Effect of probiotic supplement feeds Amilocin on the productive qualities of laying hens

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Abstract. The paper considers the result of the experiments. It was found that when adding supplement feeds Amilocin with water to laying hens of the Hisex Brown cross according to the developed schedule, the average weight of one egg for the entire experimental period in the 2nd, 3rd and 4th experimental groups exceeded the values of the 1st control group by 0.89%; 2.4% and 3.13%, respectively. The egg production of the experienced laying hens in comparison with the control was higher, i.e., in the second group it was higher in 4.9%, in the third it was higher in 10.7% and in the fourth it was higher in 5.4%.

1. Introduction
Poultry farming is one of the fast growing and priority livestock industries in the world. Its main advantages are a fairly fast rate of livestock reproduction, a high level of productivity, as well as the availability of finished products for a lot of segments of the population. This industry gives meat, eggs as the main products, and fluff, feathers, organic fertilizers as additional products [1, 2, 3].

The efficiency of obtaining finished products of high quality on the scale of modern poultry farming depends largely on the genetic potential of poultry crosses. And as a result of a number of studies, scientists have found that modern crosses are very demanding and sensitive to conditions of keeping and feeding. They are liable to various stresses that can be caused by a change in food ration, various necessary veterinary treatments, even minor fluctuations in ambient temperature and other. As a consequence, all this contributes to a decrease in the productivity of laying hens, quality of eggs and the profitability of production in general [4, 5].

It is necessary to use various effective and safe supplement feeds containing various components such as probiotics, prebiotics, synbiotics, antibiotics, antioxidants, flavorings, sorbents, immunostimulants to stimulate natural resistance and increase the productivity of laying hens, [6, 7, 8, 9, 10].

The probiotic supplement feeds Amilocin is the result of the work of Russian scientists. It does not contain genetically modified compounds, and it is absolutely safe for birds. It contains a mixture of biomass of bacteria of the strains Bacillus subtilis and Bacillus amyloliquefaciens. It helps to normalize the natural intestinal microflora after the use of antibiotics, anthelmintics, coccidiostatics, reducing the negative effect of mycotoxins on the organism. It is used to replace antibiotics in
compound feeds, to increase the efficiency of feeds use and increase the productivity of birds, to improve digestion processes and accelerate the adaptation of animals to food ration [11].

The aim of the study was to determine the efficiency of using the probiotic supplement feeds Amilocin in the production of edible eggs. The following tasks were set to achieve the goal:

1) study the productive qualities of laying hens when using the probiotic supplement feeds Amilocin;
2) evaluate the quality indicators of edible eggs;
3) evaluate the morphological and physical parameters of laying edible eggs.

2. Material and research methods

The experiment was carried out on clinically healthy laying hens of the “Hisex-Brown” cross from 17 to 65 weeks old in the conditions of the scientific and educational center for poultry farming of the educational and scientific innovation centre “Agrotekhnopark” of the Belgorod State Agrarian University according to the schedule presented in table 1.

The probiotic supplement feeds Amilocin was added to clinically healthy birds through the drinking system at various doses during the study period.

Table 1. Schedule of study.

| Groups       | Amount of laying hens | Amilocin dose to the food ration | Dosing schedule of Amiloca |n |
|--------------|-----------------------|----------------------------------|----------------------------|
| 1st control  | 54 hens               | Main food ration                 | Feeding Amiloca at the beginning of the laying period is 10 days, at the peak of laying period is 10 days, then once a month for 10 days until the end of laying period |
| 2            | 54 hens               | Dosing schedule+ 0.4 g of Amiloca per hen per day at the beginning of the laying period; dosing schedule + 0.5 g of Amiloca per 1 hen per day in the future |
| 3            | 54 hens               | Dosing schedule + 0.5 g Amiloca per head per day at the beginning of the laying period; + 1 g of Amiloca per 1 head per day in the future |
| 4            | 54 hens               | Dosing schedule + 0.6 g of Amiloca per head per day at the beginning of oviposition; the laying period + 1.5 g of Amiloca per 1 hen per day in the future |

3. Research results

During the entire period of study, we kept records of the quantitative and qualitative indicators of laying hens' eggs. The mass of eggs is one of the most important characteristics of an edible egg because the product category and its final cost largely depend on it (table 2).

