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Using Plant-Mineral Supplements In Feeding Young Pigs.

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ABSTRACT

In result of the conducted researches it is established that complex supplement to the diet of piglets, including Echinacea purpurea and bentonite clay, had a positive impact on the growth and development, the natural resistance of the organism of young pigs of large white breed, it also significantly improved the hematological parameters of animals. The most prominent effect of the supplement was noted in hemoglobin content; the values observed in the experimental group exceeded those of the control by 10.06-13.43 g / l. The introduction of the supplement to the diet had a positive effect on the percentage content of lymphocytes, rod neutrophils. There also observed a higher content of T-lymphocytes in the blood of piglets of the experimental groups, compared with analogues of the control group. The piglets of the experimental group were characterized by higher bactericidal activity of blood serum as well. As a result of the experiment, it was established that the weaned piglets providing with the supplements to the main diet exceeded the animals of the control group by 94.3 g in live weight gain. The studies revealed the optimal ratio of the supplement components: 0.5% Echinacea Purpurea and 1.5% bentonite clay from the dry matter of the feeding ration of the weaned piglets.

Keywords: piglets, mineral, hematology, bentonite.

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INTRODUCTION

The period of rearing piglets is characterized by the highest potential for growth. At the same time, it is known from the practice of pig-breeding that the highest percentage of young pigs' death happens during the initial period of rearing, that is, when weaning pigs from sows. This is due to a number of diseases caused by a decrease in the protective functions of the body, as a consequence of the post-weaning stress. The stress is caused by the piglets' being away from their mothers, changing the equipment for their maintenance, transfer to other facilities, changing the group of pigs and changing feeding rations. These negative factors contribute to disruption of adaptation mechanisms and reduction of piglets ' natural resistance [3,5,16].

In this situation, it is necessary to look for optimal ways to solve the problem of stress, increasing growth indexes, resistance and protective functions of animals [1,8,11].

In this regard, natural plant and mineral supplements that increase productivity, resistance of the body and reduce the harmful effects of stress conditions are worth paying attention [2,4,6,7,9,10, 13-15].

MATERIALS AND RESEARCH METHODS

In the conditions of the breeding hog production farm "Uchkhoz Ramzay" in Penza state agricultural academy of Mokshan district of Penza region the research on studying the efficiency of introduction of complex supplement consisting of dry powdered mass of purple Echinacea and bentonite clay to the diet of weaned piglets was conducted.

To conduct the experiment, six groups of young pigs of large white breed at the age of 45 days were formed. Control group of animals was provided with the basic diet (BD), the 1st experienced group was provided with BD + 1% bentonite clay, the 2-nd experienced group – BD + 0,5% of Echinacea purpurea, the 3d one –BD + 1% bentonite clay and 0.5% Echinacea purpurea, 4th experienced group – BD + 0.5% of bentonite clay and 0.25% of Echinacea purpurea and 5-th group – BD + 1.5 percent bentonite clay and 0.5% Echinacea purpurea by weight of dry matter of the diet.

The number of young pigs in all farms was kept in typical production facilities with a high level of mechanization of production processes. Keeping parameters of the experimental groups, features of the microclimate of pig-breeding facilities met the requirements of generally accepted standards.

In feeding young pigs of the pig-breeding farm the combined fodder of its own production was used. The composition of the diet included the following feedstuffs: wheat, barley, oats, peas, whey and separated milk.

To stimulate the body's defenses, to reduce stress susceptibility and to raise productivity of young pigs the supplements from the aerial parts of the plants Echinacea purpurea (Echinacea purpurea Moench) were used in feeding. In the experiments, Echinacea purpurea varieties of Polesskaya krasavitsa was used. Echinacea was grown on the experimental field of the Penza SAA. To obtain a dry mass, Echinacea was mowed during the budding and flowering phase. The dried mass of Echinacea was crushed on the crusher Elikor-1.

As an additive to the diet of pigs bentonite clay originated from Luninsky district was used. The clay used in the experiment was classified as bentonite (nontronite) and it was in a layer with a depth of 5-7 m.

The obtained experimental data were processed using Microsoft Excel spreadsheets. The accuracy of differences values was determined by the criterion Student.

RESULTS

In the experiment it was noted that in the middle of the experiment there was no significant difference in the content of erythrocytes and leukocytes (table 1). There observed differences in hemoglobin content in the experimental groups of young animals. Thus, the highest hemoglobin content of 123.83 g/l was observed in the 5th experimental group, which was higher than the control group by 10.06 g / l ($P<0.05$). At

the end of the experiment, a similar situation was observed: in the 5th experimental group, the amount of hemoglobin was 131.93 g/l, which was by 13.43 g/l higher than the results of the control group (P<0.05).

