Using ergotropics to normalize the homeostasis system activity in broiler chickens

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Abstract. The article describes the research results on the complex enzyme and antibacterial drugs use in feed for the Hubbard cross broiler chickens. A studies review is presented, which showed that ergotropic preparations complex use when growing broiler chickens is poultry increasing the meat productivity effective method, as per basic zootechnical indicators. As a studying result an ergotropics complex combined use effectiveness in growing poultry, a significant decrease in a highly toxic elements number concentration in the broiler chickens carcasses and organs has been established, which is very important today. The preparation complex influence on the Hubbard cross broiler chickens meat chemical composition, physicochemical and tasting parameters was traced. Our research has proved the ergotropic drugs use effectiveness in broiler chickens, which is one of the increasing poultry meat productivity effective methods and the quality products necessary to provide the population needs with high nutritional and biological products values.

1. Introduction

Poultry farming has become one of the Russian economy most profitable and important sectors, which is developing under the industry development program since poultry farming is agriculture relatively simple type that can provide the population with nutritious and healthy products: eggs, meat and fat, as well as provide raw materials for secondary processing - down, feathers and droppings.

At a meeting dedicated to the FSTP subprogram implementation, held by First Deputy Minister of Agriculture Jambulat Khatuov, with the Deputy Minister of Agriculture Maxim Uvaydov participation, Ministry of Education and Science representatives, agro-industrial complex regional governing bodies heads, industry unions and organizations, it was noted that the dynamically developing poultry industry occupies a leading position among all branches of animal husbandry. Russia Ministry of Agriculture creates all conditions for the highly efficient and competitive Russian poultry farming development, and the poultry meat share in the total production volume is 44.2%, and the self-sufficiency level in 2019 reached 100.3%. Particular emphasis was placed on the fact that compared to 2018, the export of poultry products increased by 13%, that is, up to 209.8 thousand tons.
Today, the Belgorod region is a Russia dynamically developing industrial and agricultural region, in which, thanks to stable investments and the regional target programs implementation, a new production base has been created on an innovative basis, which makes it possible to successfully develop and achieve high results in the poultry industry.

According to independent experts, at present, the Belgorod region share in the poultry meat production total volume in Russia is more than 16.5%. And what is typical, every year there is an increase in the poultry industry production [1, 2].

Large agricultural holding structures are effectively operating in the Belgorod region - Russia leading enterprises, which have become national brands. The Russian experience in growing broiler chickens suggests that only if resource-saving technologies are used, it is possible to compete with other countries in growing these birds breed, therefore the region poultry agricultural holdings use fully automated technological equipment from well-known firms and companies. Household climate control is automatic, taking into account the outside air temperature, house temperature and relative humidity [3, 4].

Today, the region poultry industry retains the prospect of further development and the ability to quickly, with minimal losses in the shortest possible time, ensure the country food security, supplying to the consumer market cheap dietary poultry products containing high-quality animal protein, phosphorus, minerals and vitamins necessary to maintain the human body health. Poultry contains much less fat than beef and pork most types [5, 6].

Experts estimate that a modern poultry farm main costs are feed costs amounting to 70-80 %, so each agricultural holding in the Belgorod region is building and equipping feed plants that fully provide the industry with full-fledged compound feeds, which reduce the feed and transport costs for their delivery cost [3, 4].

2. Material and research methods
Harmful resistant microflora causes great harm to the poultry industry, therefore, the complex preparations creation based on several antimicrobial agents, as well as immunomodulators, is one of the effective ways to combat this problem. And here the first place belongs to antibacterial drugs for feed purposes, which, acting on the pathogenic microflora, do not accumulate in the bird organs and tissues, are excreted from the body practically unchanged, at the same time they improve the birds feed conversion and growth rates. At the same time, at the exit, we get environmentally friendly poultry products, which contribute to an increase in the production' economic efficiency [7. 8, 9].

More and more researchers are engaged in these developments, but despite this, the new feed components creation and their effect study on the bird's body remains an urgent task.