Table 2. Weight of eggs by months during the entire study period, g.

| Group of laying hens | Period | 1st control | 2nd control | 3rd control | 4th control |
|----------------------|--------|-------------|-------------|-------------|-------------|
|                      | June   | 56.13±0.32  | 56.24±0.36  | 56.74±0.37  | 56.11±0.41  |
|                      | July   | 56.92±0.25  | 57.19±0.45  | 58.93±0.36  | 58.97±0.34  |
August 60.38±0.37 61.28±0.29 61.71±0.41 60.44±0.37  
September 59.21±0.41 60.47±0.37 61.48±0.34 61.23±0.29  
October 60.27±0.51 61.38±0.42 61.89±0.46 61.31±0.25  
November 62.99±0.34 63.84±0.37 62.39±0.29 64.36±0.31  
December 61.78±0.37 62.07±0.29 63.34±0.39 61.52±0.34  
January 62.29±0.28 62.64±0.46 64.34±0.41 64.97±0.43  
February 63.23±0.41 63.72±0.32 64.39±0.42 66.86±0.44  
March 63.27±0.45 63.55±0.39 65.21±0.49 67.54±0.37  
April 63.85±0.38 63.48±0.43 64.87±0.39 64.03±0.39  
average 60.94±0.44 61.48±0.37 62.40±0.41* 62.85±0.41*  
*(p≤0.1)

The data in table 2 indicate that with age, the weight of eggs increased in all groups. The average egg weight for the entire period of egg production in all experimental groups was 0.89% higher than the control one; 2.4% and 3.13%, respectively, and amounted to 60.94 ± 0.44 g in the control one, 61.48 ± 0.37 g in the second one, 62.40 ± 0.41 g in the third one, and it turned out to be the largest in the fourth group and amounted to 62.85 ± 0.41 g. Also, this group of laying hens is characterized by the largest increase in egg weight throughout the entire period of productivity, by 12.01%, while in the control group this indicator was 8.57%, in the second group it was 9.32%, in the third it was 9.98%.

The high productivity of poultry can be revealed only in conditions of full feeding, as well as the balance of feeds with all the necessary nutrients and the degree of their assimilation by the bird's organism. The completeness of feeding and the maximum digestion of all elements included in food ration improves the quality indicators of eggs, and it also increases the productivity of laying hens (table 3).

Table 3. Productivity indicators of laying hens.

| Indicator                        | 1st control | 2nd control | 3rd control | 4th control |
|----------------------------------|-------------|-------------|-------------|-------------|
| Live weight of the bird at the beginning of the experiment, kg | 1907.1 ±15.4 | 1893.8 ±14.1 | 1887.1 ±12.3 | 1909.0 ±14.2 |
| Live weight of the bird at the end of the experiment, kg | 2027.7±11.8 | 2088.5±17.2 | 2092.3±12.8* | 2042.6±9.8  |
| Absolute gain, g                | 120.6       | 194.7       | 205.2       | 133.6       |
| Average daily gain, g           | 0.38        | 0.62        | 0.65        | 0.42        |
| Safety,%                        | 94.4        | 96.3        | 98.1        | 98.1        |
| Total egg production, pcs.      | 12329       | 12928       | 13647       | 12995       |
| Productivity to the control group,% | 100         | 104.9       | 110.7       | 105.4       |
| Egg production for a laying hen housed, pcs. | 228.3±2.37   | 239.40±3.12 | 252.72±4.26 | 240.65±2.91 |
| Egg production for an average laying hen during the experience, pcs. | 234.84±4.72 | 243.92±3.53 | 255.08±2.67 | 246.90±3.21 |

