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Full Length Research Paper

Effects of the level of protein and energy on growth dynamics, feed conversion and quality of stern of growing breeding gilts

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This paper examined the effect of two levels of energy and protein in the diet of growing breeding gilts on the dynamics of growth, feed conversion and quality of stern. The results showed that increasing levels of energy and protein lead to an increase in daily growth, more efficient exploitation of feed and a better quality of stern of gilts.

Key words: Protein, energy, gilts, quality of stern.

INTRODUCTION

Production of high quality breeding gilts is a prerequisite for effective and successful reproduction in the pig production. Nutrition during growth is necessary to provide a high daily gain, the effective utilization of feed and good quality of stern, since these are criteria for evaluating gilts by the performance test and for their involvement in the reproduction process. However, high meatiness is negatively correlated with parameters of effective reproduction according to the researchers (Whittemore, 1987; Kovčin, 1993; Beltranena et al., 1993; Rydhmeri et al., 1992; Chen et al., 2003). Therefore, the best performance gilts are not ready for mating after the completion of the performance test because they reach body weight of 90 to 100 kg within 160 to 180 days of age and have little energy reserves in the body. Accordingly, it is necessary to change the structure of feed, reduce the level of protein and increase the energy consumption after the completion of performance tests, so the thickness of back bacon can increase at least to 20 mm until the expected mating. During the period of mating, gilts should be about 220 to 230 days old, with a body mass of 120 to 130 kg and the mating should be done during the second or third estrus (Close and Cole, 2000).

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To achieve this, the gilts have to make daily gain of at least 720 to 770 g during the growth and test and the living daily gain should be 530 to 600 g (Kovčin et al., 2005).

Due of the previously stated, production of high quality breeding gilts has become more complex in recent decades. Exclusion of young sows in reproduction is very high on many farms and it is a consequence of the inclusion of unprepared gilts in the process of reproduction. Therefore, the main goal of this research was to determine the effects of different levels of energy and protein in the diet of gilts during the growth and performance test on high daily gain, feed efficiency and quality of exploiting sterns under practical conditions of production.

MATERIALS AND METHODS

Tests were carried out on the pig farm PIK-"Bečej" in Bečej. Total of 80 gilts were divided into four groups of 20 heads according to the body weight and origin. Gilts were fed *ad libitum* with mixtures during the experiment. These mixtures differed in the level of protein and energy (Table 1). Within two-factorial experiment 2 x 2, two levels of energy and protein with appropriate structure of amino acids were examined. The first group used a mixture with 16% of protein and 13 MJDE/kg. The same protein level was in the second group but with 14.5 MJDE/kg. The third group used a mixture with

Table 1. Composition of the diets-first period of experiment 30 to 60 kg.

Group	I	II	III	IV
Level of protein	**Low**		**High**	
Level of energy	**Low**	**High**	**Low**	**High**
Corn	67.37	66.36	61.38	59.39
Wheat bran	5	0	5	0
Soybean meal	16	7	21	13
Full fat soy	0	12	0	12
Sunflower meal	6	6	7	7
Yeast	2	2	2	2
Oil	0	3	0	3
Lysine	0.13	0.14	0.12	0.11
Dicalcium phosphate	1	1	1	1
Limestone	1	1	1	1
Salt	0.5	0.5	0.5	0.5
Premix	1	1	1	1
Total	100	100	100	100
Crude protein (%)	16.25	16.02	18.29	18.47
Lysine (%)	0.91	0.91	1.04	1.05
Methionine + Cystine (%)	0.54	0.53	0.60	0.60
Tryptophane (%)	0.21	0.19	0.24	0.23
DE, MJ/kg	13.74	14.94	13.69	14.89
Calcium (%)	0.72	0.72	0.74	0.74
Phosphorus (%)	0.59	0.54	0.62	0.57

18% of protein and with 13 MJDE/kg, and the level of protein in the fourth group in the mixture was the same but the energy level increased to 14.5 MJDE/kg. With the body weight of 60 kg, protein level in all mixtures was reduced by 2%, so there was an expansion of the relationship between energy and protein.

During the entire experiment, gilts in all groups were fed *ad libitum* from automatic feeder. The experiment was completed at the same time in all groups, when the gilts reached a weight of 90 kg. At the end of the experiment, a weight, thickness of back bacon, content of meat in carcass and the feed consumption was assigned. The effect of the evaluated diet treatments is highly valued on the basis of the dynamics of growth, efficiency of feed exploitation and the quality of stern of gilts.

The experiment was carried out under practical conditions of production in the winter and in the buildings where the ambient temperature was lower than optimal, as the gilts were kept in boxes with the drop. In such conditions, the production of breeding gilts for all farms of PIK-Bečej was organized.

