

## STUDIES ON PHYSICO-MORPHOLOGICAL CHARACTERISTICS AND FERTILIZING ABILITY OF SEMEN OF TARAI BUFFALO BULLS\*

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ABSTRACT

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A total of 60 semen ejaculates were collected from six Tarai buffalo bulls using sterilized artificial vagina twice weekly. The ejaculates were evaluated and characterized for various physico-morphological characteristics as well as in-vitro fertility using hypo-osmotic swelling and poly-acrylamide gel penetration tests. The ejaculate volume, pH, sperm mass motility, progressive motility, density, livability, head, mid piece, tail and total abnormalities, acrosomal integrity and methylene blue reduction time in Tarai buffalo bulls were  $3.25 \pm 0.12$  ml,  $6.79 \pm 0.02$ ,  $4.180 \pm 0.03$ ,  $83.66 \pm 0.71\%$ ,  $1289.83 \pm 51.64$  million/ml,  $92.70 \pm 0.50\%$ ,  $1.520 \pm 0.08\%$ ,  $1.120 \pm 0.04\%$ ,  $3.85 \pm 0.18\%$ ,  $6.48 \pm 0.22\%$ ,  $95.86 \pm 0.24\%$ ,  $6.36 \pm 0.28$  minutes, respectively. The hypo-osmotic swelling per cent and poly-acrylamide gel penetration distance were  $77.420 \pm 0.73$  per cent and  $25.50 \pm 0.44$  mm/hr, respectively. It was concluded that quality of semen was good and physico-morphological characteristics were in the normal range described for the buffalo, hence may be utilized for freezing and further use in propagation and development of the Tarai buffalo.

**Key words:** Tarai buffalo semen, Physico-morphology, Fertilizing ability, HOST

The buffalos are the backbone of Indian farmer's economy and dairy industry. In spite of having world's largest buffalo population, India has only nine well recognized and documented breeds of buffalo. Most of the non-descript buffalo populations are unique in their adaptation to the local agro-climatic conditions. The Tarai buffalo is one of such buffalo breeds that has adapted and is thriving under stressful climatic conditions of the Tarai region. Thus, characterization of Tarai buffalo and its semen would be worth doing in the course of establishing it as a breed. Consequently, for multiplication of superior germ plasm of Tarai buffaloes, knowledge on physico-morphology and fertilizing ability of its semen would help in formulation of suitable dilutor for production of good quality deep frozen semen. In the light of above facts, the present study was undertaken to study various seminal attributes and fertilizing ability of Tarai buffalo semen.

The experimental animals comprised of six Tarai buffalo bulls aged 4 to 6 years. They were maintained under standard managemental conditions. Semen samples were collected using sterilized artificial vagina from the bulls twice weekly. Soon after collection, the semen samples were evaluated and characterized for the physico-morphological characteristics like ejaculate volume, pH, sperm mass motility, progressive sperm motility, livability, sperm abnormalities, sperm density (Tomar, 1997), acrosomal integrity (Watson, 1975) and metabolic test like methylene blue reduction text (Tomar, 1997). Fertilizing ability of the semen was assessed using in-vitro fertility tests like hypo-osmotic swelling (Jayendran *et al.*, 1984) and poly-acrylamide gel penetration tests (Kumar *et al.*, 2004). Data obtained were statistically analyzed using analysis of variance (Snedecor and Cochran, 1967).

In the present study, ejaculate volume averaged  $3.25 \pm 0.12$  ml and varied ( $p < 0.01$ ) between bulls which agreed well with the findings of Singh *et al.* (1992) in Murrah bulls. The significant variation in ejaculate

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volume between bulls as observed in the present study has also been recorded by Rao and Rao, (1980).

The pH of the semen averaged  $6.79 \pm 0.02$  and varied significantly ( $p < 0.05$ ) between bulls, in accordance with Bhosrekar (1980). The variations in semen pH between bulls may be due to differences in ionic and sperm concentration and motility (Tomar, 1997).

The sperm mass motility of semen varied highly significantly ( $p < 0.01$ ) between bulls with a mean of  $4.18 \pm 0.03$  on 0-5 scale and agreed well with the findings of Tiwari (2004). The significant variation in mass motility between bulls as observed in the present study has also been recorded by Bhosrekar (1980).

The average value of progressive sperm motility of fresh semen in the present study was  $83.66 \pm 0.71\%$  and it varied significantly ( $p < 0.01$ ) between bulls. The variations between present study and earlier reports may be due to variations in the season of study, age and genetic makeup of the bulls (Saxena and Tripathi, 1983).

The average sperm concentration was  $1289.83 \pm 51.64$  million spermatozoa per ml. It agreed well with the findings of Dhama *et al.* (1998). However, lower sperm concentrations of 1023.79 and higher concentrations of 1335.42 (Pandey and Gupta, 2004) are reported. The significant variation in sperm concentration between bulls as observed in the present study may be possibly due to age, genetic make up of the bulls and number of false mounts (Saxena and Tripathi, 1983).

The live spermatozoa in the neat semen of Tarai buffalo averaged  $92.70 \pm 0.50$  per cent, which varied significantly between bulls. Fairly similar values were also recorded by Tiwari (2004), while others reported lower value of the livability. To some extent this discrepancy may be due to variations in age of the bulls, season of the study and different agro-climatic conditions (Bhosrekar *et al.*, 1991) and possibly due to individual variation and sex libido of the bulls (Saxena and Tripathi, 1983).

The sperm head, mid piece and tail abnormalities in the present study were  $1.52 \pm 0.08$ ,  $1.12 \pm 0.04$  and  $3.85 \pm 0.18$  per cent respectively. The total sperm abnormalities observed in the present study compared with the findings of Pandey and Gupta (2004). However, other workers reported higher percentage of sperm abnormalities of 15.53% (Saxena and Tripathi, 1983).

The per cent intact acrosomes in the study averaged  $95.86 \pm 0.24\%$ . It is somewhat comparable to the reported value of 92.75 % (Kodagali *et al.*, 1973) in surti buffalo. However, other workers reported lower per cent intact acrosome of 67.90 to 91.90 % (Pant *et al.*, 2002). The differences may be attributed to the differences in the breed and genetic makeup of the bulls (Pant *et al.*, 2002)

The average methylene blue reduction time of semen in the present study was  $6.36 \pm 0.28$  min and it varied significantly between bulls. However, other workers reported lower value of 271.25 sec. (Saxena and Tripathi, 1983)

The hypo-osmotic swelling test (HOST) evaluates the structural and function integrity of sperm membrane (Jayendran *et al.*, 1984). The HOST reacted spermatozoa in the present study averaged  $77.42 \pm 0.73$  per cent. However, other workers reported lower value of 62.11 % (Pandey and Gupta, 2004), 40.60 to 68.80 % (Pant *et al.*, 2002) in Murrah bulls. The differences may be conceived, as semen quality varies between breed, season, age and genetic makeup of bulls (Saxena and Tripathi, 1983).

The sperm penetration distance (SPD) in poly-acrylamide gel in the present study averaged  $25.50 \pm 0.44$  mm/hr. However, Singh *et al.* (1992) recorded SPD of 21.49-0.22 mm/20 min in buffalo semen. Kaushal *et al.* (2004) noted SPD value of  $19.8 \pm 0.17$  to  $23.8 \pm 0.60$  mm/20 min. Similar to HOST, the differences are well conceivable. However, information on this trait in buffalo semen is not sufficient and more investigation is needed.

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