



Seasonal variations in the quality and freezability of Red Sindhi bull semen

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Red Sindhi cattle, the most popular of all zebu dairy breeds, are kept for milk production across India, Pakistan, Bangladesh, Sri Lanka and other countries. They are used for crossbreeding with temperate (European) origin dairy breeds to combine their tropical adaptations (heat tolerance, tick resistance, disease resistance, fertility at higher temperatures, etc.) with the higher milk production of dairy cattle of temperate regions. It has been crossed with Jersey cattle in India, the United States, Australia, Sri Lanka, etc. It has also been crossed with Holstein Friesian, Brown Swiss and Red Dane breeds of European cattle. At Animal Breeding Centre, Salon, Red Sindhi bulls are kept for semen production, which is used for its genetic conservation and for field artificial insemination. Under tropical conditions, exotic breeds showed significantly seasonal fluctuations in semen characteristics (Bhosrekar *et al.* 1980, Saxena and Tripathi 1984). High ambient temperature during summer adversely affects testicular size, libido and semen quality (Soderquist *et al.* 1996), and epididymal spermatozoa are adversely affected by elevated testicular temperature decreasing ability of spermatozoa to maintain motility and acrosomal integrity after freezing (Vogler *et al.* 1991). For bulls used in artificial insemination, the information on semen characteristics, fertility and semen production efficiency are some important basic parameters about which information in Red Sindhi breed is lacking. Therefore, the main objective of this study is, to evaluate the semen characteristics and production efficiency of Red Sindhi bulls maintained at Semen Station, Animal Breeding Centre, Salon, Rae Bareilly (Uttar Pradesh).

Red Sindhi bulls (4), 51- to 57-month-old, were maintained under housing system (covered area –700 Sq. m × and uncovered area – 700 Sq. m) and standard feeding

schedule was planned to ensure intake of 2–3 kg dry matter/100kg body weight using the feedstuffs, concentrate: 0.4% of the body weight (2.0–3 kg), green fodder: 40 to 60 % of the balance dry matter (20–30 kg), roughages: remaining 40–60% (7–9 kg), mineral mixture: 1% of cattle feed (25–30g). Data from April 2010 to March 2011, were studied season wise. The seasons were classified as winter (November to February), summer (March to June) and rainy (July to October). All the bulls were kept under identical conditions of care and management. As per roaster schedule all the bulls were brought in collection arena for semen collection twice a week. On each collection roaster day, 2 ejaculates per bull were collected rarely third ejaculate was taken in case of excited bulls. Semen was collected with the help of an artificial vagina. Two false mounts were provided to each bull prior to actual collection. Ejaculate volume was recorded immediately after collection, sperm concentration was estimated by photometer. Semen was diluted in tris diluent (Rasbech 1975). Sperm concentration per straw was kept 20 million and freezing was carried out after equilibration under standard conditions (Graham *et al.* 1985). Post thaw progressive motility was assessed 24 h after freezing. If the post thaw motility was found > 50%, the frozen semen was cryopreserved. The data were subjected to analysis of variance (Snedecor and Cochran 1989).

The mean values with SE of seminal parameters in different seasons are presented in Table 1. The overall mean for ejaculate/month/bull was 16.06. This value is higher than those reported by Singh *et al.* (1994) in Mehsana bulls. Overall mean ejaculate volume was 4.32±0.07 ml which ranged from 1 to 15 ml. This value is lower to the findings of Bhosrekar *et al.* (1980) in Jersey and Holstein Friesian breeds and higher to the reports of Dhami *et al.* (1998) and Tiwari *et al.* (2010) in Murrah buffalo breed. Such variability between reports on semen volume might be attributed to difference in age, breed, nutritional status and geographical location of bulls, besides the season of the year under study, and method and frequency of semen collection. However, the range of values given for semen volume in the literature

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Table 1. Mean values with SE of seminal parameters in different seasons in Red Sindhi bulls

