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Comparative Study on Physico-morphological Characteristics of Semen from Murrah Buffaloes and Jersey Crossbred Cattle

T.C. Balamurugan[1], R. Prakash Krupakaran[1], G.D.V.Pandiyan[1], S.Arunkumar[1] and P. Perumal[2*]
[1]TANUVAS-Veterinary College and Research Institute, Orathanadu, Tamil Nadu (India)
[2]ICAR-Central Island Agricultural Research Institute, Port Blair, Andaman and Nicobar Islands (India)
**Corresponding Author: perumalponraj@gmail.com*

Abstract

A study was conducted to compare the physico morphological attributes of cattle and buffalo semen. Semen from four Murrah buffalo and Jersey crossbred apparently healthy bulls of approximately 4 to 6 yr of age with good body condition was collected using artificial vagina as per the standard practice. The average semen volume of buffaloes was 2.6 ± 0.13 as compared to 3.4 ± 0.12 in Jersey cross bred bull semen. The pH of buffaloes was 6.46 ± 0.32 as compared to 6.82 ± 0.05 in Jersey bulls. The average mass activity of Buffaloes was 2.82 ± 0.09 as compared to 3.82 ± 0.22 in Jersey cross bred bull. The average initial motility of Buffaloes was 69.53 ± 0.42 as compared to 78.24 ± 0.36 Jersey cross bred bull semen. The average sperm concentration was 992.85 ± 10.56 observed in Buffaloes. This might be due to individual variations of bull used in their respective studies. In the present study, the average sperm concentration of Jersey cross bred bull semen was 1044.65 ± 28.56. The average live sperm count in buffalo bull semen was 84.23 ± 0.56 as compared to 87.52 ± 0.53 in Jersey crossbred bull semen. The average abnormality (%) in Buffaloes was 4.24 ± 0.68 as compared to 5.89 ± 0.29 in Jersey cross bred bull semen. Based on the present study, it was concluded that the physico morphological attributes of Murrah buffaloes was comparatively lower than Jersey cross bred bull semen.

Key words: *Physico morphological characters,Semen, Murrah buffaloes, crossbred cattle*

Introduction

Artificial insemination (AI) has played a major role in the genetic improvement of cattle and buffaloes by increasing the selection intensities of males and wide dissemination of their valuable germplasm. Attempts are being intensified to augment the coverage of AI so as to develop the full potential of the technology. The use of the best bulls is often limited by the restricted number of doses of semen produced as there are several inherent and practical constraints to achieve the breeding goals through AI. The bull's fertility depends upon the morphologically normal spermatozoa. Moreover, there is variable degree of morphological, physiological and biochemical alterations in sperm population after post thaw, making them unsuitable for optimum fertility. There are extrinsic or intrinsic factors responsible for post thaw semen quality. Semen volume, sperm concentration, proportion of dead and abnormal spermatozoa, and motility of spermatozoa are recognized as important indices of semen quality and significantly correlated with freezability and/or fertility of bovine semen (Fiaz *et al*., 2010).

Semen producing ability and quality of individual bull are essentials to guarantee the supply of superior quality germplasm for maintaining the production. Although buffalo bulls are known for poor libido, there are also anatomical and physical limitations to produce good quality germplasm with good number of viable sperms all over the year. They have comparatively smaller testicular size, lower daily sperm production rate and epididymal sperm reserve in buffalo bulls compared to cattle (Singh *et al*., 2000). Besides these constraints, seasonal influences and prophylactic measures also adversely affect semen production performance directly or indirectly (Mondal *et al*., 2000;Rajoriya *et al*., 2013). There is much wastage of superior germplasm due to poor semen quality, poor freezability and poor libido resulting in enormous economic losses as well as drop in genetic gain. Hence, the objective of this study was to compare the physico morphological attributes of Murrah buffalo to Jersey crossbred bull semen thereby to select a breeding bull in Cauvery delta region of Tamil Nadu.

