Using Probiotics in Young Pig Nutrition

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Abstract
The research was performed during the period 18.03.09 to 10.05.09 at the enterprise "Moldsuinghibrid". The aim of the experiment was to study the effectiveness of the utilization of the probiotic Biomin IMBO supplement at different levels, using the indices of weight growth and substance exchange in young pigs. The obtained data showed that the addition of preparation Biomin IMBO to the mixed fodders for young pigs at the level of 1.0 - 2.0 kg/t did not lead to an increased body weight (the experimental lots compared with the control lot); it also showed that the fodder consumption decreased and that it was eaten better.

Keywords: dose, nutrition, optimal rations pigs, probiotics,

1. Introduction

Over recent years probiotics have been successfully used to stimulate animal growth and to increase the intensity of animal productivity.
Probiotics are utilized for prophylaxis and treatment of mixed gastro-intestinal infections, digestive disorders arising from sudden changes of diet, irregularity of the feeding process and technological stress, and for the stimulation of non-specific immunity [1].
They are also used for faster restoration of microbiocenosis of intestines after antibiotic treatment [2]., the replacement of antibiotics in the fodder for young animals [3], the acceleration of animals' adaptation to high-energy diet and non-nitrogenous substances, the improvement of the efficiency of feed utilization and the productivity of animals [4].
Probiotics possess a high fermentative activity, stimulate digestion, providing an antiallergenic and antitoxic effect, and increase the non-specific resistance of the organism [5 - 8].

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According to S. Cerguiglini [9], probiotics have diverse pharmacological effects.
According to I.M. Zhukova [10], the involvement of symbiotic microorganisms in nitric (protein) diet is one of their main functions.
When using probiotics (prophylactic) in feeding, the microflora balance of the digestive tract of animals and their resistance improve, which leads to an increase in body weight, in immunity, and digestibility of feed.
Thus, the study of the probiotics properties and their effects on animals including young piglets is of current importance and certain interest.

2. Materials and methods

In the period 18.03.09 to 10.05.09 at the State Research and Production Enterprise «Moldsuinhibrid» researches were conducted in order to determine the optimal level of probiotic Biomin IMBO supplementation of the fodder for pig weanlings, and its impact on animal growth and development.
In order to carry out the scientific experiment, 40 pigs were selected on the basis of analogies: by sex, age, body weight, origin and growth energy

during the preliminary period [11], which were then divided into 4 lots of 10 animals.

All the pigs were kept in special cages and fed in accordance with the accepted norms of feeding, with fodders prepared using the technology of this enterprise [12]. The feeding distinctive feature of pigs in the experimental lots was that the pigs were fed fodder in which the preparation probiotic Biomin IMBO was introduced at different levels (Table 1).

The animals were systematically monitored for their health, general condition, appetite, water consumption, mobility, and the presence of adverse or unwanted effects.

The used fodder, the animal blood and feces were objects of analysis in the experiment.

The hematological tests were carried out using conventional methods in the Laboratory of the State Diagnostic Centre of the Republic of Moldova.

The composition of microflora in the piglets' intestine was studied in the Laboratory of the Centre for Epidemiology and most Dangerous Infections and Bioterrorism Combating of Moldova by testing the excrements for the presence of pathogenic microorganisms.

The piglets' growth and development were evaluated by weighing their live weight, the total and average daily weight gain by individual weighing on an empty stomach for two days running on average.

Statistical processing of experimental data was carried out using A. P. Plohinskogo's [13] and I. Gh. Cucu et.al. [14] methods.

Table 1. Scheme of the experiment

Lot	Number of pigs in a lot, head	Feeding features
LM – control	10	BF (basic fodder)
LE 1 – experimental	10	BF+1.0 kg/t of probiotic Biomin IMBO
LE 2 – experimental	10	BF+1.5 kg/t of probiotic Biomin IMBO
LE 3 – experimental	10	BF+2.0 kg/t of probiotic Biomin IMBO

3. Results and discussion

Forty weaned piglets (35days of age) were randomly selected and divided into 4 lots; one control lot (LM) and three experimental lots (LE 1-3). The piglets of the first control lot consumed basic feed (BF), and the piglets in the experimental lots were fed according to the scheme of research, that is with the supplementation of the basic fodder with the preparation probiotic IMBO (LM - basic fodder (BF); respectively LE 1 - BF + 1.0 kg/t; LE 2 - BF + 1.5 kg/t; LE 3 - BF + 2.0 kg/t).

