Characteristics of meat productivity of goslings that consumed feed with enzymes in various combinations

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Abstract. The aim of the work was to study the effectiveness of enzyme preparations in the composition of animal feed on the increase in live weight and meat productivity of goslings. Amylsubtilin and protosubtilin were introduced into the feed for goslings of the first experimental group; amylsubtilin and celloviridin were added into the feed for goslings of the second experimental group. It was found that the absolute increase in live weight in the control group was 6366.9 g in gander and 5734.43 g in geese. In the first experimental group this indicator was exceeded: for gander by 7.51%, in geese - by 7.24%; in the second experimental group - by 10.35% and 9.07%, respectively. The slaughter yield of half-hulled carcasses of gander in the control group was 79.27%; in the first group this indicator was higher by 1.34% and in the second group higher by 3.03%. The geese in the control group amounted to 81.80%. In the first experimental group it was higher by 1.2% and in the second experimental group higher by 1.96%. The slaughter yield of gutted carcasses of gander in the control group was 60.78%, in the first experimental group - 61.16% (+1.6%) and in the second experimental group - 62.76% (+1.98%); in geese - 62.76%, 63.17% (+1.69%) and 64.86% (+2.1%) respectively.

1. Introduction

Poultry farming is one of the most important branches of agriculture, designed to provide the population with dietary food: eggs and poultry meat, characterized by a high content of animal protein with low-calorie content. Farmers and private farms can make a great contribution to the increase in poultry meat production. Depending on the available conditions in such farms it is possible to contain a bird from several heads to several hundred and even thousands. Birds, when feeding feed, give 3-5 times more gain in live weight per unit of consumed feed than other farm animals.

The main goal in poultry farming at the present stage is the effective production of the industry, with the lowest cost and high quality. It is possible to achieve this goal by increasing the productivity of birds, which is now extremely important.

In the poultry meat industry, one of the early maturity sectors is goose breeding, which in recent years, like other branches of the poultry industry, has been gradually increasing production. The meat of geese on the chemical composition differs in the high content of protein, mineral elements, vitamins. Due to the relative unpretentiousness of geese to the conditions of keeping and feeding, they are easy to breed in any climatic zone of the country.

In recent years, many large poultry farms in addition to the traditional production of chicken...
chicken meat) began to produce meat of other poultry species, such as Turkey, geese, and ducks. The share of goose meat in the total structure of poultry production is less than one percent. And in countries with developed poultry its share in the total number of birds can reach 25% [1-4].

Goose breeding is precocious and unpretentious industry. Geese, unlike other species of animals and poultry, have the ability to provide humans with tasty and full-fledged meat, delicious liver, the most valuable fat, durable and warm feather.

In order to reduce the cost of its production, poultry farmers are tasked with increasing the live weight at the end of cultivation with a relative reduction in their terms. To reduce the cost of production throughout the composition of animal feed farmers include components of local production, such as grain cereals, cake and sunflower meal, and many others. However, due to the significant content of fiber and non-starchy polysaccharide they have low nutritional value and poor digestibility. Studies of a number of authors show that this problem is solved by the inclusion of biologically active substances (BAS) in the composition of feed and of great importance in this belongs to enzymes, which contributes to the efficiency of feed nutrients [5-9].

Introduction of enzyme preparations of microbial origin to the rations of animals and poultry is one of the ways to solve this problem. Which, unlike hormones and biostimulants, do not accumulate in the body and in the final products, but act only on the components of the feed contained in the gastrointestinal tract. By choosing the right enzymes, with a certain activity, or their compositions, it is possible to increase the digestibility of nutrients in feed containing, inter alia, LLQQ, and other anti-nutritional substances. This improves protein, carbohydrate and fat metabolism, increases productivity, reduces feed costs.

In poultry farming, as in other livestock industries, there is some experience in the use of enzymes, but a number of issues on their use in goose breeding are currently insufficiently studied. Therefore, to increase the growth of live weight and meat productivity there is a need to study them [10].

The purpose of this work is to study the effect of the use of a mixture of enzyme preparations of domestic production in animal feed for geese on their productive and meat quality.