For a detailed study of the hematological characteristics of piglets, the studies of the leukocyte blood formula were carried out (table. 2). According to the results of the first study, it was established that all the blood parameters did not exceed the physiological norms and did not differ significantly.

In the middle of the experiment, the highest percentage of lymphocytes was observed in the 1st experimental group – 54.67%, which exceeded the data of the control group (P>0.05). The relative number of rod neutrophils in the 3rd experimental group was higher than in the control group – 3.33% (P>0.05). The highest percentage of segmented neutrophils in the blood was recorded in the 3rd and 4th experimental groups – 50.0 and 51.0%, respectively (P>0.05). There were no significant differences in the content of other blood elements.

At the end of the experiment, the highest percentage of lymphocytes was observed in the 1st experimental group – 56.33%, which significantly exceeded the control group (P<0.05). The largest number of rod neutrophils was observed in the 3rd and 5th experimental groups. In the 4th experimental group the number of segmented neutrophils was 51.0 % (P>0.05).

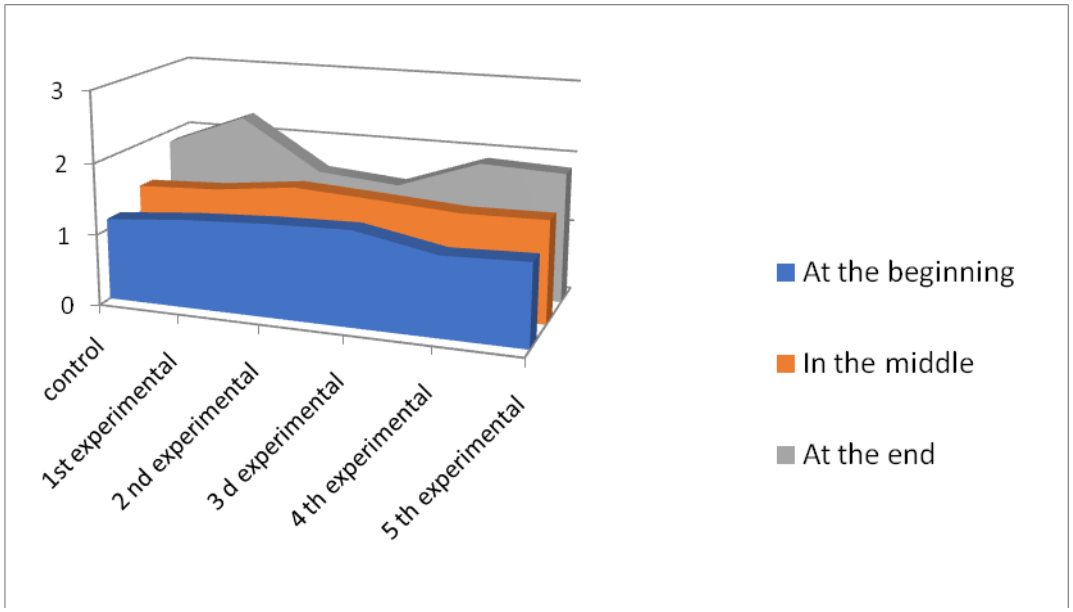

Figure 1: The content of T-lymphocytes in the blood of piglets, 10^9 l

At the beginning of the experiment, there were no significant differences in groups in the content of T-lymphocytes. In the middle of the experiment, an increased number of lymphocytes was observed in the groups with additional introduction of the additive of Echinacea purpurea in the amount of 0.5% from the dry matter mass of the diet (2nd, 3d and 5th experimental groups).

At the end of the experiment, the following pattern is observed: the content of T-lymphocytes was higher in the groups with additional introduction of supplement of bentonite clay to the diet (1^{st}, 4th and 5th experimental groups).

To examine the natural resistance of animals bodies, the bactericidal activity of blood serum was studied (Fig. 2)

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Table 1: Hematological parameters of weaned pigs