For the entire period of the experiment the fodder was prepared according to the accepted technology of the enterprise and corresponding standards, taking into account the piglet's body weight and age. The mixed feed composition used in the trial is presented in table 2.

The concentration of nutrients in the fodder met the modern standards of feeding (3) (Tab. 3).

Probiotic Biomin IMBO was introduced into the fodder for each group separately. The fodder was then packed up into bags, and numbered in accordance with its destination according to the lot.

Table 2 The mixed feed composition used during the course of the trial

Ingredients	%, by mass
Corn	7.5
Extruded corn	15.0
Extruded wheat	17.0
Extruded peas	8.0
Extruded barley	19.0
Soybean grouts	14,1
Sunflower grouts	4.0
Fish meal	5.0
Powdered milk	5.0
Premix 2231	2.0
Soybean oil	2.0
Salt	0.5
Chalk	0.9

Table 3. The mixed feed nutritional characteristics

Issue	Quantity
Energy feed unit	1.02
Feed unit	1.15
Exchange energy, MJ	12.51
Dry matter, kg	0.74
Crude protein, g	177.64
Digestible protein, g	150.90
Crude fiber, g	33.81
Lysine, g	9.29
Methionine + cystine, g	5.48
Salt, g	5.00
Calcium, g	9.00
Phosphorus, g	5.61
Iron, mg	1.39
Copper, mg	6.30
Zinc, mg	30.56
Manganese, mg	19.35
Cobalt, mg	0.11
Iodine, mg	282.89
Vitamin A, IU	500
Carotene, mg	1.84

Table 4. Feed consumption during the course of the trial

Issue	Lots			
	LM	LE 1	LE 2	LE 3
Average feed intake during the experiment: kg /lot	429.64	403.40	398.76	396.67
Average feed intake during the experiment: kg /head	42.96	40.34	39.88	39.67
Average daily feed intake: kg /head	0.955	0.896	0.886	0.881

The piglets were fed three times a day. The feed intake during the course of the trial was determined on the basis of data from a given feed and its residues (Tab.4).

The piglets live weight was determined by their weighing at the beginning of the preparatory and testing periods of the experiment and at the end of the experiment.

Table 5. Average weight gain of piglets

Lots	Issue	The average weight of piglets, kg		
		at the age of 35 days	at the age of 45 days	at the end of the experiment
LM	$\overline{X} \pm S_{\overline{X}}$	8.66 ± 0.086	9.86 ± 0.069	27.18 ± 0.602
	S ± Ss	0.27 ± 0.061	0.22 ± 0.049	1.90 ± 0.426
	V,% ± Sv%	3.16 ± 0.707	2.23 ± 0.499	7.00 ± 1.567
LE 1	$\overline{X} \pm S_{\overline{X}}$	8.85 ± 8.670	9.95 ± 0.070	23.21 ± 0.32****
	S ± Ss	0,18 ± 0.040	0.22 ± 0.050	1.00 ± 0.220
	V,% ± Sv,%	2.13 ± 0.470	2.27 ± 0.050	4.32 ± 0.960
LE 2	$\overline{X} \pm S_{\overline{X}}$	8.66 ± 0.046	9.79 ± 0.088	26.45 ± 0.430
	S ± Ss	0.15 ± 0.033	0.28 ± 0.062	1.36 ± 0.304
	V,% ± Sv,%	1.69 ± 0.377	2.83 ± 0.632	5.14 ± 1,150
LE 3	$\overline{X} \pm S_{\overline{X}}$	8.98 ± 0.118	9.83 ± 0.079	24.65 ± 0.242**
	S ± Ss	0.37 ± 0.083	0.25 ± 0.056	0.76 ± 0.171
	V,% ± Sv,%	4.16 ± 0.929	2.54 ± 0.568	3.10 ± 0.693

Significant differences - t * - B = 0.90; ** - B = 0.95; *** B =0.99; **** - B = 0.999

The analysis of the results of piglet average weight gain (Tab. 5, Fig. 1) showed, that during the period of study there was not an additional increase in body weight under the influence of probiotic BIOMIN IMBO supplementation in the experimental lots. It should be also pointed out, that the weight of piglets in the LE 1, which were fed fodder with the addition of preparation in the quantity of 1kg/t (according to manufacturer's recommendations), at the end of the experiment

was significantly lower (23.21 kg in comparison with the LM – 27.18 kg, while B = 0.999).

