3932.81 ± 43.25	1839.69 ± 72.75
F value			3.08*	1.24	1.84	24.17**	0.99
p-value			0.03	0.30	0.15	0.00	0.40

Mean values with different superscript within a column differ significantly at $p < 0.05$.

Table 2: Correlation coefficients (r) among various seminal attributes of Surti buck fresh semen

Seminal attributes	*Volume*	*Mass motility*	*Sperm concentration*	*Total sperm count*
Volume	1	--	--	--
Mass motility	0.124	1	--	--
Sperm concentration	-0.302*	-0.197	1	--
Total sperm count	0.961**	0.083	-0.042	1
Density	0.604**	0.152	-0.149	0.605**

*Significant at p <0.05 level, **Significant at p <0.01 level.

of semen volume with the sperm concentration and positive (r = 0.97) with total sperm count in crossbreed bucks. Similarly, in Sirohi goats, the ejaculate volume was negatively (r = -0.18) correlated with the sperm concentration (Khadse *et al.,* 2019). Moreover, semen volume showed a positive correlation with mass motility. Kumbhar *et al.* (2019) also reported a positive correlation of the semen volume with mass motility, whereas sperm concentration showed a non-significant negative correlation with total sperm count and sperm density. There is generally a negative correlation between ejaculate volume and sperm concentration; as the volume of semen increases, the sperm concentration decreases. This might be the reason behind the negative correlation between sperm concentration with total sperm count and density. In addition to these, the total sperm count showed a significant ($p < 0.01$) positive correlation with sperm density (r = 0.605).

The study established the normal values of fresh semen quality parameters of Surti bucks, and that bucks above two years of age can be used for semen collection two times a week with good quality semen harvested as indicated by its physical attributes.

Acknowledgement

The authors are thankful to Dean & Principal, Veterinary College, Navsari, and Research Scientist, Livestock Research Station, Navsari Agricultural University, Navsari, for providing necessary facilities and support for conducting this study.

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