POSSIBILITIES OF KEEPING OPTIMAL PERFORMANCE OF BREEDING BOARS DURING SUMMER PERIOD

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SUMMARY

Summer is a critical period on pig breeding farms for reproduction. Therefore, in this research effects of a feed supplement in a summer period were studied. Boars were given Ascogen® mixed with food during a period of 60 days. The indicators of reproduction successfulness of each boar were collected before the research, after 30 days and finally after 60 days. According to the results, the control and the experimental group were equally successful before the treatment as well as after 30 days of the treatment. After 60 days, however, in the control group conception rate decreased and fewer piglets were born. The experimental group did not have a decline in reproduction.

Keywords: boars, summer, reproduction, feed supplement

INTRODUCTION

Summer is a critical period on pig breeding farms for the reproduction of boars and sows (Love et al., 1993). Environmental factors such as high temperature and long photoperiod can lead to problems both with ejaculate quality and fertilization (Claus et al., 1985; Kunavonkrit et al., 2005).

During hot weather, pigs may eat less (Rinaldo et al., 2000; Nardone et al., 2006) and the nutritional balance of their diet may be affected (Kunavonkrit et al., 2005). In such a way the environment presents a restriction factor for energy intake which animals require in order to carry out specific bodily functions, e.g. to grow and to reproduce, while the continuing failure of the animal to meet its nutrient requirements can be seen as a chronic stressor (Kyriazakis and Savory, 1997; Rinaldo et al., 2000). Furthermore, because of high temperatures, the animal is outside its comfort zone and experiences stress to maintain homeothermy. This requires extra energy in order to thermoregulate, so less energy is available for production processes (Nardone et al., 2006).

In adult boars used for reproduction the decreased nutritional intake has, as a consequence, a decreased libido and a smaller amount of sperm (Levis, 1997). However, some feed supplements may have a positive influence on bodily balance, and, as a consequence, on reproduction. For example, it is believed that feeding a boar with additional vitamin C during stress caused by summer heaths can enhance sperm quality (Lin et al., 1985; Wilson et al., 2004). Similarly, in the researches carried out by Marin-Guzman et al. (1997) boars which were given selenium and vitamin E had better reproduction results.

In spite of difficulties in summer period boars are used for reproduction, which can have a negative effect on their well-being. Therefore in this research, in order to overcome heat stress as

well as potential feed intake problems, boars were given Ascogen®. The objectives of this study were to gain optimal reproduction results of breeding boars by applying Ascogen® in summer period, giving particular emphasis to safety and welfare of the boars.

METHODS

The experiment was carried out on a pig breeding farm with 14 mature boars used for semen collecting for AI (artificial insemination).

The research was conducted during the summer months (in June, July and August). The boars were housed individually in pens with outdoor enclosures. Indoor temperatures were between 25°C and 34°C, while outdoor temperatures were between 26°C and 36°C.

Fourteen boars were divided by random choice into a control group (N=7) and an experimental group (N=7). Every day during 60 days the experimental group boars received Ascogen® at a concentration of 500 g/ton in a food mixture. Ascogen®, powder made of natural substances, is a feed supplement with PSB-Complexes. The main active ingredients of Ascogen® are purified RNA (ribonucleic acid), purified nucleotides and precursors, specific organic acids and inactivated yeasts.

The indicators of reproduction successfulness were collected for each boar, i.e. sperm volume (ml) and motility (%), number of inseminated sows, conception rate and return to heat, abortion, as well as the number of live and stillborn piglets two months later. The experimental and the control group data were compared prior to the Ascogen® treatment, after 30 days and finally after 60 days of the treatment. Statistical analyses were done with ANOVA ($p<0.05$).

RESULTS

Results of the findings in this study are shown in Table 1 and 2 and in Graphs 1, 2 and 3. Statistically relevant differences were found in the control group of boars concerning the sows' conception rate, the number of sows that returned to heat and the number of sows that farrowed. Consequently, smaller number of piglets was obtained from the control group of boars.