*(p≤0.1)

The poultry weight increased during the whole study period. So the absolute increase in poultry in the control group for the entire study period was 120.6 g, and in the second group it was 194.7 g, which is higher than in the control group by 74.1 g, in the third group it was 205.2 g, which is higher than in the control group by 84.6 g, in the fourth it was 133.6 g, which was higher than in the control group by 13.0 g.
According to the result of the analysis, the productivity of the experimental laying hens in comparison with the control was higher: in the second group it was by 4.9%, in the third it was by 10.7%, in the fourth it was by 5.4%. More eggs were obtained from the experimental flock, both for the laying hen housed and for the average hen.

The better safety of poultry and an increase in the gross collection of eggs in the experimental groups had a positive effect on egg production, both on the laying hen housed and on the average laying hen. 234.84 pcs were received for an average laying hen eggs in the control group, then already 243.92 pcs were received in the second group, which is 3.9% more, 246.90 pcs were received in the fourth, 5.1% more, and 255.08 pcs were received in the third, 8.6% more than in the first group, which was not fed probiotic feeds supplement Amilolin.

Morphological and physical parameters of laying hens' eggs of all groups during the whole period of productivity are presented in table 4.

Table 4. Morphological and physical parameters of laying hens' eggs in the experimental groups.

| Indicator/age of laying hens | 1st control | 2nd control | 3rd control | 4th control |
|-----------------------------|-------------|-------------|-------------|-------------|
| **Productive age, 20 weeks** |             |             |             |             |
| Egg white mass, g           | 31.81±10.11 | 31.12±9.87  | 35.06±11.15 | 32.72±10.38 |
| Yolk weight, g              | 12.45±4.02  | 12.97±4.10  | 14.07±4.49  | 13.89±4.09  |
| Shape index, %              | 77.47±1.07  | 77.01±0.24  | 76.88±0.84  | 76.62±1.07  |
| Egg white index, %          | 9.4±0.5     | 9.2±0.5     | 9.2±0.7     | 8.6±0.6     |
| Yolk index, %               | 47.03±4.2   | 44.11±2.3   | 45.17±1.9   | 45.21±3.2   |
| Egg white / yolk ratio      | 2.62±1.08   | 2.43±0.99   | 2.47±1.12   | 2.38±0.99   |
| Shell thickness, mm         | 0.44±0.03   | 0.45±0.02   | 0.52±0.04   | 0.48±0.04   |
| Egg white pH                | 8.6±0.07    | 8.74±0.12   | 8.46±0.16   | 8.64±0.07   |
| Egg white pH                | 5.95±0.33   | 5.21±0.19   | 5.9±0.22    | 5.28±0.20   |
| **Productive age, 40 weeks** |             |             |             |             |
| Egg white mass, g           | 32.64±1.12  | 33.52±2.07  | 33.74±1.58  | 34.17±1.29  |
| Yolk weight, g              | 16.29±0.74  | 17.42±0.89  | 18.01±1.03  | 17.95±0.93  |
| Shape index, %              | 73.09±1.08  | 73.03±0.94  | 73.53±0.76  | 72.64±0.70  |
| Egg white index, %          | 7.5±0.1     | 6.3±0.5     | 7.0±0.5     | 7.0±0.4     |
| Yolk index, %               | 38.1±3.1    | 32.7±17.1*  | 36.5±1.3    | 36.4±4.2    |
| Egg white / yolk ratio      | 1.81±0.10   | 1.79±0.02   | 1.78±0.09   | 1.81±0.07   |
| Shell thickness, mm         | 0.45±0.01   | 0.51±0.02*  | 0.51±0.05   | 0.61±0.05   |
| Egg white pH                | 8.56±0.20   | 8.75±0.11   | 8.97±0.32   | 8.76±0.11   |
| Yolk pH                     | 5.51±0.36   | 5.63±0.17   | 5.70±0.13   | 5.86±0.09   |
| **Productive age, 65 weeks** |             |             |             |             |
| Egg white mass, g           | 34.79±0.99  | 34.45±1.48  | 35.14±1.96  | 36.79±2.07  |
| Yolk weight, g              | 19.37±0.62  | 20.68±0.89  | 21.09±0.63  | 20.33±0.62  |
| Shape index, %              | 72.51±1.32  | 71.91±0.66  | 71.54±0.75  | 72.17±0.70  |
| Egg white index, %          | 5.7±0.7     | 5.4±0.8     | 4.9±0.6     | 5.3±0.8     |
| Yolk index, %               | 34.1±5.1    | 37.1±7.2    | 35.4±1.8    | 32.3±3.2    |
| Egg white / yolk ratio      | 1.81±0.09   | 1.70±0.14   | 1.67±0.09   | 1.70±0.09   |
| Shell thickness, mm         | 0.34±0.02   | 0.35±0.02   | 0.43±0.05   | 0.53±0.05   |
| Egg white pH                | 8.52±0.14   | 8.73±0.16   | 9.06±0.11*  | 9.06±0.05** |
| Egg white pH                | 5.62±0.12   | 5.75±0.16   | 5.87±0.26   | 6.01±0.07*  |

