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Veterinary-sanitary assessment of pig meat using probiotics

Sergey Yu. Smolentsev[1], Irina I. Strelnikova[1]*, Galiya R. Yusupova[2], Ellada K. Papunidi[2], Ilham T. Vafin[2], Niyaz F. Sadykov[2], Tagir M. Zakirov[2], Zaira F. Auhadeeva[2]

[1]Agrarian Institute of technology, Mari State University, Lenin Square 1, Yoshkar-Ola city, 424000, Russia
[2]faculty of veterinary medicine, Kazan State Academy of Veterinary Medicine by N.E. Bauman, Sibirsky tract 35, Kazan city, 420029, Russia

Abstract.

One of the main reserves in increasing the production of meat for the implementation of the food program of our country is the successful development of pig breeding. Probiotic feed preparations are currently considered as a potential substitute for feed antibiotics, as a necessary element for obtaining healthy animals. These products increase their immune status, normalize the intestinal microflora - a natural barrier against the penetration of pathogens into the body, stimulate the work of defense systems. The purpose of this work is to study the effect of intestinal polypeptides, as well as probiotics Lactobifid and Immunobac on the fattening and meat qualities of pigs of the steppe type of the fast-growing meat breed. The research was conducted in 2005–2009 in the subsidiary farm of the military unit 3033, Oktyabrsky District, Rostov Region, where 5 groups of healthy, normally developed young pigs were formed. Each group contained 30 animals; they were observed till slaughter. The article presents the identified differences between productivity indicators of pigs of five groups: I – control group, II – animals receiving Immunobac, III – extract of pigs' duodenum and Immunobac, IV – animals receiving Lactobifid, V – extract of duodenum and Lactobifid. Animals receiving probiotics along with the intestinal polypeptides had better indicators of meat productivity.

Key words: pigs, probiotics, intestinal polypeptides, productivity.

INTRODUCTION.

Nowadays the Southern Federal District of the Russian Federation carries out research programmes aimed at stabilization and subsequent growth of agricultural products. Pig breeding as one of the most promising and highly productive sectors merits special attention [1]. In 1980 academician P.E. Ladan wrote that increase in animal productivity along with a good food supply requires introduction of new technological methods of work with young animals, including the use of eco-friendly biologically active substances that promote and improve digestion, digestibility of food, and growth and development processes [2]. Today methods of optimizing and improving animal breeding technologies based on external humoral regulation of growth processes are of particular importance among the issues of small animal science [3]. All over the world biologically active preparations are widely used at different technological stages of growing pigs, poultry, and cattle. Biopreparations obtained not as a result of chemical synthesis but isolated from organs and tissues of healthy animals merit special attention. Such substances include enzymes, tissue preparations and extracts of internal secretion glands, blood and lymph derivatives, organic acids and provitamins [4]. In our country experiments on the use of hormonal substances produced by the endocrine cells of the intestine, stomach, and pancreas are also being conducted. These substances are polypeptides: gastrin, secretin, cholecystokinin, serotonin, motilin, etc. They control the amount of digestive enzymes, regulate the processes of absorption, membrane digestion, motility and secretion of the stomach, pancreas, and gall bladder. They also promote the renewal of the mucous membranes of the digestive system organs. These substances are not products of specific endocrine glands, however, they fully meet the requirements applicable to the hormones [5]. In 1961 Rocha e Silva called these substances «tissue - kinin hormones». In the 1970s the term «digestive hormones» was accepted. The name was given by the place of localization, since the majority of active polypeptides are the product of secretion of the endocrine apparatus of the small intestine; they are produced by the certain clones of secretory cells "disseminated" on the mucous membrane [6]. The majority of such cells is located in the duodenum, that is why the hormones are also called duodenins. Nowadays biologically active preparations that promote digestion and growth of livestock are made of endocrine cells of duodenum. A new generation of these hormonal preparations is made in the form of powder, which is given to animals with food and water [7].

In view of the above matter, it is necessary to find out how these preparations affect the fattening qualities, the indicators of meat productivity and the reproductive functions of pigs, the resistance of animals. It is also important to find out how the costs of production (purchase) of intestinal polypeptides in the new dry fraction correlate with the possible profit from their use. It is necessary to develop optimal doses of duodenum extract for young pigs and breeding pigs when giving it with dry food and water, etc. [8,9].

Currently, a poorly studied area of research in pig breeding is the effect of probiotics on fattening qualities and meat productivity of animals.

