

Effectiveness of using Elevit feed additive in pig feeding

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Abstract. In a number of experiments, adding of Elevit feed additive in the amount of 100, 150, 200, or 250 grams per day to the basic ration of breeding boars helps to increase sperm production by 5.0, 8.6, 11.9, and 11.1% in comparison with the control group of boars. In the boars of experimental groups, qualitative parameters of sperm increased as following: sperm resistance by 6.6, 8.1, 12.3, and 11.9%; the ability of sperm cell to live outside the body by 6.0, 6.7, 7.4, and 8.1% in comparison with the control group. Adding this drug at the dose of 50, 100, 150, and 200 g to the basic diet of sows during the period of their preparation to insemination has a favorable effect on increasing the following parameters: sexual heat by 5.0, 10.0, 10.0, and 10.0%; productive insemination by 1.0, 7.1, 1.9, and 7.1%; number of piglets in a litter by 2.8, 6.6, 7.6, and 5.7% in comparison with the control group.

1 Introduction

One of the priority spheres that determine country's development prospects is providing the population with high-quality domestic food products. An important role in solving this problem is played by one of the most effective sectors – pig farming [1,3,4].

Phytogenic feed additives include more than 100 components that are the basis of many active substances, for example, essential oils, medicinal bitters, saponins, flavonoids, and others [2,6,7,11,12,13,14,15].

Increased feeding is an important issue in raising piglets and lactating sows. Increased feed using is important for the development of the gastrointestinal tract of piglets, increasing milk of sows and maximal weight gain in piglets [5,8,9,10,24-27].

It is planned to apply a large range of measures during the implementation of different programs for improving pig farming that are aimed at implementation the best practices of domestic and foreign companies that comply with international standards and provide:

- minimum amount of feed, i.e. not more than 3.5 kg per 1 kg of weight gain. It can be achieved with the use of modern equipment and balanced rations;
- applying high-tech equipment in all technological processes (whether it is imported or of domestic origin); it allows automating the production process to the maximum extent, reducing energy costs and creating optimal microclimate parameters in premises;
- the main measure is the use for production of livestock with high genetic potential what ensures a minimum fattening period and maximum growth at minimum expenses;

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- training highly qualified personnel for work in pig farming; it is an important issue; they should be perfect in applying all the technologies used at the enterprise.

Industrial pig farms, when drawing up diets for pigs and when growing modern highly productive crosses, try to use different balancing feed additives and vitamin preparations which, in turn, help to fully ensure the complete feeding of animals.

OOO Vita company (Belgorod Region) has produced Elevit feed additive based on wheat germ flour.

During this laboratory and production experiment, physiological and biochemical studies were carried out using standard methods.

Studies on the effect of Elevit feed additive on the productive qualities of pigs were carried out by the comparative method of analogous groups; biometric analysis was also used. Reproductive parameters of sows, such as fertility, multiple fetation and size of fetus, were defined by evaluating the actual farrowings.

Live weight was determined on the basis of individual weighing of piglets. All groups of pigs received balanced diets in accordance with the standards of the All-Russian Institute of Animal Husbandry. Sperm from breeding boars-producer was taken using a manual method. Sperm quality was assessed in a routine way. For insemination, the sperm used was diluted with GCCS (glucose, chelate, citrate, sulfate) medium depending on the concentration of motile sperm cells in it.

2 Results

The first experiment was carried out in “Gorin Kolkhoz” agricultural production cooperative where the effectiveness of using Elevit feed additive when feeding pigs was studied. 15 Landrace breeding boars at the age of 2.5-3 years were divided by the principle of analogues into five groups (one control group and four experimental ones).

Quantitative parameters of sperm of boars are shown in Table 1.

Table 1. Quantitative parameters of sperm of boars depending on giving them Elevit feed additive.

Test groups	Feeding of boars	Number of animals	Number of ejaculates	Quantitative parameters of boar sperm		
				Sperm volume, mL	Concentration of sperm cells in 1 mL of sperm, mln	Total number of sperm cells in ejaculate, bln
1	Basic diet	3	12	303.0±1.3	183.0±1.5	54.8±1.9
2	BD+100 g of Elevit feed additive	3	12	311.0±1.3	213.0±1.8	65.8±1.5
3	BD+150 g of Elevit feed additive	3	12	316.0± 1.2	217.0±1.5	68.1±1.4
4	BD+200 g of Elevit feed additive	3	12	319.5±1.4	221.0± 1.2	70.1±1.6
5	BD+250 g of Elevit feed additive	3	12	318.0± 1.7	219.6±1.4	69.5±1.6

Zoological hygiene parameters were the same for experimental and control groups, the only differences were in feeding animals. Breeding boars of the first group received standard compound feed K-57-2 in the amount of 3.5 kg for animal per day. The second, third, fourth, and fifth groups in addition to the basic diet received Elevit feed additive at the dose of 100, 150, 200, and 250 grams for 1 animal per day, respectively. Elevit feed additive was given to the boars of experimental groups (groups 2-5) during 60 days. 12 ejaculates were obtained from each boar in the course of this period.

