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Research Article

CHARACTERISTICS OF FRESH CROSSBRED HAMPSHIRE BOAR SEMEN

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ABSTRACT

In the present study, a total of 32 ejaculates, 8 from each of 4 crossbred Hampshire breeding boars were used to evaluate the fresh boar semen characteristics viz. colour of semen, volume, sperm concentration, initial motility, live sperm, intact acrosome and HOST (Hypo-osmotic swelling test) reacted sperm. Analysis of variance revealed that the mean strained volume, total ejaculate volume, sperm concentration, intact acrosome and HOST reacted sperm differed significantly ($P<0.01$) among boars but there was no significant difference among boars in volume of gel mass, initial motility and percentage of live sperm. It conclusion, various parameter of fresh semen of crossbred Hampshire boars were within the normal range.

Keywords: Fresh semen, Hampshire boar, Semen characteristics

Pig farming is common especially among the tribal masses and predominates throughout the North-Eastern Region of India. The share of meat production from pig is 17481 tonnes out of the total meat production of 44813 tonnes in Assam during 2015-16 (Integrated Sample Survey Report, 2015-16). However, a huge gap exists between the demand and availability of pork due to rearing of non-descript local pigs having poor productive performances though they have better adaptability and disease resistance under the prevailing agro-climatic condition of the region as compared to the exotic breeds. Hence, in order to improve the production potentiality of indigenous pigs, crossbreeding is the only remedy which can be achieved through artificial insemination (AI) with germplasm of elite exotic breeds.

For the success of any livestock industry, the information on the reproductive traits of the animal is important as the ultimate goal of AI centres is production of high quality sperm of superior genetic merit (Frangez *et al.*, 2005). Semen volume, sperm concentration and gross sperm morphology are semen traits that affect the profitability of an AI centre in terms of better fertility (Robinson and Buhr, 2005). Thus, successful breeding of pigs widely depends on the quality of boars used for semen collection. In the context, the present study was undertaken to determine the various semen characteristics of crossbred Hampshire boars.

MATERIALS AND METHODS

Four clinically healthy crossbred Hampshire breeding boars (B1, B2, B3 and B4) of 2 years age maintained at All India Coordinated Research Project (AICRP) on Pig, College of Veterinary Science, AAU, Guwahati, Assam, India were utilised in the present study. The boars were maintained in closed housing system having proper ventilation and concrete flooring with adjacent exercising paddock. All the boars were fed similar balanced ration during the study. A total of 32 semen ejaculates, eight from each of the four boars were collected once weekly between January and May, 2018 by Simple fist method (Tamuli, 1982) using a portable iron dummy as mount. Semen from different boars was collected at different time in the morning hours between 8.00 and 9.00 A.M. The hands were washed thoroughly with diluted potassium permanganate (1:1000) and dried prior to semen collection. The semen was allowed to pass through a Buchner funnel lined with sterilized tissue cloth (Mira cloth) to separate the gel mass at the time of semen collection into a pre-warmed (37 ºC) thermos flask of 500 ml capacity.

Immediately after collection, the semen sample was brought to the laboratory and evaluated for different semen characteristics. Semen volume i.e. strained semen volume and volume of gel mass in graduated measuring cylinders (total ejaculated volume was recorded by adding strained semen volume and volume of gel mass) and expressed in ml, colour (by visual appraisal), sperm concentration (using haemocytometer and expressed in million per ml) and initial sperm motility (evaluated microscopically in per cent). The percentage of live sperm (Blom, 1950), intact acrosome (Watson, 1975) and HOST reacted sperm (Jeyendran *et al.*, 1984) were also recorded.

The data were analysed with one way ANOVA using the Statistical Analysis Systems (enterprise Guide 4.2 version) and Duncan's Multiple Range Test was applied to compare the differences between mean values. When ANOVA revealed a significant effect, values were

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compared by Least Significant Difference Multiple Comparison Post Hoc Test. Difference were considered significant if the calculated probability of their occurrence by chance was 5% (P<0.05).

RESULTS AND DISCUSSION

In the present study, the data of different semen characteristics are furnished in Table 1. The mean volume of strained part of semen was 228.66±9.47 ml with a range of 130 to 340 ml (Table 1) which is within the normal range. The present finding was in close conformity with that reported by Khan *et al.* (2007). The present mean volume was higher than that recorded by Borah (2009) in Hampshire and crossbred boars. However, the values were lower than that recorded by Bania (2017) in Hampshire and Rani boars. The discrepancies in the findings might be due to difference in genetic make-up, age of boars, body weight of boars, frequency of semen collection and method of semen collection. Analysis of variance revealed the mean strained volume differed significantly (P<0.01) among the boars. Similar observation was also made of by Deka (2011). The significant difference among the boars might be due to the genetic predisposition, body weight and individual physiological status of the boars.