Value	Group					
	control	1st experimental	2nd experimental	3d experimental	4th experimental	5th experimental
At the beginning of the experiment						
Erythrocytes, 10^{12} l	5,28±0,05	5,26±0,07	5,21±0,05	5,32±0,09	5,28±0,07	5,31±0,04
Leukocytes, 10^{9} l	10,23±0,06	10,29±0,12	10,34±0,07	10,32±0,06	10,32±0,07	10,32±0,06
Hemoglobin, g/l	98,30±1,05	98,10±1,21	101,5±1,16	101,5±3,02	98,60±1,2	101,80±2,06
In the middle of the experiment						
Erythrocytes, 10^{12} l	5,34±0,05	5,33±0,06	5,34±0,04	5,37±0,07	5,36±0,05	5,38±0,03
Leukocytes, 10^{9} l	10,35±0,03	10,38±0,07	10,4±0,07	10,39±0,06	10,39±0,07	10,39±0,05
Hemoglobin, g/l	113,77±2,00	115,20±3,3	115,60±3,3	116,90±3,8	114,33±2,16	123,83±3,39
At the end of the experiment						
Erythrocytes, 10^{12} l	5,39±0,04	5,36±0,05	5,39±0,04	5,41±0,05	5,40±0,06	5,42±0,02
Leukocytes, 10^{9} l	10,36±0,05	10,44±0,07	10,45±0,07	10,46±0,06	10,46±0,05	10,47±0,04
Hemoglobin, g/l	118,50±1,84	129,43±1,23	130,13±2,16	125,47±5,52	122,47±7,82	131,93±1,88

Table 2: Leukocyte formula of the blood of the weaned pigs, %

Value	Group					
	control	1st experimental	2nd experimental	3d experimental	4th experimental	5 th experimental
At the beginning of the experiment						
Lymphocytes	42,67±0,41	42,33±1,08	42,67±1,08	42,00±3,08	41,33±3,27	42,67±0,41
Juvenile neutrophils	1,33±0,41	1,67±0,41	1,33±0,41	1,33±0,41	1,67±0,41	1,33±0,41
Rod neutrophils	2,33±0,24	2,67±0,41	2,33±0,41	2,67±0,41	2,33±0,41	2,33±0,41
Segmented neutrophils	43,67±1,08	39,33±1,47	43,33±1,08	43,33±0,41	44,00±1,41	44,33±1,08
Eosinophils	1,00±0,07	1,03±0,04	1,07±0,08	1,07±0,04	1,03±0,04	1,07±0,04
Monocytes	0,39±0,01	0,36±0,03	0,39±0,01	0,37±0,01	0,38+0,02	0,38±0,02
Basophils	0,13±0,01	0,13±0,01	0,12±0,01	0,12±0,01	0,12+0,01	0,12±0,01
In the middle of the experiment						
Lymphocytes	47,33±2,94	54,67±2,86	46,33±2,48	43,67±4,32	41,67±3,49	47,67±1,08
Juvenile neutrophils	1,67±0,41	1,67±0,41	1,33±0,41	2,00±0,00	1,67±0,41	1,67±0,41
Rod neutrophils	2,67±0,41	2,67±0,41	2,33±0,41	3,33±0,41	2,67±0,41	3,00±0,00
Segmented neutrophils	47,33±3,27	40,00±2,12	48,67±3,63	50,00±3,94	51,00±3,74	46,67±0,82
Eosinophils	1,03±0,04	1,03±0,04	1,47±0,33	1,07±0,08	1,03±0,04	1,10±0,07
Monocytes	0,45±0,02	0,50±0,02	0,45±0,02	0,45±0,04	0,47±0,02	0,47±0,02

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Basophils	0,13±0,01	0,15±0,01	0,15±0,01	0,15±0,01	0,16±0,01	0,16±0,01
At the end of the experiment						
Lymphocytes	47,33±0,41	56,33±2,16	45,33±1,78	45,33±3,89	43,67±4,14	49,00±0,71
Juvenile neutrophils	2,00±0,00	1,67±0,41	1,67±0,41	1,67±0,41	1,33±0,41	1,33±0,41
Rod neutrophils	3,00±0,00	2,67±0,41	2,33±0,41	3,33±1,08	3,00±0,00	3,33±0,41
Segmented neutrophils	46,67±0,41	38,67±2,04	49,33+2,86	48,67±3,27	51,00±3,74	45,33±1,08
Eosinophils	1,07±0,04	1,07±0,04	1,47±0,33	1,07±0,04	1,07±0,04	1,10±0,07
Monocytes	0,47±0,01	0,52±0,01	0,48±0,01	0,49±0,02	0,47±0,01	0,49±0,01
Basophils	0,14±0,01	0,16±0,01	0,15±0,01	0,16±0,01	0,16±0,01	0,16±0,01

