



Study on Physical Characteristics of Bhadawari buffalo Bull Semen

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ABSTRACT

One twenty ejaculates from 10 Bhadawari bulls were collected twice daily with the help of Artificial Vagina. The average mean Value for physical constitutes were ejaculate volume 1.68 ± 0.07 ml, initial pH 6.54 ± 0.02 , mass motility (0-5 scale) 2.67 ± 0.09 , individual motility 48.23 ± 0.61 per cent, sperm density 0.95 ± 0.02 million/ mm^3 , live sperm count 68.32 ± 1.00 per cent, total abnormal sperm count 14.25 ± 0.53 and cold shock resistance (CSR) 27.27 ± 0.25 per cent. Overall semen quality of Bhadawari breed was found optimum for use in breeding programme.

Keywords: Physical characteristics, semen, Bhadawari bull.

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INTRODUCTION

The buffaloes are the backbone of Indian farmer's economy and Dairy industry. In spite of having world's largest buffalo population, India has only thirty well recognized and documented breed of buffalo. Most of the non-descript buffalo population are unique in their adaptation to the local agro-climatic conditions. The Bhadawari buffalo is one of such buffalo breeds that has adapted to harsh agro-climatic conditions.

Peculiar characteristics of this breed are high fat, high SNF and high protein contents in milk, resistance to many tropical bovine diseases and ability to utilize low grade roughages. The productivity of buffaloes could be enhanced by upgrading them through artificial insemination on utilizing superior germplasm of selected potential Bhadawari buffalo sires.

MATERIALS AND METHODS

Bhadawari buffalo bulls aged 4-5 years maintained under NATP project "Characterization and Conservation of Bhadawari Buffalo." Bhadawari bull calves were procured from the breeding tract (Etawah and Agra districts of U.P.) and maintained at experimental dairy farm, College of Veterinary Science & Animal Husbandry Mathura under Department of Animal genetics & Breeding.

Under present study ten Bhadawari mature bulls were selected and trained for semen donation. Twelve semen sample from each bull were collected and examined for the semen characteristics. All ejaculated obtained from the bulls were evaluated for macroscopic and microscopic semen quality tests. Immediately after collection, volume 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 (10X) and was graded on 0-5 scale as per the procedure [6]. The individual progressive

motility and per cent motile spermatozoa were estimated using a small drop of diluted semen under cover slip on high power objective (40X).

Live and dead as well as abnormal sperm counts were estimated from semen sample by differential eosin-nigrosin staining technique under oil immersion (100X) as per procedure. The sperm concentration per ml was estimated by Haemocytometer method as per the procedure. The data were analyzed statistically as per the standard procedure [13].

RESULTS

Table 1: Average value for volume, pH, mass motility, individual motility and sperm density of Bhadawari bulls semen (n=10)

Bull No.	Volume	pH	Mass motility (0 to +5)	Individual motility (%)	Sperm density (Million/mm ³)
1	1.48 ^a ±0.21	6.68 ^c ±0.03	3.13 ^c ±0.07	49.05 ^{bc} ±1.85	1.02 ^{cd} ±0.03
3	1.37 ^a ±0.19	6.68 ^c ±0.03	3.42 ^{cd} ±0.10	51.15 ^c ±1.85	1.09 ^{de} ±0.02
5	1.63 ^a ±0.13	6.63 ^c ±0.04	3.46 ^{cd} ±0.14	49.88 ^{bc} ±1.94	1.06 ^{de} ±0.04
7	2.30 ^b ±0.24	6.18 ^a ±0.04	1.17 ^a ±0.21	41.73 ^a ±2.39	0.66 ^a ±0.04
9	1.77 ^{ab} ±0.18	6.35 ^b ±0.06	1.38 ^a ±0.22	46.16 ^b ±1.26	0.73 ^{ab} ±0.05
10	1.48 ^a ±0.19	6.65 ^c ±0.03	3.38 ^{cd} ±0.11	50.51 ^c ±1.82	1.07 ^{de} ±0.03
11	1.91 ^{ab} ±0.02	6.48 ^{bc} ±0.08	2.50 ^b ±0.26	46.92 ^{bc} ±1.88	0.94 ^c ±0.05
14	1.84 ^{ab} ±0.29	6.45 ^b ±0.10	1.54 ^a ±0.14	44.90 ^{ab} ±1.32	0.75 ^b ±0.03
21	1.41 ^a ±0.12	6.65 ^c ±0.03	3.13 ^c ±0.07	49.63 ^{bc} ±1.87	1.04 ^{de} ±0.02
24	1.58 ^a ±0.15	6.65 ^c ±0.03	3.63 ^d ±0.11	52.37 ^c ±1.13	1.12 ^e ±0.02
Overall	1.68±0.07	6.54±0.02	2.67±0.09	48.23±0.61	0.95±0.02

