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Seasonal Variation In Semen Production Of Bhadawari Buffalo Bulls

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ABSTRACT
Total of 120 ejaculates collected from ten Bhadawari buffalo bulls were studied to observe the effect of Month on Semen quality and freeze ability during frozen semen production. Mean values for Seminal Parameters viz Volume, pH, Mass motility, Individual motility, Sperm Density, Live Sperm count (%), Total Sperm abnormality(%) and CSR(%) was 1.68 ± 0.07,6.54 ± 0.02,2.67 ± 0.09, 48.23 ± 0.61,0.95 ± 0.02,68.32 ± 1.00, 14.25 ± 0.53 and 27.27±0.27, respectively. Individual motility, Sperm Density and Total Sperm abnormality differ significantly (P<0.05) between month of collection, however Volume, pH, Mass motility, Live Spermatozoa and CSR were not found to be affected due to month. Bull to bull variation was significant (P<0.05) for all Seminal attributes.
***Key words**: Bhadawari Bulls, Seminal characteristics, Seasons, Physio Morphological Characters, Sperm*

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INTRODUCTION

In India, Buffalo is an important livestock resource, providing milk, meat and draught power in many ecologically disadvantaged agricultural systems, Hence, it is the mainstay in rural economy, contributing dairy and meat industry. Buffaloes play an important role in the rural livestock production, particularly in Asia. Factors affecting their productivity are of paramount importance to agricultural economics in this Region. Reproductive efficiency is the primary factor affecting productivity and is hampered by a number of factors including distinct Seasonal reproductive patterns [12]. The quality of semen is of great importance in the fertility and productivity of many species including buffaloes.It has been reported [14] that season play an important role in the libido and also in quality of buffalo Semen. These effects need to be studied in all area where buffaloes are bred, due to the considerable environmental differences.
The present study was designed to investigate the effect of seasons on the quality of Bhadawari buffalo bull semen being produced at dairy farm, college of Veterinary Science and Animal Husbandry, Mathura.

MATERIALS AND METHODS

Bhadawari buffalo bulls aged 4-5 years maintained under NATP project "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 present study ten Bhadawari growing bulls were selected and trained for semen donation. Twelve semen sample from each bull were collected and examined for the semen characteristics. Total numbers of Semen Collections from all the bulls were one hundred twenty, during the period from October, 2004 to March, 2005. All the bulls were healthy and were reproductively sound. The bulls were maintained under uniform Conditions of feeding and management. All ejaculated obtained from the bulls were evaluated for macroscopic and microscopic semen quality tests. Immediately after collection, volume of semen was recorded mass motility was observed procedure given by Herman *et al.,* [4]. The individual progressive motility and per cent motile spermatozoa were estimated using a Standard procedure.
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 by Snedecor and cochran [15].

RESULTS AND 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 Sharma *et al*.,[13] in Bhadawari buffalo. However, the value was higher than that reported by earlier workers in Bhadawari bull by Yadav [19]. The months had non-significant effect on ejaculate Volume(Table 3).The mean ejaculate Volume was found to be 1.50 ± 0.12,1.64 ± 0.12,1.56 ± 0.15,1.64 ± 0.15,1.91 ± 0.22 and 2.02 ± 0.23 ml in October, November, December, January, February and March respectively (Table 1). Similar non-significant effect of months/seasons on ejaculate Volume of Murrah bulls have been reported by Rao *et al*, [11]. Howe ever, present finding was not in agreement with the results reported by Kapoor [5], Who observed significant Variation ($P<0.05$) in the ejaculated Volume between months.

Non-significant effect of month of volume of semen ejaculate in Bhadawari Buffalo bulls could be due the fact that the months of collection i.e. October- march were comparatively comfortable months (winter and spring season) for the collection of semen. Hence volume of semen was not affected in different month during the experiment.

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. Months of collection did not show any Significant effect On initial pH Value (Table 3). The average initial pH of Semen during 6 months ranged from 6.47 ± 0.05 to 6.62 ± 0.07(Table 1).

The present studying that months had not Significant effect on initial pH in the Semen of Bhadawari bulls are in Agreement with the findings of Kapoor [5],Who have also reported non-significant effect of months on the pH Value of Murrah Semen. However, Kushwaha *et al.*, [6] reported significant difference in pH Value between month Within the seasons. Significant Variations between months Were also reported by Tomar [17]. Vitality of semen is determined by pH and its variation is unwarranted.

No-significant change in pH of Bhadawari Buffalo bull semen indicate the fact that the winter to spring season are the almost comfortable season for the bulls for reproduction.