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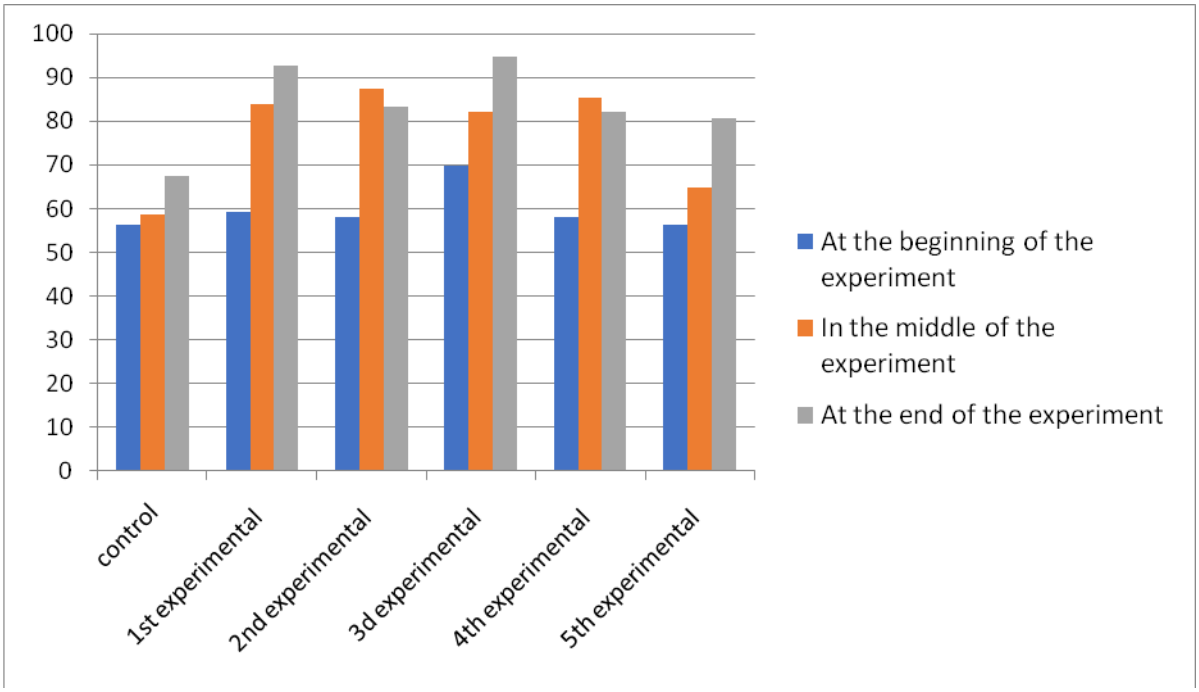

Figure 2: Bactericidal activity of blood serum, %

In the middle of the experiment, the highest bactericidal activity of blood serum was observed in the groups of animals receiving the supplement made of Echinacea purpurea (2nd and 4th experimental groups). At the end of the experiment, this figure was higher in the groups receiving bentonite clay (1st ,3d and 5th experimental groups).

The results of the experiment showed that the animals providing with the supplements to the diet had an advantage in the growth rate compared to the control group (table. 3). At the age of 70 days the greatest live weight of 18.79 kg was observed in the piglets of the 5th experimental group, which was higher in comparison with the control group by 2.29 kg ($P<0.05$). In other experimental groups the weaned piglets also significantly surpassed the analogues of the control group in live weight characteristics. This tendency continued to preserve in further age periods of growth of young pigs. So, at the age of 120 days the highest live weight kg 37,86 was noted in pigs of the 5th experimental group, which was higher than that of the control group by 5.79 kg ($P<0.05$). As a result of the experiment, it was found that the weaned piglets that received the supplements to the main diet exceeded the control group animals by 94.3 g ($P<0.01$) in the average daily live weight gain during the period of 45-70 days. In the period of 75-120 days there was a similar situation: in the 5th experimental group, the average daily weight gain was 381.4 g, which is 70 g higher than that of analogues in the control group ($P<0.05$). The greatest absolute increase of 19.07 kg was also observed in the 5th experimental group, which is 3.5 kg higher than the young pigs of the control group ($P<0.05$).

Table 3: The dynamics of live weight of pigs used in the experiment, kg, $\overline{X}$ ±m

Group	Age, in days		
	45	70	120
Control group	11,36±0,54	16,50±0,52	32,07±0,82
1st experimental	11,21±0,68	17,64±0,47	34,14±0,97
2nd experimental	11,07±0,43	17,57±0,51	34,36±0,80
3d experimental	11,64±0,60	18,50±0,28	37,00±0,86
4th experimental	11,14±0,34	17,50±0,37	35,43±0,97
5th experimental	11,29±0,49	18,79±0,46	37,86±0,78

CONCLUSION

Thus, the conducted research shows that the introduction of bentonite clay and Echinacea purpurea into the diet of weaning pigs increases the natural resistance of the body of young pigs. The optimal ratio of the supplement components was revealed: 0.5% Echinacea purple and 1.5% bentonite clay of dry matter of the feeding ration.

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