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GENETIC STRUCTURE OF EGG CROSSES AND EFFECT OF FEED SUPPLEMENT ON EGG PRODUCTION

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Egg crosses are hens whose main purpose is to lay eggs. Breeders have done a lot of work, which has resulted in highly productive species capable of laying up to 320-330 eggs in the first year of life.

It has been scientifically proven that cross females are more hardy, better adapted and have higher productivity. However, such efficiency is observed only in the first generation.

The right choice of laying hen crosses is a guarantee of high productivity.

Breeding companies offer poultry farmers a wide variety of egg crosses of chickens, which differ in productivity, maintenance technology, requirements for the quantity and quality of feed consumed by birds and the level of productivity. Today, one of the most productive crosses of hens is the poultry of German breeders Lohmann Tierzucht GmbH, hens: Lohmann Brown, Lohmann White (LSL Classic), Lohmann Sandy. Chickens with high egg production and egg quality are the result of many years of work by German geneticists Lohmann. At the beginning of the creation of new crosses of chickens, it was assumed that their habitat would be only the mild climate of Europe, but today they are widely kept in industrial poultry for cost-effective profitable poultry farming around the world. These crosses of laying hens have proven themselves in poultry farms in Ukraine.

It was found that under the influence of the enzyme "Rovabio" in birds of the 2nd group increases the gross collection of eggs by 12.5% (P≤0.05) relative to control analogues. Additional consumption of enzyme supplement by laying hens increases live weight by 7.6% (P ≤ 0.05) and absolute increase by 15.4% (P≤0.05), compared with control counterparts.

It was found that the use of laying hens in the 2nd group helps to increase the large diameter of the dense layer of protein by 1.2% (P≤0.05), small diameter of the yolk by 5.2% (P≤0.05) and large diameter by 10% (P≤0.01), compared with the control indicator.

The starting lines of Lohmann Brown and Dominant Brown D-102 can be used in the production of new high-performance crosses, due to their high egg-laying, and in some cases quite high egg weight and other indicators. It is recommended to use more crosses of domestic selection, as more adapted to local conditions of keping and feeding.

Key words: *laying hens, egg laying, eggs, enzyme additive, feeding, crosses, hybrids, heterosis, preservation.*

Яремчук О.С., Марценюк А.В. Генетична структура яєчних кросів та вплив кормової добавки на яєчність

Яєчні кроси – це кури, основним призначенням яких є кладка яєць. Селекціонери виконали велику роботу, результатом якої стали високопродуктивні види, здатні в перший рік життя приносити до 320-330 яєць.

Науково доведено, що кросові самки більш витривалі, краще адаптуються і мають більш високу продуктивність. Правда, така ефективність відзначається тільки в першому поколінні.

Правильний вибір кросів курей-несучок – це гарантія високої продуктивності.

Селекційні компанії пропонують птахівникам велике різноманіття яєчних кросів курей, які різняться за показниками продуктивності, технологіями утримання, вимогами до кількості та якості кормів, які споживає птиця і рівнем продуктивності. На сьогодні є одними з найпродуктивнішими кросами яєчних курей птиця німецьких селекціонерів фірми Lohmann Tierzucht GmbH, куринесучки кросів: Lohmann Brown, Lohmann White (LSL Classic), Lohmann Sandy. Кроси курей з високими показниками несучості та якості яйця результат багаторічної праці німецьких генетиків фірми Lohmann. На початку створення нових кросів курей передбачалося, що ареалом їх проживання буде лише м'який клімат Європи, проте сьогодні їх масово утримують у промисловому птахівництві для рентабельного ведення прибуткового птахівництва у різних країнах світу. Зазначені кроси курей-несучок добре зарекомендували себе у птахівничих господарствах Україні.

Встановлено, що під впливом ферменту «Ровабіо» у птахів 2 групи збільшується валовий збір яєць на 12,5% (P≤0,05) порівняно з контрольними аналогами. Додаткове споживання ферментної добавки несучкам збільшує живу масу на 7,6% (P ≤ 0,05) і абсолютне збільшення на 15,4% (P≤0,05), порівняно з контрольними аналогами.