The mean volume of gel mass in crossbred Hampshire boars semen was 54.38±1.97 ml with the range of 40 to 90 ml which was in close proximity with that reported by Khan *et al.* (2007) but higher than that recorded by previous researchers in Hampshire boars (Deka, 2011; Bonia, 2017). This also could be due to individual difference, age, body weight, frequency of semen collection, environmental cause and technique of semen collection. Analysis of variance revealed that the mean gel volume did not differ significantly among boars. The mean total ejaculate volume was 283.03±10.00 ml. The present finding was in agreement with findings of Frydrychova *et al.* (2010). However, present value was higher than that observed by Kumaresan *et al.* (2009a) but lower than the findings of Bania (2017) in Hampshire boars. The mean total ejaculated volume differed significantly (P<0.01) among the crossbred Hampshire boars. The significant difference among the boars might be due to difference in genetic predisposition or difference in their inherent idiosyncratic pattern of semen ejaculation, body weight and other environmental factors. The mean ejaculate volume recorded in the present study was within the range stipulated for normal ejaculate of fertile boars (Larsson, 1986).

In the present study, the colour of the fresh semen was observed to be milky white in all the samples which is comparable with other breeds of boar. The mean sperm concentration was 273.63±2.58 million per ml of semen with a range of 258 to 291 million per ml. The present findings were in close agreement with that of Kumaresan *et al.* (2009b) in Hampshire boars. However, the present findings were found to be higher than that of Khan *et al.* (2007) and lower than that of Saikia (2014) in Hampshire boars. The variation in sperm concentration in different studies might be attributed to the difference in breed, age, body weight and size of testes of boars, season, frequency and method of semen collection, method of semen estimation and environmental factors. The concentration of spermatozoa varied significantly (P<0.01) among boars. The difference could be attributed to the difference

Table 1

Fresh semencharacteristics (Mean ± SE) in crossbred Hampshire boars

Boar	SEMEN CHARACTERISTICS							
	Strained volume (ml)	Volume of gel mass (ml)	Total ejaculate volume (ml)	Initial motility (%)	Sperm Concentration (million/ml)	Live sperm (%)	Intact acrosome (%)	HOST (%)
1(n=8)	171.88^{b}±6.94 (130-190)	53.75^{a} ±3.37 (40-70)	225.63^{b} ±7.22 (190-260)	90.00^{a} ±1.89 (80-95)	269.38^{b} ±2.76 (258-280)	85.31^{a} ±0.63 (82.22-87.83)	84.69^{c} ±0.69 (83.01-88.50)	80.99^{bc} ±0.47 (79.65-83.26)
2(n=8)	276.50^{a} ±17.71 (210-340)	56.88^{a} ±5.50 (40-90)	333.38^{a} ±20.59 (255-395)	91.88^{a} ±0.91 (90-95)	285.50^{a} ±1.66 (281-291)	86.41^{a} ±1.20 (80.86-91.83)	93.88^{a} ±0.75 (90.35-96.22)	83.55^{a} ±1.08 (79.25-89.56)
3(n=8)	260.63^{a} ±13.77 (210-330)	54.38^{a} ±4.27 (40-75)	315.00^{a} ±13.82 (260-370)	91.25^{a} ±1.25 (85-95)	281.50^{a} ±1.93 (270-287)	88.21^{a} ±1.14 (84.36-93.67)	92.07^{ab} ±2.05 (82.72-98.07)	82.60^{ab} ±0.71 (79.81-85.21)
4(n=8)	205.63^{b} ±5.21 (180-225)	52.50^{a} ±2.67 (40-60)	258.13^{b} ±6.19 (240-285)	90.63^{a} ±6.19 (85-95)	258.13^{c} ±6.19 (265-282)	85.71^{a} ±0.60 (83.00-88.17)	88.61^{b} ±1.40 (82.53-92.77)	79.80^{c} ±0.71 (77.67-84.01)
Mean (n=32)	228.66±9.47 (130-340)	54.38±1.97 (40-90)	283.03±10.00 (190-395)	90.94±0.69 (80-95)	273.63±2.58 (258-291)	86.41±0.49 (80.86-93.83)	89.81±0.90 (82.22-98.07)	81.74±0.45 (79.65-89.56)

Figures in parenthesis indicate range; n=Number of ejaculates; Means bearing different superscripts are significantly (P<0.05) different.

