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# Use Of Nanostructured Additive In Turkey Breeding.

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**ABSTRACT**

The purpose of the research is to study the blood indices, metabolism, productivity and quality of the products obtained by feeding nanostructured additive to young turkeys. It has been established that the inclusion of a nanostructured additive (based on modified natural zeolite and soy production waste - soybean okara) in the turkey ration improves the morphological composition of their blood, the biochemical status of the body, enhances metabolic processes, increases weight gain, and provides ecologically clean high-quality meat.

**Keywords:** feed additive, turkey, zeolite, soybean okara, blood, metabolism, body weight.

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## INTRODUCTION

In modern conditions one of the main tasks of poultry breeders and animal breeders is to obtain high-quality and ecologically safe food for humans (1-3). The main source of nutrients, minerals and vitamins for animals and birds is feed. During the fattening of young animals there is an intensive formation of muscle tissue. The lack of protein, amino acids, minerals and vitamins in their bodies leads to metabolic disorders, slowing growth and development (4-6). Violation of protein metabolism affects the mineral nutrition, there is a deterioration of digestion and assimilation of feed ration substances, which leads to a decrease in the productivity of animals and birds (7-8). Modern kinds of turkeys have a genetically determined high growth rate and are sensitive to even minor fluctuations in the diet of nutrient and mineral levels (9).The use of nanotechnology in feed production allows us to encrease the beneficial properties of natural minerals - zeolites, and contributes to the development of new highly effective feed additives (10-14).

## OBJECTS AND METHODS OF RESEARCH

In Ulyanovsk region the Russian Federation, a physiological and research production experience was organized on the basis of a peasant farm. The object of the study was young turkeys of the breed "Hybrid Credmeyker" 40…45 days of age.They were formed into two groups of analogues (10 birds each).Feeding conditions: the 1-st control group was fed the basic diet. The diet of birds of the 2-nd group included nano-additives (100 g/head/day), which consisted of a modified zeolite from the Ulyanovsk region and waste from the production of soy milk, soybean okara (1:1). At the end of the experiment, 5 birds from each group were slaughtered, muscle samples were taken. Organoleptic evaluation of meat, physico-chemical studies were carried out by standard methods: determination of moisture by drying, fat by the Soxhlet method, protein by Kjeldahl, ash by burning at a temperature of 600-800 ° C, and mineral content by atomic spectrophotometry. To investigate the indicators used analyzers: "PCE-90Vet", "AKBa-01-BIOM", "Stat Fax 1904 Plus". The growth dynamics of the birds was assessed by control weighing. The data were processed with the help of Statistika program.

## THE RESULTS OF RESEARCH

The intake of young turkeys with nano-additives had a positive effect on the morphological composition of their blood. The increase in the content of erythrocytes by 7,39 %, leukocytes - by 3,6 %, hemoglobin - by 5,72 %, hematocrit - by 4,67 % compared to the control was detected.

The analysis of the biochemical composition of turkey blood showed that in birds of the 2-nd group the amount of total protein in serum increased by 6,78 % and amounted to 44,89±01,17 g/l, against 42,04±1,27 g/l in group of analogues. The level of albumin of birds in the experimental group significantly increased by 7,38 % and was 33,72±0,84 g/l at $p < 0,05$, against 31,40±0,57 g/l in the control. There was also an increase in the content of α-, β-, γ-globulins by 9,29, 6,53 and 3,6 %, respectively, compared with analogues. This characterizes the increased synthesis of proteins in the body of birds under the influence of nano-additives. The study of the activity of enzymes in the blood of birds revealed some patterns. The use of nano-additives to turkeys contributed to the reduction in the physiological standards of the activity of aspartate aminotransferase (AST) by 5,51 % to 689,27±10,93 nkat/l, while the activity of alanine aminotransferase (ALT) increased by 2,75 % to 635,94±14,98 nkat/l. Pointing to the activation of amino acid synthesis by the catabolic way - reducing protein breakdown and increasing the efficiency of using nitrogenous substances in the metabolism. The use of nano-additives contributed to the normalization of alkaline phosphatase activity in the blood of birds, which decreased by 4,7 % and was in the range of 2621,70±147,46 nkat/l compared with the control.