Our research and production studies were carried out in the conditions of the Belgorod State Agrarian University Agrotechnopark ESIC poultry breeding laboratory. The laboratory includes an automated complex for broiler chickens floor keeping, which is equipped with a microclimate control system, two independent drinking lines and has two independent feeding lines, each of which is in a separate section, which allows you to create conditions for research, as close as possible to production.

The obtained results production check was carried out in the CJSC Prioskolye, the Belgorod Region, using the Hubbard cross broiler chickens. The studies were carried out on poultry from 1 to 40 days of age with floor housing adopted at the poultry farm.

In the experiment course, we studied the complex enzyme preparation Sunzyme combined use effectiveness and the antibacterial Neoxivital in feed for the Hubbard cross broiler chickens.

To assess the drugs used effectiveness, the diets used chemical composition, growth and development indicators (live weight, average daily and absolute growth), the products' quantity and quality, the blood morpho biochemical composition, the nutrients absorption and balance were studied under the generally accept under technical research using GOSTs and the AUAAS recommendations, the branch of the Federal scientific centre The All-Russian Research and Techcentrecal Institute of poultry farming of the Russian Academy of Sciences methods.
At the feeding period end, bird physiological status general assessment, under the rules for study under indicators (appearance and carcasses colour, consistency, smell, transparent coloured broth aroma), an organoleptic assessment was carried out for tasting broth and meat products - pectoral and femoral muscles, which was carried out according to GOST 51944-2002 [1, 2, 10, 11, 12].

3. Results and discussion

The research results of biologically active substances used in poultry farming make it possible to solve not only the rations missing components replacing problems and nutrition correction, but also other tasks to optimize the poultry feeding.

Because the biological components in optimal amounts include substances capable of exhibiting noticeable biological and pharmacological activity, it became possible to solve the preventive feeding problems and therapeutic effects on the bird's body [13, 14].

High-grade vitamin nutrition helps to increase growth, safety, improves the quantity and products quality, reduce feed costs for its production, and prevent poultry diseases. In the vitamins absence or lack, the enzymes' formation is disrupted, which leads to a decrease in the flow processes and biosynthesis regulation, cells specific functions and, as a consequence, a decrease in the poultry meat productivity [15].

The complex enzyme preparation that we introduce into mixed feed is distinguished by its ability to break down glucanases, xylanases, mannanases and fibre, which are found in large quantities in grain feeds, since it has cellulolytic, beta-glucanase, xylanase, amylolytic and proteolytic activity [1, 2, 4].

The poultry industry has always had good live weight growth rates and feed conversion rates, which have increased significantly in recent years due to improvements in housing and feeding technology. But at the same time, new problems arose that led to an increase in the poultry incidence, which is directly related to the intensive production technology, since as its increased sensitivity result to various factors (transportation, vaccination, diet change, rearrangement, crowding) in poultry reduced resistance and immunity, and at the same time more frequent outbreaks of infectious diseases.

The most favorable conditions for feeding and keeping, broiler chickens organism favourable instance can guarantee a sufficiently high increase in healthy, developed young animals with high vitality and growth energy, formed by the body natural defenses [16, 17].

In our research, we used a complex preparation containing its composition the vitamins, minerals optimal ratio, and preparation with antimicrobial components. The drugs were used together to prevent gastrointestinal and systemic bacterial infections occurring in association with vitamin and mineral deficiency, as well as to maintain high meat productivity in poultry.

![Figure 1. The bone tissue mineralization.](image)
The data obtained in the research course in production allow us to say that when the studied drugs' complex was added to the rations, a persistent increase in the use of nitrogen, calcium and phosphorus was observed in the experimental groups' poultry, which was reflected in the bone mineralization improvement in the poultry of the experimental broiler chickens, which indicates the feed main nutrients most complete assimilation.

As a vitamins and microelements positive effect result, one should evaluate the fact that the increase in broiler chickens live weight was due to the muscles, and not to the bones weight.

The ash, calcium and phosphorus content in the all experimental groups broilers tibia was higher than in the control.