Table 1. Control group results of reproduction in June, July and August

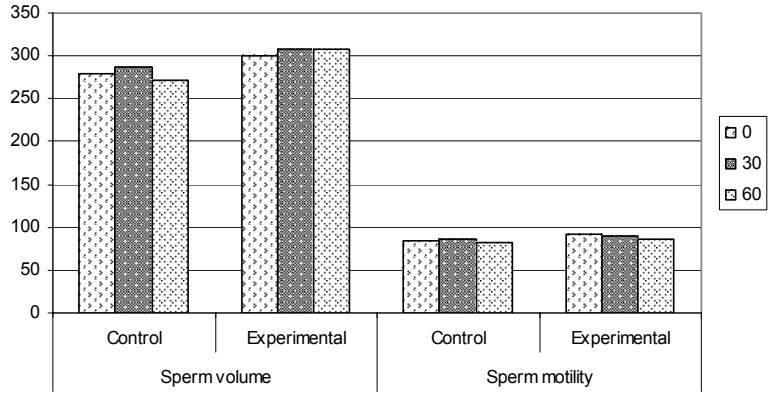
	Days		
	0	30	60
Sperm volume (ml)*	279 ± 14.87^a	286 ± 14.29^a	271 ± 14.87^a
Sperm motility (%)*	85 ± 4.63^a	86 ± 4.68^a	82 ± 3.06^a
Number of inseminated sows*	6 ± 0.29^a	6 ± 0.26^a	5 ± 0.34^a
Conception rate*	5 ± 0.40^a	5 ± 0.40^a	3 ± 0.77^b
Return to heat*	1 ± 0.20^a	1 ± 0.28^a	2 ± 0.71^b
Abortion*	0 ± 0.00^a	0 ± 0.00^a	0 ± 0.00^a
Number of sows that farrowed*	5 ± 0.40^a	5 ± 0.40^a	3 ± 0.81^b
Number of piglets*	55 ± 5.21^a	55 ± 5.38^a	21 ± 7.04^b
Number of live born piglets*	52 ± 4.97^a	52 ± 5.21^a	20 ± 6.83^b
Number of stillborn piglets*	3 ± 0.40^a	3 ± 0.52^a	0 ± 0.29^b

*Means±S.E. in the same row with different letter differ significantly ($p<0.05$)

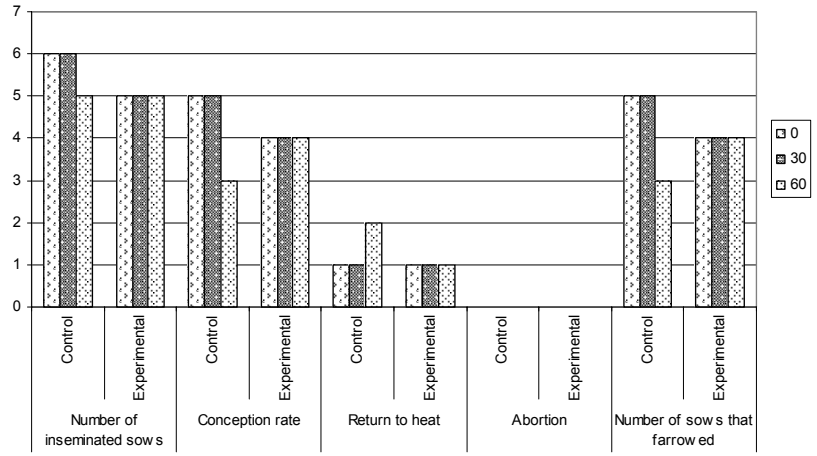
Table 2. Experimental group results of reproduction in June, July and August

	Days		
	0	30	60
Sperm volume (ml)*	300 ± 34.50[a]	307 ± 39.98[a]	307 ± 35.23[a]
Sperm motility (%)*	91 ± 0.71[a]	89 ± 1.70[a]	86 ± 1.80[a]
Number of inseminated sows*	5 ± 0.69[a]	5 ± 0.75[a]	5 ± 0.20[a]
Conception rate*	4 ± 0.58[a]	4 ± 0.75[a]	4 ± 0.47[a]
Return to heat*	1 ± 0.31[a]	1 ±0.44[a]	1 ± 0.34[a]
Abortion*	0 ± 0.00[a]	0 ± 0.00[a]	0 ± 0.14[a]
Number of sows that farrowed*	4 ± 0.51[a]	4 ± 0.71[a]	4 ± 0.51[a]
Number of piglets*	40 ± 6.08[a]	45 ± 9.00[a]	35 ± 4.87[a]
Number of live born piglets*	38 ± 5.77[a]	43 ± 8.55[a]	34 ± 5.11[a]
Number of stillborn piglets*	2 ± 0.42[a]	2 ± 0.53[a]	2 ± 0.53[a]

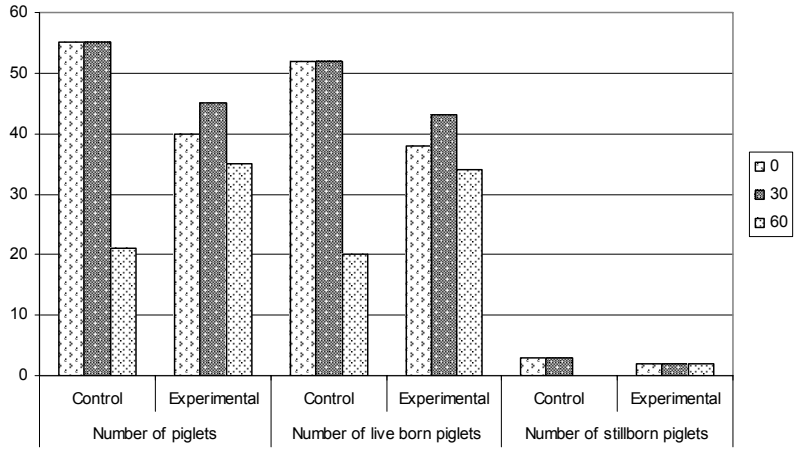
*Means±S.E. in the same row with different letter differ significantly ($p<0.05$)



Graph 1. Sperm volume and motility in control and experimental group



Graph 2 Insemination results in control and experimental group



Graph 3. Number of piglets born in control and experimental group

DISCUSSION

Boars used for AI have a great influence on the productivity of the farm (Levis, 1997), and semen production of boars may be influenced by many factors (Park and Yi, 2002). In this research we studied the influence of summer conditions and one feed supplement.