Mass motility

The overall mean mass motility on 0-4 scale in Bhadawari buffalo bull was observed as 2.67 ± 0.09(Table 1). The mean mass motility was found to be 2.67 ± 0.19, 2.52 ± 0.23, 2.68 ± 0.24, 2.82 ± 0.25, 2.63 ± 0.23 and 2.83 ± 0.31 in October, November, December, January, February and March respectively (Table 1).There was no significant difference in mass motility due to months (October, November, December, January, February and March).However maximum mass motility(2.82 ± 0.25) was recorded in the month of January. Highest initial motility of Spermatozoa in Winter has also been reported by Mukherjee and Bhattacharya(1952).

As found in present study, Non-significant variation between months within seasons were recorded by Kushwaha *et al.,* [5].Significant ($P<0.05$) Seasonal variation on mass activity of Semen was also observed by Dhami *et al*.,[2]. Gill *et al.,*[3] also reported poor quality semen between November and February months. The too low temperature and chilly wind adversely affect the vigour and testosterone production of bulls thereby Suppressing the testicular function and accessory sex gland secretion as opinioned by Mudgal and Radhye Shyam [9].

Individual motility

The overall average percentage of progressively motile spermatozoa in Bhadawari bull was recorded as 48.23 ± 0.61. Analysis of Variance (Table 1) Showed Significant ($P<0.01$) effect of months on individual motility. The mean individual motility was found to be 45.77 ± 1.22, 47.22 ± 1.64, 53.48 ± 1.00, 51.15 ± 0.96, 44.48 ± 0.94 and 44.69 ± 1.91 in October, November, December, January, February and March, respectively (Table 1)

Highest individual motility (53.48 ± 1.00 percent) was recorded in the month of December, and the lowest mean individual motility was observed as 44.48 ± 0.94 in February The difference is highly significant ($p<0.01$). December, January being cooler months and precisely a falls under peak breeding season could be the season for uniformly high individual motility. While sudden change in climate in February, March might have affected.

However, the range of percentage of individual motility itself is a concern and perhaps could be further improved by standardizing the freezing technique & procedures. Which was not significantly different from the month of January. Individual motility recorded in October,November, February and March did not differ significantly and was lower than December and January.

The present findings, that months has significant effect on individual motility are in agreement with the findings of Gill *et al.,* [3]. However, the present results, did not agree with the findings of Rao and Sreemannarayana [19], Who observed non-significant Variations between seasons for individual motility.

Sperm density

The average sperm concentration of all Bhadawari bulls was found to be 0.95 ± 0.02 million/mm^3. Analysis of Variance (Table 3) Showed Significant (P<0.05) effect of months on Sperm concentration..Highest sperm concentration (1.02 ± 0.04 million/mm^3) was recorded in the month of December, which was not significantly different from the month of January and March. Sperm concentration recorded in October, November and February did not differ significantly and was lower than December, January and March. The result on sperm density corroborates with the result on individual motility and was as expected.

Higher sperm concentration, observed in December in the present investigation, was in close agreement with the findings of Kapoor [4] who have also recorded significant (P<0.05)variation between months in the concentration of sperm per ml of semen with higher sperm concentration in December and January (winter) months. Similarly, Dhami *et al*., [2] also found significant (P<0.05) effect of seasons for sperm concentration per ml in Murrah bulls. However, the present results did not agree with the findings of Tomar *et al*.,[19] Who recorded non-significant differences in the sperm concentration between the months in Murrah bulls.

Live spermatozoa

The overall average for live spermatozoa was observed to be 68.32 ± 1.00 per cent. There was not significant variation in percent live Spermatozoa due to months. The averages for live spermatozoa were found to be 73.00 ± 1.79,66.24 ± 2.58,66.71 ± 2.36,71.08 ± 1.90,66.84 ± 2.16 and 65.59 ± 4.20 percent in October, November, December, January, February and March, respectively(Table 2). There was non-significant difference for percent live spermatozoa during 6 months (October to March). However, the highest overall percentage of live spermatozoa (73.00±1.79) was recorded in the month of October. The results obtained by Tomar *et al.,* [18], on non-significant month to month variations in live percentage of Sperms, are similar to be findings obtained in the present study. Mohan *et al*.,[7]) also observed non-significant difference in live spermatozoa between seasons. Contrary to this, Dhami *et al* [2] observed Significant (P<0.05) effect of seasons on live Sperm in Murrah bulls. Bhosrekar [1] reported highest live count during summer followed by monsoon and least live count during winter. Due to uniform, climatic and environment temperature condition, These result of no significant variation in live spermatozoa was observed.

Sperm abnormalities

The mean total abnormal live spermatozoa was found to be 14.25 ± 0.53 per cent(Table 2). Analysis of Variance showed significant (P<0.05) effect of months on total abnormal live spermatozoa. Significantly lower number of total live abnormal Spermatozoa (11.12 ± 0.94 percent) was found during December month and it was not Significantly different from total live abnormal Spermatozoa observed in January month. Significantly higher number of total live abnormal Spermatozoa (18.90 ±1.10 percent) was observed during October and did not differ Significantly from vale obtained in March month (16.80 ± 1.27 percent). The results, therefore, indicated that winter months (December and January) were best to favors to maintain normal structure of spermatozoa.