Materials and Methods

The proposed study was carried out at the Department of Veterinary Physiology and Biochemistry, Veterinary College and Research Institute (TANUVAS), Orathanadu, Tamilnadu, India. The institute is located at an altitude of 30m feet above the mean sea level, at a latitude of 10.6° North and a longitude of 79.3° east.

Four Murrah buffalo and Jersey crossbred apparently healthy bulls of approximately 4 to 6 yr of age with good body condition (score 5-6) were selected from the herd of organized farm, Orathanadu, India and were maintained under uniform feeding, housing and managemental conditions. Semen was collected twice a week from 4 buffalo bulls of Murrah breed having age between 8 - 10 years by using Artificial Vagina method as described by Tomar (1986). Semen was collected from each bull in the morning hours between 8.00 to 9.00 a.m. A total of thirty two ejaculates (Eight ejaculate × four bulls) were studied. Immediately after collection, the ejaculates were placed in a water bath maintained at 35°C and samples were evaluated for various macroscopic examinations and microscopic parameters, the former consisted of volume, colour, consistency and density while the later consisted of mass activity, individual motility, total sperm count, live and dead sperm count and morphological abnormality of spermatozoa (Tomar, 1986).

The volume was measured immediately after collection, directly from the graduated semen collection tube. The colour of bull semen varied from milky or Creamy white. The colour graded according to Zemjanis (1970). Colour of semen was graded as creamy, milky, watery and pH was recorded with the help of pH indicator paper. The mass motility of semen was recorded by placing a small drop of neat semen on glass slide without coverslip under low magnification (10 X) and graded from 0 to + 5 scale graded based on the appearance of waves and swirls (Salisbury *et al*., 1978). Concentration of spermatozoa (million/ml) in the neat semen was determined by the haemocytometer method adopting RBC counting procedure. Percentage of live spermatozoa was estimated by differential staining technique using Eosin-Nigrosin stain (Salisbury *et al*., 1978).

Results and Discussion

The physico morphological seminal attributes of Murrah buffalo bulls and Jersey crossbred cattle bull semen are compared and depicted in Table -1. The mean semen volume of Murrah bulls (2.62 ± 0.13 ml) was significantly ($p< 0.05$) lower than in Jersey crossbred bull (3.24 ± 0.12 ml). Similar results were observed by other workers in buffaloes (Prajapati*et al*., 2000; Kumar *et al.,* 1993), cattle (Patel *et al.,* 2000; Perumal *et al*., 2016) and mithun (Baruah *et al*., 2016). However, higher results were observed by Gokhele *et al*. (2003) (6.35 ± 0.09), Kanchan and Singh (2005) (3.47 ± 0.14 in Murrah buffaloes.

Table 1: Mean values of physical and morphological attributes of neat Murrah buffalo bull and Jersey crossbred bull semen

Sl. No.	Parameter	Buffalo	Cattle
1.	Volume (mL)	2.62 ± 0.13^{a}	3.24 ± 0.12^{b}
2.	pH	6.46 ± 0.12	6.82 ± 0.15
3.	Colour	White	Yellow
4.	Mass activity (scale)	2.82 ± 0.09^{a}	4.32 ± 0.22^{b}
5.	Initial motility (%)	69.53 ± 0.42^{a}	78.24 ± 0.36^{b}
6.	Sperm Concentration (x 106/mL)	992.85 ± 10.56^{a}	1044.65 ± 18.56^{b}
7.	Livability (%)	87.52 ± 0.53	84.23 ± 0.56
8.	Abnormality (%)	5.89 ± 0.29^{a}	4.24 ± 0.68^{b}

Means bearing superscripts differ significantly ($p< 0.05$) between rows

Table 2:Correlation coefficient among the physico-morphological attributes of cattle bulls

No	Attributes	1	2	3	4	5	6	7
1	Volume	1.00	-0.10	0.28	0.18	0.31	-0.12	0.02
2	Concentration		1.00	0.23	0.14	0.32	-0.47	-0.09
3	Mass activity			1.00	0.87*	0.85*	-0.65*	-0.18
4	Individual motility				1.00	0.88*	-0.66*	-0.41
5	Livability					1.00	-0.72*	-0.47
6	Abnormality						1.00	0.36
7	pH							1.00