Встановлено, що використання курей-несучок 2-ї групи сприяє збільшенню великого діаметра щільного шару білка на 1,2% (P≤0,05), малого діаметра жовтка на 5,2% (P≤0,05) і великого діаметра. на 10% (P≤0,01), порівняно з контрольним показником.

Стартові лінії Lohmann Brown і Dominant Brown D-102 можуть бути використані у виробництві нових високопродуктивних кросів, завдяки їх високої несучості, а в деяких випадках і досить високої яєчної маси та інших показників. Рекомендується використовувати більше кросів домашньої селекції, як більш пристосованих до місцевих умов утримання та годівлі.

Ключові слова: *кури-несучки, несучість, яйця, ферментна добавка, годівля, схрещування, гібриди, гетерозис, консервація.*

Introduction. Modern industrial poultry is based on the use of highly productive crosses of hens of foreign selection, the productivity of foreign crosses in their operation in the conditions of industrial poultry in Ukraine, does not always meet the indicators guaranteed by suppliers in their promotional materials. In addition, crosses created by a number of foreign companies are close to each other because they have a similar genetic basis. A significant decrease in productivity in imported crosses is observed in unadapted to the conditions of keeping in poultry farms of Ukraine, which may be due to genetic changes in the lines during breeding and acclimatization. It is established that during the adaptation of crosses there are significant changes in the genetic structure of their baselines, including significant changes in the level of heterozygosity and frequency of alleles of different polymorphic loci [5].

Review of literature sources. Solving the problem of improving the efficiency of food egg production is necessary, firstly, to meet the demand of the population of Ukraine for food of animal origin, and secondly, to increase exports of eggs and products of their processing to the world market.

Chicken eggs are a nutritious and healthy food. Biologically complete egg white in its composition is close to the optimal need of the human body for amino acids. Lipids include beneficial unsaturated fatty acids and phospholipids, mainly lecithin, which helps speed up the metabolism of fats and increase their digestibility. Edible eggs contain most of the essential vitamins, macro-and micronutrients.

The study of productive qualities of poultry is of great importance for understanding the biological characteristics of different species and breeds, as well as for the development and practical application of scientifically sound breeding methods, appropriate egg production technology to increase the profitability of poultry farms.

Many researchers believe that the productivity of poultry depends on the feeding and use of feed additives of natural origin, which do not accumulate in the body of birds [6-10].

The purpose and objectives of the study. The aim of the work was to study the egg productivity and efficiency of feed use in laying hens for the use in their feeding of the enzyme preparation "Rovabio".

Laying hens of the Dominant breed were selected for the experiment by the method of analogous groups [1].

The bird was kept on the floor in a deep litter. Laying hens were selected at 145 days of age in 2 groups of 20 heads each according to the experimental scheme (Table 1).

Table 1

Scheme of scientific and economic experience

Group of birds	Duration of the period, days		Quantity, ch.	Features of feeding
	equalization	the main		
Control	10	90	20	OR (complete feed)
Research	10	90	20	OR + 340 g / t of feed enzyme preparation "Rovabio"

The duration of the experiment was 100 days, of which the equalization period was 10 days, and the main – 90 days.

In the diet of laying hens fed compound feed brand "Multigain". In the experimental group of birds in addition to the feed was added the enzyme preparation "Rovabio" at a dose of 340 g / t of feed.

This combination allows you to have the strongest effect on a wide range of anti-nutrients that are present in all plant foods, namely, araboxylans – in wheat, glucans – in barley, oats, etc. Therefore, the composition of "Rovabio" is such that it completely affects the structure of fiber, acts on all its anti-nutritional factors.

During the research, all groups of birds were in equivalent zootechnical conditions. Temperature, humidity, world regime, content of harmful gases were within zoohygienic standards.

Livestock survival was calculated for the entire study period, according to the difference between the initial and final livestock population, taking into account slaughter and death. Laying was recorded in 180 days.