Analysis of Table 2 revealed that adding Elevit feed additive in doses of 100, 150, 200, and 250 grams to the main diet increases the volume of ejaculates by 2.6, 4.3, 5.4, and 4.9%, respectively.

An increase in sperm concentration by 0.9, 2.8, 4.7, and 4.5% per 1 mL of sperm was noted for the relevant groups. Total sperm count in the ejaculate also increased by 3.6, 7.2, 10.4, and 9.4% in comparison with the control group 1.

Analysis of the data in Table 2 results in the conclusion that using Elevit feed additive leads to better qualitative sperm parameters in breeding boars. So, in experimental groups (groups 2-4), sperm resistance outside the body increased by 5.5, 6.4, 11.8, and 11.6%, respectively, and viability increased by 9.7, 10.4, 11.1, and 13.8%, respectively, in comparison with the control group 1.

Table2. Qualitative parameters of sperm of boars depending on giving them Elevit feed additive.

No.	Number of animals	Number of studied ejaculates	Qualitative parameters of sperm		
			Motility, points	Resistance	Living outside the body, hours
1	3	12	8.1±0.01	1,118.0±60	72.0 ±1.2
2	3	12	8.1±0.01	1,180.0±80	79.0 ±1.3
3	3	12	8.1±0.01	1,190.0±75	79.5±1.1
4	3	12	8.2±0.01	1,250.0±60	80.0 ±1.2
5	3	12	8.2±0.01	1,248.0±65	82.0 ±1.4

Thus, results of the studies performed showed a positive trend in the assessment of quantitative and qualitative parameters of sperm of breeding boars when adding Elevit feed additive to their diet.

Effectiveness of using Elevit feed additive in the diets of breeding boars is shown in Table 3.

Table 3. Effectiveness of using Elevit feed additive in boars.

Parameters	Feeding animals				
	Basic diet	BD + 100 g of Elevit feed additive	BD+ 150 g of Elevit feed additive	BD + 200 g of Elevit feed additive	BD + 250 g of Elevit feed additive
Number of animals, pcs	3	3	3	3	3
Duration of experiment, days	60	60	60	60	60

Expenses for 1 animal per period, RUR	3,601.0	3,601.0	3,601.0	3,601.0	3,601.0
Cost of Elevit per 1 animal, RUR	0	485.0	725.0	965.0	1,205.0
Sperm doses obtained from 1 boar	178	2132	221	228	228
Cost of 1 sperm dose, RUR	20.46	19.16	19.85	19.79	21.40

Assessing economic parameters in Table 3, we can conclude that using Elevit feed additive in the amount of 100, 150, 200, and 250 grams in addition to the daily ration of breeding boars contributes to an increase in sperm doses per 1 male by 19.6, 23.5, 28.6, and 27.5%, respectively, for the studied groups.

The cost of 1 sperm dose was the lowest in group II when boars were given Elevit feed additive in the amount of 100 g in addition to the basic ration. It also should be noted that with the increase in the amount of Elevit feed additive from 100 grams to 200 grams, the number of sperm doses increased by 19.6-28.6%, and their cost increased at the same time but in these cases it did not exceed this of the control group.

Using Elevit feed additive in the amount of 250 grams in addition to the daily diet led to the fact that the cost of 1 sperm dose exceeded this of control group by 4.5% despite the fact that the number of sperm doses in group 5 was 27.5% higher than in the control group 1. This is obviously caused by the increasing cost of the diet of boars due to the increase in Elevit feed additive by 33% when compared with the control group 1.

The second experiment was carried out on replacement gilts; 100 animals were selected for this test. According to the principle of analogues, this population was divided into 5 groups. The age of these pigs was 8 months. Feeding conditions for replacement gilts were different, and keeping conditions were the same. Group 1 received basic diet according to the standards of the All-Russian Institute of Animal Husbandry.

Groups 2-5 were given Elevit feed additive at the dose of 50, 100, 150, and 200 g, respectively, in addition to BD.

The preparation was used in this age-sex group until signs of sexual heat appeared. This period was no more than 20 days. Gilts with the signs of heat within 21 days were transferred to an artificial insemination department (Table 4).