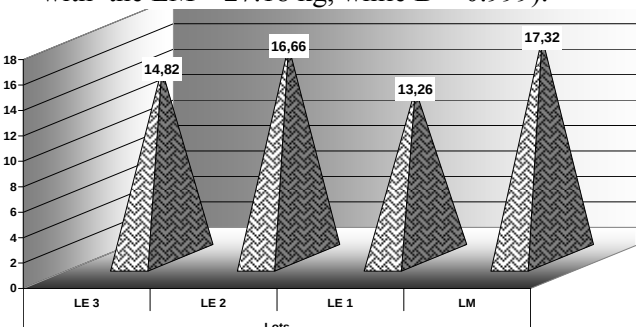

Figure. 1 The total weight gain of piglets, kg/head

When probiotic was added to the fodder in the quantity of 1.5 kg/t for the piglets in the LE 2, the results coincided with the results in the LM that is they were the same.

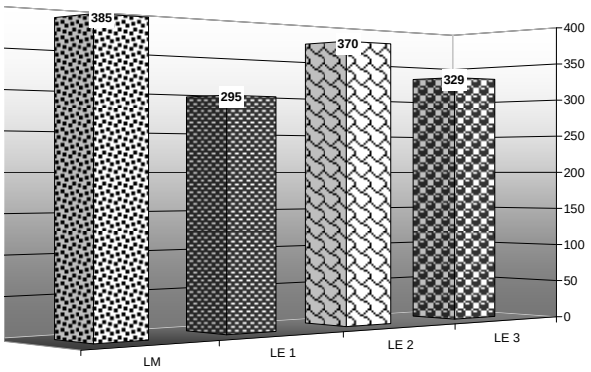

Figure. 2. The average daily weight gain, g/head

During the experiment in the LM the average daily weight gain (Fig. 2) was of 0.385 kg /head (B = 0,095), which is 3.90 % higher than in the LE 2, and 14.55 % higher than in LE 1.

The obtained data on the feed conversion (Fig.3) the supplementation of the rations for piglets with probiotic led to some consumption reduction in the LE 2 in comparison with the LM (i.e., the consumption were lower by 3.63 %).

It can be assumed that the level of probiotic inputting should depend on the properties of probiotic, peculiar properties of feeding, and differences in animal age.

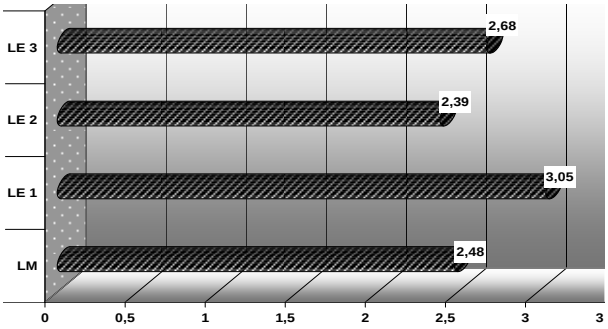

Figure. 3 Feed conversion during the experiment, kg

It can be assumed that the level of probiotic inputting should depend on the properties of probiotic, peculiar properties of feeding, and differences in animal age.

A number of hematological studies were carried out during the trial. The analysis of the data on blood (Tab.6) showed a lower content of hemoglobin; the other indices were within the physiological norms.

In order to study the piglets' micro flora intestine, samples of their faeces were taken; the excreted conditionally-pathogenic micro organisms from the piglets' faeces did not differ significantly (Tab. 7) and were within the norm in all the test groups.

