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Studies on seminal attributes of Berari bucks

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Abstract

The twelve semen samples from six adult Berari bucks were collected by using artificial vagina, once in a week during July- September 2017. The average semen volume was 1.18 ± 0.06 ml with creamy colour. The seminal pH was 6.78 ± 0.01 . The average mass motility was 3.92 ± 0.14 in 0 to 5 scale while individual motility was 84.44 ± 0.88 percent. The live sperm count was 86.42 ± 0.88 percent, abnormal sperm count was 5.08 ± 0.26 percent and the total sperm concentration was 3417.36 ± 35.93 ($\times 10^6$ /ml). The overall quality of Berari buck semen was found optimum for use in breeding programme.

Keywords: berari buck, buck semen, Maharashtra

Introduction

Selection of buck represents the starting point in goat development program. Selection of male is much more important because a buck can produce thousands of kids a year through artificial insemination, therefore the main avenue for genetic improvement is the selection of breeding male. For better propagation of the species of goat, there should have good breeding buck. But unfortunately, there is severe shortfall of stud bucks all over the country, especially in the rural areas, where more than 80% goats are being reared by the farmers. One important element for selection of breeding bucks for either natural mating or AI relies on semen quality evaluation [1]. The semen evaluation helps in early detection of impaired fertility in males due to poor quality of semen. Berari is recognized as 23rd goat breed of India registered as a distinct breed by the National Bureau of Animal Genetic Resources in May 2012, with accession number INDIA_GOAT_1100_BERARI_0623. The "Berari" is a local breed of goat found in the Vidarbha region of Maharashtra and in the Nimar region of Madhya Pradesh. The seminal attributes of some of the indigenous goat breeds has been studied. Considering the paucity of seminal attributes studies in Berari breed, the aim of the present study was to evaluate the semen quality of Berari bucks by adopting the Macroscopic tests (Colour, Volume, pH) and Microscopic tests (Mass motility, Individual Motility, Live sperm percent, Abnormal sperm percent Sperm concentration and Damaged acrosome).

Materials and Methods

Six mature, healthy breeding Berari bucks aging between 12 – 18 months maintained in identical optimal management and feeding conditions at goat farm, PGIVAS, Akola (Maharashtra) were selected. Bucks were given ad. Lib. Green fodder and concentrate at the rate of 250g/animal/day. The bucks were trained to donate the semen in artificial vagina for three months before the onset of actual collection.

All ejaculates obtained from the bucks were evaluated for macroscopic and microscopic semen quality tests. Immediately after collection, volume and colour of semen was recorded in collection cups. The mass motility was observed by placing a small drop of freshly collected neat semen on warm glass slide without cover slip under low magnification and was graded on 0 to 5 scale. The individual progressive motility and percent motile spermatozoa were estimated using a small drop of diluted semen under coverslip on high power objective. Live and dead spermatozoa were estimated by differential eosin-nigrosin staining technique. The smears prepared for live sperm counts were utilized to determine the percentage of morphologically abnormal spermatozoa count. The sperm concentration per ml was estimated by Haemo cytometer method.

Results and Discussion

The colour of Berari buck semen was found creamy during the experiment. Creamy colour of buck semen was reported by Olurode *et al.* 2018^[2] and Dagli, 2011^[3] in West African Dwarf and Sirohi bucks respectively. However, some researchers reported yellowish^[4] and yellowish white semen^[5] colour of goat semen. The colour pattern of the neat semen is the species specific and is also dependent on the sperm concentrations and presence of pigmented proteins and caratinoids in the seminal plasma.

The mean volume of Berari buck semen was 1.18 ± 0.06 ml which ranged between 0.80 to 1.60 ml (Table 1). The results are in concurrence with other Indian breeds reported by Dagli (2011)^[3] in Osmanabadi and Sirohi, Islam *et al.* (2008)^[6] in Black Bengal, Bhushkat *et al.* (2000)^[7] in Jamnapari and Ajmeri breeds of buck. However, a wide variation in the volume of the neat semen has been reported for few other breeds viz. West African Dwarf buck^[2], Black Bengal^[8].

