

EFFECT OF THE INJECTIVE APPLICATION OF SELENOPYRAN ON THE PRODUCTIVITY IN GROWING GILTS

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Abstract

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The trace element selenium plays an important role in the biochemical processes of the living organisms. The wide application of the selenium-contented food additives is based on its antioxidative, cancer prevention and anti-inflammatory effects.

A scientific and economic trial, comprising two groups of gilts from the Danube White, was carried out at the Agricultural Institute, Shumen. The aim of the present work was the study of the selenopyran effect on the growing intensity and meat quality in gilts.

The trial started at 30.4-30.5 kg live weight and at 120 days of age, and finished at reaching 100 kg live weight. The groups were equalized by age, origin and live weight. The animals were raised and fed individually with equal rations.

Percutaneous injection of selenopyran in the form of oil solution was given to the gilts from the experimental group, in dose of 0.1 mg/kg live weight, every 30 days. Slaughter analysis was performed after finishing the trial, and the meat quality was estimated by the control slaughtering method.

A trend for higher daily gain by 8 % in the gilts from the experimental group during the first sub-period (up to 60 kg) compared to the control group has been shown. The higher daily gain of 29 g (4.5%) in the animals treated with selenopyran was kept and the difference was significant by the whole experimental period. The gilts from the experimental group had significantly lower feed conversion ratio (by 278 g) and nutrients (by 9%, $P < 0.05$) during the first sub-period (up to 60 kg live weight).

The results about the slaughter traits shows a trend for higher content of meat in the hind ham (by 69 g) and the weight of the right half (by 236 g) in the experimental group, whereas with respect to *m. long. dorsi* area (by 0.89 cm²) and percentage of meat in the right half (by 1.18%) the differences are in favor of the control gilts. Fat thickness average from five measurements was not substantially influenced by the application of selenopyran.

The gilts treated with selenopyran had meat with lower water holding capacity (WHC) (free water - 31.87%)

compared to the animals from the control group - 30.54% (by 1.33%, (PJ0.05). There are significant differences for the loss at roasting. Its value is lower by 3.2% (PJ0.05) for the meat of the treated animals.

Key words: selenopyran, gilts, productivity

Introduction

The trace element selenium is incorporated at least in 30 selenoproteins, which play an important role in the biochemical processes of living organisms (Kryukov et al., 2003). The wide application of the selenium-containing food additives is based on its antioxidative (Neve, 1996), cancer prevention and anti-inflammatory effects (Clark, 1996; Arthur et al., 2003; Ullrey, 1992; Levander, 1986).

In addition, selenium is essential for optimal immune function (Боряев, 2005; Oldfield, 2003). Besides, three of selenoproteins are thioredoxin reductases and influence thyroid hormone metabolism, which actively participates in the energy metabolism that is very important for the productivity of agricultural animals. (Kryukov et al., 2003; Gromer et al., 2004).

The use of the inorganic selenium is limited by reason of its high toxicity. As an alternative should be recommended the organic compound selenopyran (9-phenyl-symmetrical octahydroselenoxantene $C_{19}H_{22}Se$), which was synthesized from academician A.F. Blinokhvatov in Penza State Agricultural Academy, Russia in 1981. Selenopyran in comparison with inorganic selenium possesses lower toxicity, fat solubility and positive influence on the immune function in young animals (Boryaev et al., 1999). During the experiment (Boryaev and Ostapchuk, 2005) it was established that selenopyran compared with sodium selenite in pregnant cows enhances the immunoglobulin level in milk and immunological state of new-born calves. The effect of selenopyran on the growth rate of pigs has not been profoundly investigated.

The objective of this study was to estimate the selenopyran effect on the growth rate and carcass quality in gilts.

Material and Methods

A scientific and economic trial, comprising two groups of gilts from the Danube White, with 9 gilts in each group, was carried out at the Agricultural Institute, Shumen. The trial started at 30.4-30.5 kg live weight and at 120 days of age, and finished at reaching 100 kg live weight. The groups were equalized by age, origin and live weight.

The animals were raised and fed individually with equal rations. They received water *ad libitum* from nipple drinkers.