Table 4. Results of the effect of Elevit on the sexual heat of gilts.

No.	Feeding gilts	Number of animals	Gilts with the signs of sexual heat during 21 days	
			number	%
1	Basic diet	20	14	70.0
2	BD+100 g of Elevit feed additive	20	16	80.0
3	BD+150 g of Elevit feed additive	20	19	95.0

4	BD+200 g of Elevit feed additive	20	19	95.0
5	BD+250 g of Elevit feed additive	20	19	95.0

Table 4 demonstrate the values obtained. Gilts that were given Elevit feed additive in the amount of 50, 100, 150, and 200 g showed increase of sexual heat by 10.0, 25.0, 25.0, and 25.0%, respectively.

Effectiveness of using Elevit feed additive in young sows and results of insemination are shown in Table 5.

Data in Table 5 show that giving Elevit feed additive to replacement gilts in the amount of 50, 100, 150, and 200 g in addition to the main diet increases reproductive functions as following: fertility by 3.6, 7.5, 7.5, and 7.5%, respectively; multiple fetation by 2.1, 5.4, 5.4, and 5.4%, respectively. Fetus size in all groups of replacement gilts was similar and had no reliable differences.

Using Elevit additive during their preparation for insemination has a positive effect on the increase of sexual heat signs and reproductive function in gilts.

Table 5. Result of using Elevit feed additive in young sows.

No.	Feeding animals	Number of sows	From them farrowed		Total piglets, pcs		Fetus size, kg
			number	%	total	per 1 litter	
1	Basic diet	14	10	71.4	91	9.1±0.1	1.25±0.01
2	BD+50 g of Elevit	16	12	75.0	112	9.3±0.1	1.24±0.02
3	BD+100 g of Elevit	19	15	78.9	145	9.6±0.1	1.24±0.01
4	BD+150 g of Elevit	19	15	78.9	144	9.6±0.1	1.23±0.02
5	BD+200 g of Elevit	19	15	78.9	145	9.6±0.1	1.24±0.01

Positive changes in obtaining piglets could be noted when adding Elevit feed additive in the amount of 100-200 g to the basic diet of young sows.

Economic effectiveness of using Elevit feed additive in the diets of replacement gilts is shown in Table 6.

Table 6. Economic effectiveness of using Elevit feed additive.

Parameter s	Conditions of feeding				
	Basic diet	BD+50 g of Elevit	BD+100 g of Elevit	BD+150 g of Elevit	BD+200 g of Elevit
Number of animals, pcs	20	20	20	20	20
Number of gilts in heat during 21 days, pcs	14	16	19	19	19
Farrowed females, pcs	10	12	15	15	15
Multiple fetation, pcs	9.10	9.30	9.60	9.60	9.60

Total piglets, pcs	91	112	145	144	145
Expenses per 1 sow, RUR	96,006.0	96,006.0	96,006.0	96,006.0	96,006.0
Expenses for additive, RUR	0	800.0	1,600.0	2,400.0	3,200.0
Total expenses for piglets obtained, RUR	96,006.0	9,686.00	97,606.00	98,406.00	99,206.00
Cost of 1 piglet at birth, RUR	1,057.95	867.29	674.11	684.34	683.14
± to the control group, RUR	-	-190.65	-381.83	-371.60	-370.80
± to the control group, %	-	-18.01	-36.12	-35.21	-35.12

Results in Table 6 demonstrate the positive trend: giving Elevit feed additive to replacement gilts in the process of preparing them for insemination in the amount of 50, 100, 150, and 200 g per 1 animal in addition to their daily ration has increased their sexual heat by 10.0, 25.0, 25.0, and 25.0%, respectively. Reproductive rates increased as follows: fertility by 3.6, 7.5, 7.5, and 7.5%, respectively; multiple fetation by 2.1, 5.4, 5.4, and 5.4%, respectively; finally, it contributed to an increase in the total number of obtained piglets by 23.0, 59.3, 58.2, and 59.3%, respectively.

The final result influenced the cost of animals at birth; it decreased by 190.66, 381.84, 371.61, and 370.81 RUR, or 18.0, 36.1, 35.2, and 35.1%, respectively, in comparison with the control group.

The third experiment was conducted on sows; 100 animals were selected for this test. According to the principle of analogues, this population was divided into 5 groups. The age of these pigs was 2.5-3 years, after weaning piglets at 28 days.

Animals after being transferred to the reproduction department were in similar keeping conditions; the only differences were in the composition of diet. Group 1 received basic diet according to the standards of the All-Russian Institute of Animal Husbandry.

