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COMPONENTS OF EGG PRODUCTION OF EGG-LAYING CHICKENS AND THEIR ASSOCIATION WITH EGG PRODUCTION

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Abstract:

Egg production in laying hens is a complex biological process influenced by multiple factors, including genetics, hormonal regulation, nutrition, and management conditions. However, the interaction between these components and their direct impact on total productivity remains insufficiently studied.

This study aims to identify the key physiological, biological, and management-related components affecting the egg production performance of Borkovskaya Barvistaya hens and to analyze the correlation between these parameters and overall egg yield.

The experiment was conducted over a 52-week period on hens kept in standard two-tier cage systems. Variables such as age at first egg, age at 50% production, egg weight at 30 weeks, peak production intensity, intensity index, and average weekly production growth were measured. Data were processed using correlation analysis.

The highest correlation with total egg yield was observed in the intensity index (r = 0.97). Early

sexual maturity and faster ascent to peak production also positively correlated with higher productivity. The relatively low peak production value (84.8%) suggests potential for genetic enhancement.
The study highlights the strong interdependence between physiological indicators and egg productivity. The integration of egg-laying curve components into selection strategies is recommended to enhance breeding efficiency and improve long-term egg production outcomes.

Keywords: Egg-laying hens, Borkovskaya Barvistaya breed, intensity index, sexual maturity criterion, average weekly growth.

Introduction. Egg production is one of the most important areas of the poultry industry. The productivity of laying hens is formed under the influence of many factors. In particular, their genetic potential, hormonal balance in the body, nutritional conditions, care and management systems play an important role in this process. The physiology of egg production is a complex system in which the ovaries, the oviduct, the hormonal regulation system, and metabolic processes work in harmony[1].
The ovaries and fallopian tubes are the central organs of egg formation, and at each stage there is a role of various tissues and hormones. Hormonal regulation primarily involves the hormones of the hypothalamus, pituitary gland, and ovaries. Also, the temperature, light regime, stress factors, and feed composition of the chickens' habitat directly affect the efficiency of egg production. This article thoroughly analyzes the main components of the egg production process, their functional significance, and their interrelationship in egg production[2].

Research objective

The main goal of this study is an in-depth study of the main components that determine the egg production process of laying hens - the function of the ovaries and fallopian tubes, the hormonal regulation system, genetic factors, feeding conditions, and care factors. Also, the main task of the research is to determine the relationship between these components and the efficiency of egg production and to scientifically analyze the possibilities of increasing production efficiency[3-4].

Object of research.

Promising chicken crosses bred in the "Nurummat Kurbanov" farm of the Ellikkala district of the Republic of Karakalpakstan.

Methodology

The study was conducted on a population of Borkovskaya Barvistaya laying hens, a Ukrainian-originated egg-laying breed, housed at the “Nurummat Kurbanov” poultry farm located in Ellikkala district, Republic of Karakalpakstan. The birds were managed under controlled conditions aligned with national poultry farming standards. A total of 82 families (656 hens) were observed over a full production cycle of 52 weeks[5-6]. The birds were kept in two-tier group cage systems, with 8 hens and 1 rooster per cage, and a stocking density of 11.1 birds per square meter. Two breeding selection strategies were compared in the study: one group was selected based on traditional methods, i.e., egg number at 40 weeks and egg weight at 30 weeks, while the other group was selected using key egg production curve components, including age at first egg, age at 50% laying rate, peak laying intensity, growth rate of production, and intensity index[7].
Weekly egg production data were recorded for all hens, and various physiological and productivity-related indicators were calculated. The primary indicators evaluated included: egg weight at 30 weeks, age at first egg, age at 50% productivity, peak production percentage, average weekly growth rate of production, intensity index over 40 and 52 weeks, and total egg count at both time intervals. Pearson correlation coefficients were computed to assess the relationships between these variables and overall egg productivity. Statistical significance and data consistency were ensured by replicating measurements across all family groups, with equal feeding and environmental conditions[8-9]. Data

were analyzed using Microsoft Excel and SPSS software for quantitative comparison and correlation analysis[10].

