

BIOSTIMULATION OF ESTRUS AND OVARIAN ACTIVITY IN GILTS IN SPRING

M. TEŠIĆ*, D. ROGOŽARSKI**, IVANA PEJIN*, S. ARSENOVIĆ*, and M. MIRILOVIĆ*

* Department of Economics and Statistics, Faculty of Veterinary Medicine, Beograd
** Institute of Veterinary Medicine, Požarevac (Yugoslavia)

(Received, 15. May 1993.)

In the experiment, the aggregate and partial (auditive) effects of boars on biostimulation of estrus and ovarian activity was examined in gilts. The experiment was organized in the period — January-May with three groups of 24 gilts, each subdivided in to two pens. Gilts from the 1st group were stimulated by an auditive boar effects for 30 minutes a day, gilts from the 2nd group by a sexually mature boar and auditive effects for 30 minutes a day, and the gilts from the 3rd group were control gilts and were not stimulated. The gilts were fed ad libitum, until the start of the experiment of the age of 140 days. During the experiment 2 kg. of complete mixture was offered per gilt.

The occurrence of first estrus in the 1st (66.67%) and 2nd group (75.00%) represented a statistically significant difference compared to the 3rd group ($P<0.01$ and $P<0.05$). The interval, from the moment of induction to the occurrence of 1st estrus, was shortest in the 2nd group (37,94 days) and the difference was statistically significant compared to the 3rd group ($P<0.01$), as was the difference between the 1st and 3rd group ($P<0.05$). The age of gilts at 1st, 2nd and 3rd estrus occurrence was lowest in the 2nd group (178, 199 and 217 days). The age difference between the 1st and 2nd group for all three estruses was significant ($P<0.01$). The mass of the ovaries in culled gilts was approximately the same in all groups and for all estrus occurrences. The ovulation value was same in the 1st and 2nd group at 1st estrus (10.5) and in the 1st and 3rd group at 2nd estrus (11.5) and in the 1st and 2nd group at 3rd estrus (11.0). Statistically significant differences in ovulation value between the groups and between estrus occurrences were not found ($P>0.05$).

Key words: gilts, estrus, ovulation.

INTRODUCTION

Reproduction in gilts in intensive hog raising is a most important problem in providing continuous production of piglets. A short reproduction interval and

intensive usage of sows in reproduction lead to significant increases in the number of defective sows in production, and therefore there is constant a demand for sufficient numbers of high quality breeding gilts for substitution of excluded sows (Jović et al., 1975; Kroes et al., 1979; Tešić et al., 1987). The gilts' age at the period of first estrus depends upon a series of genetic and paragenetic factors. Most significant paragenetic factors are: way of rearing breeding gilts, nutrition, ambiental microclimate, annual birth season, length of the photoperiod and some stress factors like transport, relocation, boar exposure. Examination of the influence of these factors on reproductive characteristics in gilts is a main subject for many authors (Mavrogenis et al., 1976; Christenson 1981; Flowers et al., 1989; Stančić et al., 1990). Previous examinations by some authors have acknowledged that biostimulation of estrus in gilts by the presence of a boar has a positive influence on ovarian activity (Kirkwood et al., 1980; Wise et al., 1980; Caton et al., 1986; Tešić et al., 1990). The boar has an aggregate influence on estrus, stimulating it by direct contact with the gilt as well as by visual, auditive and olfactory effects (Petrović 1988; Estham et al., 1986; Tešić et al., 1991). Having this in mind, the purpose of these investigations was to estimate aggregate and patrial — auditive boar effects on estrus biostimulation and ovarian activity in the spring of the year.