Seminal parameters	Source of variation			Overall
	Winter season	Summer season	Rainy season	
Total No. of ejaculates	251	266	254	771
No. of ejaculate per month/bull	15.69	16.63	15.88	16.06
Ejaculate volume (ml) EVOL	4.49 ^a ±0.14	4.41 ^a ±0.10	4.06 ^c ±0.10	4.32±0.07
Sperm concentration (10 ⁶ /ml) SCON	1133.49 ^a ±34.85	1035.96 ^b ±24.38	963.22 ^c ±23.96	1043.75±16.35
Initial motility (%)	66.35±0.72	67.29±0.62	66.99±0.58	66.89±0.37
Post thaw motility (%)	50.05±0.03	50.09±0.04	50.19±0.06	50.11±0.03
Discard rate of neat semen (%)	10.76	7.89	10.63	9.73
Discard rate of frozen semen (%)	3.98	7.52	5.12	5.58

Means bearing a common superscript in rows do not differ significantly with each other ($P \geq 0.05$).

agrees with the present result. Ejaculate volume was significantly ($P < 0.05$) affected by the season with minimum during rainy (4.06±0.10 ml) and remained indifferent during winter (4.49±0.14 ml) and summer (4.41±0.10 ml) seasons. Over all mean sperm concentration (SCON) was 1043.75±16.35 million/ml. However, Bhakat *et al.* (2011) reported lower values of 766.69±5.50 million/ml in Sahiwal bulls. SCON was significantly ($P < 0.05$) affected by the season, the values were maximum (1133.49±34.85 million/ml) during winter and minimum (963.22±23.96 million/ml) during rainy season. The overall average for sperm output/ejaculate (SOUT) was 4538.80±94.88 million. SOUT was significantly ($P < 0.05$) influenced by the season. Highest value for SOUT was obtained during the winter and lowest during the rainy season. The initial motility and post thaw motility (PTM) had no significance between the seasons. Overall mean percentile initial motility was 66.89±0.37 and overall mean PTM (%) was 50.11±0.03 (Table 1). The average yearly production of frozen semen doses (FSD) per bull was 39536.75, however, Bhosrekar *et al.* (1980) reported much lower values in Jersey (10099 FSD) and in Holstein Friesian (10458 FSD) bulls. The overall average number of FSD produced per ejaculate was 220.26±5.51 and ranged between 22 and 783, FSD produced and FSD stored were significantly ($P < 0.05$) influenced by the season. Significantly lower number of FSD (193.99±8.60 FSD) were produced per ejaculate during rainy season, whereas no significant difference was found in number of FSD produced during winter (242.44±11.49 FSD) and rainy (224.41±8.17 FSD) seasons. Maximum semen doses of poor quality were obtained during rainy and summer seasons leading to more discard (rejection) of semen doses, whereas winter had minimum discards. Overall 84.70% ejaculates sustained freezing and successfully stored, maximum ejaculates stored after freezing in winter (85.26) followed by summer (84.59) and rainy (84.25) seasons. The overall mean substandard neat ejaculates discarded were 9.73%, which was highest in winter (10.76%) and lowest in summer (7.89%). The overall discard rate of FSD was 6.14%. The highest discard rate of FSD was

recorded in summer (8.59%) than in rainy (6.57%) and lowest in winter (3.37%) seasons. Bhosrekar *et al.* (1980) reported higher FSD discard in summer in Jersey and Holstein-Friesian bulls which is in line with the result of present study.

It may be concluded from this study that semen characteristics, freezability and semen production efficiency of Red Sindhi bulls are comparable to other breeds of cattle and buffaloes. Based on higher ejaculate volume, sperm concentration, sperm out put/ejaculate, FSD produced per ejaculate and FSD stored per ejaculate and lower discard rate of neat and frozen semen during winter, it is concluded that winter is the best season for production of Red Sindhi bull semen.

SUMMARY

The aim of present study is to evaluate the variables affecting semen characteristics in Red Sindhi bulls. Semen ejaculates (771) collected from 4 Red Sindhi bulls during various seasons (winter, summer and rainy) of the year were studied. Ejaculate volume (EVOL), sperm concentration (SCON) showed significant effect of seasons. However, initial motility (IM) and post-thaw motility (PTM) did not differ significantly between seasons. Mean values for semen parameters, viz. number of ejaculates per month, EVOL, IM, SCON, PTM, were 16.06, 4.32±0.07 ml, 66.89±0.37 %, 1043.75±16.35 million/ml and 50.11±0.03 %, respectively. Discard (rejection) rate of frozen semen was the highest in summer (7.52%) followed by rainy (5.12%) and lowest in winter (3.98%).

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