Vegetable oil various types together with enzyme preparation influence on broiler chickens’ meat productivity and quality

V A Zlepkin¹, V V Salomatin¹, A A Ryadnov¹, N A Zlepkina¹, M N Mishurova¹, T A Ryadnova¹ and Yu A Kurskaya²

¹ Volgograd State Agrarian University, 26 University Avenue, Volgograd, 400002, Russia
² Smolensk State Agricultural Academy, 10/2 Bolshaya Sovetskaya Street, Smolensk, 214000, Russia
E-mail: zlepkin@mail.ru

Abstract. The article provides data on the vegetable oil various types together with the "CelloLux-F" enzyme preparation influence on the broiler chickens of the meat cross "Cobb-500" meat productivity and quality indicators. Chickens of the control group got compound feed with sunflower oil; the experimental group I received the same compound feed and additionally 100 g/t of the "CelloLux-F" preparation, the experimental group II received compound feed, which was added with mustard oil (instead of sunflower oil) and additionally 100 g/t of the "CelloLux-F" preparation, the experimental group III received compound feed, which was added with camelina oil (instead of sunflower oil) and additionally 100 g/t of the "CelloLux-F" preparation. It was found that young animals of the experimental groups, in comparison with the control group, the weight of the drawn bird increased by 4.2-9.2%, the edible carcass parts - by 4.3-9.6%, the pectoral muscles - by 5.42-10.96%. The most expedient, both from a zootechnical and from an economic point of view, is the use of camelina oil (instead of sunflower oil) together with the enzyme preparation "CelloLux-F", which will increase the poultry meat production profitability level by 18.02%.

1. Introduction
The problem of providing the population with high-quality competitive food products, including poultry meat, is considered the most important for the agricultural industrial complex. The solution to this problem is possible not only by increasing the poultry genetic potential, but also through scientifically based balanced feeding.

In this regard, in the market economy conditions, the issue of increasing the poultry breeding efficiency based on the rational use of local food means, research and production of new unused feed products with a high content of nutrients and energy, such as oilseed cakes (oilseed sunflower, camelina, rape, etc.), which combine well the best potential seed productivity with a high content of oil and protein [1, 2, 3, 4], is of great importance.

It was proved that high doses of protein not associated with the energy of the diet, lead to a negative effect, that is, to the decrease in the protein use, the most expensive component of the diet, since its part is used to replace the body’s energy needs. To improve the protein use, it is necessary to
increase the energy part of the diet by adding high-calorie components, such representatives can be fodder fats and vegetable oils [5].

Poultry feeding programs in Russia take into account the rather high use of wheat, barley, bran, peas, sunflower processing by-products, rapeseed, etc. in compound feed. At the same time, non-starchy polysaccharides contained in these ingredients have a negative effect on the compound feed energy use by poultry, as well as for the digestibility and assimilation of other nutrients. This, in turn, is reflected in the decrease in its productivity. [6, 7].

In recent years, the genetic potential of poultry productivity has significantly increased. However, the poultry productivity genetic potential realization is impossible without proper and high-quality feeding. An integral part of modern diets are enzymatic preparations that allow to increase the level of feed assimilation, optimally balance the feed and at the same time optimize the cost of rations through the use of more accessible, but difficult to digest components [8, 9, 10].

The purpose of our research was to study vegetable oil various types in combination with the "CelloLux-F" enzyme preparation influence on growth and development, digestibility and use of nutrients, morpho-biochemical parameters of blood, broiler chickens meat productivity and quality.

2. Materials and methods

To carry out a scientific, economic and physiological experiment by the method of analogs, 4 groups of broiler chickens of the meat cross "Cobb-500" (control and three experimental ones) at the age of one day were formed, 100 heads each. The period for breeding broiler chickens was 40 days. The experiment was carried out in the conditions of JSC "Poultry Farm Krasnodonskaya" in the Ilovinsky district of the Volgograd region.

Throughout the experiment, the chickens were fed with 4 brands of compound feed (CF): CF-0 at the age of 1 to 4 days; CF-2 from 5 to 14 days; CF-5 from 15 to 28 days and CF-6 from 29 to 40 days.

In terms of the compound feed ingredients set in the control and experimental groups, they practically did not differ during all the breeding periods. The difference was that broiler chickens of the control group received a compound feed, which was supplemented with sunflower oil, during the breeding; broiler chickens of the experimental group I received the same compound feed as broiler chickens of the control group, but they additionally got 100 g/t of the "CelloLux-F" enzyme preparation; broiler chickens of the experimental group II received compound feed, which included mustard oil (instead of sunflower oil) and 100 g/t of the "CelloLux-F" enzyme preparation; broiler chickens of the experimental group III received compound feed, which included camelina oil (instead of sunflower oil) and 100 g/t of the "CelloLux-F" enzyme preparation.

