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Characterization of ejaculates from Berari male goats in breeding season

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Abstract

An artificial vagina was used to collect semen from six adult Berari goats, at once weekly intervals starting on 1 oct 2017 and ending on 30 December 2017. Creamy semen color was the characteristic feature throughout the study. The average mean values for seminal attributes were: ejaculate volume 1.22 + 0.04ml, seminal pH 6.79 + 0.01, mass motility (0-5 scale) 4.06 + 0.12, individual motility 85.28 +0.95 per cent, live sperm count 90.01 + 0.5 per cent, abnormal sperm count 3.72 + 0.20 percent and total sperm concentration 3664.58 +22.76 ($\times 10^6$ /ml). Overall semen quality of Berari breed was found optimum for use in breeding programme.

Keywords: berari buck, seminal attributes, semen

Introduction

Maharashtra possesses 10 million goats which contribute 0.45, 2.16 and 1.3 million tons of meat, milk and skin pieces respectively. Berari is recognized as 23rd goat breed of India. The "Berari" is a local breed of goat found in the Vidarbha region of Maharashtra and in the Nimarregion of Madhya Pradesh. For a profitable livestock industry the reproductive performance is an important element for selection of breeding bucks for either natural mating or AI relies on semen quality evaluation (Devendra *et al.*, 2009) [12]. It helps in early detection of impaired fertility in males due to poor quality of semen. The seminal attributes of some of the indigenous goat breeds has been studied. Considering the paucity of seminal attributes studies in Berari breed, the research was implemented. An artificial vagina was used to collect semen from six adult Berari goats. The studies pertaining to colour, ejaculate volume, seminal pH, mass motility, individual motility percent, live sperm count, abnormal sperm count percent, and total sperm concentration of the Berari Goat semen were undertaken.

Materials and Methods

Investigation was carried out at the Department of Animal Reproduction, Gynaecology and obstetrics, PGIVAS, Akola (Maharashtra). For this, six mature, healthy breeding Berari bucks aging between 12 – 18 months maintained in identical optimal management and feeding conditions at goat farm 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.

A total 72 ejaculates obtained from the bucks were properly processed 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 cover -slip using a phase contrast microscope at 200 magnification. 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 determined using Neubauer Haemocytometer as described by Hafez, 1987 [19]. The mean, standard deviation (SD) and standard error (SE) and ANOVA of all the parameters were calculated as per the standard methods outlined by Snedecor and Cochran (2004) [27].

Results and Discussion

Berari buck semen had creamy colour. Creamy colour of buck semen was reported by Olurode *et al.* 2018^[25] in West African Dwarf and Dagli, 2011^[11] in Sirohi bucks. However, yellowish and yellowish white colour of goat semen was reported by Bezjian *et al.* 2013^[5] and Bras, 2012^[8] respectively. The colour pattern of the neat semen is dependent on the species, sperm concentrations, presence of pigmented proteins and carotinoids in the seminal plasma of semen.

The mean volume of Berari buck semen was 1.22 ± 0.04 ml which ranged between 0.90 to 1.60 ml (Table 1 and Table 2). The results are in synchrony with other Indian breeds in Osmanabadi and Sirohi reported by Dagli (2011)^[11], in Black Bengal by Islam *et al.* (2008)^[20], in Jamnapari and Ajmeri breeds of buck by Bhuskat *et al.* (2000)^[6]. However, a wide variation in the volume of the neat semen has been reported for few other breeds by Olurode *et al.* (2018)^[25] in West African Dwarf buck and by Blogra *et al.* (2016)^[7] in Black Bengal buck.

The mean pH of Berari buck semen recorded in the present study was 6.79 ± 0.01 with a range of 6.70 to 7.00 (Table 1 and Table 2). The earlier studies on by Zamiri and Heidari (2006)^[32] in Rayini buck has shown semen pH less than 6.60. The studies carried out by Yotov (2015)^[15] on Bulgarian White milk, by Ferdinand *et al.* (2012)^[16] in West African Dwarf buck, by Dagli (2011)^[11] in Osmanabadi and Sirohi buck and Bhuskat *et al.* (2000)^[6] in Jamnapari, from Osmanabadi and Local breeds of buck have reported seminal pH varies from 6.6 to 7.00. However, slightly higher value of 7.15 reported by Tekin *et al.* (1996)^[29] in Angora bucks, where electroejaculatory method of semen collection was used. A non-significant variation was shown by the individual bucks for the seminal pH. These findings are in concurrence with Mahmood *et al.* (1988)^[24] who observed non significant difference among bucks.