Groups 2-5 were given Elevit feed additive at the dose of 50, 100, 150, and 200 g, respectively, in addition to BD. Preparation was used in this age-sex group until signs of sexual heat appeared. This period was no more than 20 days. Animals with the signs of heat within 21 days were transferred to an artificial insemination department (table 7).

Table 7. Effect of giving a feed additive to adult sows on the effectiveness of their insemination.

Test groups	Conditions of feeding sows	Number of inseminated sows	From them – farrowed		Piglets obtained, pcs		Fetus size, kg
			number	%	total	per 1 litter	
1	Basic diet	17	14	82.3	148	10.5±0.1	1.25
2	BD+50 g of Elevit	18	15	83.3	163	10.8±0.1	1.24
3	BD+100 g of	19	17	89.4	191	11.2±0.1	1.25

	Elevit						
4	BD+150 g of Elevit	19	17	89.4	190	11.1±0.1	1.27
5	BD+200 g of Elevit	19	17	89.4	189	11.1±0.1	1.26

Sows with the signs of heat within 21 days were transferred to an artificial insemination department; they were inseminated twice, first time immediately after sampling and once again, in 24 hours.

Adding Elevit feed additive in the amount of 50, 100, 150, and 200 g to BD of adult females after weaning offspring led to an increase in their sexual heat by 5.0, 10.0, 10.0, and 10.0%, respectively.

Results in Table 7 demonstrate the positive trend: giving Elevit feed additive to sows in the process of preparing them for insemination in the amount of 50, 100, 150, and 200 g per 1 animal in addition to their daily diet increased their reproductive parameters as follows: fertility of sows by 1.0, 7.1, 7.1, and 7.1%, respectively; multiple fetation by 2.8, 6.6, 5.7, and 11.1% respectively.

Using Elevit for feeding sows results in better transfer of nutrients and energy from feed into milk and in reduced risk of additional loss of live weight by lactating animals.

The greatest positive result, i.e. the maximum number of piglets at birth, was achieved by using Elevit feed additive in the amount of 100-200 g per 1 adult sow.

Final conclusion about the optimal dose of Elevit feed additive for sows can be made by analyzing economic efficiency; the information is shown in Table 8.

Table 8. Economic effectiveness of using Elevit feed additive on the signs of sexual heat in sows.

Parameters	Conditions of feeding sows				
	Basic diet	BD + 50 g of Elevit feed additive	BD + 100 g of Elevit feed additive	BD + 150 g of Elevit feed additive	BD + 200 g of Elevit feed additive
Number of animals, pcs	20	20	20	20	20
Number of sows with the signs of sexual heat during 21 days	17	18	19	19	19
Number of farrowing sows	14	15	17	17	17
Total piglets obtained, pcs	148	163	191	190	189
Expenses for keeping 20 sows for 120 days, RUR	9,606.0	9,606.0	9,606.0	9,606.0	9,606.0
Expenses for Elevit feed additive, RUR	0	805.0	1,605.0	2,405.0	3,205.0
Total expenses for piglets obtained, RUR	96,000.0	96,805.0	97,605.0	98,405.0	99,205.0
Cost of 1 piglet at birth, RUR	649.64	594.86	511.99	518.89	525.86
- in comparison with the first group, RUR	0	-54.78	-137.65	-130.75	-123.78

Data in Table 8 show that the adding Elevit feed additive in the amount of 50, 100, 150, and 200 g to the diet of sows during the period or preparing them for insemination led to the increase of their fertility, multiple fetation, and also has a positive effect on their sexual heat.

It finally led to the fact that the total number of piglets obtained also increased by 10.1, 29.0, 28.3, and 27.7%, respectively. Cost of piglets at birth decreased slightly by 54.78, 137.65, 130.75, and 123.64 RUR. If this is expressed as a percentage, then it amounts to 8.4, 21.2, 20.1, and 19.0% in comparison with the control group 1.

Analysis of the abovementioned material reveals that adding Elevit feed additive to the diet of sows in the period of their preparation for insemination brings positive results.

3 Conclusions

Analysis of the results obtained revealed that using Elevit feed additive in pigs gave a positive effect. But it should be noted that the best results in the terms of productivity and economic efficiency were obtained at the following doses: for breeding boars – 100 g in addition to the basic diet, for replacement and adult sows during their preparation for insemination – 100 grams in addition to the basic diet, for piglets during growing period from 1 to 3 months – 10 grams per day per 1 animal in replacement of compound feed, for piglets in fattening period – 1.0% in addition to the basic diet during 30 days from 4 to 5 months.

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