In accordance with the adopted technology, broiler chickens were housed in a floor housing with deep-litter system. The experimental broiler chickens were kept in the building separately in groups in specially fenced off sections with a stocking density of 16.4 heads per 1 m² during 40 days with free access to water and feed. All microclimate parameters for all groups were the same and corresponded to the recommendations for breeding broiler chickens of the “Cobb-500” cross.

During the scientific and economic experience, the following indicators were taken into account and studied:
- livestock survival rate - with daily poultry inspection;
- broiler chickens live weight - by individual weighing on electronic scales;
- chemical composition of feed, metabolic products were determined according to the general method of zootechnical analysis;
- nutrients digestibility in the diet, nitrogen, calcium, phosphorus balance and use were determined in a digestible trial;
- morphological and biochemical blood tests were carried out on 6 broiler chickens from each group;
- meat productivity - by control slaughter and complete anatomical cutting of dressed chicken at the age of 40 days, 6 heads from the group (3 cockerels and 3 pullets) according to the All-Russian Scientific Research and Technological Institute of Poultry Breeding method.
- chemical composition and energy nutrition of the pectoral muscles (according to the All-Russian Scientific Research and Technological Institute of Poultry Breeding method);
- tasting assessment of meat and broth was determined in accordance with the All-Russian Scientific Research and Technological Institute of Poultry Breeding method.

3. Results and discussion
Live weight is considered the most important indicator of the broilers growth and development and one of their productivity results. The control over the movement of live weight makes it possible, even during the chickens’ life, to judge the meat productivity and some processes associated with the development of the whole organism, allows to plan feed costs per unit of live weight gain and the economic efficiency of breeding the young birds. The growth rate of experimental broiler chickens can be judged by live weight at different age periods [11].

How the broiler chickens growth proceeded when using various types of vegetable oil in compound feeds in combination with the "CelloLux-F" enzyme preparation can be judged by the change in live weight during the entire breeding period (40 days), as well as by the average daily gain in poultry live weight.

As the research result, it was found that the broiler chickens live weight at the age of one day was 45.18-45.54 g. At the age of 7 days, the broiler chickens live weight between the groups differed slightly and varied within 157.2-159.6 g. At the age of 14 days, broiler chickens of the experimental group exceeded the control group by 9.8-20.3 g or 2.5-5.3%, at the age of 28 days - by 5.3-12.5 g, or 0.41-0.96%. At the end of the breeding period (40 days), the broiler chickens live weight in the experimental groups was 2364.90-2484.40 g, exceeding the control group by 38.65-119.2 g or 1.7-5.1%, average daily increase - by 1.67-5.14%. For the entire breeding period (1-40 days) the survival rate in the control group was 94.8, in the experimental group, respectively, it was 95.8; 96.9 and 99.0%, which is more by 1.0; 2.1 and 4.2%, compared with the control group.

Compound feed containing the same amount of nutrients and energy has a different effect on the poultry productivity. This is largely due to the fact that the nutrients of the feed components have different digestibility and availability.

During the experiment, it was found that the feed dry matter digestibility coefficient in broilers of the experimental groups was higher than in the control group, respectively, by 1.32 (P < 0.01); 1.44 (P < 0.01) and 1.58% (P < 0.01), crude protein - by 1.69; 2.33 (P < 0.01) and 3.39% (P < 0.001), crude fat - by 0.16; 0.85 and 0.99% (P < 0.05), crude fiber - by 1.70 (P < 0.01); 3.81 (P < 0.001) and 4.72% (P < 0.001) and nitrogen-free extractive substances - by 1.69; 2.39 (P < 0.001) and 2.54% (P < 0.001).

In broiler chickens of the experimental groups, the nitrogen utilization coefficient was higher, in comparison with the control one, by 5.44, respectively; 6.40 and 7.44% (P < 0.001), calcium - by 1.03; 2.64 (P < 0.05) and 5.65% (P < 0.001), phosphorus - by 3.54 (P < 0.001); 6.22 (P < 0.001) and 6.98% (P < 0.001).

The determination of the blood constituent parts number quantitative and qualitative content is extremely important for the broiler chickens body health.

