Research Article

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COMPARATIVE ANALYSIS OF SEMINAL CHARACTERS OF EXOTIC AND CROSS-BRED BOARS

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ABSTRACT

The present study comprised of 40 ejaculates from Large White Yorkshire (LWY) and 30 ejaculates from crossbred (LWY×Zovawk) boars collected from sexually healthy, mature boars belonging to All India Coordinated Research Project (Pig) and Instructional Livestock Farm Complex (Pig), College of Veterinary Sciences and Animal Husbandry, CAU, Selesih, Aizawl. The macroscopic characters of the ejaculate was evaluated for gel mass volume, strained volume and total ejaculate volume and microscopically it was evaluated for initial sperm motility, live spermatozoa, HOST-reacted sperm and concentration of sperm. Significantly ($P<0.01$) higher gel mass, strained part, total ejaculate volume and HOST-reacted sperm cell was recorded in Large White Yorkshire than crossbred boars. However, initial sperm motility (85.00 vs 86.33%) and live spermatozoa (80.50 vs 79.28 %) did not differ significantly between the groups.

Key words: Ejaculate, Gel mass, HOST, Live spermatozoa, Sperm concentration, Sperm motility

Boar is the crucial part of the pig breeding farm influencing economic outcome of the farm. The reproductive efficiency of a breeding farm depends upon the fertility of the boar. The most phenotypically sound boars get chance to enter into the breeding herd, and usually produces good quality semen. However, not all breeding boar can produce comparable numbers of litters in a breeding farm. Moreover, cross-bred boars with indigenous inheritance produce smaller litter size than purebred boars. Therefore, routine examination of boar semen is utmost important in breeding farm.

Evaluation of boar semen for assessment of fertility is routine practice in artificial insemination unit. While seminal assessment is not highly related to fertility outcomes such as farrowing rate and litter size. But use of poor quality semen with poor motility and increased abnormalities is associated with reduced fertility. As a result, the essentials for semen quality includes the basics for overall assessment of the ejaculate and the more specific measures for sperm cell concentration, motility, and percentage of normal sperm cells. Daily evaluations of gross motility and morphology of stored semen sample will ensure that poor quality semen is not used for insemination. With this view, the objective of this study was taken up to evaluate the semen characteristics of the LWY and crossbred boars in a swine breeding farm.

MATERIALS AND METHODS

A total of four healthy Large White Yorkshire (LWY) and three crossbred (LWY×Zovawk) trained sexually healthy breeding boars were selected at All India Coordinated Research Project (Pig) and Instructional Livestock Farm Complex (Pig), College of Veterinary Sciences and Animal Husbandry, CAU, Selesih, Aizawl. All the boars were maintained under similar managemental condition.

The study comprised of 40 ejaculates from LWY and 30 ejaculates from crossbred boars collected ten from each boar twice weekly, by "Gloved hand method" using a fixed IMV dummy sow as mount (IMV® Technologies, France). Semen collections were carried out in the morning between 8 and 9 AM. Semen was collected into a pre warmed (37ºC) thermos flask and was filtered at the time of ejaculation to separate the gel mass using a Buchner funnel. Semen and gel mass was brought to the laboratory immediately after collection and macroscopic and microscopic evaluation was performed. The macroscopic evaluation was recorded for gel mass volume, strained semen volume and total ejaculate volume. The microscopic evaluation was performed for initial sperm motility, live spermatozoa and Hyposmotic sperm swelling test (HOST) and sperm concentration.

To evaluate sperm motility, a drop of the semen was placed on a clean glass slide maintained at 37ºC by placing it over a biotherm. A cover glass was placed over the drop and examined subjectively under a phase contrast microscope at a magnification of 400X. Motility was recorded from 0 to 100 on visual appraisal based on the percentage of progressively motile spermatozoa. For estimation of live spermatozoa, a drop of the semen was mixed with two drops of eosin-nigrosin stain (Blom, 1950). After incubation of the semen-stain mixture for 30 second, a thin smear was prepared on a clean grease free microslide. Two hundred spermatozoa were counted in each smear under a compound microscope at a magnification of 1000X (oil immersion lens) to determine the percentage of live spermatozoa.

The HOST was performed, according to the protocol of Jeyendran *et al.* (1984). Hundred micro litre of

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neat semen was added to one millilitre of 100 mOsmol solution in a sterilized glass test tube, mixed and incubated at 37°C for 60 minutes in a water bath. A drop of incubated suspension was put onto a glass slide, covered with cover slip and examined at 400X magnifications using a phase contrast microscope. At least 200 sperm cells were counted on each slide. Sperm concentration was determined using a haemocytometer by taking 50 µl of semen diluted with 950 µl of GEPS extender incorporated with formalin and observed under 400X magnification. Spermatozoa was counted in left top, right top, right bottom, left bottom and central secondary squares and the total number of spermatozoa was multiplied by 5 and recorded in million per millilitre.