MATERIAL AND METHODS

A total of 72 crossbred gilts of the F1 generation (Swedish Landrace x Large Yorkshire) was divided into three groups. They were born at the beginning of August and at the start of the experiment they were approximately 140 days old. The experiment lasted from 3rd of January to 3rd of May. Each group of 24 gilts was subdivided in to two pens of 12 animals. Gilts from the first group were auditive stimulated for 30 minutes (7.00 — 7.30h) a day, and gilts from the second group were additionally stimulated for 30 minutes a day by the presence of a boar. Biostimulation by boar exposure was performed by placing a boar in each per for the period from 11.30 to 12.00h. The 4 pens dividing the first and second groups of gilts were empty. Gilts from the third group, used as a control group, were placed in a separate hall and were not artificially stimulated. The diet was the same for all groups. Feed was offered ad libitum up to 140 days of age. During the experimental period the gilts were group fed at the level of 2 kg of complete mixture per gilt. There was 13.9 kJ/kg ME and 160 g of crude protein per kg mixture. The weight of the gilts was measured at estrus and 14 days later, after the 1st, 2nd and 3rd estrus, two gilts per group were sacrificed. The ovarys were removed from the sacrificed gilts, their weight was measured and the number of yellow bodies (c. lutea and c. hemorrhagica) was determined. For each group the average age at estrus, the interval from the beginning of stimulation till estrus occurred, the weight of gilts at estrus and the percentage of estrus occurrence was computed. The results were analized biometrically and the level of significance of the difference between mean values for groups was computed by Student's t-test.

RESULTS AND DISCUSSION

Out of the total number of stimulated gilts in the 1st and 2nd group, the 1st estrus occurred in 66.67% and 75.00% of gilts respectively. This represents a statistically significant difference ($P < 0.05$ and $P < 0.01$) compared to the 3rd group (50.00%) — (Table 1.). The occurrence of the 2nd and 3rd estrus in the experimental groups (1st group — 59.09% and 55.00%; 2nd group — 72.73% and 70.00%) was also statistically significantly ($P < 0.01$) greater than the 3rd group (40.91% and 35.00%), as was the difference between the 2nd and 1st group ($P < 0.05$). The interval from the moment of indication to the moment of first estrus, was most short in the 2nd group (37.94 days) and the difference was statistically significant with regard to the 3rd group ($P < 0.01$), as was the gilts at the difference between the 1st and 3rd group ($P < 0.05$). Moreover, the age of the occurrence of the 1st, 2nd and 3rd estrus was lowest in the 2nd group (177.94, 197.85 and 216.80 days). The age difference between the 2nd and 3rd group of gilts at the moment of 1st, 2nd and 3rd estrus was statistically highly significant ($P < 0.01$), as was that between the 2nd estrus in the 1st and 3rd group, while at the 3rd estrus, the age difference between the 1st and 3rd group and 2nd and 1st group was significant ($P < 0.05$). The body weight of the gilts of the 1st and 2nd group at the 1st estrus was approximately the same ($P < 0.05$), while the weight difference between the 2nd and 3rd estrus was significant ($P < 0.05$). The weight difference between gilts in the 1st and 2nd group at 1st, 2nd and 3rd estrus was statistically significant in comparison to the 3rd group ($P < 0.01$).

Table 1. Basic indexes of reproduction

Characteristics	I			II			III		
	1.	2.	3.	1.	2.	3.	1.	2.	3.
1. No. of gilts	24	22	20	24	22	20	24	22	20
2. Gilts in estrus	16	13	11	18	16	14	12	9	7
3. Estrus occurrence (%)	66.67	59.09	55.00	75.00	72.73	70.00	50.00	40.91	35.00
4. Interval till estrus (days) occurrence	45.06*	66.50	85.93	37.94**	57.85	76.80	52.73	76.33	95.93
5. Age (days)	187	206**	226*	178**	199**	217**	193	216	236
6. Gilt weight (kg)	82**	93**	104**	81**	92**	101**	88	99	111