The level of productivity of turkeys is characterized by such important indicators as their body weight and growth energy. According to the control weighing data, the birds in the experimental group showed a dynamic to the increase in their body weight compared to their analoguescounterparts (таble 1). At the beginning of the experiment, the difference in body weight in the 1st and 2-nd groups was insignificant, about 30...40 g (3,74±0,10 and 3,77±0,08 kg). During the experiment, a noticeable increase in the body weight of young birds of the experimental group was revealed. From 50 to 55 days of growing turkeys surpassed their peers in the control of body weight by 4,23 %, in 60...65 days - by 6,25 %, in 70...75 days - by 7,24 % and by 80.. 85 - by 9,5 %, respectively. At the end of the experiment, young turkeys of the experimental group surpassed

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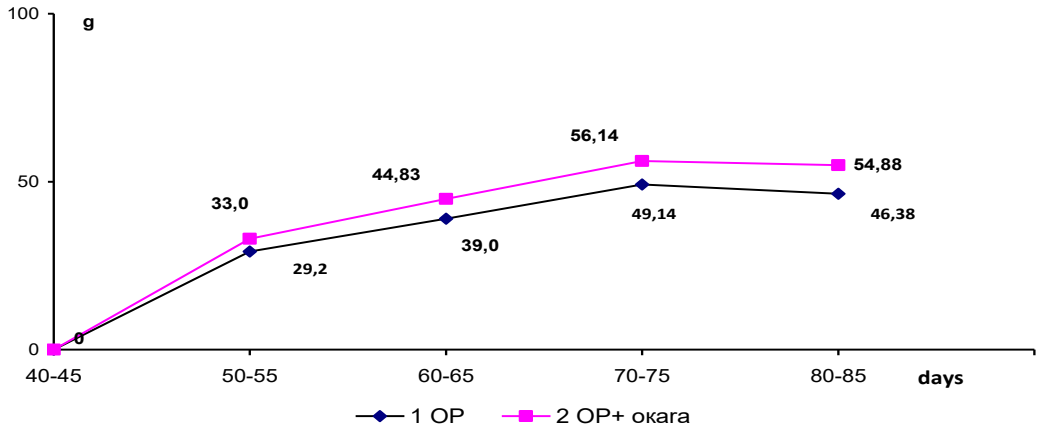
their peers in body weight in average by 710 g. The growth rate of the birds of the 2-nd group is shown by the increase of average daily gain their body weight by 13...18,3 % in comparison with the peers (figure 1).

The study of the chemical composition of turkey meat revealed a beneficial effect of the additive on its qualitative composition and nutritional value. White and red meat was distinguished by a high content of protein and ash and less - fat, which indicates an increase in its dietary value. A comparative analysis of turkey meat of the 2-nd group showed (figure 2) that the protein content in white and red meat increased by 9,52 and 10,27 % and was 24,50±1,05 and 21,14±1,8 % against 22,37±2,33 and 19,17±2,35 % in the 1-st group. Against this background, the concentration of ammonia nitrogen decreased significantly by 4,75 and 5,21 %, indicating the intensive use of nitrogen in the synthesis of tissue protein. The fat content in white meat decreased by 3,73 % and in red meat- by 2,53 %. The ash content, on the contrary, increased, both in the pectoral and femoral muscles of birds of the 2-nd group by 6,83 and 7,69 %, which is due to the saturation of their body with the necessary mineral elements, the source of which was nano-additive.

The correction of the mineral homeostasis under the influence of the studied additive (table 2) contributed to an increase in the content of mineral elements such as calcium, magnesium, phosphorus, iron, zinc, copper and manganese in poultry meat. White meat of turkeys of the 2-nd group exceeded the control level: magnesium 7 times, calcium - by 11,43 %, phosphorus - by 4,9 %, iron - by 11,58 % and copper - by 107,3 %. Similar dynamics of the increase in the mineral value of muscle tissue was also observed in the study of red poultry meat from the experimental group. The analysis of the content of toxic substances in the sample of muscle tissue of turkeys of both the 1-st and 2-nd groups did not reveal excess of the standard indicators (table 3). The content of toxic substances and heavy metals was insignificant: the concentration of mercury in the sample of the experimental group was 0,0001±0,0001 mg/kg, arsenic – 0,002±0,001, cadmium 0,0003±0,0001, lead 0,003±0,001 mg/kg. Radiometric studies showed that the specific activity of radioactive cesium in a sample of muscle tissue of turkeys of the 2-nd group was 1,0 Bq/kg, which is below the acceptable level, which was 200,0 Bq/kg (table 4). Microbiological analysis of turkey meat (table 5) did not reveal any obvious deviations from the standard indicators, the presence of pathogenic microorganisms, Salmonella, L. Monocytogenes was not detected in the samples, mesophilic aerobic and optional anaerobic microorganisms are present in the amount of 2,3*10, which is much lower than acceptable level ($1*10^4$).

