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Research Article

Service behaviour and semen characteristics in cross-bred boars*

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ABSTRACT

Six cross-bred boars (Large White Yorkshire X Indigenous) were ejaculated at 72 hours interval by the "Gloved hand method" using estrus females as dummies. The mean reaction time and duration of ejaculation was 2.72 ± 0.05 and 3.97 ± 0.07 minutes, respectively. The average total semen volume was 161.31 ± 3.29 ml and gel volume contributed an average of 24.58 ± 0.16 per cent. The average values of pH, sperm concentration, total sperm per ejaculate, motile sperm percentage and live sperm percentage were 7.61 ± 0.05, 216.25 ± 7.8 million per ml, 26.69 ± 1.33 X 10^9, 79.27 ± 1.26 per cent and 82.07 ± 1.1 per cent, respectively. The gel volume and pH varied non-significantly. There was significant variation ($P<0.05$) in motile sperm percentage and total sperm per ejaculate among boars. The service behaviour, total semen volume, gel free volume of semen, sperm concentration, and live sperm percentage varied significantly ($P<0.01$) between boars.

Key words: Cross-bred boars, Gloved hand method, Semen characteristics, Service behaviour.

INTRODUCTION

Piggery is one of the important branches of Indian animal husbandry. A significant effort is essential towards the genetic improvement of indigenous pigs. Artificial insemination using semen of genetically superior breeds is greatly successful in improving indigenous animals. But the purebred exotic breeds are unable to perform efficiently in hot and humid climate and so emphasis should be given to develop cross-bred boars of varying superior genotype combinations. Reports are meager on semen characteristics of cross-bred boars in India. Hence, the present investigation was undertaken to evaluate the service behaviour and semen quality of cross-bred boars.

MATERIALS AND METHODS

Six cross-bred boars (Large White Yorkshire X Indigenous) aged 10 to 18 months maintained at All India Coordinated Research Project on Pigs, Jabalpur were used. All the animals were kept under identical management. Forty eight ejaculates, eight from each boar, were collected at 72 hours interval by the "Gloved hand method" using estrus females as dummies. Reaction time and duration of ejaculation of each boar was recorded. The gel mass of semen was separated through four layers of muslin cloth during collection. The volume of gel and gel free portion of semen were separately measured. Initial motility was recorded to determine the percentage of motile sperm immediately after collection by examination of a drop of neat semen on glass slides under coverslip at 37^0C maintained on biotherm under magnification of 450X. Live sperm percentage was determined using eosin-nigrosin stain. The pH of semen was measured with help of pH indicator strips (Ranged between pH 7.0 to 8.5, BDH). Sperm concentration was estimated by using Neubauer's Haemocytometer. Total sperm per ejaculate were calculated by multiplication of sperm concentration with gel free volume. The various morphological abnormalities of cross-bred boar spermatozoa were studied using Rose Bengal staining technique under magnification of 1000X.

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RESULTS AND DISCUSSION

The mean values of service behaviour and semen characteristics are presented in Table 1.

Reaction time: The mean reaction time was 2.72 ± 0.05 minutes which is in close agreement to the time as reported in cross bred boars by Ugwu *et al.* (1984). However, Rao *et al.* (1992) noted shorter reaction time (1.58 minutes) in cross-bred boars, which may be due to weekly collection of semen in comparison to 72 hours collection interval in the present study. Reaction time in the present study varied significantly (P<0.01) between boars which was similar to that reported by Murthy (1974) in Large White Yorkshire and Ugwu *et al.* (1984) in cross-bred boars.

Duration of ejaculation: The mean duration of ejaculation was 3.97 ± 0.07 minutes. Similar observations were made in cross-bred boars by Rao *et al.* (1992) in cross-bred boars. However, higher values of 5.7 to 6.4 minutes have been reported in exotic boars (Tamuli and Rajkanwar, 1988). The present study showed highly significant (P<0.01) variation between boars which supported the finding of Ugwu *et al.* (1984) in cross-bred boars. The variation in duration of ejaculation may be attributed to individual wave pattern of ejaculation of individual boar and breed difference (Swierstra and Rahnefeld, 1967).

Semen volume: The average total volume and gel free volume of semen was 161.31 ± 3.29 ml and 121.64 ± 2.56 ml, respectively. These are in close agreement with that reported by Rao *et al.* (1992) in cross-bred boars, which is higher in comparison to findings in cross-bred boars (Ugwv *et al.*, 1984) and in native boars (Rao *et al.*, 1990). However, in exotic boars, higher gel free volume has been reported (Tamuli and Rajkonwar,1988 and Gerfen *et al.*, 1994). It could be attributed to breed difference (Swierstra and Rahnefeld, 1967) and less frequent collection of semen (Cameron, 1985). The average gel volume was noted to be 39.67 ± 1.0 ml which contributed an average of 24.58 ± 0.16 percent to the total volume of semen. However, higher gel volume has been recorded in exotic boars (Sreekumaran and Raja, 1976 and Tamuli *et al.*, 1984). The total and gel free volume of semen varied significantly (P<0.01) between boars. This may be due to different genetic make up of the boars. The variation in gel volume was non-significant. The observations are in accordance to that noted in exotic boars (Sreekumaran and Raja, 1976 and Tamuli *et al.*, 1984).

Motile sperm percentage: The mean value of motile sperm percentage was 79.27 ± 1.26 per cent. This is in accordance with the finding of Swierstra (1973) in Yorkshire boars aged 36 and 86 weeks. However, Rao *et al.* (1992) recorded higher percentage of motile spermatozoa in cross-bred boars. The ability of boar spermatozoa to metabolize carbohydrate anaerobically is negligible (Mann and Lutwak-mann, 1981). Hancock (1959) found that the motility was lost very quickly in the samples of boar semen examined under coverslip. This may be a factor of lower motility of boar spermatozoa. The motile sperm percentage varied significantly (P<0.05) between boars.

