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EFFECT OF SEASON AND BOARS BREED ON EJACULATE QUALITY*

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SUMMARY: The effects of various seasons and boar breeds on ejaculate quality parameters were investigated on intensive swine production farms in the Autonomous Province of Vojvodina, Serbia. Significant value differences were noted in the ejaculate volume, the total sperm count and sperm concentration in ejaculates, and the number of poor ejaculates due to hot and cold seasons, as well as boar breed diversity. Therefore, the potential number of insemination doses per ejaculate varies seasonally, as well as according to different boar breeds. These facts should be taken into consideration when planning the intensity of boar reproductive exploitation.

Key words: *season, breed, quolity, ejaculate, boar.*

INTRODUCTION

The fertilisation capacity parameters of native ejaculates primarily determine the number and quality of insemination doses which can be obtained from a boar ejaculate. The most important parameters are the ejaculate volume, the sperm concentration, the total sperm number in ejaculate and sperm progressive motility (Tardif et al., 1999; Stančić et al., 2003; Knox, 2004). The number of insemination doses which can be obtained from a boar ejaculate determines the total number of insemination doses per boar per year. This is the most importance factor for the reproductive exploitation rate of genetically superior boars, which is measured by the number of inseminated sows per boar per year (Stančić et al., 2009). Moreover, the ejaculate quality greatly affects the

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fertility of inseminated sows (Stančić et al., 2003; Okere, 2003). Considerable variations of these parameters were noted among different boars depending on the breed, age, sperm collection frequency, and various diseases (Colenbrander et al., 1990; Stančić et al., 2003; Wolf and Smital, 2009).

Seasons and boar breeds greatly affect the variation of native semen quality parameters. The variation of semen quality parameters within various seasons is primarily due to the seasonal variation of the ambient temperature and its great impacts on the physiology of sperm production (Setchell, 1998; Corcuera et al., 2002; Stančić et al., 2003). The value of ejaculate parameters quality also vary according to different boar breeds (Gerfen et al., 1994; Stančić et al., 2003; Smital et al., 2004).

The aim of this paper is to determine the effects of seasons and boar breeds on the main parameters of fertilisation capacity in boar ejaculates, which are used for practical artificial insemination on swine farms in Vojvodina.

MATERIALS AND METHODS

The researches were conducted on large swine farms in the Autonomous Province of Vojvodina, Serbia. The research of the seasonal effects on the ejaculate quality was conducted on one farm. During the period of one year (from March 2012 to February 2013), 4 ejaculates were tested monthly (one ejaculate per week) collected from 5 boars of Large White breed, ranging from 2 to 2.5 years of age. Consequently, 240 ejaculates were tested in total.

The breeds influence on the ejaculate quality were investigated in the pure breeds boars of Large White (n=49), Swedish Landrace (n=39), Dutch Landrace (n=29), Duroc (n=29), Hapshire (n=8), Pietrain (n=6), and in the crossbreds boars of the F_1 generation obtained from different breeds, ranging from 1.5 to 3 years of age.

Immediately after the collection, the volume of each ejaculate was determined (ml) and the ejaculates were transported to the laboratory in air-conditioned boxes for boar semen (Minitüb) at +17°C. The ejaculates were heated up to +37°C in the laboratory.

The following parameters were determined for each ejaculate: (1) the volume (ml), (2) the sperm concentration ($x10^6$/ml), (3) the total sperm count per ejaculate, and (4) the progressive sperm motility. The sperm concentration, the total sperm count, the number of insemination doses, and the level of required dissolution were determined by the photometer SDM5 (Minitüb, Germany). The progressive sperm motility was determined by a light microscope under the medium power magnification. The ejaculates with the progressive sperm motility <65% were considered as poor using for artificial insemination. The data were processed by *Statistica 10* software.

REZULTS AND DISCUSSION

The mean values of boars semen parameters were within physiological limits: the volume = 246ml, the sperm concentration =$235x10^6$/ml, the total sperm number per ejaculate = $52x10^9$, and the sperm progressive motility = 77%. There were 18% of poor ejaculates in total (Table 1).