Percutaneous injection of selenopyran in the form of oil solution was given to the gilts from the experimental group, in dose of 0.1 mg/kg live weight, every 30 days. Slaughter analysis was performed after finishing the trial, and the meat quality was estimated by the control slaughtering method.

The data was statistically processed. The significance of differences was determined by Student's method.

Results and Discussion

The amounts of compound feed and nutrients consumed by the gilts (Table 1) are practically equal as for the separate periods as for the whole experimental period.

The average daily gain is in the range from 615-662 g to 673-709 g. There is a trend for higher daily gain by 8 % in the gilts from the experimental group during the first sub-period (up to 60 kg) compared to the control group. The animals from the experimental group had insignificant lower daily gain by 5 % during the second sub-period (from 60 to 100 kg). The trend for higher daily gain in the animals treated with

Table 1
Feed intake, average daily gain and feed conversion per kg gain

Groups	I sub-period				II sub-period				The whole experimental period			
	I		II		I		II		I		II	
	$\bar{x}$	C	$\bar{x}$	C	$\bar{x}$	C	$\bar{x}$	C	$\bar{x}$	C	$\bar{x}$	C
Feed intake, per capita/day												
Compound feed, kg	2.0	8.1	1.9	10.4	3.0	1.6	3.0	2.7	2.5	5.3	2.5	4.9
Metabolizable energy, MJ	24.9	8.1	24.4	10.4	39.0	1.7	38.7	2.7	31.4	5.3	31.7	4.9
Protein, g	314.4	8.1	308.5	10.4	407.6	1.7	404.4	2.7	357.0	5.3	357.5	4.9
Lysine, g	17.0	8.1	16.7	10.3	21.9	1.7	21.7	2.7	19.3	5.3	19.0	5.0
Live weight, kg												
- at the beginning of the period	30.4	14.1	30.5	10.1	64.3	1.6	64.3	7.0	30.4	14.2	30.5	10.1
- at the end of the period	64.3	4.8	64.3	7.0	98.9	1.0	100.0	1.6	98.8	2.8	100.0	1.6
Average daily gain, g	615	11.9	662	14.2	709	4.9	673	11.0	639	13.5	668	11.1
%	100.0	-	107.6	-	100.0	-	94.9	-	100.0	-	104.5	-
Feed conversion ratio												
Compound feed, kg	3.2	9.8	2.955a	8.3	4.4	5.7	4.5	11.0	3.8	9.1	3.8	10.8
Metabolizable energy, MJ	40.7	9.8	37.12a	8.3	56.3	5.7	58.1	11.0	48.3	9.1	47.9	10.8
Protein, g	515.2	9.8	469.6a	8.3	578.7	5.7	606.4	10.9	548.2	9.1	540.0	10.8
Lysine, g	27.9	9.8	25.4a	8.3	31.6	5.7	32.6	11.0	29.6	9.1	29.0	10.8

Table 2
Slaughter traits

Groups	I			II		
	(control)			(with selenopyran)		
	$\bar{x}$	E	C	$\bar{x}$	E	C
Traits						
Live weight ,kg	98.71	0.36	0.96	99.50	0.57	1.61
Output ,%	69.06	1.22	3.23	68.95	1.26	3.57
Real ham ,kg	7.59	2.32	6.14	7.53	2.14	6.05
Real ham meat ,kg	5.72	3.80	10.06	5.72	2.82	7.98
Real ham fat ,kg	1.87	4.51	11.92	1.80	5.36	15.15
Shin total , kg	1.44	3.96	10.47	1.51	4.16	11.76
Shin meat , kg	1.07	4.90	12.97	1.13	4.28	12.09
Shin fat , kg	0.37	5.08	13.45	0.39	7.10	20.09
Hind ham total ,kg	9.03	2.03	5.37	9.04	2.14	6.04
Hind ham meat , kg	6.78	3.60	9.53	6.85	2.76	7.81
Hind ham fat , kg	2.24	3.97	10.51	2.19	5.34	15.10
Right half, kg	34.16	1.15	3.05	34.40	1.62	4.59
Right half meat, kg	23.88	2.58	6.82	23.61	2.76	7.79
Meat, %	69.85	1.68	4.46	68.67	2.50	7.08
Right half fat, kg	10.28	3.32	8.79	10.79	5.82	16.47
Right half fat, %	30.15	3.90	10.32	31.33	5.48	15.51
Small slaughter length ,cm	80.21	0.69	1.83	81.25	0.60	1.71
Large slaughter length , cm	93.21	1.15	3.05	94.31	0.68	1.92
m.long.dorsi area , mm ²	41.29	5.51	14.56	40.40	4.40	12.45
Fat thickness:						
Average of 3 measurements,mm	22.90	6.29	16.64	22.42	6.39	18.07
Average of 5 measurements,mm	23.94	6.13	16.21	23.38	6.04	17.07