Live sperm percentage: In the present study, the average value of live sperm was 82.07 ± 1.1 per cent. It is in close agreement with the observation of Rao *et al.* (1990) in native boars and Pandey and Singh (1998) in Large White Yorkshire boars, however higher values have also been reported in cross-bred boars (Ugwu *et al.*, 1984 and Rao *et al.*, 1992). In the present study many spermatozoa were found to be faintly stained (partly eosinophilic). This supported the findings of Murthy and Rao (1975) and Sreekumaran and Raja (1976) in boar semen and Mann and Lutwak-mann (1981) in bull semen stained with eosine-nigrosin stain. The variation in live sperm percentage was highly significant (P<0.01) between boars. Similar observation was made in Large White Yorkshire boars by Sreekumaran and Raja (1976).

Hydrogen Ion Concentration: The average pH of semen was 7.61 ± 0.05 with no significant difference between boars. This is at par with finding of Sreekumaran and Raja (1976) in Large White

Yorkshire boars. However, Rao *et al.* (1992) found comparatively lower pH values in cross-bred boar semen. The pH of boar semen varies in different fractions and different waves of ejaculate (Hancock, 1959).

Sperm concentration: The average concentration of spermatozoa was noted as 216.25 ± 7.8 X 10^6 per ml. The finding is in close agreement with that reported by Swierstra (1973) in Large White Yorkshire boars. However, higher sperm concentration has been reported in cross-bred boars (Rao *et al.,* 1992) and Large White Yorkshire boars (Pandey and Singh, 1998). This may be due to longer interval of semen collection and breed differences. The average total sperm per ejaculate was 26.69 ± 1.33 X 10^9. This is in accordance with observations of Ugwu *et al.* (1984) in cross-bred boars. In the present study, sperm concentration varied very significantly (P<0.01), whereas total sperm per ejaculate varied significantly (P<0.05) between boars. The findings are similar to those reported by Swierstra and Rahnefeld (1967) in Large White Yorkshire and Ugwu *et al.* (1984) in cross-bred boars.

Table 1. Service behaviour and seminal characteristics in cross-bred boars (Mean± SE)

S. No.	Reaction time (min.)	Duration of ejaculation (min.)	Total semen volume (ml)	Gel free volume (ml)	Gel volume (ml)	Gel volume percentage	Motile sperm percentage	Live sperm percentage	pH	Sperm Concentration (x 10^6 per ml)	Total Sperm per ejeculate (X 10^9)
1	2.57 ± 0.10^{bc}	4.32 ± 0.10^{a}	189.5 ± 6.78^{a}	144.5 ± 4.77^{a}	45 ± 2.64	23.65 ± 0.82	81.21 ± 2.63^{ab}	84.88 ± 1.96^{ab}	7.49 ± 0.11	287.50 ± 14.33^{a}	41.73 ± 1.15^{a}
2	2.90 ± 0.07^{a}	3.99 ± 0.21^{bc}	175.75 ± 7.07^{ab}	132.13 ± 5.74^{a}	43.63 ± 1.82	24.86 ± 0.68	80.12 ± 3.65^{ab}	83.06 ± 2.91^{bc}	7.64 ± 0.12	212.50 ± 13.08^{b}	27.90 ± 0.07^{b}
3	2.81 ± 0.13^{ab}	4.13 ± 0.17^{ab}	145.12 ± 4.69^{cd}	108.5 ± 4.60^{b}	36.63 ± 1.74	25.35 ± 1.27	72.99 ± 2.43^{b}	76.06 ± 1.94^{d}	7.83 ± 0.10	161.25 ± 8.55^{c}	16.92 ± 0.56^{d}
4	2.40 ± 0.09^{c}	3.56 ± 0.11^{c}	161.25 ± 4.35^{bc}	117.88 ± 4.16^{b}	43.37 ± 1.47	27.01 ± 0.90	86.18 ± 2.17^{a}	88.25 ± 1.83^{a}	7.45 ± 0.12	257.50 ± 12.08^{a}	30.08 ± 0.43^{b}
5-	2.98 ± 0.12^{a}	3.93 ± 0.07^{bc}	155 ± 4.16^{cd}	117.13 ± 2.65^{b}	37.88 ± 1.75	24.35 ± 0.60	75.77 ± 2.05^{b}	77.88 ± 2.25^{cd}	7.75 ± 0.12	170.00 ± 5.86^{c}	20.83 ± 0.27^{cd}
6	2.68 ± 0.08^{ab}	3.92 ± 0.15^{bc}	141.25 ± 4.79^{d}	109.75 ± 3.71^{b}	31.50 ± 1.29	22.29 ± 0.44	79.32 ± 3.96^{ab}	82.31 ± 2.57^{bc}	7.53 ± 0.10	208.75 ± 7.58^{b}	22.89 ± 0.43^{c}
Range	2.08-3.32	3.07-5.28	120-234	91-177	26-51	19.39-32.87	64.22-94.26	69.0-94.5	7.0-8.2	120-340	11.52-54.87
Mean ±SE	2.72 ± 0.05**	3.97 ± 0.07**	161.31 ± 3.29**	121.64 ± 2.56**	39.67 ± 1.00	24.58 ± 0.16	79.27 ± 1.26*	82.07 ± 1.1**	7.61 ± 0.05	216.25 ± 7.8**	26.69 ± 1.33**

* P<0.05 ** P<0.01

Means bearing same superscript within a column do not differ significantly (P<0.05)

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