Research methodology. Productivity of laying hens was determined by generally accepted methods of assessment [4]: laying per initial laying hen – number of eggs laid per period / average number of livestock per period; egg-laying intensity [(number of eggs laid by the bird during the period / number of feeders) 100%].

Morphological features of eggs were determined by indicators: egg shape index,%; yolk mass, g; protein mass, g; mass of shells, g.

The weight of the egg and its components was determined by weighing on VLTK scales – 500 M (accurate to 0.01 g).

The data obtained experimentally were processed by the method of variation statistics according to the algorithms proposed by NA Plokhinsky (1978). Computing and Microsoft Excel were used in the processing of experimental data [5].

The work was performed on the starting lines of Loman-Brown egg hens, Dominant Brown D-102, which are widespread in Ukraine.

Research results. It was found that the additional consumption of laying hens enzyme additive "Rovabio" increases the gross collection of eggs during the experiment by 12.5% (P≤0.05) (Table 2).

The use of feed additives with compound feed increases the laying intensity in laying hens of the 2nd group by 6.7%, relative to the control group.

Table 2

Poultry egg productivity, M ± m, n = 20

Indicator	Group of birds	
	control	research
Gross collection of eggs, pcs.	961 ± 24,13	1081 ± 37,43*
Laying during the experiment, pcs.	49,0 ± 13,54	55,0 ± 17,42
Laying intensity,%	54,3 ± 18,41	61,0 ± 22,32
Saving,%	94	97

The use of Rovabio enzyme additive in feeding laying hens helps to increase live weight and poultry growth (Table 3).

It was found that additional consumption of the enzyme by laying hens increases live weight by 7.6% (P ≤ 0.05) and the absolute increase by 15.4% (P≤0.05), compared with control analogues.

Table 3

Growth of laying hens, M ± m, n = 20

Indicator	Group of birds	
	control	research
Live weight, d: at the beginning of the experiment	1186,0 ± 22,12	1195,0 ± 30,52
at the end of the experiment	2249,0 ± 31,38	2422,0 ± 40,32*
Live weight gain: absolute, g	1062,0 ± 23,54	1226,0 ± 31,31*
average daily, g	10,6 ± 4,11	12,4 ± 5,12
relative,%	60,7 ± 10,26	66,6 ± 9,52

During the experiment, the physical and morphological composition of laying hen eggs of tables 4 – 6 was studied.

It was found that the use of laying hens in the 2nd group contributes to the tendency to increase the weight of eggs by 5.4%, protein by 7.9% and yolk by 2.1%, relative to control counterparts.

Table 4

Mass and morphological composition of the egg, M ± n, n = 10 (in absolutely dry matter)

Indicator	Group of birds	
	control	research
Egg weight, g	61,0 ± 3,43	64,3 ± 2,52
Mass of protein, g	36,3 ± 1,37	39,1 ± 1,46
Yolk mass, g	17,5 ± 0,58	18,0 ± 0,52
Shell mass, g	7,5 ± 0,51	7,7 ± 0,77

It was found that the additional consumption of enzyme additives in poultry feeding increases the egg shape index by 0.4%, volume by 3.0%, but no probable changes with control were recorded (Table 5).

Table 5

Shape and size of laying hen eggs, M ± m, n = 10

Indicator	Group of birds	
	control	research
Small diameter, mm	4,2 ± 0,11	4,3 ± 0,06
Large diameter, mm	5,5 ± 0,12	5,6 ± 0,13
The ratio of large diameter and small	1,31 ± 0,04	1,30 ± 0,03
Form index,%	75,6 ± 1,11	76,0 ± 1,11
Egg volume, ml	57,3 ± 1,56	59,1 ± 1,37
Density, g / cm^3	1,08 ± 0,05	1,09 ± 0,05
Shell thickness, mm	0,31 ± 0,007	0,33 ± 0,006

At the same time, we studied the quality of eggs under the action of the enzyme additive "Rovabio" (Table 6).

