

## EFFECTIVE USE OF PEAT PRODUCTS IN PIG INDUSTRY

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### SUMMARY

Application of humic substances from peat in the pig is an effective means of increasing productivity and resistance of pigs of different ages. The studies found that the use of sodium humate and oxyhumate improves aerobic processes in pigs. Feed additive designed on the basis of peat is effective for improving the growth of suckling pigs and prevention of stress at weaning.

KEYWORDS: peat, humic products, pig

### INTRODUCTION

Peat and various products resulting from its processing, is widely used in animal husbandry and veterinary medicine. In particular, humic preparations are stimulated of growth when used in diets of animals and birds (Stepchenko *et al.*, 2000; Stepchenko, 2004; Stepchenko *et al.*, 2008) due to the influence on the processes of digestion of feed, changes in basic metabolic processes and immune system function. The using of humic substances in the diet of cattle contributed to promote the gas-energy metabolism, increased levels of anabolic processes (Gryban *et al.*, 2008), and the combination of deficient micronutrients allowed increasing the effect and enhancing the performance of mineral metabolism. More recently research showed a possibility of using peat in the diets of pigs as a stimulator of natural resistance levels in sows and piglets (Trckova *et al.*, 2005).

The aim of our study was to examine the effectiveness of humic substances derived from peat – sodium humate, oxyhumate, as well as food additives based on peat, in the pig industry.

### MATERIALS AND METHODS

In the first experiment studied the effect of sodium humate on blood parameters and body weight gain of weaned piglets and the pigs of 4-6 months old. Was formed four groups of animals – two controls and two experimental, 20 animals in each group. The pigs of the experimental group received sodium humate at 15 mg/kg body weight daily for 21 days. In the second experiment was observed the effect of oxyhumate on growth and performance of young pigs, morphological and biochemical parameters of blood. also was formed by two groups of piglets after weaning (15 gilts and 15 boars in each) and fattening pigs 4--month-old (15 in each). Experimental groups of animals received oxyhumate in addition to the diet in dose of 0,15 ml / kg body weight.

In the third experiment examined the efficacy of peat as feed additive in the diets of suckling pig. Peat was treated with high temperature and was enriched by trace elements. When choosing peat used evaluation methods, previously developed by us (Stepchenko *et al.*, 2010). One week before farrowing was formed two groups of sows 18, each. From the control group received 192 pigs and 188 experimental piglets. Starting from 3-5 days after birth, piglets were given feed supplement by a rate of 250 g per 1 litter for 14 days. Observations of the piglets was carried out during the suckling period. Weaning was performed in 28-day old, and 24 hours blood samples were taken for investigation.

In the blood of animals were estimated: the number of red blood cells and white blood cells – using counting chamber, the concentration of hemoglobin – by the method of Drabkin, glucose and urea – enzymatically, total lipids - gravimetrically, pyruvate – as their 2,4-dinitrophenylhydrazones, lactate – by method of Barker and Samerson, total protein – by biuret method, albumin - by method of Doumas, AST and ALT – by method of Reitman and Frankel. The results were processed statistically.

## RESULTS

The use of sodium humate for piglets after weaning leads to increased weight gain by 8% ( $P < 0.01$ ). In their blood increases the number of red blood cells with 7.04 to 7.47  $10^{12}/l$  ( $P < 0.05$ ), hemoglobin – of 10% ( $P < 0.05$ ). In 4-6-month-old piglet daily gain increased by 14%, and there was an increase in blood hemoglobin from 106.6 to 121.6 g/l ( $P < 0.001$ ), number of red blood cells of 10% (from 6.22  $10^{12}/l$  to 6.89  $10^{12}/l$ ,  $P < 0.05$ ). The results of the study preparation on blood biochemical parameters are presented in Table 1.

Table 1. Effect of sodium humate on biochemical blood parameters of pigs ( $M \pm m$ ,  $n=10$ )

Parameters	2-4-month-old		4-6-month-old	
	control	experience	control	experience
Glucose, mmol / l	4,07±0,08	4,79±0,11**	5,14±0,3	4,28±0,27*
Lactate, mmol / l	1,16±0,05	0,95±0,08*	1,26±0,03	1,09±0,02***
Pyruvate, umol / l	92,89±4,08	68,27±4,08**	79,0±3,5	66,31±3,9*
Total lipids, g / l	3,89±0,05	4,12±0,03**	3,58±0,05	3,79±0,06*

\* $P < 0,05$ ; \*\* $P < 0,01$ ; \*\*\*  $P < 0,001$  compared with control animals

In pigs 2-4-month-old showed a decrease in blood lactate levels by 14% ( $P < 0.05$ ), pyruvate – 27% ( $P < 0.001$ ). These changes were accompanied by increased levels of glucose by 16% ( $P < 0.001$ ), which, in our opinion, due to increased intensity of aerobic oxidation in the tissues of the body. However, increasing concentrations of glucose leads to an increase in total lipid content in the blood serum of piglets.

In pigs, 4-6-month-old under the influence of sodium humate similar changes were observed: the content of lactate in the blood decreased by 15% ( $P < 0.001$ ), pyruvate – 16% ( $P < 0.05$ ) increased total lipid content of 5,9 % ( $P < 0.05$ ). However, the level of glucose in their blood decreased by 17% ( $P < 0.05$ ), which may be associated with a greater need for energy in the

tissues of the material in increasing increments of weight. Studies have shown that pigs treated with sodium humate, diseases of the digestive system met at least 20%, while the duration of treatment of cases has fallen by an average of 2 days. Thus, the use of sodium humate in the diet of pigs within a positive effect on metabolic processes in the organism, which leads to increased levels of natural resistance of animals and weight gain.