Results were expressed as the means ± SE. A difference with value P<0.01 was considered statistically significant where NS indicated non-significant. The significant differences between the groups were determined by independent sample t-test using the Statistical Product and Service Solutions, Version 20.0 software (SPSS Inc., Chicago, IL, USA).

RESULTS AND DISCUSSION

Semen characteristics of Large White Yorkshire and crossbred boars were presented in Table 1. In our study, the gel mass, strained part and total ejaculate volume was recorded significantly (P<0.01) higher than that of crossbred boars. The volume of semen and gel mass of an ejaculate is exclusively contributed from the accessory sex glands. Thus, it indicated that the accessory sex glands in LWY boars might be larger in size or highly active or both. The mean volume of strained part of the semen in LWY boars was (231.22 ml) in close agreement with the findings recorded by Khan *et al.* (2007) and Chutia (2010) in Hampshire boar; and higher than the observation made by Kantharaj and Athman (2009) in Large White Yorkshire boar and Tyngkan (2009) in Hampshire boars. The mean volume of strained part of the semen in CB boars was (153.73 ml) in conformity with the results recorded by Bhuyan *et al.* (1991) and Tyngkan (2009) in Hampshire boars; lower than that reported by Gogoi (1996) in Hampshire crossed boar; and higher than that recorded by Nath (1992) in 50 and 75 per cent exotic (Hampshire) inherited crossbred boars, Pande *et al.* (2007) in crossbred boars. On the other hand, the mean volume of gel mass in LWY and crossbred boars was (27.52 vs 12.23 ml) found to be lower than that recorded by Kantharaj and Athman (2009) in Large White Yorkshire boar and Das *et al.* (2005) in Hampshire and crossbred boars. The mean of the total ejaculate volume in LWY boars was (259.12 ml) in close agreement with the observation recorded by Kommisrud *et al.* (2002) in crossbred (Duroc × Landrace) boars, Sutkeviciene *et al.* (2004) in Danish Landrace and Duroc boars. However, the total ejaculate volume of LWY and crossbred boars in the present study were found to be higher than that reported by Eriksson *et al.* (2002) in Landrace, Yorkshire and Hampshire boars. The discrepancies in findings might be due to the genetic make-up, age and body weight of the boar, frequency and procedure of semen collection and environmental factors.

Table 1:
Seminal characters of Large White Yorkshire and crossbred boars

Parameters	LWY		Crossbred		P-value
	Mean ± SE	Range	Mean ± SE	Range	
Strained volume (ml)	231.22 ± 6.23^a	140-340	153.73 ± 10.95^b	80-270	<0.01
Gel mass volume (ml)	27.52 ± 1.25^a	10-40	12.23 ± 0.71^b	5-20	<0.01
Total ejaculate volume (ml)	259.12 ± 6.89^a	160-370	166.06 ± 11.52^b	85-290	<0.01
Initial sperm motility (%)	85.00 ± 0.66	80-95	86.33 ± 0.75	80-95	NS
Live spermatozoa (%)	80.50 ± 3.38	75-88	79.28 ± 0.67	70-86	NS
HOST-reacted sperm (%)	77.00 ± 0.50^a	70.5-83.5	75.03 ± 0.63^b	70-81	<0.05
Sperm concentration (mil/ml)	179.87 ± 2.35^a	150-216	228.50 ± 3.17^b	200-285	<0.01

The mean initial sperm motility and live spermatozoa of the LWY and crossbred boars were 85.00 and 80.50, and 86.33 and 79.28 per cent, respectively. Statistical analysis revealed that the mean initial sperm motility and live spermatozoa did not differ significantly between the LWY and crossbred boars (Table 1). Similar sperm motility was recorded by Das *et al.* (2005) in Hampshire and crossbred boar and Naskar *et al.* (2006) in 75% crossed (Hampshire x Khasi local) boars. However, the live spermatozoa recorded in the present study was found to be lower than that recorded by Kumaresan *et al.* (2009), Tyngkan (2009) and Chutia (2010) in Hampshire boars. The differences in observations might be due to the differences in breed, age and body weight of the boars, season, frequency and method of semen collection, procedure of the staining and methods of evaluation.

In the present study, the mean HOST reacted sperm was significantly (P<0.01) higher in LWY than crossbred boars (Table 1). But the present findings were lower than that reported by Perez *et al.* (2001) and Dziekonska *et al.* (2009). HOST reacted sperm indicated ejaculate having functionally active sperm with intact plasma membrane which is important for the fertilization process. Lower HOST reaction rate in crossbred boars indicated sperm cells are more fragile than that of LWY boar sperm. The mean sperm concentration of LWY and crossbred boars were 179.87 and 228.50 million per milliliter (Table 1). Statistical analysis revealed that crossbred boar had significantly higher numbers sperm cells per milliliter than that of LWY boars. The lower sperm concentration in LWY boars might be due to presence of significantly (P<0.01) higher volume of semen than that of crossbred boars. Similar observation was recorded by Chutia *et al.* (2017) in Hampshire boars.