Thickness of back bacon and meat content in warm carcass was measured with the device model Krautkramer USM 22. All data (where it was possible) were processed with ANOVA and the differences between the groups were done by Duncan test.

RESULTS AND DISCUSSION

The level of protein and energy had a significant impact on the dynamics of growing gilts (Table 2). The lowest daily gain and the worst feed conversion were realized in the first group; where the level of protein and energy was the lowest. Growth in this group was 622 g, while the feed conversion was 3.75 kg. Increasing the energy level in group II led to a reduction in feed consumption at 3.23 kg and to the increase in daily gain of 656 g. Within group III and IV in which the level of protein increased by 2%, achieved daily gain amounted to 668 and 633 g, and the feed conversion was 3.67 and 3.16 kg. Looking at only the effect of protein, regardless of the level of energy, it was observed that, the increase in protein levels had a little impact on the production of gilts in terms of this research. At a higher level of protein, the daily gain was increased from 639 to 651 g respectively for 1.88%, and feed consumption per kilogram of gain was reduced from 3.49 to 3.41 kg or 2.3%.

Increased level of energy, regardless of the level of protein had no effect on the amount of daily gain, which was almost identical in both studied levels of energy but the higher level of energy significantly led to reduction of feed consumption per kilogram of gain. At a lower level of energy, consumption of feed amounted to 3.71 kg, and at a higher level, consumption was reduced to 3.19 kg or about 14%.

The level of protein and energy affected the quality of stern of gilts (Table 3). Content of meat was lower in first and second group; which were fed with mixtures of low levels of protein and it amounted to 50.57 and 49.63%. Increasing level of protein in group 3 and 4 led to an increase in meat content of 53.58 and 55.32%. Thickness of back bacon was higher in groups which were fed with mixtures of low levels of protein and it was 14.40 and 16.55 mm in the second group. In group 3 and 4, which were fed with mixtures of higher levels of protein; bacon

Table 2. Daily weight gain, feed conversion and consumption.

Group	I	II	III	IV
Protein level	**Low**		**High**	
Energy level	**Low**	**High**	**Low**	**High**
Number of gilts	20	20	20	20
Body weight (kg)				
At start	33.25	33.45	33.15	33.20
At the end	88.65	91.85	93.33	89.50
Daily weight gain (kg)	622^{a}	656^{a}	668^{b}	633^{a}
Feed conversion	3.75	3.23	3.67	3.16
Feed consumption (kg/day)	2.28	2.07	2.43	2.03

Effect of protein level	**Low**	**High**
Daily weight gain (g)	639	651
Feed conversion	3.49	3.41
Feed consumption (kg/day)	2.17	2.23
Effect of energy level	Low	High
Daily weight gain (g)	649	644
Feed conversion	3.71	3.19
Feed consumption (kg/day)	2.35	2.05

a - b = P<0.05; a – a = non significant.

Table 3. Carcass quality of gilts.

Group	I	II	III	IV
Protein level	**Low**		**High**	
Energy level	**Low**	**High**	**Low**	**High**
Backfat, mm				
Back	16.9	19.2	14.78	13.65
Backfat P_2	14.40^{A}	16.55^{Aa}	12.89^{b}	10.40^{B}
Sacrum 1	20.55	21.6	18.94	17.25
Sacrum 2	19.95	21.3	18.83	16.95
Sacrum 3	23.95	26.0	23.39	21.65
Meat content (%)	50.57^{Aa}	49.63^{A}	53.58^{ABc}	55.32^{B}

A - B = P < 0.01; a - b; a - c = P < 0.05; A - A = non significant.

thickness was smaller and amounted to 12.89 mm in the third and 10.40 mm in the fourth group.

Exclusion of a large number of gilts who for the first time gave birth and young sows from breeding is often the result of introducing the gilts with small body mass and little energy reserves in the organism, in the process of reproduction, which is very often the case for extremely meat animals (Whittemore et al., 1980; Gueblez et al., 1985; Esbenshade et al., 1986; Challinor et al., 1996; Stančić, 2002; Kovčin et al., 2005). Since on the basis of the performance test, gilts with a maximum content of meat and bacon minimum thickness were selected as a very serious problem is the question of how to prepare gilts with the highest potential meatiness for the big load in the process of reproduction. Close and Cole (2000) proposed that after the completion of performance test level, the quality of protein should be reduced which will lead to the slowdown in growth and an increase in reserves of energy in the body. They also suggested that, the back bacon thickness should be at least 18 to 20 mm during the period of mating.