Results and Discussion

The research was conducted on promising egg-laying chickens of the Borkovskaya barvistaya breed of Ukrainian breed in the "Preservation of the Local Poultry Gene Pool" experimental farm of the State Scientific and Production Association of Uzbekistan. Adult chickens are kept in two-tiered group cage batteries (8 chickens and 1 rooster per cage), naturally mated, and with a stock density of 11.1 birds/m2[11].

In the experiment, we studied the components of the egg-laying curve of laying hens and their relationship with total egg production during the period of their use (52 weeks of life). Increasing egg productivity in chickens was carried out in breeding using egg production components for 40 weeks of life, such as growth rate (the average weekly increase in egg-laying intensity from the beginning to the peak). , peak egg-laying point (value of maximum egg-laying intensity), intensity index (total deviation of average weekly intensity along the line)[12]. At the same time, for further selection, some nests were selected according to the new method (30 families), others (30 families) - according to the main method, i.e., according to egg production at 40 weeks of life and egg weight within 30 weeks. In both variants, the conditions for feeding and keeping poultry were similar and complied with the current standards[13].

The effectiveness of selecting egg production components in relation to the main selection variant was assessed by comparing the productivity of offspring of the corresponding selected groups of birds. Assessment of egg-laying hens of line A of the Borkovskaya Barvistaya breed according to egg productivity and the components of the egg-laying curve is presented in the table. 1.

Table 1. Egg production components of laying hens and their relationship with egg production

Egg production indicators	Midline	Correlation coefficients with egg production	
		40 weeks	52 weeks
Number of families/layers	82/656	-	-
Weight of 30-week-old eggs, g	55,2±0,26	-0,14	-0,15
First egg-laying age, days	152,5±0,69	-0,54	-0,36
Age at which 50% egg production was achieved, days	165,5±0,61	-0,67	-0,52
Maximum egg production, %	84.8	0,74	0,58
Egg production growth rate, % per week	11.1	0,64	0,49
Intensity index, %: for 40 weeks of life	1.2	0,97	0,86
At 52 weeks of life	3.4	0,86	0,97
Egg production, pcs: for 40 weeks of life	81,7±1,05	-	0,87
At 52 weeks of life	138,4±1,93	0,87	-
Average intensity for 52 weeks of life, %	59.9	0,87	0,99

The age at which the first eggs are laid, as well as the age at which egg production in laying hens reaches 50%, are used as criteria for sexual maturity. Among the birds studied, these two ages are equal to 152.5 days and 165.5 days, respectively, i.e., from the moment of laying the first egg to the moment when the egg laying intensity reaches 50%, almost 2 weeks pass. The height of the peak, i.e.,

the maximum intensity of egg production during the week, is of particular importance as an indicator of the most complete manifestation of the genetic capabilities of the bird, determined by the genome. As you can see, in chickens of the Borkovskaya Barvistaya breed it is low - at the level of 85%. At the same time, the egg production growth rate, defined as the average weekly increase in intensity from the beginning of the biological cycle to the peak, was 11.1% per week[14-15].

Conclusion

This study confirms that egg production in laying hens is a multifactorial process shaped by a combination of physiological, genetic, and environmental factors. Among the evaluated traits, the intensity index showed the strongest positive correlation with total egg yield, making it a reliable predictor for selection purposes. Furthermore, early sexual maturity and a rapid rise to peak productivity were also associated with improved reproductive performance, emphasizing the importance of early development in genetic selection. Despite the relatively moderate peak production level observed (84.8%), the average weekly growth rate and stable laying intensity throughout the 52-week cycle suggest that the Borkovskaya Barvistaya breed possesses significant potential for genetic improvement. The comparison of traditional and component-based selection strategies revealed that integrating egg-laying curve metrics such as growth rate and peak intensity into breeding programs enhances selection efficiency and long-term productivity. These findings can contribute to the development of more targeted and evidence-based breeding approaches, ensuring the sustainable advancement of poultry production systems. Future studies are recommended to explore genomic markers related to the identified key traits for further optimization.

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