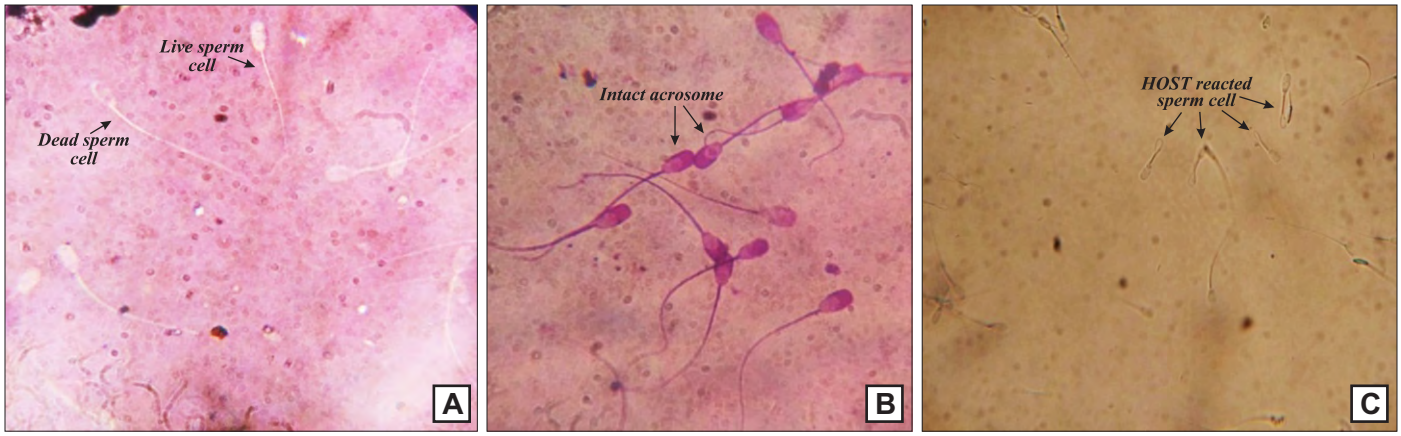

Fig. 1. Semen characteristics: (A) Live and dead sperm cells (B) Intact acrosome(C) HOST reacted sperm

in individual genetic make-up, testicular size and age.

The mean initial sperm motility in crossbred Hampshire boar was 90.94±0.69 per cent. Similar findings were reported by Khan *et al.* (2007) in Hampshire boars. In this study, there was no significant difference in the initial sperm motility among the boars. In the present study, the mean live sperm was 86.41±0.49 per cent with a range of 80.86 to 93.83 per cent (Fig. 1A) which was in concurrence with the reports of previous researchers in Hampshire boars (Bania, 2017). The percentage of live sperm did not differ significantly among the boars. The mean percentage of intact acrosome was recorded as 89.81±0.90 per cent (Fig. 1B). This result was in accordance with the findings of Strzezek *et al.* (2004). The percentage of mean intact acrosome differed significantly ($P<0.01$) between the boars. Significant difference among the boars might be due to the individual differences for their inherent qualities.

The mean HOST reacted sperms in crossbred Hampshire boars was 81.74±0.45 per cent (Fig. 1C). The present findings were in close agreement with Singh (2017) but higher than the results recorded by Frydrychova *et al.* (2010). During the HOST test, the biochemically active spermatozoa, when exposed to osmotic stress will undergo swelling due to the influence of water and subsequently increase in volume to establish equilibrium between the fluid compartment within the spermatozoon and the extracellular environment (Jeyendran *et al.* 1984). In this study, the mean HOST reacted sperm differed significantly ($P<0.01$) among the boars. The difference in HOST reacted sperms among the boars might be due to the difference in physical and biochemical properties of plasma membranes of the spermatozoa of various breeds resulting in differences in the degree to which electrolytes and non-electrolytes penetrate their membranes (Guraya, 1987). Different semen characteristics influence the quality of semen. Ejaculate volume and sperm progressive motility are important characteristics that determine the number of doses produced per ejaculate and reproductive capability.

The results of this investigation revealed that the various parameters of semen are within the normal range which greatly influences semen quality.

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