

## RESULTS OF SOW REPRODUCTIVE PERFORMANCE DUE TO APPLICATION OF INSULINGENIC DIET AND NATURAL STIMULATION OF ESTRUS

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### Abstract

The aim of the study was to evaluate sow reproductive performance traits due to administration of diet which enhanced insulin secretion and by early contact with adult boar. The experiment was carried out on 40 crossbred gilts PL x PLW. At age of 142 day animals were fed with diet enriched with maize starch and glucose as the basic source of energy. The diet was given during 21 days and then the gilts were subjected every day to 20 minutes contact with adult boar and were observed in respect to estrus symptoms. Intensity estrus symptoms was evaluated in scale given by Karalus and attained on average 2.37 points. Gilts were mated during second estrus at on average 216 days and at 123.5 kg body weight. Effectivity of natural mating was at 92%. Sows fertility estimated as number of live-born piglet was normal on the level as in breeding herds (10.76 piglets in the litter). Number weaned piglet was 9.94. Litter weight at birth was 16.71 kg and at weaning 60.03 kg. Applied diet accelerated the ovarian development and physiological function of reproductive system and in conjunction with natural stimulation of sexual puberty by contact with boar the sow reproductive performance results were on the very good level.

**Key Words:** Pigs, insulingenic diet, estrus, reproductive performance

One of the most challenging elements of pig keeping and breeding is the reproduction process itself, as it very often affects the ultimate success of any production activity (Kapelański et al. 1994). Modern breeds of pigs are characterized by a rapid growth and are therefore gaining high body weight at a relatively early age. This may be seen as a chance for early mating of the gilts, provided it shall be accompanied by an accordingly rapid reproduction system development. This is particularly required in the event of planned sexual maturity stimulation (Kapelański et al. 2002).

Insulingenic diet application is a natural way of stimulating sexual maturity in case of gilts, inducing cyclical postprandial insulin production (Kapelański et al. 2002, 2003; Zięcik et al. 2002). It has been confirmed that introducing easily digestible sugars (preferably glucose) to the diet, effectively and periodically increased the insulin level in blood serum (Zięcik et al. 2002); and in consequence increased the weight of ovaries, uterus and number of ovulations (Kapelański et al. 2000, Kapelański, Zięcik, 2001).

An affective and highly recommended means of accelerating sexual maturity is to allow young gilts the contact with the boar and to utilize the influence of the produced pheromones on the physiological functions of the reproductive system. Numerous authors confirm (Huges et al. 1990, Rekwot i et al. 2001) that frequent contact with the boar accelerates estrus occurrence.

The purpose of the studies presented herein was the assessment of breeding performance with regard to gilts upon insulinogenic diet application, natural estrus stimulation; and to establish the results of the mating.

### Material and methods

The scope of the study covered 40 gilts, F<sub>1</sub> crossbreeds of: Polish Landrace and Polish Large White breeds (PL x PLW). The animals were kept up to the 142<sup>nd</sup> day of their life according to the principles of farm keeping technology, i.e. groups of 10 individuals in pens, with a free access of each of the animals to the feeding trough and the possibility of using the drinking troughs. During the period of gilt rearing, from the 142<sup>nd</sup> day of life for 21 days, flushing had been applied, i.e. a diet supplemented with maize starch and 60g of glucose, designed according to the recipe by Van den Brand et al. (1998). Natural stimulation was carried out by means of direct, physical contact of the gilts with an adult boar, twice a day. The estrus occurrence was also controlled twice a day (in the morning and afternoon) and the level of its intensity was measured as per the scale developed by Karalus (1990) (3 pts – red and swollen labia, tolerance reflex, infrequent effluent from the cervix; 2 – red and swollen labia, lack of tolerance reflex; 1 – partial reddening and slight swollenness of labia; 0 – lack of any physical or behavioural estrus syndromes). Upon registering the first (I) estrus, the gilts were left until the consecutive, spontaneous (physiological) estrus occurred, during which double natural mating service took place. The mating effectiveness, number of born and weaned piglets as well as weight of the litters in the 1<sup>st</sup> and 28<sup>th</sup> day of rearing have been established.

A statistical description was carried out with regard to all analysed features. The arithmetic mean ( $\bar{x}$ ) and standard deviation (s) were calculated. The calculations were done

with the aid of the STATISTICA 8 PL (2008) computer software.

## Results and discussion

Table 1 presents the results of the observations of estrus and mating effects with regard to the analysed gilts. The I and II estrus was confirmed in case of 37 of the gilts. The average age of sexual maturity amounted to 194.62 days.

The period between the I and II estrus was, on average, 21.78 days.

The estrus intensity, assessed according to the scale developed by Karalus et al. (1990), was identified on the level of 2.37 pts, which confirms the regularity of the studied gilts' estrus.

Out of 37 gilts subjected to mating, 34 (91.89%) were mated successfully at the age of 216.40 days and with a body weight of 123.50 kg.

