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EFFECTS OF GENOTYPE AND AGE ON SEMEN QUALITATIVE CHARACTERISTICS OF PIGS

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Abstract

The effects of genotype and age on semen qualitative characteristics of boar pigs were studied at the Piggery Research Unit of the Delta State University Farm, Asaba Campus, Nigeria. This study was carried out to evaluate the effects of different genetic groups and age of boar pigs on semen characteristics. Six boar pigs constituted the experimental stocks. They were raised intensively and separated according to genetic groups, respectively. Data were collected from the experimental animals over the period of the trial using standard methods. Data collected were subjected to analysis of variance and significantly different means separated by Scheffe using the General Linear Model (GLM) procedure SPSS (2010) program. Genotype effect is significant at (P<0.05) for most of the semen quality traits measured, with the exception of semen pH and primary abnormality (%). Age effect on semen quality parameters were significant (P<0.05) for most of the traits measured, except for semen pH; while the interaction effects of genotype x age on the semen traits measured were found not statistically significant at (P>0.05). The study revealed that genotype has a substantial effect on most of the traits measured except for pH and primary abnormality (%). The results also revealed that no genetic groups surpassed in all the semen characteristics monitored. Most of the semen parameters analysed significantly differed between age groups of boars except for pH.

Keywords: *age, genotype, boar pigs, semen parameters*

Introduction

The effect of breed on semen characteristics has been described by a number of authors (Kuciel *et al*., 2003; Kennedy and Wilkins, 1984; Rothschild, 1996; Jankeviciute and Zilinskas, 2002; Oh *et al*., 2003) as stated by (Smital, 2010). Most authors agreed that no breed excels in all semen characteristics. Differences between breeds are often manifested by extremely low volume of ejaculate in Duroc boars (Smital, 2009).The effect of boar's age on sperm output was observed in many studies (Colenbrander and Kemp, 1990; Jankeviciute and Zilinskas, 2002; Marchev, Apostolov, and Szostak, 2003). Semen output increases rapidly with the boar's age during the first two years, which is connected with increasing live weight and testicular weight of boars. It culminates at the age of 3.5 years together with the termination of growth of boar and declines later on (Falkenberger, Pfeiffer, and Ritter, 1992; Smital, 2009). Many researchers have demonstrated that changes in semen characteristics are related to the sexual intensity of the boars. Most authors agree that with increasing frequency of collections semen volume and sperm concentration and thereby total sperm output decrease (Cerovsky, 1976; Falkenberger *et al*., 1992; Frangez *et al*., 2005; Pruneda *et al*., 2005) as reported by (Smital, 2010). Clark, Schaeffer, and Althouse, (2003) reported a dramatic increase in average total sperm numbers from 8 to 10 months up to 14 months of age with little change thereafter.

Materials and Methods

The study was carried out at the Piggery Unit of the Teaching and Research farm of Delta State University, Asaba Campus, Asaba, Nigeria. Asaba is located between longitude 6^{o}E and 8^{o}N, and between latitude 4^{o}N and 10^{o}N. It is in an area marked with moderate rainfall and soil fertility, which falls within the rain forest zone. Rainy season is between April and October, with a mean annual rainfall of 1500mm. The distribution is bimodal with peak in July and September and a period of low precipitation in August. The mean temperature is 23.8^{o}C. The area has a mean relative humidity of 77.2%. The mean monthly sunshine is 4.8 bars (Asaba Meteorological Office).

A total of 6 boars constituted the experimental stocks. They were raised intensively and separated according to genetic groups, respectively. The experimental animals were sourced from the piggery unit of Delta State University investment limited (DIL) farm. The experimental animals were subjected to 14 days adaptation period within which proper routine health management practices were carried out. The pigs were placed on prophylactic drugs against baby pig anaemia and intestinal worms. Sperm qualitative parameters were estimated 40 - 45 days interval for the period of the study. Massaging method was adopted in the collection of semen from boars on a standing heat sow or gilt. The sperm-rich fraction of each ejaculate was evaluated in the Department of Animal Science laboratory, Delta State University, Asaba Campus; for the following parameters: Total sperm count (TSC) were determined by the use of haemocytometer; Ejaculate volume (EV): the volume of filtered sperm rich fraction were measured in calibrated measuring cylinder; Sperm progressive motility (SM) (%): the proportion of cells actively moving straight forward were evaluated subjectively by observing the movement of the spermatozoa under the microscope. A drop of semen on a clean slide and observed at X10 objective overlaid with a cover slip; Sperm viability (% live Sperm): a drop of semen on a clean slide and observed at X10 objective without a cover slip, showing the mass activity was graded as follows: zero; +++ showing high activity; pH: were determined using pH meter; Live/dead ratio: were determined microscopically. Prepared smear on a clean slide dry in air fixed in methanol and stained with Nigrosin-eosin, overlaid with a cover slip. Allowed to dry and observed at X10 objective on oil immersion; Primary abnormality (%): were also determined microscopically. Prepared smear on a clean slide dry in air fixed in methanol and stained with fast green eosin. Allowed to dry and observed at X10 objective on oil immersion. Data collected were subjected to analysis of variance and significantly different means separated by Scheffe using the General Linear Model (GLM) procedure SPSS (2010).