Boars' sperm volume in the control group and in the experimental group ranged, on average, from 271 to 307 ml, while sperm motility was between 82 and 91%. These are common values for breeding boars (e.g. Frangež et al., 2005). According to these indicators of sperm quality, i.e. sperm volume and motility, in every of the three measurements there was no statistically

important difference in sperm quality ($p>0.05$) neither in the control group nor in the experimental group of boars (Graph 1). However, indicators of quality in vitro are not always sufficient indicators for an estimate in vivo (Popwell and Flowers, 2004).

On the other hand, although 5 or 6 sows were inseminated by the sperm of every boar, the conception rate of the control group decreased during the summer period, that is, it fell from 5 successful to 3 successful conceptions (Table 1). The conception rate of the experimental group neither increased nor decreased, and, on average, out of 5 sows inseminated with the sperm of the same boar, 4 became pregnant. On average, in one sow mating did not succeed so she returned to heat (Table 2). As a consequence, the number of sows which farrowed was higher in those inseminated with the sperm from the boars from the experimental group (Graph 2).

Litter size is a complex trait influenced by a paternal, maternal and fetal component and boars have a significant influence on fetal survival rate (Hamann et al., 2004; Popwell and Flowers, 2004). In this research, on average, from one sperm dose from one boar in the control group 55 piglets were born in June and July, whereas in August that number was decreased to 21 piglets, which was significantly less compared to previous months ($p<0.05$, Table 1). The experimental group, which was treated with Ascogen® for 60 days, did not have a decline in reproduction during three summer months (Table 2, Graph 3).

CONCLUSION

Environmental conditions during summer are unfavourable for boars to maintain homeostasis and reproduction but it is possible to improve it with feed supplement. Therefore, it is recommended to treat breeding boars with Ascogen® as a measure of prevention of summer losses.

REFERENCES

Claus, R., U. Weiler (1985): Influence of light and photoperiodicity on pig prolificacy. J. Reprod. Fertil., Suppl. 33, 185–197.

Frangež, R., T. Gider, M. Kosec (2005): Frequency of Boar Ejaculate Collection and its Influence on Semen Quality, Pregnancy Rate and Litter Size. Acta vet. Brno 74, 265–273.

Hamann, H., R. Steinheuer, O. Distl (2004): Estimation of genetic parameters for litter size as a sow and boar trait in German herdbook Landrace and Pietrain swine. Livest. Prod. Sci. 85, 201–207.

Kunavongkrit, A., A. Suriyasomboon, N. Lundeheim, T. W. Heard, S. Einarsson (2005): Management and sperm production of boars under differing environmental conditions. Theriogenology 63, 657–667.

Kyriazakis, I., C. J. Savory (1997): Hunger and Thirst. In: M.C. Appleby and B.O. Hughes (eds.): Animal Welfare. CAB International, Wallingford, UK.

Levis, D. G. (1997): Managing postpubertal boars for optimum fertility. Comp. Cont. Educ. Pract. 19, Suppl. S, S17–S23.

Lin, H. K., S. Y. Chen, C. Y. Huang, Y. H. Kuo, L. C. Wung (1985): Studies on improving semen quality of working boars fed diet with addition of vitamin C in summer season. Annu. Res. Rept., pp. 59–73., Anim. Ind. Res. Inst. TSC.

Love, R. J., G. Evans, C. Klupiec (1993): Seasonal effects of fertility in gilts and sows. J. Reprod. Fertil. 48, 191–208.

Marin-Guzman, J., D. C. Mahan, Y. K. Chung, J. L. Pate, W. F. Pope (1997): Effect of dietary selenium and vitamin E on boar performance and tissue responses, semen quality and subsequent fertilization rates in mature gilts. J. Anim. Sci. 75, 2994–3003.

Nardone, A., B. Ronchi, N. Lacerta, U. Bernabucci (2006): Climatic effects on productive traits in livestock. Vet. Res. Com. 30, Suppl. 1, 75–81.

Park, C. S., Y. J. Yi (2002): Comparison of semen characteristics, sperm freezability and testosterone concentration between Duroc and Yorkshire boars during seasons. Anim. Reprod. Sci. 73, 53–61.

Popwell, J. M., W. L. Flowers (2004): Variability in relationship between semen quality and estimates of in vivo and in vitro fertility in boars. Anim. Reprod. Sci. 81, 97–113.

Rinaldo, D., J. L. Dividich, J. Noblet (2000): Adverse effects of tropical climate on voluntary feed intake and performance of groowing pigs. Livest. Prod. Sci. 66, 223–234.

Wilson, M. E., K. J. Rozeboom, T. D. Crenshaw (2004): Boar Nutrition for Optimum Sperm Production. Adv. Pork. Prod. 15, 295–306.