The mean pH of Berari buck semen recorded in the present study was 6.78 ± 0.01 with a range of 6.60 to 7.00 (Table 1). The earlier studies on Rayini^[9] has shown semen pH below 6.60. The studies carried out on Bulgarian White milk^[10], West African Dwarf^[11], Osmanabadi and Sirohi buck^[3], Jamnapari, Ajmeri, Osmanabadi and Local^[7] breeds of buck have reported seminal pH in the range of 6.6 to 7.00. However, slightly higher value of 7.15 in Angora bucks has been recorded by Tekin *et al.* (1996)^[12], where semen was collected by electro ejaculatory method. The individual bucks had shown non- significant variation (Table 2) in the seminal pH. These findings are in agreement with Mahmood *et al.* (1988)^[13] who did not observe significant difference among bucks.

The mass motility of the Berari buck semen ranged between the +3 to +5 with a mean of 3.92 ± 0.14 (Table 1). These findings are in agreement with the observations of^[14, 11] in West African Dwarf buck semen, Farshad *et al.* (2009)^[15] in Markhoz bucks, Dagli (2011)^[3] in Osmanabadi and Sirohi buck, Jadav *et al.* (2008)^[16] in Surti buck. However, much lower value of mass motility 2.72 ± 0.11 was recorded by Mahmood *et al.* (1988)^[13] in Changthangi breed. Significant individual variation (Table 2) was found in present investigation whereas and Jadav *et al.* (2008)^[16] found varied findings. The differences could be attributed to the difference in the breeds and climatic conditions under which experimental animals were reared.

The individual motility percentage in Berari buck ranged between 70 to 90 percent keeping the mean 84.44 ± 0.88 percent (Table 1). Farshad *et al.* (2009)^[15] in Morkhoz, Dagli (2011)^[3] in Osmanabadi and Sirohi, Yotov (2015)^[10] in Bulgarian white milk breed, Tahar *et al.* (2018)^[17] in Arbia buck semen have reported the individual motility in the range of 70 to 90 percent. Whereas, higher individual motility was also reported in exotic breed by Olayemi *et al.* (2011)^[14], Bras (2012)^[5] in Stud breed. However, much lower value of 50.00 ± 5.50 was recorded by Bezjian *et al.* (2013)^[4] in Makhor buck. The individual motility of Berari buck semen seems to be more nearer to the exotic breeds as compared to some of the Indian breeds. Significant individual variation (Table 2) in present study varies from the opinion of Barbas *et al.* (2006)^[18] and Jadav *et al.* (2008)^[16]. The individual motility seems to be a specific breed character.

The live sperm count recorded for the Berari buck semen in present study ranged between 74 to 93 percent with mean

value of 86.42 ± 0.88 percent (Table 1). The earlier studies conducted by Jadav *et al.* (2008)^[16] in surti, Kulaksiz and Daskin (2010)^[19] in Sannen, Dagli (2011)^[3] in Osmanabadi and Sirohi have reported above 80 percent live sperm count. Bras (2012)^[5] in Stud, Olayemi *et al.* (2011)^[14] in West African Dwarf bucks have reported 90 percent and above normal live sperm count which is higher than the results of the present study. However, much lower value of 48.9 ± 6.0 was recorded by Bezjian *et al.* (2013)^[4] in Makhor buck. Highly significant individual variation (Table 2) in present study supports the findings of Barbas *et al.* (2006)^[19]. Whereas Jadav *et al.* (2008)^[16] found non-significant individual variation among bucks for live sperm count. The variation in the live sperm count may be due to seasonal fluctuation or ambient temperature existing in the goat shed.