Gilts in the conditions of these studies did not achieve high enough daily gain so they could have body mass of 120 to 130 kg, during the mating, despite increasing levels of protein and energy. The probable reason for this is the unfavorable conditions under which tests were performed. The experiment was conducted in the winter in the house which was half-open and where growing gilts were kept for all farms of PIK-Bečej. Under these conditions, most of the feed was spent on nutritional needs of animals which must be reflected on the dynamics of growth.

By keeping gilts in conditions of very low temperature environment, Trottier and Johnston (2000) propose that, it reduce the level of protein, lysine and minerals in the feed since the feed consumption during decreasing of the ambient temperature significantly increases. Under these conditions, there is a surplus generated in the metabolism of these substances which can not be used.

Conclusion

In order to determine the effect of protein and energy levels on the dynamics of growth, efficiency and quality of feed exploitation of gilts stern in prepubertal period of development, an experiment was carried out in which 80 gilts with body weight of about 30 kg were divided into four groups with 20 animals according to body weight, and racial background. Examined protein level was 16 and 18% in the first phase and 14 and 16% in the second phase, while the energy level was 13 and 14.5 MJDE/kg. The experiment lasted until the body mass reached 90 kg when the measurement of the back bacon thickness and meat content in carcass was made. According to this experiment, conclusions can be drawn that an increase in the level of protein in the diet gilts did not lead to statistically justifiable increase in daily gain, or it had a big impact on a feed conversion. Higher levels of proteins led to a statistically significant increasing in content of meat in hot carcasses and reduced the thickness of back bacon. Increasing level of digestible energy did not have an impact on the daily gain but it resulted in significant improvement of feed conversion. Consumption of feed per day feeding was reduced in the groups where the level of digestible energy was increased. Digestible energy level had no effect on the weight of back bacon, considering that the higher energy level led to increase in thickness of the bacon in the group with lower levels of protein, whereas in the group with higher levels of protein, increasing the content of digestible energy led to a reduction in thickness of bacon.

Based on the presented data, it can be concluded that an increase in protein levels above 16% in the first phase of the test and 14% in the second phase in terms of these investigations was not justified since it did not led to significant improvements of natural basic parameters of production. Increasing the concentration of power has its justification, especially in the winter period when the ambient temperature is often below the lower critical threshold.

REFERENCES

Beltranena E, Aherne FX, Foxcroft GR (1993). Innate variability in sexual development irrespective of body fatness in gilts. J. Anim. Sci., 71(2): 471-80.

Challinor CM, Dams G, Edwards B, Close WH (1996). The effect of body condition of gilts at first mating on long-term sow productivity. Anim. Sci., pp. 62-660.

Chen P, Baas TJ, Mabry JW, Koehler KJ (2003). Genetic correlations between lean growth and litter traits in U.S. Yorkshire, Duroc, Hampshire, and Landrace pigs. J. Anim. Sci., 81(7): 1700-1705.

Close HW, Cole DJA (2000). Nutrient of sows and boars. Notthingham, UK: Nottingham University Press.

Esbenshade KL, Britt JH, Armstrong JD, Toelle VD, Stanislaw CM (1986). Body condition of sows across parities and relationship to reproductive performance. J. Anim. Sci., 62(5): 1187-93.

Gueblez R, Gestin JM, le Henaff G (1985). Effect of age and epaiseur of back fat at 100 kg on the career reproductive sows of Large white. *J de la Researche Porcine en France*, 17: 113-120.

Kovčin S (1993). Pigs nutrition. Novi Sad, Faculty of Agriculture.

Kovčin S, Stančić B, Stanaćev V, Beuković M, Korovljev Z, Pejin B (2006). Feeding pigs a condition of efficient reproduction. Contemporary Agric., 55(1-2): 111-117.

Rydhmer L, Johansson K, Stern S, Eliasson-Sellnig L (1992). A genetic study of pubertal age, litter traits, weight loss during lactation and relations to growth and leannes in gilts. Acta Agric. Scand., 42: str. 211-219.

Stančić BL, Veselinović S (2002). Biotechnology in the reproduction of domestic animals. Novi Sad, Faculty of Agriculture. A textbook for postgraduate studies

Trottier LN, Johnston LJ (2000). Feeding gilts during development and sows during gestation and lactation. u: Lewis J.A., Southern L.L. (ur.) Swine nutrition.

Whittemore CT, Franklin MF, Pearce BS (1980). Fat changes in breeding sows. Anim. Prod., 31: 183.

Whittemore TC (1987). Tactics and strategies for the nutrition of breeding sows. u: Elements of pig science, Longman Handbooks in Agriculture.