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THE EFFECTIVENESS OF NEW VITAMIN-ENZYME COMPLEX IN THE DIETS OF PIGS

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Abstract

The enzymatic activity of pigs' digestive tract increases with the age, however, the increase in consumption of vegetable feeds, which are the main source of carbohydrates and proteins, requires large metabolic costs of the body for their digestion. However, the store pigs' digestive system is not yet fully formed in functional and morphological state. For this reason, the organization of pigs feeding requires the use of enzymes of exogenous origin, since the synthesis of certain hydrolytic enzymes in animals is fully absent.

The possibility of replacement of well known enzyme preparations (Agrocel -15g, Agrofit - 30g and Ronozim ProAct) to new vitamin-enzyme complex in pigs diets, is considered in the article. During the experiments on weanling pigs, it was set high pharmacological efficacy of the studied vitamin-enzyme complex. After its application, the average daily gains of pigs increased by 39.6% compared with the control group. The protein level in the blood serum increased by 3.6%; the activity of aspartate aminotransferase and lactate dehydrogenase decreased to physiological norm (by 20.5 and 15.3%, respectively); the level of creatinine decreased by 17.4%. Based on the conducted research, we recommend adding into the diet of weanling pigs, developed by us vitamin-enzyme complex at the rate of 6.3 g/kg of feed, replacing by them standard enzyme supplements.

Keywords: enzymes, vitamins, pigs, pharmacological efficacy, diets.

Introduction

The relevance of the topic. The increase of pigs' productivity is largely dependent not only on the food supply sector, but also on the rational use of feed resources. It is known, that the usefulness of diet can be supported by adding of enzymes (Okolelova T.M. et al, 2001; Noskov S.B. et al, 2011). This greatly reduces the waste of young

animals, increases feed digestion and reduces their cost per unit of products, that will allow to improve animal productivity while improving the quality of obtained products (Tarasenko O.A., 2009)

It was found, that the use of enzyme preparations while growing weanling pigs allowed to increase live weight by 9-17% and to increase safety, herewith to reduce the cost of feed per unit of production (Kupriyanov S.V. et al., 2007).

Due to the small volume of digestive tract and the absence of proventriculus, concentrated feeds have fundamental importance in the feed balance of pigs: their share in pig farms is more than 60% of the nutritious substances, in large complexes - 75-95%. Pigs are fed by milled grain of cereals and legumes, grass and grass meal, wastes of flour-milling industry (Alekseev V.A. 2007; Tarasenko O.A. 2009).

The main drawback of these feeding crops is that they contain anti-nutritional non-starch polysaccharides, such as β -glucan, arabinoxylan, cellulose. These substances are not degraded by own enzymes of the animals digestive tract, and, being the main components of the endosperm cell walls and membranes of grains, prevent the effects of digestive enzymes on the cell contents (protein, starch, etc.) and decrease their digestibility (Kononenko, S.I., 2009, Kupriyanov, S.V., 2007).

In the digestive tract of pig, its own enzymes are produced, and feeds nutrients are digested with the help of them. However, these animals have almost no own enzymes, digesting non-starch polysaccharides, and due to that, they virtually are not digested by the body. Moreover, non-starch polysaccharides prevent the access of its own enzymes to other nutrients and their digestion.

Non-starch polysaccharides have another negative property - they intensively swell, forming viscous, adhesive-like solutions, limiting the absorption of already digested protein, starch, fat and other important biological compounds. As a result, the concentration of unabsorbed nutrients increases in intestinal content. This contributes to the development of conditionally pathogenic microflora in the lower bowels, that further creates problems with the health of pigs.

Therefore, the use of enzymes facilitates the selection of the food base, that allows to work with all types of diets. The use of enzyme compositions makes it possible to use cheaper feeds and to receive good results (Tarasenko O.A., 2009).

The problem of non-starch polysaccharides fermentation can be solved through the use of specialized enzyme preparations. Using the enzyme preparations, the nutrients are extracted more fully and the energy releases, the

digestibility of proteins increases, the costs of feed on live weight gain reduce, and, thus, the efficiency of production increases (Kupriyanov, S.V., 2007).

The use of enzymes facilitates the selection of the food base that allows to work with all types of diets. The use of enzyme compositions makes it possible to use cheaper feeds and to receive good results (Reznichenko L.V. et al., 2015).

Based on this, we together with the employees of CJSC "Petrohim" (Belgorod) developed new vitamin and enzyme additive. Its composition: pepsin- 1.5 mg, pankreaza - 1.5 IU; vitamins, per 1 g: A - 500ME; E - 0.74 mg; B1 - 0.17 mg; B2 – 0.17 mg; D3- 44 IU; B6- 0.18mg; PP - 2 mg; folic acid - 0.06 mg; pantothenic acid - 0.75 mg; biotin - 0.002 mg; B12 - 0.36 mcg; C - 9.2 mg; citric acid - 20 mg; remaining - sucrose.

The aim of our study was to investigate the possibility of using this vitamin and enzyme additive in diets of pigs as a substitute for other enzyme preparations.

Materials and Methods

Clinical characteristics, changes of protein, carbohydrate and mineral metabolism, the intensity of growth and productivity of animals showed the influence of vitamin and enzyme additives on the animals' bodies. Experimental studies were carried out in the collective farm n. a. Gorin, Belgorod region.

The formation of the groups was carried out taking into account animals breed, sex, age, body weight and state of health. Biochemical parameters were determined by generally accepted methods. At that, the hematology analyzer "Hitachi" was used.

