

## THE SEASON EFFECT ON SEXUAL BEHAVIOR AND SPERM QUALITY OF EAST-BALKAN BOARS

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**Abstract.** The aim of this study was to determine the season effect on sexual behavior and sperm quality of East-Balkan boars and changes in different periods of the year (April, August and October). During a 7-month study period, 120 ejaculates were collected from 8 mature boars. In each ejaculate the volume of liquid fraction, percentage of spermatozoa motility, spermatozoa concentration and the percentage of spermatozoa agglutination were determined. Before each collection the boars' sexual behavior, involving courting time and time for ejaculation was estimated. A tendency for more strongly expressed libido and more continued ejaculation into the autumn vs. the summer was observed. The semen of East-Balkan boars do not differ from those of commercial boars, but season have a significant effect on the sperm quality. The ejaculates of the highest volume (228 ml) are produced in the autumn in comparison in the summer (193 ml). The seasonal influence is more strongly expressed on the spermatozoa concentration where the difference of 33 mln/ml between two seasons is significance ( $P \leq 0.05$ ), and especially in spermatozoa agglutination ( $P \leq 0.01$ ), where the difference between the summer (27.2%) and the autumn (10.7%) is more than 2.5 times.

**Key words:** boars, East-Balkan swine, season, sexual behavior, sperm quality

### INTRODUCTION

The potential for multiparity in some domestic animal species, including *Sus scrofa*, could be interpreted as a historically occurring and genetically determined product of evolutionary adaptation [Svechin 1976]. Using of brood animals

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with high libido and sperm quality is exclusively important for little size in closed populations for their existence guarantee.

East Balkan swine similar to wild forms, are characterized with a late onset of maturity. The reproduction could begin after reaching live body weight of 80 kg in boars [Palova 2007]. A lot of factors influencing the sexual behavior and sperm quality of boars are known – origin, season, way of breeding, individual peculiarity, rank position in the hierarchical structure of the group [Benkov 1987, Dimitrov et al. 2000, Gorecki 2003, Peadar and Lynch 2007, Dimitrov and Bonev 2008]. It is important to notice that in consequence of improved feed and breeding conditions the boars' sexual activity is preserved all year. Despite of that two peaks are observed – February – April (spring) and October – (autumn).

In investigation of wild boars sperm quality in 14 months period Kozdrowski and Dubiel [2004], Sweeney et al. [2003] not found out differences in comparison commercial breeds but some seasonal differences have been observed. In the autumn ejaculates have been with higher volume, sperm concentration and motility in comparison the summer. This peculiarity in reproduction was under comment in the 40es years of last century by Svetozarov and Schtraih [1940]. The authors quoted Marshal, who underlined: – "the initial periodic of sexual function is preserve in the form of increasing of the activity in typical of wild forms periods".

The boars' sexual behavior is ritual and in typical for breed raising in outdoor conditions sexual reflexes are clearly expressed. All phases of the sexual behavior are observed – to mark the territory by the boar, making court to swine and trials to covering [Ivanova-Peneva 2010]. This typical sexual behavior is ordinary revealed firstly by the leader in hierarchical structure.

## MATERIAL AND METHODS

The study was carried out with 8 boars from East-Balkan swine breed, raising in natural conditions into two farms, during the period from April till October – 2011 year. Boars were tested at the age of 2–3 years and weighing 150–165 kg. Reared in outdoor conditions, on the pasture and feed up with a compounded fodder, consisted of 15.5% crude protein.

The sexual behavior evaluation was performed into mating pen with the presence of heated sow. The courting time and time for ejaculation was estimated by chronometer. The total time for covering was calculated.

From each of boars in the months April, (Spring), August (Summer) and October (Autumn) were collected up to 5 ejaculates. In each ejaculate immediately after collection the volume (ml), percentage of spermatozoa motility, spermatozoa concentration (mln/ml) and the percentage of spermatozoa agglutination were determined.

The experimental information was processed by variation statistics. The significances were determined by *t*-Test using.

## RESULTS AND DISCUSSION

The obtained results from two farms do not show significant effect of the season on the boar's sexual activity. A tendency for more strongly expressed libido and more continued ejaculation into the autumn vs. the summer was observed (Table 1). The time carried on for contact with the sow including taking a smell at the vulva, court to abdominal area of the swine and trials to covering generalized as a "courting time" are with lowest values in autumn (October) – 78 sec for boars from the first farm and 86 sec for these from the second one. The highest values have been observed in summer (August) – 117 sec and 121 sec respectively. In the spring the sexual activity occupy intermediate position but closed to these in autumn vs. the summer.