The mass motility of the Berari buck semen ranged between the +3 to +5 with average mean of 4.06 ± 0.12 (Table 1 and Table 2). These findings are harmonious with the observation in West African Dwarf buck semen by Olayemi *et al.* (2011) and Ferdinand *et al.* (2012)^[16], in Markhoz bucks by Farshad *et al.* (2009)^[15], in Osmanabadi and Sirohi buck by Dagli (2011)^[11] and in Surti buck by Jadhav *et al.* (2008)^[21]. However, lower value of mass motility 2.72 ± 0.11 was recorded in Changthangi breed by Mahmood *et al.* (1988)^[24]. In present investigation significant individual variation was found whereas, Jadhav *et al.* (2008)^[21] found varied findings. The differences could be associated with the difference in the breeds and climatic conditions of experimental animals.

The individual motility percentage in Berari buck ranged between 70 to 90 percent with the mean 85.28 ± 0.95 percent (Table 1 and Table 2) in Markhoz by Farshad *et al.* (2009)^[15], in Osmanabadi and Sirohi by Dagli (2011)^[11], in Bulgarian white milk breed by Yotov (2015)^[15] and in Arbia buck by Tahar *et al.* (2018) 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) and in Stud breed by Bras (2012)^[8]. However, much lesser value of 50.00 ± 5.50 was recorded in Makhor buck. As compared to some of the Indian breeds, the individual motility of Berari buck semen seems to be more nearer to the exotic breeds. Significant individual variation in present study varies from the opinion of Barbas *et al.* (2006)^[2] and Jadhav *et al.* (2008)^[21]. The individual motility appear to be a specific breed character.

In present study Berari buck semen shows the live sperm count ranged between 81 to 95 percent with mean value of 90.0 ± 0.66 percent (Table 1 and Table 2). The earlier studies conducted in surti by Kulaksiz and Daskin (2010)^[23], in Sannenby Jadhav *et al.* (2008)^[21] and in Osmanabadi and Sirohi by Dagli (2011)^[11] have reported above 80 percent live sperm count. In Stud by Bras (2012)^[8] and in West African Dwarf bucks by Olayemi *et al.* (2011) have described 90 percent and above normal live sperm count which is greater than the results of the present study. However, much lower value of 48.9 ± 6.0 was reported in Makhor buck by Bezjian *et al.* (2013)^[5]. Barbas *et al.* (2006)^[2] noted highly significant individual variation in live sperm count as we recorded in present study. Whereas Jadhav *et al.* (2008)^[21] observed non-significant individual variation for live sperm count among bucks. The variation in the live sperm count because of seasonal fluctuation or ambient temperature existing in the goat shed.

The abnormal sperm count of semen in Berari buck was recorded as 5.08 ± 0.26 percent, ranging from 3 to 8 percent (Table 1 and Table 2). Similarly, in Jamnapari by Bhuskat *et al.* (2000)^[6] and in crossbred buck by Puranik *et al.* (1993) recorded the mean abnormalities of sperms in the range of 5.0 to 5.91 percent. However, in Stud by Bras (2012)^[8], in Osmanabadi and Sirohi by Dagli (2011)^[11] and in Sannenby Kulaksiz and Daskin (2010)^[23] stated much higher sperm abnormalities. In present study non significant variation among bucks for abnormal sperm count was in concurrence with the findings of Mahmood *et al.* (1988)^[24], Batista *et al.* (2009)^[3] however Barbas *et al.* (2006)^[2] and Jadhav *et al.* (2008)^[21] recorded significant variation for abnormalities of sperms among the bucks. The variation in the abnormal sperm count may because of semen volume (Kang and Chang, 1976)^[22], age of the buck, pH of dilutor, season (Vinha, 1980)^[30] and frequency of semen collection.