Similar superscripts within the column do not differ significantly

Table 2: Average Value for live spermatozoa, sperm abnormality and cold Shock resistant spermatozoa of semen of Bhadawari bulls

Bull No.	Live spermatozoa (%)	Sperm abnormality (%)			CSR (%)
		Head	Tail	Total	
1	72.35 ^{bc} ±1.23	2.58±0.92	9.93±1.64	12.50±2.11	26.28 ^b ±0.77
3	76.31 ^c ±1.74	3.03±1.13	10.69±0.45	13.73±1.32	27.16 ^b ±0.48
5	74.14 ^c ±1.70	4.96±1.14	12.19±0.86	17.50±1.70	29.08 ^c ±0.51
7	52.40 ^a ±1.83	1.16±0.52	12.04±0.84	13.20±1.00	24.01 ^a ±0.39
9	56.10 ^a ±3.54	3.39±1.18	11.54±0.93	14.93±1.90	25.79 ^{ab} ±0.58
10	76.58 ^c ±1.28	4.83±1.17	10.52±0.93	15.35±1.83	28.57 ^{bc} ±0.60
11	67.19 ^b ±1.66	2.95±0.95	10.41±0.97	13.36±1.52	26.91 ^b ±0.69
14	57.44 ^a ±2.23	3.14±1.15	9.88±0.99	13.02±1.71	28.04 ^{bc} ±1.65
21	73.13 ^c ±0.86	2.17±0.97	12.09±0.84	14.26±1.38	27.54 ^{bc} ±0.59
24	77.64 ^c ±1.26	4.77±1.12	1.027±1.07	15.04±2.03	29.33 ^c ±0.51
Overall	68.32±1.00	3.29±0.34	10.96±0.31	14.25±0.53	27.27±0.27

Similar superscripts within the Column do not differ significantly

Table 3: Analysis of variance for the effect of bull and month on volume, pH, mass motility, individual motility and sperm density of Bhadawari Semen

Source of Variation	Df	M.S.S.				
		Volume	pH	Mass motility	Individual motility	Sperm density
Between bull	9	1.004*	0.340**	10.902**	133.175**	0.356**
Between months	5	0.706 ^{NS}	0.05185 ^{NS}	0.09246 ^{NS}	291.701**	0.04459*
Error	105	0.460	0.0326	0.304	25.430	0.1433

*- Significant at (P<0.05)

**- Highly Significant at (P<0.01)

NS- Non-significant

Table 4: Analysis of variance for the effect of bull and month on live spermatozoa, sperm abnormality and cold shock resistant spermatozoa of Bhadawari bull semen

Source of Variance	d.f.	M.S.S				
		Live spermatozoa	Sperm abnormality			CSR
			Head	Tail	Total	
Between bull	9	409.392**	16.025 ^{NS}	9.851 ^{NS}	12.823 ^{NS}	31.194**
Between month	5	53.397 ^{NS}	63.379**	23.714 ^{NS}	44.867*	10175 ^{NS}
Error	105	15.051	10.390	11.213	16.107	6.715

*- Significant at (P<0.05)

**- Highly Significant at (P<0.01)

NS- Non-significant

DISCUSSION

Ejaculate volume

The overall mean ejaculate volume of semen in Bhadawari buffalo bulls was found to be 1.68 ± 0.07 ml, which was comparable with that reported by [10] in Bhadawari buffalo. However, the value was higher than that reported by earlier workers in Bhadawari bull [17]. The mean ejaculated volume of other breed of buffalo in the study was within the range from 2.52 ± 0.10 ml in Murrah bulls [9] to 6.36 ± 0.33 ml in Jaffarabadi bulls [8]. The variation in ejaculate volume from that reported in earlier study might be due to difference in age, body weight, season and frequency of semen collection.

pH

Depending on the concentration and activity of spermatozoa the pH of semen varies. The average pH of semen for Bhadawari bulls was found to be 6.54 ± 0.02 . The average pH of semen observed in the present study was close to the findings of [11] for Bhadawari bulls. The estimates of mean initial pH (6.78 ± 0.02 for Murrah semen [9] and seminal pH (6.81 ± 0.01) for Surti buffalo bull [3] were comparatively higher than present estimate.