In the second experiment found that oxyhumate stimulate increased weight gain by 14% compared with control animals. Stimulation of erythropoiesis by oxyhumate was similar with sodium humate. Under his influence number of red blood cells of pigs 2-4-month-old increased by 14%. However, it should be noted that we have a more pronounced effect is seen when the preparation fed boar (28%), whereas gilts noted a slight increase in the number of red blood cells.

Effect of oxyhumate on metabolic processes is also dependent on sex pigs. So, the level of glucose and pyruvate in the blood of boars under the influence of the preparation significantly decreased by 11% and 27%. In gilts, on the contrary, the concentration of glucose in the blood increased by 10% ( $P < 0.05$ ), whereas lactate levels decreased by 25% ( $P < 0.01$ ), and pyruvate – 16% ( $P < 0.05$ ). The content of total lipids in the blood serum also increased only in boars (7%,  $P < 0.05$ ). Thus, changes in metabolism and general physiological condition of pigs under the influence of oxyhumate also depend on their sex, and a more pronounced effect was manifested at boars.

When feeding oxyhumate at 4-6-month-old weight gain of pigs increased by 15% ( $P < 0.01$ ). At the same time their blood hemoglobin content increased by 7% ( $P < 0.05$ ), and the number of red blood cells (15%,  $P < 0.01$ ) and leukocytes (7%,  $P < 0.05$ ). Results of the study of parameters of carbohydrate metabolism indicate that oxyhumate increases the level of aerobic energy processes in pigs, which is accompanied by a decrease in lactate content to 25% ( $P < 0.05$ ), pyruvate – by 9% ( $P < 0.01$ ) and glucose at 11% ( $P < 0.001$ ). However, the blood levels of total lipids increased by 6% ( $P < 0.05$ ).

Thus, the using of sodium humate and oxyhumate in diets of pigs we have noted several major effects: the stimulation of weight gain, increased the synthesis of red blood cells and hemoglobin, as well as metabolic changes associated with the intensification of the processes of aerobic oxidation of carbohydrates in the tissues. However, our data indicate the presence of sex differences in the response of animals to the effect of humic substances, which requires further study.

The using of peat as feed additive increase a feed intake in piglets. During the study period in the experimental group were died 7 piglets, whereas in the control group – 16. The main cause of death of piglets in groups was diseases of the digestive tract. After weaning, weigh of the animals were conducted in both groups. The average weight of pigs of the experimental group was 7.82 kg, whereas in the control group - 7.35 kg.

In the study of hematological parameters (Table 2) was found that after stress of weaning there is a greater number of red blood cells in the blood of piglets of the experimental group compared to control by 11.7% ( $P < 0,2$ ).

Table 2. Parameters of erythropoiesis in piglets after weaning (M±m, n=6)

Parameters	group	
	control	experimental
The number of red blood cells, 10 <sup>12</sup> /l	5,48±0,33	6,12±0,24 <sup>▲</sup>
The content of hemoglobin, g/l	80,40±6,61	97,61±3,84*
Hematocrit, %	32,20±1,67	32,23±2,66
The average volume of erythrocytes, fl	58,94±1,96	55,16±3,99
The average content of hemoglobin in 1 red blood cell, pg	14,62±0,57	16,78±0,73*
The average concentration of hemoglobin in red blood cells, %	24,91±1,25	30,88±2,00*

<sup>▲</sup> – P<0,02; \*P<0,05 compared with control animals

It should be noted that due to the development stress after weaning at piglets of the control group, there are signs of anemia, while the rate in the experimental animals is at the lower limit of physiological values. The average content of hemoglobin in one erythrocyte in piglets of the control group was also decreased and amounted to 14,62±0,57 pg, whereas the experimental group of animals, it was higher by 21.4% (P<0,05). However, the average concentration of hemoglobin in one erythrocyte in piglets treated with peat addition increased by 14.8% (P<0,05). Thus, the feed additive of the peat-rich minerals, stimulates erythropoiesis and prevents of anemia at weaning. This is manifested in the blood by increasing the number of erythrocytes and their hemoglobin saturation.

In the biochemical study of serum albumin concentration found an increase (by 3.9%, P<0,05) and decreased activity of ALT (38.8%, P<0,05) in animals treated with an additive (Table 3).

Table 3. Biochemical parameters in piglets after weaning (M±m, n=6)

Parameters	group	
	control	experimental
Total protein, g/l	62,86±1,23	62,84±2,28
Albumin, g/l	32,15±0,43	33,39±0,33*
ALT, U/l	66,88±7,92	42,24±6,16*
AST, U/l	62,48±19,36	62,48±22,00
Urea, mmol/l	4,96±0,39	5,23±0,41

\*P<0,05 compared with control animals

We assume that the positive impact we have developed a feed additive of the peat on the physiological status of pigs due to several mechanisms:

- 1) adsorption of toxic compounds in the gut through the peat, which has a high sorption capacity;
- 2) stimulation of erythropoietic processes and decrease functional load on the liver by stimulating the antioxidant defense mechanisms by means of trace elements;
- 3) change digestive capacity in the gut by stimulation of motility and more lower pH.

## CONCLUSION

The using of feed additives and peat humic substances stimulates the growth and development of piglets of different age groups, which leads to a decrease in morbidity and an increase in weight gain of pigs. We used additives have a wide range of physiological effect on the organism of pigs:

- 1) stimulate the formation of red blood cells and hemoglobin,
- 2) enhance the processes of aerobic oxidation of carbohydrates in the tissues,
- 3) reduce the negative effects of weaning stress.

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