Table 1. Boar's sexual behavior

Tabela 1. Behavior seksualny knurów

Farm Ferma	Month Miesiąc	Boars Knury	Courting time, sec. Czas gry wstępnej, sek.		Time for ejaculation, sec. Czas ejakulacji sek.		Total time for mating, sec. Łączny czas kopulacji sek.	
			$\bar{x} \pm Sx$	VC, %	$\bar{x} \pm Sx$	VC, %	$\bar{x} \pm Sx$	VC, %
I	April Kwiecień	5	85 ± 11.5	13.2	249 ± 19.3	7.8	334 ± 17.2	9.6
	August Sierpień	5	117 ± 10.2	19.8	227 ± 21.8	8.3	344 ± 19.8	13.8
	October Październik	5	78 ± 9.4	11.4	264 ± 23.4	5.2	342 ± 18.1	9.6
II	April Kwiecień	3	91 ± 11.7	16.1	275 ± 22.4	7.4	366 ± 19.6	12.8
	August Sierpień	3	121 ± 14.2	17.9	281 ± 26.1	14.3	402 ± 23.8	15.3
	October Październik	3	86 ± 11.7	12.3	292 ± 27.1	6.7	378 ± 17.9	10.7
Total Razem	April Kwiecień	8	88 ± 10.3	14.6	262 ± 24.9	7.5	350 ± 24.2	11.2
	August Sierpień	8	119 ± 14.6	18.2	254 ± 20.6	10.6	373 ± 20.5	14.4
	October Październik	8	82 ± 9.1	11.9	278 ± 22.3	6.1	360 ± 24.9	8.2

Duration of ejaculation is in the same tendency like “courting time” phase. Boars from two farms are ejaculated for a long time in October – 278 sec and of short in August – 254 sec.

There were not many differences for the total time for covering in the three observed seasons – 350 sec, 373 sec and 360 sec in spring, summer and autumn respectively.

The boars’ libido for breed raising in outdoor conditions and using natural mating the sexual reflexes intensity in technological aspect does not have practical importance but the boars’ libido give an influence on the sperm quality. Dubiel et al. [1985] established that boars with poor libido produced ejaculates with small volume and low spermatozoa concentration. The same dependency reported Benkov and Hadjistoiev [1987], Liu et al. [1994]. In this aspect the seasonal differences of the libido may to be discussed as indirect index for sperm quality.

Table 2. Sperm quality

Tabela 2. Jakość nasienia

Farm Ferma	Month Miesiąc	Boars, n Knury, n	Ejaculates, n Ejakulatory, n	Volume, ml Objętość, ml		Sperm concentration, mln/ml Koncentracja, mln/ml		Motility, % Ruch plemników, %		Agglutination, % Aglutynacja, %	
				x ± Sx	VC %	x ± Sx	VC %	x ± Sx	VC %	x ± Sx	VC %
I	April Kwiecień	5	25	206 ± 12.29	27.38	348 ± 18.80	33.04	74 ± 2.94	6.80	15.4 ± 1.22	13.54
	August Sierpień	5	25	189 ± 12.27	33.04	326 ± 18.27	41.27	72 ± 3.27	7.12	29.1 ± 1.24	14.34
	October Październik	5	25	221 ± 12.22	25.40	364 ± 18.24	33.85	78 ± 2.83	6.42	10.6 ± 1.21	13.61
II	April Kwiecień	3	15	212 ± 13.13	29.35	330 ± 18.19	38.14	76 ± 2.88	6.62	13.3 ± 1.29	12.98
	August Sierpień	3	15	197 ± 13.69	32.00	312 ± 20.35	39.52	73 ± 3.11	8.03	25.8 ± 1.32	13.59
	October Październik	3	15	235 ± 13.02	24.71	340 ± 19.59	36.97	79 ± 2.73	6.31	10.7 ± 1.16	13.01
Total Razem	April Kwiecień	8	40	209 ± 12.17	28.66	339 ± 18.66	35.94	75 ± 2.91	6.71	14.3 ± 1.26	13.29
	August Sierpień	8	40	193 ± 12.89	32.89	319 ± 19.72*	40.56	74 ± 3.20	7.57	27.2 ± 1.28**	14.37
	October Październik	8	40	228 ± 12.56	25.08	352 ± 18.54*	34.82	77 ± 2.77	6.37	10.7 ± 1.21**	12.99

Significance: \*P ≤ 0.05; \*\*P ≤ 0.01. Istotność różnic: \*P ≤ 0,05; \*\*P ≤ 0,01.