Table 1. Boars ejaculate parameters in different seasones

Tabela 1. Parametriejakulata nerastova u različitim sezonama

Parameters / *Parametri*	Months in year / *Meseci u godini*				Total*Ukupno*
	D-J-F	M-A-M	J-J-A	S-O-N	
Ejaculate examin./*Ispitano ejakulata* (n)	60	60	60	60	240
Volume / *Volumen* (ml)	273[a]	265[a]	203[b]	245[c]	246
Conc. / *Konc.* (x 10^6/ml)	265[a]	256[a]	219[b]	200[b]	235
Tot. sperm number *Ukupan br. spermatozoida* (x10^9)	62[a]	56[ab]	52[ab]	40[c]	52
Prog. motility /*Progr. pokret.* (%)	80[a]	80[a]	70[b]	75[a]	77
Bad ejaculates / *Loših ejakulata (%)**	10%	12%	22%	28%	18%

*Smal ejaculate volume (< 120ml), smal total no. sptz. in ejaculate (< 20x10^9), saml progr. motility (< 65%).

**Mali volumen ejakulata (< 120ml), mali ukupan broj sptz. u ejakulatu (< 20x10^9), mala progresivna pokretljivost (< 65%).*

[a, b, c] Values within rows with different superscripts differ ($P < 0.05$).

[a, b, c] *Vrednosti unutar redova sa različitim superskriptima su statistički različite* ($P < 0.05$).

However, the value parameters of the tested ejaculates varied greatly due to seasons. Namely, the mean ejaculate volume in the season of June, July and August, and the season of September, October and November (203ml and 245ml respectively), the sperm concentration (219 and 200x10^6/ ml respectively) and the total sperm number per ejaculate (52 and 4 0x10^9respectively) were statistically significant lower ($P<0,01$) in comparison with the season of December, January and February (273ml, 265x10^6/ ml, 62x10^9 respectively) and the season of March, April and May (265ml, 256x10^6/ml, 56x10^9 respectively). It was confirmed that a significantly higher number of poor ejaculates ocurred during the warmer seson of the year (22% and 28%) in comparison with the cooler seasons (10% and 12%) (Table 1).

Table 2. Ejaculate parameters in different boar breeds

Tabela 2. Parametri ejakulata nerastova različitih rasa

	Boar breeds / *Rasa nerastova*							Total *Ukupno*
	VJ	ŠL	HL	D	H	P	F_1	
No. Boars/*Broj nerastova*	49	39	29	29	8	6	22	182
Volume / *Volumen* (ml)	253[a]	290[b]	282[b]	190[c]	301[b]	176[c]	246[a]	258
Conc. / *Konc.* (x 10^6/ml)	223[a]	218[a]	210[a]	256[b]	181[c]	222[a]	215[a]	210
Tot. sperm number *Ukupan br. sptz.* (x10^9)	56[a]	63[a]	59[a]	49[b]	54[a]	39[b]	52[b]	56
Prog. motility*Progr. pokret.* (%)	77[a]	76[a]	77[a]	75[a]	81[a]	80[a]	79[a]	77
Bad ejaculates*Loših ejakulata (%)**	21[a]	24[a]	21[a]	15[b]	19[a]	13[b]	12[b]	19

*Smal ejaculate volume (< 120ml), smal total no. sptz. in ejaculate (< $20x10^9$), smal progr. motility (< 65%).