Taking into consideration that sexual maturation in gilts passes through 5 stages: very early, early, middle, late and the stage shortly before ovulation, the very best period for the start of stimulation is in the period of the late stage., or into the period when the ovarian estrogen has a positive feedback effect on the CNS — hypothalamus — hypophysis (Mišković, 1982). Many authors point to variation of the average age of gilts at first estrus, depending on the beginning of estrus induction. Kirkwood and Hughes (1979) ascertained that gilts subjected to the very first contact with a sexually mature boar at the age from 125 to 132 days have the longest interval till the occurrence first

estrus (54 and 42 days). With stimulation at the ages of 139, 146, 153, 160, 167, 174 and 181 days the interval reduced from 27 to 16 days. Hughes and Cole ((1976) found interval of 34.3 days in gilts aged 169.4 days and weighing 97.3 kg at first estrus. Deligeorgis and coworkers (1984) stimulated gilts 156 days old (1st group — direct contact with a sexually mature boar and 2nd group — visual effect of boar presence) and noted the first estrus at 167.9 days in the 1st group and 192.2 days in the 2nd group. Paterson and Lindsay (1980) stated that 160 day old boar stimulated gilts, attain puberty in 17 days or at the age of 177 days. Eastham and coworkers (1986) stimulated 160 day old gilts (1st group — with a sexually mature boar and auditive stimulation, 2nd group — olfactory and auditive effect, 3rd group — unstimulated gilts) but did not establish any significant difference between the groups in the interval from the start of stimulation till the occurrence of first estrus in the experimental group (16.7 and 13.8 days) and control group (15.9 days). Examining the effects of stimulation length of gilts with a sexually mature boar (5.10 and 30 minutes, constant presence + 10 minutes and constant presence) at the age of 130 days, Caton and coworkers. (1986) ascertained that gilts stimulated for 30 minutes a day reach their first estrus at the age of 198.5 days or 20.2 days after the beginning of stimulation and have a percentage of estrus occurrence of 52.6%. Tešić and coworkers (1990) stimulated gilts with a sexually mature boar and found that the age of the gilts at first estrus, was 192.4 days in the experimental group and 208.7 days in the control group, after intervals of 12.4 and 28.7 days and conception rate was 68.10 and 68.42%. Also, Paterson and coworkers (1991) ascertained the interval from moment of stimulation until the occurrence of estrus to be 26.8 days in the experimental group and 45.1 days in the control group, and the occurrence of estrus from 79.8 and 39.8%. After examining the influence of the auditive effect of a boar on the induction of estrus in gilts at the age of 214.50 days — experimental group and 217.30 days — control group, Tešić and coworkers (1991) found a statistically significant difference ($P < 0.01$) for estrus occurrence between the 1st (89.04%) and 2nd group (70.42%). In our investigation, the achieved results concerning the age of gilts at 1st estrus and the length of the interval from the moment of stimulation until the occurrence of 1st estrus, indicated approximately the same values as the fore mentioned authors obtained, as well as for the percentage of estrus occurrence.

The average age of the sacrificed gilts at 1st estrus ranged from 166.5 days in the 2nd group to 184.0 days in the 3rd group, at 2nd estrus from 184.5 days in the 2nd group to 205.0 days in the 3rd group and at 3rd estrus from 205.5 in the 2nd group to 227.0 days in the 3rd group (Table 2). The mass of the ovaries at 1st estrus ranged from 3.568 g. in the 2nd to 3.754 g. in the 1st group, at 2nd estrus from 4.523 g. in the 1st to 4.728 g. in the 2nd group and at 3rd estrus from 4.752 g. in the 1st to 5.123 g. in the 2nd group.

Ovulation values for the experimented gilts were established on the basis of the number of c.hemorrhagica and c.lutea at the 1st, 2nd and 3rd estrus. The average number of ovulations at 1st estrus was the same in the 1st and 2nd group (10.5), at 2nd estrus in the 1st and 3rd group (11.5) and at 3rd estrus in the 1st and 2nd group (11.0). The largest ovulation value at 1st estrus

was found in gilts of the 3rd group, at 2nd estrus in gilts of the 1st and 3rd group and at 3rd estrus in gilts of the 1st and 2nd group.