Obtaining in all the experiments digital material is subjected to statistical processing on the personal computer, according to generally accepted methods of variation statistics with calculation of the Student argument (td). The difference between the compared values were considered significant at $p \leq 0,05$.

Results and Discussion

3 groups of weanling pigs, 25-day-old, 25 animals each, were formed for the experiment on the principle of analogues. The first group was the control and received standard diet with enzymes: Agrocel - 15 g, Agrofit - 30 g, Ronozim ProAct.

In the second experimental group we replaced all the enzymes with studied by us vitamin and enzyme additive. In the third experimental group, Ronozim ProAct was changed to vitamin and enzyme additive. The plan of the research is shown in Table. 1. The experimental period lasted for 3 weeks.

Table 1 – The plan of the research on pigs.

Groups	Additives	Dose: mg/kg of feed compound
1 - control	Agrocel	0,075
	Agrofit	0,15
	Ronozim ProAct	0,6
2 - experimental	Vitamin and enzyme complex	6,3
3 - experimental	Vitamin and enzyme complex	8,75
	Agrocel	0,075
	Agrofit	0,15

It should be noted that at the end of the experimental period, the highest average daily weight gains were observed in weanling pigs of the second and the third experimental groups (39.6 and 27% respectively, comparable to the control group), wherein the standard enzyme preparations were replaced to studied additive (Table 2).

At that, the amount of eaten feed in animals of experimental groups did not differ from the control group. This indicates about high feed conversion in pigs of the second and the third experimental groups.

Table 2 – The test results of vitamin-enzyme complex on pigs.

Indicators	Groups		
	1-control	2-experimental	3-experimental
Viability, %	100	100	100
The average weight of pigs at the beginning of the experiment, kg	6,95	7,0	6,95
The average weight of pigs at the end of the experiment, kg	9,9	11,13	10,7
Average daily gain, g	174	243	221
±to the control, %		+39,6	+27
The amount of eaten feed compound during the experiment, kg	174	175	174

When analyzing the morphological composition of the pigs' blood, the significant changes were not found, however, some differences (Table 3) have been defined according to blood biochemical indicators.

Table 3 – Biochemical blood indicators of pigs.

Indicators	Groups		
	1-control	2-experimental	3-experimental
Basic data			
Total protein, g/l	54,3±1,18	53,3±1,16	53,7±1,21
Albumin, g/l	32,8±1,20	33,0±1,19	34,2±1,23
Calcium, mmol/l	2,23±0,50	2,46±0,40	2,31±0,47
Phosphorus, mmol/l	2,54±0,33	2,47±0,39	2,36±0,22
BUN, mmol/l	3,4±0,42	3,8±0,28	3,6±0,31
Creatinine, umol/l	101,4±2,87	100,6±2,92	102,3±2,14
LDH, Unit/l	1440	1462	1457

AAT Unit/l	36,4±2,12	35,2±1,98	35,9±1,86
ALT Unit/l	38,9±1,50	38,7±1,33	37,8±1,49
After the use of preparations			
Total protein, g/l	54,3±1,18	56,3±1,16	57,4±1,21
Albumin, g/l	36,3±1,29	30,3±1,27	34,4±1,21
Calcium, mmol/l	2,7±0,33	2,8±0,29	2,9±0,41
Phosphorus, mmol/l	2,8±0,30	2,5±0,32	2,4±0,27
BUN, mmol/l	2,9±0,27	1,6±0,30	3,2±0,25
Creatinine, umol/l	102,4±3,87	84,6±3,92**	101,0±3,14
LDH, Unit/l	1431±41,34	1212±43,42**	669±56,53***
AAT Unit/l	83,4±2,46	66,3±2,50**	45,8±2,64***
ALT Unit/l	47,44±1,42	46,32±1,64	48,10±1,56

** - $p < 0,01$;

*** - $p < 0,001$

So, at the end of the trial period in the experimental groups of pigs, where the standard enzyme preparations was replaced to studied by us vitamin-enzyme complex, it was the increase of protein in the blood serum by 3.6 and 5.7%, the decrease of creatinine by 17.4 and 1.4% respectively, while in the second experimental group, the difference with the control group was confirmed statistically ($p < 0.01$). Moreover, in experimental groups, the activity of lactic dehydrogenase significantly decreased: by 15.3% in the second and more than 2 times in the third group (in all cases $p < 0.01-0.001$).

In these groups, there was a decrease of aspartate aminotransferase activity (20.5% in the second group), and almost 2-fold decrease in the third experimental group; in all cases the difference with the control group was confirmed statistically, $p < 0.01-0.001$.

As far as the increased content of these enzymes in blood serum is observed while the destruction of cardiomyocytes, hepatic disorders, necrosis of skeletal muscles, and after applying the vitamin-enzyme complex it was the normalization of these bodies, that redound in the increase of pigs gain in the second and the third experimental groups.

Conclusion:

Studied vitamin and enzyme additive, for its growth promoting and biological activity, doesn't inferior to standard enzyme preparations, and also surpasses them in cost-effectiveness and positive effect on the physiological condition of the pigs. To increase the productivity of animals, it is recommended to put into the diet of weanling pigs developed by us vitamin and enzyme complex at the rate of 6.3 g/kg of feed compound, replacing by them standard enzyme supplements: Agrocel- 15 g, Agrofit -30 g, Ronozim ProAct.

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