Mass motility

The overall mean mass motility (scale 0-4) in Bhadawari buffalo bull was recorded as 2.67 ± 0.09 . The mean mass motility recorded in the present investigation was comparatively higher than the mean value of motility (2.42 ± 0.05) reported by [11] in the semen of Bhadawari bulls. The present estimated was lower than the mean value of motility (3.92 ± 0.09) reported by [17] for the semen of Bhadawari during summer season.

Individual motility

The overall average per centage of progressively motile spermatozoa in Bhadawari bull was recorded as 48.23 ± 0.61 . The present value of initial sperm motility was lower in Bhadawari bull (73.95 ± 5.22 , 87.50 ± 1.09 , 76.67 ± 0.98 and 66.75 ± 1.04 per cent) reported by [16, 4, 5, 8] respectively for Murrah bulls.

Sperm density

The average sperm concentration of all Bhadawari bulls was found to be 0.95 ± 0.02 million/mm³. The average sperm concentration recorded in the present study was comparatively higher than the average value of sperm concentration (0.88 ± 0.02 million/mm³) reported by [11] in the Bhadawari bulls. The present estimate was lower than the average value of sperm concentration (985 ± 17.76 million/ml and 992.86 ± 17.76 million/ml) reported by [17] in the semen of Bhadawari bulls during summer and winter season, respectively. The highest value of sperm concentration (1384.00 ± 40.00 million/ml) was reported by [8] in the semen of Jafarabadi bulls during summer season. Sperm concentration per unit volume is an important trait in semen processing, since along with the initial motility and viability the dilution rate depends on concentration of spermatozoa in given ejaculate.

Live spermatozoa

The overall average for live spermatozoa was observed to be 68.32 ± 1.00 per cent. The present estimate of live spermatozoa (64.46 ± 1.10 per cent) reported by [11] in the semen of Bhadawari bulls. [17] reported higher (79.78 ± 0.92) per centage of live spermatozoa in the semen of Bhadawari bulls during summer season. Lower value of live spermatozoa recorded in the present study may be due to the fact that bulls were very young and there was gradual increase in per centage of live spermatozoa with the advancement of age.

Sperm abnormalities

The mean total abnormal live spermatozoa was found to be 14.25 ± 0.53 per cent. The variation between bulls was non-significant. Among the bulls, the per cent abnormality varied from 12.50 ± 2.11 to 17.50 ± 1.70 . The mean value of total live sperm abnormalities found in present study was close to the findings of [2] for Murrah semen. Our value for total live sperm abnormality for Bhadawari bulls was lower than the values (16.90 ± 0.84 and 28.77 per cent) reported by [9, 1] in Murrah bulls. The value was however, higher than those reported by [11] for Bhadawari bulls. It has already been reported in the literature that good quality of fresh semen should not contain more than 20 per cent abnormal spermatozoa [15].

Percent head abnormalities of spermatozoa

The abnormalities of head are much more important. Any deviation in the head anatomy of the spermatozoa may certainly retard its normal functioning of fertilization. The average

head abnormalities recorded in the present study was 3.29 ± 0.34 per cent. [1] observed 7.10 per cent total head abnormality during winter season in Murrah bull semen.

Cold shock resistant (CSR) spermatozoa

The average CSR spermatozoa in Bhadawari bulls were found to be 27.27 ± 0.27 per cent. Semen with higher motility rate may be expected to have more resistant spermatozoa but it may show variations among species. Buffalo semen, which is comparatively less motile than Zebu semen, has more resistant spermatozoa [14]. The average CSR spermatozoa observed in the present study was comparable with the average value of CSR spermatozoa (26.81 ± 1.11 per cent) reported by [12] in the semen of Murrah bulls. However, [16, 7] have reported higher CSR spermatozoa in the semen of Murrah bulls than the values recorded in present investigation. Analysis of variance revealed that bulls varied significantly ($P < 0.01$) as regards CSR spermatozoa.

CONCLUSION

There was a clear evidence of the genetic control on the reproductive behaviour in respect of quality and quantity of semen. The information contained in the present study, on the various semen characteristics indicated that the variation between bulls was more important and the selection of particular bull may be done on the basis of better semen quality.

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