The semen of East–Balkan boars did not differ from this of the boars from commercial breeds (Table 2). The significant seasonal effect on the sperm quality

was established. The ejaculates of the highest volume (250 ml) are produced in the autumn in comparison with the summer (193 ml). The seasonal influence is more strongly expressed on the spermatozoa concentration where the difference of  $33 \text{ mln} \cdot \text{ml}^{-1}$  between these two seasons is significant ( $P \leq 0.01$ ), and especially in spermatozoa agglutination ( $P \leq 0.01$ ), where the difference between the summer (27.2%) and the autumn (10.7%) is more than 2.5 times. It is good to be noticed that independently of seasonal differences the individual peculiarities of animals are strongly expressed which could be seen from the higher VC – 25.08% for the volume and 34.82% for the spermatozoa concentration.

The spermatozoa motility have preserved in approximately constantly limits independently from annual season. This result is logical because motility is important biological factor ensured moving of spermatozoa to the fertilization place and it's preserving in constantly and highly limits independently from the impact of lateral factors may be warranty for successful reproduction. The slight season' influence is demonstrated by low extent of variation ( $CV = 6.37\%$ ).

The quality of ejaculates collected in the spring follow tendency established in sexual behavior. The values of controlled indexes are closed to these observed in the autumn especially in relation of sperm concentration ( $339 \text{ mln} \cdot \text{ml}^{-1}$ ). These results supported the conclusions of Sweeney et al. [2003], West et al. [2009] for presence of two basic peaks in the function of reproductive system in animals from aboriginal breeds like East-Balkan swine.

## CONCLUSIONS

There is a tendency for high libido and more continued ejaculation of East Balkan boars in the autumn vs. the summer. Season has not significant effect on the sexual behavior manifestation.

Season have a significant effect ( $P \leq 0.05$ ) on the sperm quality. The semen of the highest volume and spermatozoa concentration was ejaculates produced in autumn (October) vs. summer (August).

The quality of ejaculates collected in the spring indicate the presence of two basic seasonal peaks in the function of reproductive system of East Balkan boars.

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## WPLYW SEZONU NA AKTYWNOŚĆ PŁCIOWĄ I JAKOŚĆ NASIENIA KNURÓW RASY WSCHODNIO-BALKAŃSKIEJ

**Streszczenie.** Celem niniejszej pracy było określenie wpływu sezonu na zachowania seksualne i jakość nasienia knurów rasy wschodnio-bałkańskiej i zmian w różnych porach roku (kwiecień, sierpień, październik). Badaniem objęto 120 ejakulatów pochodzących od 8 młodych, dojrzałych płciowo knurów. Przed otrzymaniem każdego ejakulatu kontrolowano i rejestrowano czas od momentu wejścia knura do kojca z lochą, znajdującą się w rui i wspięcia się na lochę oraz całkowity czas ejakulacji. Każdy ejakulat oceniono pod kątem objętości, koncentracji i ruchu plemników oraz częstotliwości występowania aglutynacji plemników. Ocenę statystyczną wyników wykonano jednoczynnikową analizą wariancji. Otrzymane wyniki wykazały, że libido knurów

nie ulegało zmianom przez cały okres obserwacji. Stwierdzono wpływ sezonu, w którym były pobierane ejakulatory na jakość nasienia knurów. Ejakulatory o największej objętości (228 ml) były produkowane jesienią, a najmniejszą objętość miały ejakulatory pobierane latem (193 ml). W największym stopniu sezon pobierania ejakulatów wpłynął na koncentrację i aglutynację plemników w nasieniu knurów. Różnica w koncentracji plemników (33 mln/ml) pomiędzy dwoma sezonami (latem i jesienią) była istotna przy  $P \leq 0,05$ . Aglutynacja plemników w lecie (27,2%) była ponad 2,5 razy większa w porównaniu z jesienią (10,7%).

**Słowa kluczowe:** ejakulatory, knury, libido, sezon, świnie wschodnio-bałkańskie, sezon

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