The purpose of this work is to study the effect of intestinal polypeptides, as well as probiotics Lactobifid and Immunobac on the fattening and meat qualities of pigs of the steppe type of the fast-growing meat breed.

MATERIAL AND METHODS.

The research was conducted in 2005–2009 in the subsidiary farm of the military unit 3033, Oktyabrsky District, Rostov Region, where 5 groups of healthy, normally developed young pigs were formed. Each group contained 30 animals; they were observed till slaughter.

The young pigs of the first group from the 5th to the 10th day of life were given the preparation Lactobifid with water, each 0,1 g. once a day during five days. Later this preparation was given from the 15th to the 20th day; from the 35th to the 40th day, from the 55th to the 60th day and from the 75th to the 80th day at a dose of 0,4 g. for each pig once a day.

Animals of the second group along with Lactobifid were given the extract of the duodenum at a dose of 30 ml once a day during the first five days and at a dose of 100 ml from the 15th to the 20th day; m the 35th to the 40th day, from the 55th to the 60th day and from the 75th to the 80th day of life.

The third group was given the preparation Immunobac with water from the 5th to the 10th day of life at a dose of 0,05 g. for each pig once a day during five days, then from the 15th to the 20th day; from the 35th to the 40th day, from the 55th to the 60th day and from the 75th to the 80th day of life and on in case of stress load at a dose of 0,1 g. for each pig once a day during five days.

Animals of the fourth group along with the Immunoback at the indicated doses and water were given the extract of the duodenum at a dose of 30 ml once a day during the first five days and at a dose of 100 ml from the 15th to the 20th day; m the 35th to the 40th day, from the 55th to the 60th day and from the 75th to the 80th day of life. The fifth group was not given any preparation and was a

control one.

The control measurements of the carcass were made. Its length and weight, the thickness of the fat above the thoracic vertebrae, the correlation of bones and meat were defined. The data obtained during the research were processed by the biometric methods.

RESULTS AND DISCUSSION.

The results of the effect of probiotics and the extract of the duodenum on the fattening indicators are shown in the tables 1, 2 and 3.

Due to the fact that the body weight gain was higher in pigs receiving Lactobifid and Immunobac in combination with the intestinal polypeptides, feed costs per 1 kg of the body weight gain in the animals of the second and fourth groups were lower than in the control one, on average by 0.25 feed units.

The precocity of animals in these groups was better on average by 27 days. Analysis of the products of slaughter of pigs from the experimental and control groups showed that the weight and length of carcasses in the second and the fourth groups are also greater than in the first, third and control groups. The second group also exceeded the control one due to this indicator. No difference in the thickness of the fat and the weight of the posterior third of the half carcass was revealed (tables 4, 5 and 6).

Table 1 – Fattening qualities of animals of the control group

Number of animals	Body weight of 1 pig when feeding started, kg	Body weight gain during the feeding period, kg	Age when feeding stopped, days	Average daily body weight gain, g	Age when animals reached the body weight of 100 kg, days	Feed costs per 1 kg of body weight gain, food unit
30	30,50±0,25	68,90±0,95	255,0±2,45	510±8,21	223,7±1,29	4,40±0,05

Table 2 - Fattening qualities of animals receiving Lactobifid

Group of animals	Number of animals	Body weight of 1 pig when feeding started, kg	Body weight gain during the feeding period, kg	Age when feeding stopped, days	Average daily body weight gain, g	Age when animals reached the body weight of 100 kg, days	Feed costs per 1 kg of body weight gain, feed unit
Without the extract of the duodenum	30	38,47±2,14	72,00±2,84	222,0±3,81	622±9,90	205,2±3,1	3,80± 0,05
With the extract of the duodenum	30	38,81±2,08	80,29±2,91	222,0±3,76	698±9,63	196,0±3,00	3,68±0,04

Table 3 - Fattening qualities of animals receiving Immunobac

Group of animals	Number of animals	Body weight of 1 pig when feeding started, kg	Body weight gain during the feeding period, kg	Age when feeding stopped, days	Average daily body weight gain, g	Age when animals reached the body weight of 100 kg, days	Feed costs per 1 kg of body weight gain, feed unit
Without the extract of the duodenum	30	33,45±1,64	72,03±2,65	222,0±3,89	647±9,90	202,0±2,96	3,78±0,06
With the extract of the duodenum	30	33,80±1,88	80,30±2,71	222,0±3,86	665±9,63	195,0±3,02	3,68±0,06