The present findings were in fair agreement with the earlier reports by Gill *et al*.,[3] Who have also reported Significant effect of period/Season on Sperm abnormalities. However, Sreemannarayana and Narsimharao [16] observed non-significant effect of seasons on the incidence of total Sperm abnormalities.

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. Analysis of Variance showed significant (P<0.01) effect of months on sperm head abnormalities. Significantly lower mean Value of Sperm head abnormality (1.03 ± 0.48 percent) was found during December month and it was not significantly different from January month. Significantly higher mean Value of sperm head abnormality (5.97 ± 0.73 percent) was observed during October and did not differ from month (5.06 ± 1.07 percent). The overall sperm head abnormality was significantly less in winter months (December and January). The present findings are in fair agreement with the findings of Bhoserekar [1] who have also recorded highly significant seasonal variation amongst head abnormalities. However, Sreemannarayan and Narsimharao [16] observed not significant differences between seasons for head abnormality.

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. The averages for CSR spermatozoa were found to be 27.22 ± 0.49, 27.35 ± 0.65,26.90 ± 0.50,28.73 ± 1.02, 26.64 ± 0.41 and 26.62 ± 0.79 percent in October, November, December, January, February and March, respectively.(Table 2). There was non-significant difference for cold Shock resistant spermatozoa during six months. However, the highest overall percentage of CSR spermatozoa (28.73 ± 1.02) was recorded in the month of January. This could be due to the tact that all the collection were in cooler months of the year.

It seemed therefore, that the viability of spermatozoa was higher during winter months. These findings were in confirmation with those of Tomar *et al* [18], who observed that spermatozoa were less resistant during day and humid hot season. Bull to bull variation in semen quality parameter was significant (P<0.05) which could be due to genetic difference among bulls.

Table 1: Average value for volume, pH, mass motility, individual motility and sperm density of Bhadawari bulls semen during different months

Month	Volume (ml)	pH	Mass motility (0 to +5)	Individual motility (%	Sperm Density (Million/mm3)
Oct	**1.50±0.12**	**6.47±0.05**	**2.67±0.19**	**45.77^{a}±1.22**	**0.92^{a}±0.04**
Nov	**1.62±0.12**	**6.50±0.05**	**2.52±0.23**	**47.22^{a}±1.74**	**0.90^{a}±0.05**
Dec	**1.56±0.15**	**6.54±0.05**	**2.68±0.24**	**53.48^{b}±1.00**	**1.02^{b}±0.04**
Jan	**1.64±0.15**	**6.62±0.05**	**2.82±0.25**	**51.15^{b}±0.96**	**0.96^{ab}±0.05**
Feb	**1.91±0.22**	**6.53±0.06**	**2.63±0.23**	**44.48^{a}±0.94**	**0.92^{a}±0.04**
March	**2.02±0.23**	**6.62±0.07**	**2.82±0.31**	**44.69^{a}±1.91**	**0.98^{ab}±0.07**
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 during different months

Month	Live Spermatozoa (%)	Sperm abnormality			CSR (%)
		Head	Tail	Total	
Oct	**73.00 ± 1.79**	**5.97^{c} ± 0.73**	**12.93 ± 0.66**	**18.90^{c} ± 1.10**	**27.22 ± 0.49**
Nov	**66.24 ± 2.58**	**3.97^{b} ± 0.74**	**10.56 ± 0.69**	**14.53^{bc} ± 1.12**	**27.35 ± 0.65**
Dec	**66.71 ± 2.36**	**1.03^{a} ± 0.48**	**10.09 ± 0.79**	**11.12^{a} ± 0.94**	**26.90 ± 0.50**
Jan	**71.08 ± 1.90**	**1.82^{a} ± 0.73**	**10.37 ± 0.62**	**12.19^{a} ± 1.26**	**28.73 ± 1.02**
Feb	**66.84 ± 2.16**	**2.91^{ab} ±0.84**	**10.56 ± 0.90**	**13.46^{ab} ± 1.29**	**26.64 ± 0.41**
March	**65.59 ± 4.20**	**5.06^{c} ± 1.07**	**11.74 ± 0.45**	**16.80^{c} ± 1.27**	**26.62 ± 0.79**
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*	10175NS
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

CONCLUSION

The attributes of semen quality characters examined in this study to evaluate the quality of semen in Bhadawari buffalo bull were found to be affected by seasons are individual motility, sperm density, sperm abnormality. The quality of semen in mid winter is better than other seasons. It is concluded that mid winter is the best season for production of frozen semen of Bhadawari buffalo bulls. Variation in semen quality parameters due to individual bull was genetic in origin and significant. These quality parameters could be used as a criterion while selecting the bull for future breeding.

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