* Correlation coefficient were significant, $p< 0.05$

Table 3.Correlation coefficient among the physico-morphological attributes of buffalo bulls

No	Attributes	1	2	3	4	5	6	7
1	Volume	1.00	-0.59	-0.65	-0.14	-0.47	0.29	0.32
2	Concentration		1.00	0.42	0.15	0.42	-0.04	-0.39
3	Mass activity			1.00	0.43	0.81*	-0.46	-0.45
4	Individual motility				1.00	0.59	-0.14	-0.24
5	Livability					1.00	-0.50	-0.51
6	Abnormality						1.00	0.09
7	pH							1.00

* Correlation coefficient were significant, $p< 0.05$

Jersey crossbred bull has significantly higher mass activity (0 to 5 scales) (3.86 ± 0.22) than Murrah bull semen (2.84 ± 0.09). Similar report was observed in Gir bulls (Sori *et al.*, 2006) and Jersey bulls (Singh *et al.*, 2000). But lower values are observed in Jersey crossbred bull by Fiaz *et al.* (2010) and Kumar *et al.* (2014). In buffaloes, similar observation was reported by various authors (Bhakat, 1994; Mondal, 1998).The pH of Murrah bull semen was 6.46 ± 0.32 as compared to 6.82 ± 0.05 in Jersey crossbred bull semen. The colour of buffalo bull semen was observed in the present study was white, which is similar to the report of Kumar (1993) in Indian buffalo bull semen. The colour of Jersey crossbred bull semen was yellow which is accorded to the report of Fiaz *et al*. (2010). The yellow colour of semen may be due to lipochrome pigment derived from the epithelium of ampulla during seminal secretion and considered to be a normal colour (Singh *et al.,* 2000).

Mean sperm concentration was significantly ($p< 0.05$) higher in Jersey crossbred bull (1044.65 ± 28.56 million /ml) than in Murrah buffalo semen (992.85 ± 10.56 million/ml). Similar reports were observed in Murrah bulls (Ram, 1988; Bhakat *et al.,*2011) and Jersey crossbred bulls (Perumal *et al*., 2011). But in buffalo, higher value was observed by Ravimurugan *et al.* (2008). This might be due to individual variations of bull ability to produce semen used in their respective studies.

Mean percentage initial motility of Jersey crossbred bull (78.24 ± 0.36) was significantly ($p< 0.05$) higher than in Murrah buffalo semen (69.53 ± 0.42). Similar reports were observed in buffalo (Kumar *et al.,*1993;

Ravimurugan *et al.,*2008) and in cattle bull semen (Singh *et al.,* 2000). Mean percentage of live sperm count in buffalo bull semen was 84.23 ± 0.56 as compared to 87.52 ± 0.53 in Jersey crossbred bull semen. The results of buffalo bull semen were similar to the results of Mondal *et al.* (2000). The average abnormality (%) in Murrah bull semen was (4.24 ± 0.68) significantly ($p < 0.05$) lower ($p < 0.05$) than in Jersey crossbred bull semen (5.89 ± 0.29). Similar results were reported in buffalo bull (Mondal *et al*., 2000) and in Jersey crossbred bull (Singh *et al.,* 2000).

Conclusion

Based on the present study, it was concluded that the physico morphological attributes of Buffaloes was comparatively lower than Jersey cross bred bull semen. The variation in semen quality parameters recorded in the present study, which were well supported by earlier reports, may be due to individual variations (Saxena and Tripathi, 1978), ejaculation rate (Nath, 1988), differences in age (Bhat *et al*., 2002), genetic makeup of the bulls (Tomar *et al*., 1996), season of study (Tuli, 1984) degree of sexual excitement, method of semen collection, and agro climatic conditions Koivisto *et al*. (2008).

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