As for the chickens live weight by rearing periods, in the experimental group it was higher than in the control group since the improved feed conversion contributed to an increase in the average daily weight gain of broilers receiving ergotropic drugs by 9.6%. A muscle mass more intensive build-up in broiler chickens under a drugs complex influence can be explained by the fact that under their influence the digestibility of the feed is significantly increased and this contributes to the metabolic processes' intensity in the chickens' growing body. The experimental group bird looked noticeably better and outwardly - plumage, brilliance and plumage purity differed significantly in their favour.

According to the anatomical cutting results, as a live weight constant superiority consequence, the poultry slaughter yield in the experimental group was 3% higher than the same indicator in the control group. The final result of studies indicates an increase in protein metabolism in the experimental chicks, which leads to broilers higher growth.

| Table 1. Data on broiler chickens anatomical cutting. |
|------------------------------------------------------|
| Indicator                                            | Control       | Experiment    |
| Pre-slaughter live weight, g                         | 2233.00       | 2758.10       |
| difference with control                              | -             | 2352          |
| Half-gutted carcass weight, g                        | 1848.82       | 2459.67       |
| semi-gutted carcass yield, %                         | 82.79         | 89.17         |
| the difference with control, %                       | -             | 33.04         |
| Gutted carcass weight, g                             | 1457.75       | 1880.30       |
| gutted carcass yield, %                              | 65.28         | 68.17         |
| Muscle mass, g                                       | 1110.34       | 1532.78       |
| % to a gutted carcass                                | 76.17         | 81.52         |
| % of pre-slaughter live weight                       | 49.72         | 55.57         |
| Bone mass, g                                         | 315.41        | 316.52        |

When studying the broiler chicken meat chemical composition, we found that in the poultry experimental group, in comparison with the control group, there was a decrease in moisture content and an increase in dry matter due to the protein accumulation in it with a decrease in fat content.

It is well known that the food products quality is seriously affected by their harmful and undesirable components (herbicides, pesticides, heavy metals, etc. residues). The complex vitamin and mineral preparation we use can be called an antioxidant kind.

Antioxidants (biological antioxidants) - a compounds group that include carotenoids, minerals, vitamins. These substances guard the cells' health - they neutralize free radicals, prevent membrane damage. Antioxidants not only prevent the cells' integrity violation but also accelerate the destroyed restoration, increase the body's resistance to infections.
Vitamins by themselves show insufficient antioxidant activity and, without the minerals combined action, cannot fully protect the body from damaging factors, be it endogenous or exogenous.

The substances contained in the complex vitamin-mineral preparation we tested can serve as protectors for intoxication with heavy metals: vitamin A; vitamin D 3; vitamin E; vitamin B 1; vitamin B 2; vitamin B 6; vitamin C; manganese sulfate; zinc sulfate; iron sulfate; copper sulfate; cobalt sulfate; potassium iodide.

The environment pollution with heavy metals and their compounds is recognized all over the world as one of the ecology and public health protection important problems. Toxic substances that are contained in soil and water pass into plants, then accumulate in the birds' body and then in products. The mercury, cadmium, lead compounds, which, even in trace amounts, are extremely harmful to animals and humans, are especially dangerous. These heavy metals enter the poultry body mainly with feed, therefore, it is necessary to constantly monitor their content, if necessary, apply to remove these substances various methods. The poultry products contamination risk with potentially hazardous substances can be reduced at the production' all stages. Therefore, methods and means are needed to prevent or limit their accumulation in a birds body during its rearing period. The heavy metal salts removal from it is possible to feed strict control, the technological methods use that reduce the absorption and accumulation of their degree in the birds' body [18].

The poultry food products ecological safety is determined by the developed and recommended by the SER (2002) maximum permissible concentrations (MPC) of toxins in meat and meat products. For slaughter poultry meat products, the MPC standards are: cadmium - 0.05 mg/kg, arsenic - 0.1 mg/kg, mercury - 0.03 mg/kg, lead - 0.5 mg/kg.