Table 6

Qualitative indicators of eggs, M ± m, n = 10

Indicator	Group of birds	
	control	research
Height of a dense layer of protein, cm	0,66 ± 0,11	0,86 ± 0,14
Small diameter of a dense layer of protein, cm	6,7 ± 0,06	6,9 ± 0,06
Large diameter of a dense layer of protein, cm	8,4 ± 0,12	8,5 ± 0,36*
Protein index	0,07 ± 0,03	0,09 ± 0,02
Height of the yolk, cm	1,3 ± 0,05	1,5 ±0,08
Small diameter of the yolk, cm	3,7 ± 0,06	3,9 ± 0,07*
Large diameter of the yolk, cm	4,1 ± 0,08	4,5 ± 0,07**
Yolk index	0,31 ± 0,03	0,33 ± 0,04
Diameter of the air chamber, mm	18,4 ± 0,28	17,8 ± 0,13
Height of the air chamber, mm	2,6 ± 0,34	2,3 ± 0,22

It should be noted that the feeding of feed additives to laying hens of the 2nd group helps to increase the large diameter of the dense layer of protein by 1.2% (P≤0.05), compared with the control indicator.

The yolk index is the ratio of the yolk's height to its diameter. As the eggs are stored, the yolk index decreases.

It was studied that in the birds of the 2nd group under the action of the preparation "Rovabio" the small diameter of the yolk increases by 5.2% (P≤0.05) and the large diameter by 10% (P≤0.01) relative to the control sample.

The maternal form and hybrid of the Dominant Brown D-102 cross have almost exactly the same characteristics as the maternal form and the final hybrid of the Lohmann Brown cross. Only the live weight of the final hybrids showed a difference of 0.2 kg.

Table 7

Productivity of studied crosses of laying hens

Breed lines	Laying eggs	Age reaches 50% of laying days	Egg weight at 52 weeks, kg	Live weight at 52 weeks, kg	Withdrawal of chickens, %	Saving,%		Heterosis, %
						adult bird	chickens up to 120 days	
Parental cross "Dominant brown D-102"								
A	248	179	63	2,2	70	94	94	–
B	250	177	59	2,0	72	94	94	–
C	249	180	61	2,1	73	95	94	–
D	252	181	60	2,0	70	92	92	–
Hybrid cross "Dominant brown D-102"								
AB	–	–	–	3,1***	–	97	96	–
CD	242	165	62,8	2,0	74,6	98	97	–
ABCD	247	160	66,8	2,1	75	97	96	2,1

Heterosis is shown by selection crosses at the level of 8.0–14.6% compared to the starting lines (with the best starting line).

Therefore, this agrees with the fact that the starting lines of imported crosses differ little in their genetic structure. The small difference between the starting lines of the cross indicates a low level of compatibility, as shown by many authors.

The starting lines of Lohmann Brown and Dominant Brown D-102 can be used in the construction of new high-performance crosses, due to their high egg-laying, and in some cases quite high egg weight and other indicators.

Discussion. It is shown that each line has its own immunogenetic status. Thus, if the farm is difficult to create conditions for keeping and feeding birds close to ideal and which would exactly meet the recommendations of the company, it is better to use crosses of domestic selection.

Conclusions. 1. It was found that the action of the enzyme additive "Rovabio" in birds of the 2nd group increases the gross collection of eggs by 12.5% (P≤0.05) relative to control analogues. The use of feed additives in poultry feeding reduces feed costs by 10 pcs. eggs by 7.14%, relative to control.

2. Additional feeding of the enzyme to laying hens increases the live weight by 7.6% (P ≤ 0.05) and the absolute increase by 15.4% (P≤0.05), compared with control analogues.

3. It was found that the use of laying hens of the 2nd group contributes to the increase of the large diameter of the dense layer of protein by 1.2% (P≤0.05), compared with the control indicator.

4. It was found that in the birds of the 2nd group under the action of the preparation "Rovabio" the small diameter of the yolk increases by 5.2% (P≤0.05) and the large diameter by 10% (P≤0.01) relative to the control sample.

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