selenopyran was kept and the difference of 29 g (4.5%) was significant. According to Marchev et al. (2008) enhancing the body defense by increasing the amount of immunoglobulin G (6.141 g/l in the experimental and 5.950 g/l in the control group) most probably helped the animals to use better their genetic potential for growth rate.

Analogical results have been obtained by Shimkus et al. (2005) by supplementing selenium-methionine in the compound feed for pigs from weaning up to slaughtering (100 kg). The authors have established that the supplement of selenium-methionine increased the daily gain by 7.3% during the growing period and

more slightly during the finishing period. As a result from the whole experimental period, the daily gain is higher by 3 % in the animals received selenium-methionine.

Borjaev and Ostapchuk (2005) established a positive effect on the growth rate in calves received selenium-methionine in the first three months after birth.

The gilts from the experimental group had significantly lower feed conversion ratio (by 278 g) and nutrients (by 9%, $P < 0.05$) during the first sub-period (up to 60 kg live weight). Utilization of compound feed and nutrients was better in the experimental animals during the whole experimental period, although

Table 3
Chemical composition of MLD, %

Groups	I			II		
	(control)			(with selenopyran)		
	$\bar{x}$	E	C	$\bar{x}$	E	C
Traits						
Water, %	74.07	0.43	1.13	73.99	0.51	1.44
Fat, %	3.73	7.37	19.50	3.96	6.77	19.14
Mineral traces, %	1.16	2.72	7.19	1.13	1.76	4.97
Protein, %	21.04	0.99	2.63	20.97	1.84	5.12
WHC, %	30.540a	1.29	3.40	31.870a	1.46	4.12
pH1	6.24	0.86	2.28	6.24	0.33	0.93
pH2	5.92	0.54	1.43	5.93	0.69	1.95
Colour, nm	22.83	3.26	8.62	24.84	3.74	10.57
Loss at boiling, %	44.29	4.56	12.07	42.63	1.98	5.60
Loss at roasting, %	44.429a	2.24	5.94	47.625a	1.68	6.50
Muscle fibre thickness, μm	44.04	4.20	11.11	41.78	3.95	11.18

it was not significant.

The slaughter traits of the experimental groups are given in Table 2. It becomes clear from the results that the injective application of selenopyran does not lead to substantial differences between the traits studied.

There is a trend for higher content of meat in the hind ham (by 69 g) and the weight of the right half (by 236 g) in the experimental group, whereas with respect to *m. long. dorsi* area (by 0.89 cm²) and percentage of meat in the right half (by 1.18%) the differences are in favour of the control gilts. Fat thickness average from five measurements was not substantially influenced by the application of selenopyran. Our results are in unison with those of Morel et al. (2008), who do not find significant differences in the fattening and slaughter qualities due to the use of Se and vitamin E. The same authors demonstrate a significant increase in the intramuscular fat (PJ0.05). There are differences with respect to the lipid content of fat, but there are not significant differences for the fat thickness in point P₂.

The gilts treated with selenopyran had meat with lower water holding capacity (WHC) (free water - 31.87%) compared to the animals from the control

group - 30.54% (by 1.33%, (PJ0.05) (Table 3). There are significant differences for the loss at roasting. Its value is lower by 3.2% (PJ0.05) for the meat of the treated animals. Taking into account the abovementioned, a conclusion can be drawn that substantial effect on the meat quality from MLD of the gilts treated with selenopyran has not been established.

Conclusions

The use of organic selenium in the form of selenopyran in gilts has a positive, although insignificant effect on the growth rate mainly during the growing period.

The slaughter qualities as well as the quality of meat from *m. long. dorsi* have not been influenced by the injective application of selenopyran in gilts.

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