2. Materials and methods

The experimental part of the research work was carried out in the conditions of AO Plemptitsezavod AO Kanashsky of the Kanashsky District of the Chuvash Republic. The objects of research were purebred goslings of the Linda breed. In the research and production experiment there were formed three groups of goslings-analogs of 60 birds in each group (table 1).

Table 1. Scheme of the experiment.

| Group (n=60) | Age, day | Characteristics of feeding |
|-------------|----------|---------------------------|
|             | at the beginning of the experiment | at the end of the experiment |
| Control     | 1        | 77 | Complete feed (CF) |
| 1st experimental | 1        | 77 | CF + amylosubtilin g3h (50 g/t) + protosubtiline g3h (50 g/t) |
| 2nd experimental | 1        | 77 | CF + amylosubtiline g3h (100 g/t) + celloviridine g3h (75 g/t) |

The poultry of the control group received feed PC 31-497 during the first 7 days, from 8 to 21 days - PC 31-3606, from 22 to 56 day - PC 32-10422, from 57 to 76 days - PC 30-10014. The composition of feed for gosling for the periods of cultivation is shown in table 2. Amylosubtiline and protosubtiline were introduced into the compound feed of the first experimental group to the feed, and amylosubtiline and celloviridine - the second experimental group.

The enzyme preparations used in the experiment were manufactured by “Sibbiopharm” LLC (Limited Liability Company).
Table 2. The composition of feed for goslings for growing periods (in %).

| Compound feed composition | Brand and composition of compound feed in different periods of cultivation, days |
|---------------------------|--------------------------------------------------------------------------------|
|                           | 0–7     | 8–21   | 22–56  | 57–77  |
| PC 31-497                 |         |        |        |        |
| Wheat                     | 100     | 75.0   | –      | –      |
| Barley                    | –       | 15.1   | 61.028 | 73.151 |
| Sunflower cale SP 32, SK 21| –       | 7.0    | 10.0   | 2.00   |
| Bone tankage SP 34        | –       | –      | 4.0    | 4.0    |
| Fish meal SP 62           | –       | –      | 4.0    | –      |
| Shell meal                | –       | –      | –      | 0.5    |
| Chalk aft                 | –       | –      | 1.0    | 1.0    |
| Lysine hydrochloride 98%  | –       | –      | 0.131  | 0.07   |
| Sunflower oil             | –       | 0.5    | 0.644  | –      |
| Tricalcium phosphate      | –       | 0.3    | 0.097  | –      |
| Sodium chloride           | –       | 0.1    | 0.1    | –      |
| Protein vitamin-mineral concentrate | –   | 2.0    | 4.0    | 4.0    |

Amilosubtilin g3h contains amylolytic enzymes (activity 600 u/g) and a small amount of proteolytic. The overall effect is associated with the combined effect of all its constituent enzymes, including beta-glucanase, xylanase, and cellulase, catalyzing the cleavage of hard-to-digest polysaccharides of barley, wheat and rye.

Protosubtilin g3h (with the proteolytic activity of 70 u/g) is characterized by proteolytic action, which provides neutral and alkaline proteases against proteins.

Celloviridin (cellolux) is a complex of cellulases (2000±200 u/g), xylanase (up to 8000 u/g) and glucanase (up to 1500 u/g). This drug catalyzes the breakdown of cellulose, xylans, beta-glucans of plant cells to readily available sugars.

Productivity control was carried out by studying live weight and average daily gains, by individually weighing them at the beginning, at the end and during the experiment at each defined time intervals.

In order to determine the effect of the tested mixtures of enzyme preparations in the feed on the feed palatability, a quarterly group accounting of the feed and its residues was carried out, which showed that during the experimental period the groups did not differ in the number of feed consumed - all the geese willingly ate them. After control slaughter of goslings was estimated and carcass quality was carried out anatomical dissection of carcasses.

The biometric processing of the data obtained in the studies was carried out according to the variational-statistical method described by N.A. Plokhinsky.