Berari buck semen showed the mean total sperm concentration as 3664.58 ± 22.76 millions with a range of 3000 to 3700 millions per ml (Table 1 and Table 2). The value recorded under the present study was in accordance with those observed for various goat breeds in Bulgarian White milk breed by Yotov (2015)^[15], in Boer Grade half-bred bucks by Sundararaman and Edwin (2003)^[28] and in Saanen bucks by Gacitua and Arav (2005)^[18]. Higher value of sperm concentration was stated in Serrana buck semen by Barbas *et al.* (2006)^[2]. Lower sperm count than results in the present study was narrated in Majorera by Batista *et al.* (2009)^[3], in Osmanabadi and Sirohi by Dagli (2011)^[11], in Stud by Olayemi *et al.* (2011), Bras (2012)^[8], in Makhor by Bezjian *et al.* (2013)^[5], in Surti by Jadhav *et al.* (2008)^[21], in Arbia breed by Tahar *et al.* (2018). The sperm concentration in goat is influenced by the frequency of semen collection, the age of the buck and season affected (Vinha, 1980)^[30]. Gacitua and Arav (2005)^[18] and Batista *et al.* (2009)^[3] observed the significant variation among bucks for sperm concentration.

In the present study the percentage of damaged acrosome reported was 2.72 ± 0.19 with a range of 1.00 to 7.00 percent (Table 1 and Table 2). The result obtained was agreed with the recording Florida buck semen by Dorado *et al.*, (2010)^[14]. Opposite to the present observations some workers stated higher acrosomal damaged spermatozoa count in buck semen (Batista *et al.*, 2009; Farshad *et al.*, 2009; Kulaksiz and Daskin, 2010)^[3, 15, 23] and other observed lower acrosomal damage count (Bucak and Uysal, 2008)^[9]. Significant difference between bucks recorded for the acrosomal

damaged sperm percent in present experiment related well with the reports of Coloma *et al.*, (2010) ^[10] and Dorado *et al.*, (2010) ^[14]. On the opposite side Dorado *et al.*, (2009) ^[13] has

not observed buck variation in percentage of acrosomal abnormalities of buck sperms.

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

Buck No.	Volume (ml)	pH	Mass Motility (0-5 scale)	Individual Motility (Percent)	Live sperm (Percent)	Abnormal sperm (Percent)	Sperm Conc (106 /ml)	Damaged Acrosome (Percent)
1 (n=12)	1.34a \pm 0.06	6.81 \pm 0.03	4.42a \pm 0.15	88.33 a \pm 1.12	91.67a \pm 0.45	2.92c \pm 0.19	3766.67 a \pm 25.62	2.25 b \pm 0.18
2 (n=12)	1.28 ab \pm 0.04	6.81 \pm 0.03	4.33ab \pm 0.14	86.67 a \pm 1.42	90.83ab \pm 0.95	3.58abc \pm 0.29	3683.33 ab \pm 33.33	2.33 b \pm 0.14
3 (n=12)	1.28 ab \pm 0.02	6.79 \pm 0.03	4.08ab \pm 0.15	85.83ab \pm 1.49	91.33 a \pm 0.38	3.50bc \pm 0.23	3641.67b \pm 46.40	2.33 b \pm 0.14
4 (n=12)	1.18c \pm 0.04b	6.74 \pm 0.02	4.00abc \pm 0.17	85.83ab \pm 1.49	90.17abc \pm 1.36	4.00 ab \pm 0.25	3620.83 b \pm 33.97	3.00 a \pm 0.21
5 (n=12)	1.13 c \pm 0.03	6.80 \pm 0.02	3.58c \pm 0.19	82.50b \pm 1.31	87.83c \pm 1.25	4.25 a \pm 0.28	3616.67 b \pm 30.98	3.08 a \pm 0.26
6 (n=12)	1.13 c \pm 0.03	6.77 \pm 0.02	3.92 bc \pm 0.15	82.50b \pm 1.79	88.25 bc \pm 1.31	4.08 ab \pm 0.26	3658.33 b \pm 30.05	3.33 a \pm 0.38
Overall Mean (n=72)	1.22 \pm 0.04	6.79 \pm 0.01	4.06 \pm 0.12	85.28 \pm 0.95	90.01 \pm 0.66	3.72 \pm 0.20	3664.58 \pm 22.76	2.72 \pm 0.19

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	0.09	5.35**	0.01	1.04 ^{NS}	1.09	3.53**	65.56	2.60*	31.28	2.44*	2.89	3.81**	37312.50	2.69**	2.66	4.06**
Error	66	0.02		0.01		0.31		25.25		12.83		0.76		13873.11		0.65	
Total	71																
CD (5%)		0.11		-		0.45		4.09		2.92		0.71		96.03		0.65	

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 Berari buck's seminal characteristics showed the in normal range values and quality of semen found for semen preservation as well as for inseminating the does.

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