Table 2. Average values for sacrificed gilts

Characteristics	I			II			III		
	1.	2.	3.	1.	2.	3.	1.	2.	3.
1. No of gilts	2	2	2	2	2	2	2	2	2
2. Age (days)	169.5	190.0	212.5	166.5	184.5	205.5	184.0	205.0	227.0
3. Mass of ovaries (grams)	3.754	4.523	4.752	3.568	4.728	5.123	3.593	4.572	5.036
4. Ovulation values	10.5	11.5	11.0	10.5	11.0	11.0	11.0	11.5	10.5

The growth and development of Graafian follicles in gilts starts after 70 days of life. Namely, after that period functional feedback occurs on the axes CNS — hypothalamus — hypophysis — ovaries (Mišković, 1982). Flowers and coworkers (1979) ascertained the ovulation value (c.lutea) of 11.7 in gilts stimulated by a sexually mature boar, and 12.0 in control unstimulated gilts. Kirkwood and Hughes (1980) stated that 160 day old gilts stimulated by boar exposure had an ovulation value of 16.3, and stimulated — control gilts of 13.6. In a another experiment the same authors obtained, an ovulation value of 15.2, in a condition of 30 minute stimulation of gilts with a sexually mature boar, and 15.3 in unstimulated gilts. Paterson and Lindsay (1980) found that gilts stimulated with a boar at 1st estrus reached ovulation value of 10.4, at 2nd estrus — 11.0, and at 3rd estrus — 11.7. Regarding the season of the year, Stančić and coworkers (1990) observed an average number of ovulations at 1st estrus of 12.6 and 11.7 and at 2nd estrus of 11.6 and 13.4. The average ovulation value in our research is approximately the same as in the investigations of some other autors, but considerably lower than others. This leads to the conclusion, agreed by a majority of authors, that the ovulation value is a characteristics depending on the nutrition, age and body mass of the gilts, the microclimate in the buildings and the annual birth season. This indicates that reproduction in gilts presents a complex problem. Nevertheless biostimulation in the presence of a sexually mature boar is one of the methods to considerably improve the reproductive performance of gilts.

A c k n o w l e d g e m e n t

This work is part of a project concerning hog raising financed by the Scientific Research Fund of the Republic of Serbia.

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BIOSTIMULACIJA ESTURSA I OVARIJALNE AKTIVNOSTI NAZIMICA U PROLETNJEM PERIODU GODINE

M. TEŠIĆ, D. ROGOŽARSKI, IVANA PEJIN, S. ARSENOVIĆ i M. MIRILOVIĆ

SADRŽAJ

Ispitivan je agregatni i parcijalni (auditivni) uticaj efekta nerasta na biostimulaciju estrusa i ovarijalnu aktivnost nazimica. Ogled je organizovan u periodu

januar — maj sa tri grupe nazimica, u svakoj po 24 grla, koje su smeštene u dva boksa. Nazimice I grupe stimulisane su sa auditivnim efektom nerasta 30 minuta dnevno, II grupa sa polno zrelim nerastom i auditivnim efektom po 30 minuta, a u III grupi su kontrolne nazimice koje nisu stimulisane. Ogled je započeo sa starošću nazimica od 140 dana. Ishrana nazimica do ulaska u ogled bila je ad libidum, a u toku ogleda obročno — 2 kg komplet smeše po grlu.

Prvi estrus kod I (66,67%) i II (75,00%) predstavlja statistički značajnu razliku u odnosu na III grupu ($P < 0,05$ i $P < 0,01$). Interval od momenta indukcije do pojave prvog estrusa najkraći je kod II grupe (37,94 dana) i statistički je značajan u odnosu na III grupu ($P < 0,01$), kao i razlika između I i III grupe ($P < 0,05$). Starost nazimica pri pojavi prvog, drugog i trećeg estrusa najniža je kod II grupe (178, 199 i 217 dana). Razlika u starosti nazimica između II i III grupe kod sva tri estrusa je značajna ($P < 0,01$), kao i pojava drugog estrusa I grupe. Masa jajnika žrtvovanih nazimica je približno ista između grupa i po estrusima. Ovulaciona vrednost je ista kod I i II grupe u prvom estrusu (10,5), kod I i III u drugom estrusu (11,5) i kod I i II grupe u trećem estrusu (11,0). Statistički značajna razlika kod ovulacione vrednosti između grupa i po estrusima nije utvrđena ($P > 0,05$).