**Table 1 - Dynamics of body weight of turkeys when feeding nano-additives, kg**

| Turkey age | Groups | | | |
|---|---|---|---|---|
| | I group | % | II group | % of control |
| 40…45 days | 3,74±0,10 | 100 | 3,77±0,08 | 100,80 |
| 50…55 days | 5,20 ± 0,17 | 100 | 5,42 ± 0,16 | 104,23 |
| 60…65 days | 6,08 ± 0,17 | 100 | 6,46 ± 0,19 | 106,25 |
| 70…75 days | 7,18 ± 0,27 | 100 | 7,70 ± 0,28 | 107,24 |
| 80…85 days | 7,45 ± 0,19 | 100 | 8,16 ± 0,58 | 109,53 |




**1. The turkeys growth with the introduction of nano-additives in their diet, g**

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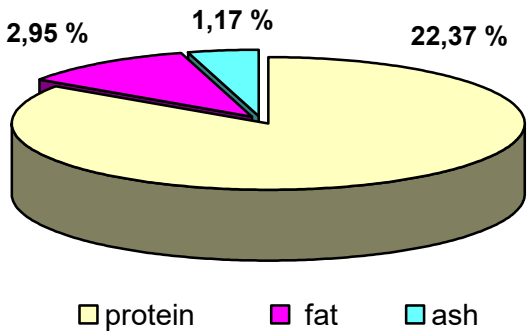
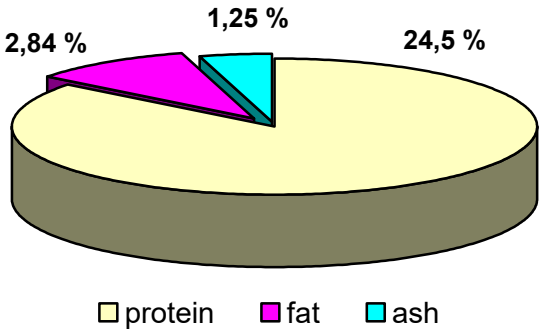



1- control group




2 - group

**2. The chemical composition of turkey meat when using nano-additives, %**

**Table 2 - Mineral composition of turkey meat when using nano-additives**

| Indicator, units | Turkey meat | | % of control |
|---|---|---|---|
| | 1 - control | 2 - experiment | |
| | white meat | | |
| Calcium, % | 0,70±0,14 | 0,78±0,18 | 111,43 |
| Magnesium, % | 0,04±0,02 | 0,08±0,03 | 200,00 |
| Phosphorus, mg/100g | 57,09±1,64 | 59,89±2,77 | 104,90 |
| Iron mg/100g | 0,95±1,38 | 1,06±0,03 | 111,58 |
| Copper mg/100g | 1,23±0,65 | 2,55±0,08 | 207,3 |
| | red meat | | 107,2 |
| Calcium, % | 0,69±0,01 | 0,75±0,02* | |
| Magnesium, % | 0,01±0,01 | 0,07±0,01* | 700,00 |
| Phosphorus, mg/100g | 65,26±1,49 | 71,02±5,14 | 108,8 |
| Iron mg/100g | 1,79±0,11 | 2,38±0,04* | 132,9 |
| Copper mg/100g | 2,36±0,18 | 2,53±0,01 | 107,2 |

Note: * - (p> 0.05) compared with the corresponding indicator in the control

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**Table 3 - The content of toxic and radioactive substances in turkey meat by feeding nano additives**

| Indicator, units | Quantity in meat | ND standards |
|---|---|---|
| Mercury mg / kg | 0,0001±0,0001 | no more than 0,03 |
| Arsenic, mg / kg | 0,002±0,001 | no more than 0,1 |
| Cadmium mg / kg | 0,0003±0,0001 | no more than 0,05 |
| Lead mg / kg | 0,003±0,001 | no more than 0,5 |
| Cesium-137, Bq / kg | 1,0 | no more than 200 |

**Table 4 - Microbiological analysis of turkey meat when feeding nano additives**

| Indicator | Quantity in meat | ND standards |
|---|---|---|
| Pathogenic microorganisms, including salmonella | not found in 25,0 | not allowed at 25,0 |
| L. monocytogenes | not found in 25,0 | not allowed at 25,0 |
| QMAFAnM - quantity of mesophilic aerobic and facultative anaerobic microorganisms | 2,3*10 | no more $1*10^4$ |

## CONCLUSION

Feeding a nanostructured supplement based on a modified zeolite and soybean okara to young turkeys contributes to a positive effect on the morphological composition of their blood, metabolism, growth energy, meat quality, its value. It provides: an increase in the protein content, macro- and microelements (calcium, magnesium, phosphorus, iron, copper, zinc, manganese), a reduction in fat, ammonia nitrogen in meat, and the general environmental safety of products.

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