Table 4 – Meat qualities of pigs receiving Lactobifid

Group of animals	Number of animals	Carcass weight, kg	Carcass length, cm	Thickness of the fat above the 6 - 7 ribs, mm	Weight of the posterior third of the half carcass, kg
Without the extract of the duodenum	10	69,1±3,08	93,8±1,82	31,1±2,04	11,2±0,51
With the extract of the duodenum	10	74,5±3,12	95,3±1,70	31,3±1,90	11,5±0,53

Table 5 – Meat qualities of pigs receiving Immunobac

Group of animals	Number of animals	Carcass weight, kg	Carcass length, cm	Thickness of the fat above the 6 - 7 ribs, mm	Weight of the posterior third of the half carcass, kg
Without the extract of the duodenum	10	68,9±2,50	92,0±1,37	34,4±1,05	10,8±0,38
With the extract of the duodenum	10	70,5±2,91	94,3±1,65	33,5±1,53	11,0±0,24

Table 6 - Meat qualities of pigs of the control group

Number of animals	Carcass weight, kg	Carcass length, cm	Thickness of the fat above the 6 – 7 spinous process of the thoracic vertebra, mm	Weight of the posterior third of the half carcass, kg
10	67,2±2,87	90,7±1,62	35,2±1,68	10,2±0,45

Table 7 – Physical and chemical properties of pork when probitics and intestinal polypeptides were given to pigs

Groups of animals	Number of animals	Moisture retention capacity, %	pH 2 hours after slaughter	Color intensity of meat, color density unit $\cdot 10^3$
1.	10	58,80±1,25	6,00±0,05	52,10 4,25
2.	10	60,05±1,28	6,12±0,03	52,00±3,45
3.	10	58,80±1,04	6,25±0,04	52,10±3,88
4.	10	62,15±1,49	6,26±0,04	52,10±3,87
Control group	10	56,26±1,32	5,82±0,04	51,75±4,30

The study of the meat qualities of pigs receiving Lactobifid in combination with the duodenum extract showed that the weight of the carcasses of animals in this group was on average 5.4 kg higher than that of their herd mates who received only Lactobifid. No statistically significant differences in the thickness of the fat above the thoracic vertebrae in pigs of the first and the second experimental groups were revealed. The weight of the posterior third of the half carcass in the animals of the second experimental group was 300 g higher than in the animals of the first group.

The weight of the carcasses of the pigs receiving Immunobac in combination with the duodenum extract was greater than the weight of the pigs receiving only Immunobac, on average by 4.6 kg and by 3.3 cm in length. The thickness of the fat and the weight of the posterior third of the carcass were almost equal in animals of these groups.

The literature reports that the selection of pigs for increase of precocity and meat productivity often leads to a decrease in meat quality. The susceptibility to the PSE defect determines the pH of meat, its moisture retention capacity and color intensity. When pale yellow color appears, moisture retention capacity decreases below 50% and pH decreases below 6.0 2 hours after slaughter, pork cannot be considered as qualitative. This defect was not found in the examined animals, however, a question about the meat quality of pigs receiving probiotics was raised. Meat of the animals of the second and the fourth experimental groups was distinguished by the best indicators of moisture retention capacity and pH (table 7). As a result of the research, it was found that the meat properties of the animals in the control group are on average worse than those of animals receiving Lactobifid and Immunobac in combination with the intestinal polypeptides. Meat of pigs of the control group had pH 0.44 lower than meat of the pigs of the fourth group and 0.40 lower than meat of the pigs of the second experimental group, as well as moisture retention capacity by 3.8 and 3.9% lower respectively (table 7). Due to the moisture retention capacity, meat of the animals receiving only Lactobifid was worse than meat of the pigs of the second experimental group by 1.25% , and due to pH it was worse by 0.12 (24 hours after slaughter). No difference in the color intensity of the pork was revealed.

In pigs receiving only Immunobac moisture retention capacity was 3.35% less than that of pigs, feeding of which also included the duodenum extract; the color intensity and pH of meat were the same in the third and the fourth groups.

It cannot be argued that there is an effect of probiotics and intestinal polypeptides on the color intensity of pork, since the number of units of color density of its extract determined with the help of a photocolorimeter was within wide limits, at the same time, the average values of the groups were almost the same.

CONCLUSION.

Thus, differences in productivity indicators and natural resistance were revealed in the pigs of five groups:

- control group,
- animals receiving Immunobac,
- the extract of the duodenum of pigs and Immunobac,
- animals receiving only Lactobifid,
- the extract of the duodenum of pigs and Lactobifid.

Animals receiving probiotics along with the intestinal polypeptides had better indicators of meat productivity.

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