Mali volumen ejakulata (< 120ml), mali ukupan broj sptz. u ejakulatu (< $20x10^9$), mala progresivna pokretljivost (< 65%).

a, b, c Values within rows with different superscripts differ (P < 0.05).

a, b, c *Vrednosti unutar redova sa različitim superskriptima su statistički različite (P < 0.05).*

Based on the statistical significance (P < 0.05), the highest ejaculate volumes were noted in the Swedish Landrace (290ml), Dutch Landrace (282ml) and Hapshire (301ml) breeds, whereas the lowest ejaculate volumes were noted in the Pietrain (176ml) and Durok (190ml) breeds. However, the highest sperm concentration in the ejaculate was detected in the Duroc breed (256 x 10^6/ml), and the lowest in the Hapshire (181 x 10^6/ml). Based on the statistical significance (P < 0.05), these values differ from the mean value parameters of other tested breeds. The largest number of poor ejaculates was detected in the Large White (21%), Swedish Landrace (24%), and Dutch Landrace (21%) breeds, whereas the smallest number of poor ejaculates was detected in the Hapshire (19%) and Pietrain (13%) breeds, as well as in the crossbreds of F1 generation (12%). The highest and the lowest values differ in a statistically significant manner (P < 0.05) (Table 2).

Despite of numerous studies, the exact mechanism of lower fertility capacity in boar sperm during warmer seasons of the year has not been entirely clarified. Nevertheless, the majority of studies indicate that this is due to the effect of increased ambient temperature (Suriyasomboon et al., 2004) and prolonged daily photoperiod (Sancho et al., 2004) in warmer seasons on the process of spermatogenesis and testosterone synthesis. Furthermore, some researches indicate that this could be due to the genetic inheritance passed from wild ancestors to domestic breeds. It is a well-known fact that wild boars demonstrate extreme seasonal sexual activity and provide the best semen quality during mating seasons, which last from late autumn to early winter (Kozdrowski and Dubiel, 2004; Macchi et al., 2010). The results of our researches indicate that the value parameters of sperm fertilisation capacity were significantly higher during cooler periods of the year in comparison with warmer seasons. Various authors have also obtained similar results which confirmed the influence of warm seasons on the semen parameters reduction and ejaculate fertilisation rate decrease in boars (Liao et al., 1996; Kunavongkrit et al., 2005; Ciereszko et al., 2000; Jankevičiute and Žilinskas, 2002; Chukwuemeka et al., 2005). Significant variations of certain parameters in the ejaculate quality due to different boar breeds have been determined by other authors as well (Gerfen et al., 1994; Ciereszko et al., 2000; Jankevičiute and Žilinskas, 2002; Stančić et al., 2003; Smital et al., 2004; Chukwuemeka et al., 2005). The obtained results can enhance the reproductive efficiency in different boar breeds during cooler and warmer periods of the year on large farms in Vojvodina.

CONCLUSION

It has been determined that there are notable variations in value parameters of fertilisation capacity in boar ejaculates due to seasonal temperature and boar breeds. The ejaculate volume, the sperm concentration, the total sperm count and the progressive sperm motility are significantly lower during warmer seasons of the year, and hence

the number of obtained insemination doses per ejaculate in almost twice as small as the number of obtained doses in cooler seasons. The number of insemination doses varies due to boar breeds and the different value parameters of ejaculate quality. These facts should be taken into consideration when planning the intensity of boar reproductive exploitation under production conditions. Therefore, it is possible to significantly reduce the negative effects of warmer seasons on sow fertility.

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UTICAJ SEZONE I RASE NERASTOVA NA KVALITET EJAKULATA

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Izvod

Ispitivan je uticaj različitih godišnjih sezona i rase na parametre kvaliteta ejakulata nerastova, na farmama intenzivne proizvodnje svinja u PA Vojvodini (Srbija). Ustanovljene su značajne razlike u vrednostima volumena ejakulata, ukupnog broja i koncentracije spermatozoida u ejakulatu i u broju loših ejakulata, kako između tople i hladne sezone godine, tako i između pojedinih rasa ispitivanih nerastova. Zbog toga je i moguć broj inseminacionih doza po ejakulatu različit u pojedinim godišnjim sezonama, kao i između pojedinih rasa nerastova. Uve činjenice treba imati u vidu kod planiranja intenziteta reproduktivne eksploatacije nerastova.

Ključne reči : sezona, rasa, kvalitet, ejakulat, nerast.

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