Table 6. Hematological indices of the experimental pigs at the beginning of the trial

Issue	Lot ($\bar{X} \pm S_{\bar{X}}$)			
	LM	LE 1	LE 2	LE3
Hemoglobin, g / l	87.0 ±2.469	107.33±0.883	80±1.529	77.33±0.153
Erythrocytes x 10^{12}	4.8 ±0.029	4.97±0.044	4.7±0.058	4.4±0.116
Reticulocytes	3.13 ±0.273	3.47±0.120	2.33±0.267	1.6±15.738
Platelets x 10^9 / l	283.33 ±22.074	397.33±3.532	438.67±20.89	398.67±40.44
Leucocytes x 10^9 / l	9.47 ±0.595	22.90±13.426	13.47±1.791	6.93±1.203
Neutrophils x 10^9 / l	3.33 ±0.667	5.33±1.094	2.67±0.441	5.33±1.156
Bazophils x 10^9 / l	23.67 ±1.455	39.67±5.140	27.33±1.643	27.0±0.578
Eosinophils x 10^9 / l	1.33 ±0.667	1.0±0.501	3.0±0.746	4.0±0.602
Lymphocytes x 10^9 / l	67.67 ±2.607	48.0±6.259	63.0±2.933	57.67±0.765
Monocytes x 10^9 / l	4.0 ±1.001	5.33±0.441	4.0±0.289	6.0±0.09
Total protein, U/l	49.43 ±1.870	34.30±1.280	49.2±3.395	57.43±78.730
Albumin, g/l	0.61 ±0.108	0.653±0.134	0.77±0.023	0.85±0.827
Albumins, g /%	44.0 ±0.577	45.97±1.176	44.47±1.038	44.9±0.102
α^1 - globulin g /%	1.93 ±0.137	1.11±0.150	1.73±0.102	2.13±0.934
α^2 - globulin g /%	23,7 ±0.500	23.70±0.126	26.33±0.568	11.950.694
β - globulin g /%	17.07 ±0.693	19.70±0.851	18.53±0.262	16.1±1.111
γ - globulin g /%	10.533±0.347	9.41±1.443	9.6±0.847	9.80±146.07
ALT, U/ l	230.33 ±56.163	66.67±9.250	83.33±9.950	345.33±1.727
ASAT	147.67 ±8.526	102.33±8.001	132.33±10.15	141.67±0.013
ALK.P	895.08 ±134.98	655.08±66.19	300.01±6.478	587.31±0.050
Phosphorus, mmol / l	2.77 ±0.240	4.02±0.854	2.91±0.211	2.78±0.026
Calcium, mmol / l	3.043 ±0.108	3.12±0.010	3.15±0.119	3.22±3.849

Table 7. The piglets' microflora intestinal indices

Issue	Lot ($\bar{X} \pm S_{\bar{X}}$)			
	LM	LE 1	LE 2	LE 3
Pathogenic microbes of intestinal family, 0	0±0	0±0	0±0	0±0
The microbes of the genus Proteus x 10^2	0±0	0±0	0±0	0±0
Conditionally pathogenic microorganisms x 10^5	1.0±0	1.0±0	1 .0±0	1.0±0
Total amount of escherichia coli 10^7	4.67±3.67	1.0±0	. 33±3.34	1.0±0.0
E.Coli with weakly expressed enzyme properties 10^5	10±0	10±0	0±0	10±0
Hemolyzing escherichia coli,10^7	0±0	0±0	0.33±0.33	1.0±0
Hemolytic staphylococcus, 10^6	0 0.33±0.33	0.37±0.32	0.33±0.33	0.33±0.30
Staphylococcus aureus (epidermal), 10^3	1±0	4.0±3.0	1.0±0	1.0±0
Enterococci,10^8	0.7±0.30	0.37±0.2	0.07±0.30	0.7±0.3
Bifidobacteria, 10^9	1.0±0	10.0±0.	10±0.3	4.0±30
Lactic bacillus, 10^8	0.34±0.33	1.0±0.0	1.0±0	0.4±0.3
Lactic streptokok, 10^8	0.34±0.33	0.34±0.34	0.7±0.30	0.4±030
Mushrooms of the genus Candida, 10^4	0.1±0	1.0±0	0±0	0±0

4. Conclusions

1. The optimum level of probiotic Biomin IMBO addition in the fodder for piglets can be 1.5 kg/ton.
2. If the piglets are fed fodder supplemented with probiotic Biomin IMBO their body live weight will not increase; but this will lead to the decrease in fodder consumption per one kg of growth (in the LE 2 the consumption is lower by 3.63 % compared with the control lot).

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