The abnormal sperm count in Berari buck semen was recorded as 5.08 ± 0.26 percent, ranging from 3 to 8 percent (Table 1). Similarly, Bhushkat *et al.* (2000)^[7] in Jamnapari and Puranik *et al.* (1993)^[20] in crossbred buck reported the mean abnormalities of sperms in the range of 5.0 to 5.91 percent. However, Bras (2012)^[5] in Stud, Dagli (2011)^[3] in Osmanabadi and Sirohi, Kulaksiz and Daskin (2010)^[19] in Sannen reported much higher sperm abnormalities. Non-significant variation (Table 2) among bucks for abnormal sperm count found in present study agreed the findings of Mahmood *et al.* (1988)^[13], Batista *et al.* (2009)^[21] however Barbas *et al.* (2006)^[18] and Jadav *et al.* (2008)^[16] reported significant variation for the same trait among the bucks. The variation in the abnormal sperm count may be due to semen volume^[22], pH of dilutor, age of the buck, season^[23] and frequency of semen collection.

The mean total sperm concentration of Berari buck semen was recorded as 3417.36 ± 59.48 million with a range of 3000 to 3700 million per ml (Table 1). The value recorded in the present study is in agreement with the different authors who reported total sperm concentration in various goat breeds [Yotov (2015)^[10] in Bulgarian White milk breed, Sundararaman and Edwin (2003)^[24] in Boer Grade half-bred bucks and Gacitua and Arav (2005)^[25] in Saanen bucks]. Higher value of sperm concentration was reported by Barbas *et al.* (2006)^[18] in Serrana buck semen. Lower sperm count than the results in the present study was reported by Batista *et al.* (2009)^[21] in Majorera buck, Dagli (2011)^[3] in Osmanabadi and Sirohi bucks, Olayemi *et al.* (2011)^[14] and Bras (2012)^[5] in Stud bucks, Bezjian *et al.* (2013)^[4] in Makhor bucks, Jadav *et al.* (2008)^[16] in Surti bucks and Tahar *et al.* (2018)^[17] in Arbia breed of bucks. The frequency of semen collection, the age of the buck and season affected the sperm concentration in goat^[24]. Gacitua and Arav (2005)^[25] and Batista *et al.* (2009)^[21] reported the significant variation among bucks for sperm concentration.

The percentage of damaged acrosome recorded in the present study was 2.85 ± 0.17 with a range of 2.00 to 5.00 percent (Table 1). The result obtained was similar to that reported by Dorado *et al.*, (2010)^[27] in Florida buck semen. Contrary to the present findings some workers reported higher acrosomal damaged spermatozoa count^[22, 27, 15, 28, 20] and other reported lower acrosomal damage count^[29]. Significant difference (Table 2) between bucks observed for the acrosomal damaged sperm percent in present study compared well with the reports of Coloma *et al.*, (2010)^[28]. On the contrary, Dorado *et al.*, (2010)^[27] has not observed buck variation in percentage of acrosomal abnormalities of sperm.

Table 1: Seminal attributes (Mean \pm S.E.) of Berari buck neat semen.