*(p≤0.1), **(p≤0.05)

The data presented in table 4 indicate that at the age of 20 weeks, in terms of the mass of egg white, yolk, and the egg white/yolk ratio, the best indicators were obtained in the experimental groups, since the largest amount of yolk is contained in the eggs of the third group, and the egg white/yolk ratio is maximum in this age was observed in the product from laying hens of the 4th group. The shell
thickness also changed, in the first group it was $0.44 \pm 0.03$ mm, in the second it was $0.45 \pm 0.02$ mm, in the third it was $0.52 \pm 0.04$ mm, and in the fourth it was $0.48 \pm 0.04$ mm.

At the age of 40 weeks, in the most productive period, a similar situation was observed, yolk weight in the experimental groups exceeded the control by 6.9%, 10.6%, 10.2%, respectively, and in the control it was $16.29 \pm 0.74$ g. The egg white weight also exceeded the control group by 0.88 g., 1.1 g., 1.53 g.

The shell thickness, increasing with age, in the groups that received different doses of supplement feeds Amilocin also increased relative to the control group. The minimum value of this indicator was observed in the control group at the age of 20 weeks was $0.44 \pm 0.03$ mm, and the maximum was obtained in the fourth group at the age of 40 weeks and amounted to $0.61 \pm 0.05$ mm.

At the end of the productive period of laying hens, i.e., at the age of 65 weeks, the tendency to increase the mass of yolk, egg white, shell thickness in the experimental groups in relation to the control remained. All study groups that used Amylocin as a supplement feeds performed better.

Having analyzed a shape index we can conclude that eggs of all groups with age have become more elongated with age.

4. Conclusion
As a result of the conducted studies, it can be concluded that the use of the probiotic supplement feeds Amilocin in the production of edible eggs had a positive effect on the quality and quantity of the products obtained. The best results were obtained with water and Amilocin at the beginning of egg production, i.e., 10 days at a dose of 0.5 g per hen per day, at the peak of egg production, i.e., 10 days at a dose of 1 g per hen per day, then once a month for 10 days until the end of egg production at a dose of 1 g per hen per day. Thus, the average weight of one egg for the whole experimental period in the 2nd, 3rd and 4th experimental groups exceeded the values of the 1st control group by 0.89%; 2.4% and 3.13%, respectively. The egg production of the experienced laying hens in comparison with the control was higher is as follows: in the second group it is higher in 4.9%, in the third it is higher in 10.7%, in the fourth it is higher in 5.4%. The better safety of poultry and an increase in the gross collection of eggs in the experimental groups had a positive effect on egg production, both on the laying hen housed and on the average laying hen. The shell thickness, increasing with age, in the groups that received different doses of supplement feeds Amilocin also increased relative to the control group.

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