**Table 1. Characteristics of experiment course and mating effects**

Trait	x ± SD
Number of gilts at mating, n	37
Number of farrowed gilts, n	34
Mating effectiveness, %	91.89
Age at diet application, days	142.05 ± 2.81
Age at first estrus, days	194.62 ± 19.32
Age at second estrus (mating), days	216.40 ± 19.77
Body weight at mating, kg	123.50 ± 10.58
Days from diet application to II estrus, days	74.24 ± 20.05
Days between first and second estrus, days	21.78 ± 1.00
Intensity of estrus in scale of Karalus (0-3)	2.37

**Table 2. Sow reproductive effects**

Trait	x ± SD
Number of farrowed gilts, n	34
Litter size, n	
live born	10.76 ± 2.45
still born	0.53 ± 0.93
Litter size at weaning, n	9.94 ± 2.00
Mortality to weaning, n	0.82 ± 1.36
Litter weight, kg	
at birth	16.71 ± 4.60
at weaning	60.03 ± 13.86

The results concerning breeding performance of the analysed gilt group are presented in Table 2. 34 litters were obtained, which means that each of the mated gilts successfully delivered. The fertility of the sows marked by the number of living piglets at birth was correct, as per the relevant level of primiparous sows in Polish pedigree breeding industry; and amounted to 10.76 piglets in a litter. The effects of piglets rearing seemed advantageous as well. Low level of mortality rate (0.82 piglets) did not cause any decrease in the litter size at weaning (9.94 piglets). The results obtained confirmed the outcome of previous own studies (Kapelańska et al. 2001) in which fertility of the primiparous sows was high (11.16 piglets in a litter) and the piglet losses were not significant (approximately 5-7%). Another fact worth drawing attention to is the relatively high body weight of the litters, both at birth (16.71 kg), as well as at weaning (60.03 kg). It is a direct outcome of an excellent care of sows and piglets and the sows' attentiveness to their progeny.

## Conclusion

The applied diet causing more intensive postprandial insulin production has also contributed to the satisfactory results in the scope of the sows' breeding performance features.

## References

- Brand H., Van Den Soede N.M., Schrama J.W., Kemp B. (1998): Effects of dietary energy source on plasma glucose and insulin concentration in gilts. *Anim. Phys. Anim. Natur.* 79, 27-32
- Hughes P.E., Pearce G.P., Patterson A.M. (1990): Mechanism mediating the stimulatory effects of the boar on gilt reproduction. *J. Reprod. Fert., Suppl.*, 40, 323-333
- Kapelańska J., Rak B., Kapelański W., Bocian M. (2001): The effect of age at first farrowing on further performance in Polish Landrace sows. *Trzoda Chlewna w Gospodarce Narodowej. XXXI Conf. Wrocław 5-6 kwiecień 2001, Zesz. Nauk.* 405, 111-117 (In Polish)
- Kapelański W., Kapelańska J., Hammermeister A. (1994): Relation between parturition course and some traits of reproductive performance of the first mated gilts. *Zesz. Nauk. nr 186, Zootechnika 25, ATR Bydgoszcz*, 35-41 (In Polish)
- Kapelański W., Soede N.M., Zięcik A.J. (2000): Effects of diet composition and frequency of feeding on postprandial insulin level and ovarian follicular development in prepuberal pigs. *14th Int. Congress Anim. Reprod., Stockholm 2000*, 1, 285
- Kapelański W., Zięcik A.J. (2001): Effect of glucose supplemented diet on natural and gonadotropins induced puberty attainment in gilts. *5th Annual Conference of the European Society for Domestic Animal Reproduction, Vienna, ESDAR Newsletter* 6, 64
- Kapelański W., Zięcik A.J., Dybała J., Kapelańska J. (2002): Effect of diet and gonadotrophic stimulation of sexual maturity on sow reproductive performance. *Med. Wet.*, 58 (10), 803-806 (In Polish)
- Kapelański W., Zięcik A.J., Dybała J., Rak B., Kapelańska J. (2003): Effect of diet enhancing insulin secretion and hormonal stimulation of the first and second estrus on reproductive performance in gilts. *Med. Wet.*, 59 (6), 546-549 (In Polish)
- Karalus U., Downey R.R., Ainsworth L. (1990): Maintenance of ovulatory cycles and pregnancy in prepubertal gilts treated with PMSG and hCG. *Anim. Reprod. Sci.*, 22, 235-241
- Rekwot P.I., Ogwu D., Oyedipe E.O., Sekoni V.O. (2001): The role of pheromones and biostimulation in animal reproduction. *Anim. Reprod. Sci.*, 65, 157-170
- STATISTICA 8 PL (2008)
- Zięcik A.J., Kapelański W., Zaleska M. (2002): Effect of glucose supplemented diet on natural and gonadotropin induced puberty attainment in gilts. *J. Anim. Feed Sci.*, 11, 461-469