Analyzing the data obtained by us, it can be noted that the ergotropic preparations receipt by chickens from the experimental group contributed to a decrease in the heavy metals' concentration in the samples under study. These indicators were lower than those of the control group. In the results obtained, no significant differences were found between the experimental and control groups, as well as the MPC standards excess was not revealed, which corresponds to the safety hygienic standards and food products nutritional value for humans.

| Indicators | Recalculation | Groups | td |
|------------|---------------|--------|----|
|            |               | control | experiment |    |
| Cadmium; mg/kg | p | 0.042 ± 0.003 | 0.030 + 0.002 | 3.565* |
|            | c | 0.151 ± 0.005 | 1.110 ± 0.009 | 3.970* |
| Lead; mg/kg | p  | 0.368 ± 0.039 | 0.309 ± 0.005 | 1.497 |
|            | c  | 1.330 ± 0.161 | 1.137 ± 0.028 | 1.183 |

The food production for humans in the poultry processing consists of a processes complex set in biology, chemistry, engineering and technology. At the same time, it is important to remember not only the chicken meat usefulness but also good organoleptic characteristics, which contain glutamic acid, essential oils, nitrogen-containing and other elements. The chicken meat one hundred grams contains about protein twenty grams, which is 92% composed of amino acids necessary for humans, in optimal quantities and proportions, fat nine grams and carbohydrates about half a gram. Chicken meat gives many useful elements (zinc, iron, potassium, phosphorus, etc.) to the broth, as well as a vitamins number (B vitamins, tocopherol, vitamin PP, provitamin A, ascorbic acid) [1, 2, 11, 19].

At the study final stage, to compare and evaluate the broth taste, chest and femoral muscle tissue, we conducted a tasting on a five-point scale. The tasting showed that broth and poultry meat from those groups to which was added an ergotropic preparations complex containing vitamins, macro-and microelements, has the highest organoleptic indexes.
Thus, by changing the rations by introducing ergotropic drugs into them, it is possible to effectively manage the poultry health, which will naturally lead to the poultry products production, capable of a person satisfying the physiological needs for the necessary substances and energy. The poultry ability to achieve the highest feed conversion with its good adaptation to products keeping, dietary quality industrial conditions (protein high mass fraction with low energy value and low cholesterol level) are factors in the industry intensive development.

4. Conclusion
In recent years, domestic meat poultry farming has been developing underworld trends and is based on the domestic and foreign selection poultry highly productive breeds and crosses use.

According to the V.I. Fisinin information, the Russian poultry industry export potential is projected to grow and will soon reach the following indicators: poultry meat in 2020 - 450 thousand tons, in 2025 - 750 - 800 thousand tons; edible eggs in 2020 - 450 - 500 million, in 2025 - up to 1 billion pieces.

The Belgorod manufacturers products today occupy about 12% of the Russian meat market and there are good opportunities for further growth, therefore, the various ergotropic preparations complexes use in the industrial poultry industry seems to be a very promising way to increase the poultry productivity and its products safety.

At the same time, to increase the competitiveness and profitability, reduce the poultry products cost, it is necessary to create new scientifically grounded techniques and industry efficient production methods, taking into account not only savings in feed and other resources costs but also an increase in the products obtained quality indicators.

The prevention emerging areas basis and sometimes poultry infectious diseases' treatment is the bacterial preparations creation and use that normalize the symbiotic intestinal microflora, which is a natural barrier to the pathogenic microflora penetration into the body, plays an immunomodulatory role, producing its anabiotic substances and stimulating the body's defences [20, 21].

Based on the foregoing, based on the experimental data obtained, it can be concluded that under production conditions during the cultivation technological period to obtain environmentally friendly and safe food for humans, the complex enzyme and antibacterial drugs combined use is reducing mortality effective method, decreasing the poultry safety and growth rate, contributing to an increase in the total slaughter weight, leading to an increase in poultry production.

The research results show these ergotropic drugs combined use feasibility, allowing optimizing digestion and improve the diets nutrient and biologically active substances' assimilation efficiency that stimulate the immune system and increase the poultry nonspecific resistance, which has a direct effect on improving the resulting products' quality that can meet the humans' physiological needs in the necessary nutrients and energy.

Thus, the complex enzyme and antibacterial preparations combined use in the rations for the Hubbard cross broiler chickens has a beneficial effect on the poultry physiological state, productivity, the products' quality necessary to meet the population needs with high nutritional and biological value food, and the industry economic efficiency.

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