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SEMEN CHARACTERISTICS OF PUNGANUR BULLS*

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ABSTRACT

The present investigation was carried out to study the semen characteristics of Punganur bulls. The overall mean ejaculate volume (ml), mass activity (0-4 scale), individual motility (%), sperm concentration (millions/ml), live sperms (%), sperm head abnormalities (%), acrosomal damage (%), mid piece abnormalities (%), tail abnormalities (%) and total sperm abnormalities in neat semen of Punganur bulls were 3.25 ± 0.15, 3.26 ± 0.06, 72.85 ± 0.71, 1427.25 ± 3.77, 79.34 ± 0.33, 4.25 ± 0.07, 4.75 ± 0.07, 1.97 ± 0.27, 4.25 ± 0.08 and 10.46 ± 0.12, respectively. Significant differences in ejaculate volume, mass activity, individual motility and live sperms were observed among the bulls.

Key words : Punganur bulls, Semen characteristics.

INTRODUCTION

Punganur, the world's shortest humped cattle (*Bos indicus*) with long tail and switch touching the ground, is at the risk of extinction (Ramesha, 2001). Since, conservation of endangered breed would prevent further reduction of current population by implementing carefully planned mating programmes in conjunction with appropriate reproductive technologies. Hence, it was proposed to take up the present study in order to preserve semen and assess the fertility of the semen by pre-freeze and post-thaw quality by using conventional and commercial semen extenders.

MATERIALS AND METHODS

The present study was undertaken at Livestock Research Station, Palamaner, Chittoor Distict, A.P and Department of Animal Reproduction, Gynaecology & Obstetrics, College of Veterinary Science, Tirupati. Experiments were designed to study semen characteristics immediately after collection.

Ten bulls aged between 6 and 10 years and maintained in semi-intensive housing system were utilized for studying the characteristics and keeping quality of semen during the year 2007-08. A total of 20 ejaculates were collected from each bull twice weekly using artificial vagina and all the ejaculates were analyzed for various semen characteristics like volume (ml), mass activity (0-4 scale), individual motility (%), sperm concentration (millions/ml), live sperms (%), sperm head abnormalities (%), acrosomal damage (%), mid piece abnormalities (%), tail abnormalities (%) and total sperm abnormalities. During every collection ¼ to ½ of the ejaculates having more than 60 per cent individual motility were utilized to study progressive sperm motility and acrosomal damage to assess the quality of semen.

RESULTS AND DISCUSSION

As per the FAO norms (Bodo, 1989 and Anonymous, 1990), Punganur breed is in an alarming state of extinction. Extensive crossbreeding with exotic dairy breeds like Jersey, Holstein Friesian and Kerry in particular (Annual Progress Report of LRS, Palamaner, 1994-95) has reduced the number of pure Punganur cattle to just about 70 (Pundir and Sahai, 1997) in the home tract of this breed. As an adjunct to the ongoing *in situ* conservation of Punganur cattle germ plasm, *ex situ* conservation by employing modern reproductive technologies was

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attempted in this study. However the present study suffers from the availability of extremely small number of bulls and cows which do not fall into homogenous groups. Care was taken in selecting as homogenous groups of animals as possible for inclusion in the study.

The overall mean ejaculate volume (ml), mass activity (0-4 scale), individual motility(%), sperm concentration (millions/ml), live sperms (%), sperm head abnormalities (%), acrosomal damage (%), mid piece abnormalities (%), tail abnormalities (%) and total sperm abnormalities in neat semen of Punganur bulls were 3.25 ± 0.15, 3.26 ± 0.06, 72.85 ± 0.71, 1427.25 ± 3.77, 79.34 ± 0.33, 4.25 ± 0.07, 4.75 ± 0.07, 1.97 ± 0.27, 4.25 ± 0.08 and 10.46 ± 0.12, respectively (Table 1). Significant differences in ejaculate volume, mass activity, individual motility and live sperms were observed among the bulls. But non-significant differences with sperm concentration, head, mid piece, tail and total abnormalities of sperm were observed among the bulls. Similar values on semen characteristic were recorded by Baburao (1996) in Punganur bulls.