The hematological parameters in the experimental broiler chickens were within the physiological norm. At the same time, broiler chickens of the experimental groups exceeded the control group in terms of hemoglobin content, respectively, by 4.36; 5.88 and 6.87%, the number of erythrocytes - by 6.0; 7.33 and 8.33%, leukocytes - by 4.47; 5.59 and 4.0%. The total protein content in the experimental groups was 2.84 more; 3.79 and 5.68% than in the control one. The concentration of calcium was lower in the control group, in comparison with the experimental groups, by 7.45; 12.94 and 10.98%, phosphorus - by 8.03; 14.66 and 7.33%.

Meat productivity is the most important economically useful property of poultry. It is characterized by poultry live weight and meat quality at slaughter age.

It was found that the increase in the broiler chickens pre-slaughter weight in the experimental groups in relation to the control group was: in the experimental group I - 38.1 g or 1.6%, in e the experimental group II - 68.4 g or 2.9% and in the experimental group III - 118.5 g or 5.1%.
A similar trend was observed for drawn bird weight. Thus, the experimental groups in terms of drawn bird weight exceeded the control group by 67.8 g (4.2%), 106.1 g (6.5%) and 150.2 g (9.2%), respectively. The broiler chickens slaughter yield in the experimental groups was 1.74-2.85% higher than in the control group. The number of the 1-st grade carcasses in all experimental groups was high from 97.34 to 98.41%, which is 0.13-1.03% more than in the control group. The highest yield of meat of the 2-nd category was found in the experimental group I and amounted to 2.53%. Non-standard carcasses were noted only in the control group in the amount of 1 piece, which amounted to 0.44%.

A more detailed assessment of the broiler chickens meat productivity was carried out during the carcass anatomical dressing, followed by chemical analysis of the meat and assessment of its tasting qualities.

The results of carcasses anatomical dressing indicate that broiler chickens of the experimental groups exceeded the control one in terms of the edible parts yield by 56.8 (4.3%), 89.7 (6.8%) and 127.4 g (9.6%)., total muscle mass - by 44.95 (4.3%), 71.1 (6.8%) and 100.9 g (9.7%). In terms of the pectoral muscles mass, the superiority of the experimental groups was 5.42-10.96%, the thigh muscles - 4.35-10.12% and the drumstick muscles - 4.3-10.35%, compared with the control group.

The meat nutritional value is characterized by the content of nutrients in it - proteins and fats. It is determined by its chemical composition and calorie content.

During the broiler chicken carcasses anatomical dressing the compared groups, the pectoral muscles, crural, drumstick and trunci were taken to study their chemical composition and energy nutrition.

Characterizing the broiler chickens muscles chemical composition and energetic nutritional value of all groups, it was found that there was more protein, respectively by 0.80; 0.94; 0.81; 0.95 and 0.83; 1.00%, but less fat by 0.49; 0.18; 0.47; 0.19 and 0.50; 0.20% in the broiler chickens pectoral muscles (white meat) of the experimental groups, in comparison with the thigh and drumstick muscles. Therefore, nutritionally white meat has higher dietary properties than red meat.

Along with the physicochemical analysis, one of the important places belongs to the organoleptic assessment, which results are final and decisive in determining the meat quality.

The tasting assessment of the broth in the experimental groups ranged from 4.37 to 4.56 points and in the control group it was 3.90 points, and the assessment of cooked meat was 4.45-4.54 points, respectively, and 4.13 points in the control group.

Economic indicators of the vegetable oil various types using together with the "CelloLux-F" enzyme preparation effectiveness when growing broiler chickens indicate that the yield of meat products was: in the experimental group I by 5.76 kg or 3.79%, in the experimental group II - 11.90 kg or 7.83% and in the experimental group III - 17.97 kg or 11.83% more compared to the control group. Feed consumption per 1 kg of live weight gain was 1.88 kg in the control group, from 1.85 to 1.78 kg in the experimental groups, which is 1.6 - 5.3% less than in the control group. Profits from the meat products sale were received in the experimental groups by 864.5; 1089.8 and 1925.7 rubles more than in the control group. The level of broiler chickens meat production profitability in the experimental groups was 22.42; 24.39 and 31.12%, up 6.67; 8.64 and 15.37% higher than in the control group.

4. Conclusion

Summarizing the results of the studies, it can be noted that the use of mustard and camelina oils as the source of fats in broiler chicken fodder together with the "CelloLux-F" enzyme preparation (instead of sunflower oil) does not reduce feed intake, livestock survival rate, growth rate, allows to reduce the cost per unit of production and increase the meat production profitability level. The highest economic effect is achieved when camelina oil (instead of sunflower oil) is added to the broiler chicken feed together with the "CelloLux-F" enzyme preparation.
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