3. Research results

The live weight of young stock was almost the same when it was put on fattening - 105.63-106.4 g in goose-ganders and 93.87-94.47 g in geese. Its absolute gain in the control group was 6366.9 g (± 14.88), in male goose and 5734.43 g (± 14.08) in female goose. In the first experimental group, this indicator was exceeded: in male geese by 7.51% (P <0.01), for female goose - by 7.24% (P<0.012); in the second experimental group, respectively, by 10.35% (P <0.013), and by 9.07% (P<0.015).

The average daily gain of live weight in geese in the control group reached 90.96±0.23 (P<0.01) and 81.92± 0.29 g (P<0.012), respectively.
In the first experimental group - 97.79± 0.89 and 87.85± 0.93 g, in the second experimental group - 100.4± 1.38 (P<0.013), and 89.35±1.45 g (P<0.015) (figure 1).

![Graph showing average daily gain live weight of goslings, g.](image1)

**Figure 1.** Average daily gain live weight of goslings, g.

In total for the period of experiment in each group, it was spent on 19.505 kg of compound feed on 1 head. At the same time, 1 kg of growth was spent: in the control group of goose-ganders - 3.06 kg of feed, in geese - 3.40 kg, in the 1st experimental group - 2.85 and 3.17 kg, and in the 2nd experimental group - 2.77 and 3.10 kg, respectively (figure 2). It should be noted that the best results were observed in the 2nd experimental group, where feed costs per 1 kg of increase in gander were 9.47% less than in the control group, and 2.8% compared with the 1st experimental group. Feed costs in geese of the 1st and 2nd experimental groups were respectively 8.82 and 2.20% less than in the control group.

![Graph showing feed costs by groups, kg.](image2)

**Figure 2.** Feed costs by groups, kg.

During the period of the experiment, each group spent 285.61 EFU. For a 1 kg gain in body weight in the control, 3.74 EFU (energy feed unit) was spent. In the first experimental group – 3.46 EFU (energy feed unit), or 7.49% less compared to the control. In the third experimental group – 3.36 EFU (energy feed unit), or less by 10.16% than in the control group, and by 2.9% compared with the first experimental group.

In order to assess the effect of enzyme preparations on the meat productivity of gooslings, we carried out a controlled slaughter - 3 goose-ganders and 3 geese in the study groups (figures 3 and 4).
The results of the controlled slaughter showed that the pre-slaughter mass of the gander of the control group was 6473 g (± 0.027), and in the first experimental group – 6950 g (P<0.029), which is more than the control group by 477 g and is 107.4%. In the second experimental group, this indicator exceeded 645 g and was 7118 g (P<0.012), or 9.9% more than in the control group. A similar pattern was observed for the female geese. The pre-slaughter weight of geese in the control group was 5827 g (P<0.022), in the first experimental group 6240 g (P<0.036) and in the second experimental group - 6350 g (P<0.028). That is, the excess is respectively 1.76% and 8.9%.

Slaughter yield of semi-polished carcasses of gander in the control group was 79.27%, in the first group - 80.98%, which is higher by 1.34% and in the second experimental group this indicator was 82.30%, which compared to the control group was higher by 3.03%. In the geese of the studied groups this indicator was slightly higher than that of the gander. In the control group the slaughter yield of half-polished carcasses was 81.8%, and in the first experimental group, it was 1.2% higher and amounted to 82.56%, in the second experimental group it was 1.96% higher and was as much as 83.76%.

The results of the anatomical cutting of carcasses showed that the mass of edible parts in carcasses of gander in the control group was 4141 g (P <0.021)), in the first experimental group - 4548 g (P<0.018), in the second group - 4761 g (P <0.015); in geese: 3698 g (P<0.019), 4047 g (P<0.013) and 4208 g (± 0.009) respectively. Thus, the gander of the second experimental group exceeded in this indicator by 14.9% and the first group by 4.7% and the female goose, respectively, by 13.7% and 3.9%.

**Conclusion**

The results of the study show that under the influence of the enzyme preparations amylolubtiline and protosubtiline as well as amylolubtiline and celloviridine (cellosuxe) in compound feeds for goslings, growth and development are accelerated during their growing. It causes their higher slaughter and meat qualities and, as a result, the output of slaughter mass, semi-gutted carcasses, as well as the output of edible parts in the carcass. It should be noted that the geese of the second experimental group had the highest indicators.

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