It emerged from the present study that external appearance did not sufficiently represent the sexual or fertile status of the breeding boar. Genetical factor

influences greatly in the seminal characters of the boars where LWY breed possesses better semen quality than its crossbred having Zovawk inheritance. Evaluation of semen precisely exposed *in-vivo* scenario of soundness of breeding boars.

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REFERENCES

Bhuyan, D., Borgohain, B.N., Ahmed, K., Sarmah, B.C. and Chakravarty, P. (1991). Physico-morphological and biochemical characteristics of semen of Hampshire and crossbred boars. *Indian J. Anim. Reprod.* **12(1)**: 90-91.

Blom, E. (1950). A simple rapid staining method for the differentiation between live and dead sperm cells by means of Eosin and Nigrosin. *Nord. Vet. Med.* **2**: 58.

Chutia T. (2010). Preservation of boar semen at liquid state. M.V.Sc. thesis submitted to Assam Agricultural University, Khanapara, Guwahati-22, India.

Chutia, T., Tamuli, M.K., Biswas, R.K., Deka, B.C., Sinha S. and Goswami J. (2017). Interrelations of service behaviour and seminal attributes of Hampshire boars. *Indian J. Anim. Reprod.* **38(2)**: 28-30.

Das, B.C., Bujarbaruah, K.M., Sanyal, S., Das, P.K., Ghosh, P.R., Khan, M.H., Naskar, S., Das, A.B., Bandopadhyay, S. and Bordoloi, R.K. (2005). DNA integrity test for boar spermatozoa preserved in liquid state. *J. Curr. Sci.* **7(2)**: 373-378.

Dziekonska, A., Fraser, L. and Strzezek, J. (2009). Effect of different temperatures on the metabolic activity of spermatozoa following liquid storage of boar semen. *J. Anim. Feed Sci.* **18:** 638-649.

Eriksson, B.M., Petersson, H. and Rodriguez-Martinez, H. (2002). Field fertility with exported boar semen frozen in the new Flat Pack container. *Theriogenol*. **58**: 1065-1079.

Gogoi, T. (1996). Effects of exogenous hormones on the quality of boar semen. Ph.D thesis submitted to Assam Agricultural University, Khanapara, Guwahati, Assam, India.

Jeyendran, R.S., Vander Ven, H.H., Perez-Pelaez, M., Crabo, B.G. and Zaneveld, L J. (1984). Development of an assay to assess the functional integrity of the human sperm membrane and its relationship to other semen characteristics. *J. Reprod. Fertil.* **70(1)**: 219-228.

Kantharaj, S. and Athman, K.V. (2009). Evaluation of boar semen collected by gloved hand technique. *Indian Vet. J.* **86**: 977-978.

Khan, M.H., Naskar, S., Bordoloi, R.K. and Das A. (2007). Enhancement of seminal characteristics of boar by oral feeding of herbal product Prolibid. *J. Env. Ecol.* **25**: 142-145.

Kommisrud, E., Paulenz, H., Sehested, E. and Grevle, I.S. (2002). Influence of boar and semen parameters on motility and acrosome integrity in liquid boar semen stored for five days. *Acta Vet. Scand.* **43(1)**: 49-55.

Kumaresan, A., Kadirvel, G., Bujarbaruah, K.M., Bardoloi, R.K., Das, A., Kumar, S. and Naskar, S. (2009). Preservation of boar semen at 18° C induces lipid peroxidation and apoptosis like changes in spermatozoa. *Anim. Reprod. Sci.* **110(1/2)**: 162-171.

Naskar, S., Khan, M.H., Das, A. and Bordoloi, R.K. (2006). Study on preservation of boar semen at different temperatures in liquid state. *Indian Vet. J.* **83**: 737-740.

Nath, M.C. (1992). Studies on semen characteristics and freezing of boar semen. Ph.D thesis submitted to Assam Agricultural University, Khanapara, Guwahati, Assam, India.

Pande, G., Bhatt, V.K. and Thakur, M.S. (2007). Service behaviour and semen characteristics in crossbred boars. *Indian J. Anim. Reprod.* **28(1)**: 22-25.

Perez, B.L., Lorenzo, J.L., Yenes, P., Trejo, A. and Garcia, P.C. (2001). A short hypoosmotic swelling test for the prediction of boar sperm fertility. *Theriogenol.* **56**: 387-398.

Sutkeviciene, N. and Zilinskas, H. (2004). Sperm morphology and fertility in artificial insemination boars. *Vet. IR Zoot.* **26**: 48.

Tyngkan, L. (2009). Effect of holding, removal of seminal plasma and extender on preservation of boar semen at 18ºC. M.V.Sc. thesis submitted to Assam Agricultural University, Khanapara, Guwahati-22, India.