The volume of semen in Punganur bulls is comparable with the volume in Tharparkar (Rao and Rao, 1975), Kangayam (Veerapandian *et al.,* 1992), Ongole (Veeraiah 1995) and Sahiwal bulls (Mandal *et al.,* 2005). The lower ejaculate volume recorded in this study could be attributed to the smaller body weight and lesser testicular measurements in Punganur bulls. Interestingly ejaculate volume exhibited a positive and significant correlation with body weight and also testicular biometry.

The overall mean mass activity in Ongole (Veeraiah, 1995) and Sahiwal (Mandal *et al.,* 2005) was also similar to the present study but slightly higher activity was reported in Tharparkar (Bhosrekar and Razdan, 1973) and Hariana (Tomar and Gupta, 1984) bulls. The significant difference in the mass activity among the bulls might be due to variation in concentration, motility and proportion of live and abnormal sperms in the ejaculates (Rao and Rao, 1978).

The overall mean percentage of individual motility values were in agreement with the observations in Hariana (Tomar *et al.,* 1966), Tharparkar (Rao and Rao, 1975), Ongole (Veeraiah, 1995) and Sahiwal (Mandal *et al.,* 2005) bulls.

The overall mean sperm concentration was similar to the reports in other breeds like Gir (Paul *et al.,* 1966), Tharparkar (Rao and Rao, 1975) and Ongole (Veeraiah, 1995) bulls. However, a lower sperm concentration was reported in Sahiwal (Mandal *et al.,* 2005) bulls. Since the concentration of sperm in ejaculates could be influenced by several factors such as frequency of collection, nutrition and health status in addition to genetic variation, it is difficult to pinpoint the reasons for the differences reported by different workers.

The overall mean percentage of live sperms was lower than that reported in Haryana (Tomar and Gupta, 1984), Kangayam (Veerapandian *et al.,* 1992), Ongole (Veeraiah 1995) and Sahiwal (Mandal *et al.*, 2005). Significant differences among bulls might be due to differences in the body weight, genetic makeup and testicular measurements.

The overall mean percentage of sperm head abnormalities are similar to the reports of Veeraiah (1995) in Ongole and Mandal *et al.* (2005) in Sahiwal bulls. On the contrary, a lower percentage of head abnormalities was reported by Rao (1988) in Ongole bulls. However, a higher percentage of sperm head abnormalities was reported in Tharparkar (Rao and Rao, 1975). Apparently occurrence of head abnormalities is related to genetic and environmental influences.

The normal morphology of acrosome in the sperm head is essential for the successful penetration of spermatozoa through the investments of ovum (Bailey and Franc, 2000). In the present study, the overall mean percentage of acrosomal damage was 4.75 ± 0.07 (Table 1). No reports on acrosomal damage in Punganur bulls are found in the literature. But similar findings were reported in Ongole bulls by Rao (1988). The difference in the proportion of acrosoma1 damage among bulls though not statistically significant, in the present study might be due to genetic makeup of bulls and defects in the spermatogenesis.

The overall mean percentage of mid piece abnormalities was in agreement with the observations of Veeraiah (1995) in Ongole bulls. Lower percentage of mid-piece abnormalities was reported in Ongole bulls by Rao (1988). Higher percentage of mid piece abnormalities was reported in Sahiwal X Holstein Friesian bulls by Hazarika *et al.* (1988). Thus in addition to inheritance,

TABLE 1: Semen characteristics (Mean ± S.E)of in Punganur bulls.