| Buck No. | Volume (ml) | pH | Mass Motility (0-5 scale) | Individual Motility (Percent) | Live sperm (Percent) | Abnormal sperm (Percent) | Sperm Conc. (10 ⁶ /ml) | Damaged Acrosome |
|---------------------|-------------------------------|-----------------|-------------------------------|-------------------------------|--------------------------------|--------------------------|-----------------------------------|--------------------------------|
| 1 (n=12) | 1.38 \pm 0.04 ^a | 6.81 \pm 0.03 | 4.42 \pm 0.15 ^a | 87.50 \pm 1.31 | 89.67 \pm 0.99 ^a | 4.50 \pm 0.40 | 3579.17 \pm 18.93 ^a | 2.25 \pm 0.18 ^c |
| 2 (n=12) | 1.29 \pm 0.04 ^{ab} | 6.80 \pm 0.02 | 4.08 \pm 0.15 ^{ab} | 85.83 \pm 1.93 | 88.17 \pm 1.07 ^{ab} | 4.17 \pm 0.42 | 3450.00 \pm 23.03 ^b | 2.58 \pm 0.23 ^{bc} |
| 3 (n=12) | 1.23 \pm 0.03 ^b | 6.74 \pm 0.02 | 3.75 \pm 0.13 ^{bc} | 85.00 \pm 1.51 | 86.17 \pm 1.25 ^{bc} | 5.50 \pm 0.48 | 3379.17 \pm 37.16 ^{bc} | 2.75 \pm 0.25 ^{abc} |
| 4 (n=12) | 1.03 \pm 0.04 ^c | 6.79 \pm 0.03 | 3.58 \pm 0.15 ^c | 84.17 \pm 1.49 | 86.00 \pm 1.08 ^{bc} | 5.08 \pm 0.38 | 3341.67 \pm 43.01 ^c | 2.92 \pm 0.23 ^{abc} |
| 5 (n=12) | 1.05 \pm 0.04 ^c | 6.77 \pm 0.02 | 4.08 \pm 0.08 ^{ab} | 82.50 \pm 1.31 | 84.58 \pm 1.03 ^c | 5.42 \pm 0.40 | 3354.17 \pm 36.65 ^c | 3.42 \pm 0.26 ^a |
| 6 (n=12) | 1.12 \pm 0.02 ^c | 6.79 \pm 0.03 | 3.58 \pm 0.15 ^c | 81.67 \pm 2.07 | 83.92 \pm 1.61 ^c | 5.83 \pm 0.51 | 3400.00 \pm 22.19 ^{bc} | 3.17 \pm 0.27 ^{ab} |
| Overall Mean (n=72) | 1.18 \pm 0.06 | 6.78 \pm 0.01 | 3.92 \pm 0.14 | 84.44 \pm 0.88 | 86.42 \pm 0.88 | 5.08 \pm 0.26 | 3417.36 \pm 35.93 | 2.85 \pm 0.17 |

Means bearing different superscripts differ significantly in a column (P < 0.05).

Table 2: ANOVA for the Seminal attributes of Berari buck neat semen

| Source | d.f | Ejaculate Volume | | pH | | Mass motility | | Individual motility | | Live sperm Count | | Abnormal sperm count | | Sperm concentration per ml | | Damaged Acrosome | |
|--------|-----|-------------------|--------------|-------|--------------|-------------------|--------------|---------------------|--------------|------------------|--------------|----------------------|--------------|----------------------------|--------------|------------------|--------------|
| | | M.S. | Cal. F value | M.S. | Cal. F value | M.S. | Cal. F value | M.S. | Cal. F value | M.S. | Cal. F value | M.S. | Cal. F value | M.S. | Cal. F value | M.S. | Cal. F value |
| Bucks | 5 | 0.236 | 16.09 | 0.007 | 0.96 | 1.333 | 5.933 | 55.556 | 1.746 | 56.333 | 3.30 | 4.867 | 2.15 | 92951.389 | 7.805 | 2.081 | 3.057 |
| Error | 66 | 0.015 | | 0.008 | | 0.225 | | 3.818 | | 17.058 | | 2.260 | | 11909.722 | | 0.681 | |
| Total | 71 | | | | | | | | | | | | | | | | |
| CD % | | 0.131* 0.099** | | NS | | 0.513* 0.387** | | NS | | 3.367** | | NS | | 118.154* 88.97** | | 0.673** | |

Superscripts are to be read column-wise

Means bearing different superscripts differ significantly (P < 0.05)

* Significant (P < 0.05)

** Highly significant (P < 0.01)

NS = Non-significant

Conclusion

The seminal attributes of Berari buck semen showed the values in normal range and quality of semen found for semen preservation as well as for breeding purpose.

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