Results and Discussion

Genotype effect is significant at ($P<0.05$) for most of the semen quality traits measured, with the exception of semen pH and primary abnormality (%) as presented in Table 1.

Table 1: Semen quality traits in the three genotypes of boars

Semen traits	Duroc	Large White	Landrace
Ejaculate vol. (ml)	132.50 ± 1.61[a]	161.25 ± 1.61[c]	141.25 ± 1.61[b]
Motility (%)	74.58 ± 1.53[a]	78.25 ± 1.53[b]	75.70 ± 1.53[ab]
pH	7.05 ± 0.05	7.05 ± 0.05	7.08 ± 0.05
Conc. ($x10^6$)	162.63 ± 1.09[c]	138.88 ± 1.09[a]	147.25 ± 1.09[b]
Live/dead ratio	4.88 ± 0.08[a]	7.00 ± 0.08[b]	5.63 ± 0.08[a]
Primary abnormality (%)	7.50 ± 1.21	8.00 ± 1.21	8.00 ± 1.21

[a,b,c.] means with different superscripts in a row are significantly different (P<0.05)

The effects of age on semen quality parameters were significant (P<0.05) for most of the traits measured, except for semen pH as presented in Table 2. The interaction effects of genotype x age on the semen traits measured were found not statistically significant at (P>0.05).

Table 2.Effects of age on semen characteristics of the three boar genotypes

Semen traits	10-12 months	12-14 months	14-16 months	16-18 months
Ejaculate vol. (ml)	116.67 ± 1.86[a]	126.67 ± 1.86[b]	160.00 ± 1.86[c]	176.67 ± 1.86[d]
Motility (%)	78.33 ± 1.76[b]	78.33 ± 1.76[a]	74.70 ± 1.76[b]	73.33 ± 1.76[ab]
pH	7.03 ± 0.06	7.05 ± 0.06	7.07 ± 0.06	7.08 ± 0.06
Conc. ($x\ 10^6$)	139.17 ± 1.26[a]	151.00 ± 1.26[bc]	155.00 ± 1.26[c]	153.17 ± 1.26[c]
Live/dead ratio	5.00 ± 0.92[a]	5.80 ± 0.92[a]	5.33 ± 0.92[a]	7.17 ± 0.92[b]
Primary abnormality (%)	5.83 ± 1.93[a]	7.00 ± 1.39[ab]	9.17 ± 1.39[b]	9.33± 1.39[b]

[a,b,c,d] Means with different superscripts in a row are significantly different (P<0.05)

In this study (as presented in Table 1) the effect of genotype was significantly (P<0.05) evident in most of the traits measured except for pH and primary abnormality (%). The results also revealed that no breed excelled in all the semen characteristics monitored. The effect of breed on semen characteristics has been described by many authors (Rothschild, 1996; Jankeviciute and Zilinskas, 2002; Oh, See, Long, and Galvin, 2003). Most of them agreed that no breed excels in all semen characteristics. On the other hand Okere, Joseph, and Ezekwe, (2005); and Banaszewka, Kondracki, and Wysokinska, (2007) opined that the breed of boar may exert an influence on some semen parameters during certain seasons. While Kunowska-slosarz and Makowska (2011) reported that breed of boars have a substantial effect on semen volume, sperm concentration and percent of live sperm in the ejaculate.

The influence of the breed of boar on the semen traits in this study supports the findings of other studies. For example, the highest semen volume with the lowest concentration was noted for Large White as was similarly reported by Ciereszko, Ottobre, and Glogowski (2000) and Knecht, Srodon, and Duzinski (2014). On the other hand the Duroc had the least semen volume

and greatest sperm concentration, while the Large White had the greatest semen volume and the least sperm concentration. This agreed with the report of Wolf and Smital (2009).

The results obtained revealed that most of the semen parameters analysed significantly differed between age groups of boars except for pH. Clark *et al*. (2003) reported a remarkable increase in average total sperm numbers from 8-10 months up to 14 months of age with little change thereafter. Smital (2009) also observed a rapid increase in sperm output with advancing age of the boar, but the culmination was found at later a time (3.5years of age). The increase of sperm output with age is probably caused mainly by testis growth and development. In this study the effect of age on primary abnormality and sperm motility were found to be increasing and decreasing with age, respectively. This is in agreement with the findings of Huang and Johnson (1996), and of Serniene, Riskeviciene, Banys, and Zilinskas (2002) that an increase in percentage of abnormal spermatozoa as the animal's age advanced. Wolf and Smital (2009) also reported that motility decreased steadily with age.

Conclusion

In this present study the findings has revealed that there were significant genotype differences affecting most of the semen characteristics studied. Boar genotype had a significant influence on the semen volume yield, sperm concentration, and percentage live sperm composition of ejaculate semen. However, no genotype group excelled in all the semen characteristics monitored. Most semen parameters significantly differ's between age groups of boar except pH.

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