Characteristic	BULL NUMBERS										Overall n=200
	5	6	16	19	20	21	26	42	44	47	
Volume (ml)	4.55^{a} ± 0.21	3.78^{b} ± 0.21	3.10^{cde} ± 0.16	2.75^{e} ± 0.16	3.49^{bc} ± 0.13	3.30^{cd} ± 0.14	2.92^{de} ± 0.12	2.70^{e} ± 0.18	2.92^{de} ± 0.12	3.04^{de} ± 0.15	3.25 ± 0.15
M. Activity (0-4 scale)	3.05^{bc} ± 0.18	2.73^{bc} ± 0.14	3.38^{ab} ± 0.13	3.38^{a} ± 0.13	3.45^{a} ± 0.13	3.48^{a} ± 0.13	3.35^{ab} ± 0.12	3.40^{a} ± 0.11	3.33^{a} ± 0.11	3.10^{bc} ± 0.18	3.26 ± 0.06
Individual Motility (%)	70.50^{bc} ± 1.25	71.25^{bc} ± 1.49	72.25^{abc} ± 1.52	74.15^{ab} ± 1.22	75.60^{a} ± 0.78	75.75^{a} ± 0.91	72.50^{abc} ± 1.28	72.50^{abc} ± 1.33	70.25^{c} ± 1.76	73.75^{abc} ± 1.45	72.85 ± 0.71
Sperm concentration (millions per ml)	1410.50 ± 11.93	1426.00 ± 9.82	1433.00 ± 7.40	1435.50 ± 7.69	1437.50 ± 9.14	1425.00 ± 10.67	1440.50 ± 9.58	1426.50 ± 11.43	1410.00 15.08	1428.00 ± 12.24	1427.25 ± 3.77
Live sperms (%)	80.55^{a} ± 0.94	77.60^{b} ± 0.85	77.65^{b} ± 1.18	81.00^{a} ± 0.90	81.95^{a} ± 0.83	80.40^{a} ± 1.03	77.00^{b} ± 1.09	77.45^{b} ± 1.09	80.60^{a} ± 1.09	79.15^{b} ± 0.75	79.34 ± 0.33
Head abnormalities (%)	4.30 ± 0.16	4.25 ± 0.24	4.25 ± 0.23	4.35 ± 0.20	4.25 ± 0.22	4.05 ± 0.29	4.10 ± 0.25	4.40 ± 0.23	4.25 ± 0.14	4.25 ± 0.20	4.25 ± 0.07
Acrosomal damage (%)	4.90 ± 0.32	4.70 ± 0.28	4.45 ± 0.33	4.75 ± 0.19	4.50 ± 0.34	4.65 ± 0.25	4.60 ± 0.26	4.80 ± 0.28	4.75 ± 0.26	5.40 ± 0.42	4.75 ± 0.07
Mid piece abnormalities (%)	1.90 ± 0.72	2.05 ± 0.69	1.95 ± 0.94	1.85 ± 0.75	2.05 ± 0.83	2.10 ± 0.97	1.85 ± 0.67	2.05 ± 0.89	1.85 ± 0.81	2.00 ± 0.73	1.97 ± 0.27
Tail abnormalities (%)	4.70 ± 0.19	4.75 ± 0.23	3.85 ± 0.29	4.30 ± 0.19	4.30 ± 0.32	4.45 ± 0.31	3.75 ± 0.27	4.20 ± 0.32	4.05 ± 0.28	4.10 ± 0.32	4.25 ± 0.08
Total sperm abnormalities (%)	10.90 ± 0.32	11.05 ± 0.31	10.05 ± 0.45	10.50 ± 0.31	10.60 ± 0.35	10.60 ± 0.41	9.70 ± 0.45	10.65 ± 0.60	10.15 ± 0.34	10.35 ± 0.36	10.46 ± 0.12

Means bearing different superscripts within a row differ significantly ($P \leq 0.05$).

environment and management also appear to influence the occurrence of mid piece of abnormalities in spermatozoa.

The overall mean percentage of tail abnormalities of the present study agree with the observations recorded in Tharparkar (Rao and Rao, 1975) and Ongole (Veeraiah, 1995). However, a higher percentage of tail abnormalities was reported in Sahiwal X Holstein Friesian (Hazarika *et al.,* 1988) and Sahiwal bulls (Mandal *et al.,* 2005).

The overall mean percentage of total sperm abnormalities is in agreement with the observations of Rao (1988), Singh and Pangawkar (1990), Veerapandian *et al.* (1992), Dhami and Shani (1994), Veeraiah (1995) and Rao (1998) in other Indian breeds. However, a higher rate of sperm abnormalities was reported in Sahiwal X Holstein Friesian bulls by Hazarika *et al.* (1988) and in reciprocal crossbred bulls of Friesian x Sahiwal and Sahiwal x Friesian by Sattar and Mirza (2002).

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