Western European Journal of Linguistics and Education
Volume 4, Issue 5, May 2026
https://westerneuropeanstudies.com/index.php/2
ISSN (E): 2942-190X Open Access| Peer Reviewed

EFFECT OF EGG TURNING FREQUENCY ON EMBRYO DEVELOPMENT

Hayitbayev Ulugbek - Master's student
Yangiboyev Abdimalik - PhD, (DSc) associate professor
Xolbutaev Ilyosjon - PhD, Assistant
Javkoshev Hassan - Assistant
To'laganova Umida, Master's Student
Tashkent branch of Samarkand State University of Veterinary Medicine, Livestock and Biotechnology

Abstract. This article studies the effect of egg turning frequency on embryo development and chick hatching rates during incubation. During the study, chicken eggs were divided into three groups and different incubation regimes were used: classical, progressive and regressive turning regimes. The level of embryo development, activity and survival rates were assessed on days 7, 14 and 18 using the ovoscopy method. The results of the study showed that turning eggs at optimal and high frequencies improves embryo development, reduces embryo mortality and increases the percentage of chick hatching. In particular, in experimental group I, where the progressive turning regime was used, the percentage of developed embryos, the number of live embryos, the percentage of chick hatching and chick weight were recorded at a high level. On the other hand, low turning frequency caused embryos to stick to the shell, slow development of blood vessels and increased embryo mortality. The results obtained are of important scientific and practical importance in improving poultry incubation technology and obtaining high-quality chicks.
Keywords: Incubation, egg turning frequency, embryo development, ovoscopy, chick hatching, embryo mortality, incubation regime, poultry egg, chick weight, biological indicators.

Introduction. Our country has adopted a number of resolutions and decrees to support agriculture, in particular the poultry industry. For example, through the Resolution of President Shavkat Mirziyoyev dated June 27, 2024 “On supporting the poultry industry, introducing modern genetic technologies and a cooperation system”, measures were taken to eliminate tax incentives and export restrictions for poultry producers. These resolutions create favorable conditions for the effective use of existing resources of the industry, modernization of incubation and breeding technologies. In implementing the tasks set out in the Resolutions of the President of the Republic of Uzbekistan Sh. Mirziyoyev dated June 15, 2022 No. PQ-281 “On measures to further improve the system of state support for the poultry sector” and No. PQ-5146 dated June 14, 2021 On additional measures aimed at developing poultry farming and strengthening the food base of the sector, as well as the Resolution of the President of the Republic of Uzbekistan Sh. Mirziyoyev dated June 27, 2024 No. PQ-238 “On measures to further support the poultry farming sector, introduce modern genetic technologies and a cooperation system ” No. PF-60 dated January 28, 2022 “On the Development Strategy of the New Uzbekistan for 2022-2026” This dissertation research serves a certain purpose. [1;2;3]

Key research : The effects of temperature, humidity, and egg turning frequency on embryo development during incubation have been evaluated by many researchers around the world. For example, Adegbenro et al. (2020) found that temperature changes of +1-2 °C

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significantly change embryo metabolism. [4] At the same time, it was noted that increasing the turning frequency can prevent embryo adhesion to the shell and increase the hatching percentage. [5] **Incubation with constant parameters is widely used in global practice, but dynamic control** based on biological changes and gradual adaptation has not yet been widely implemented. [6] Research work has been carried out mainly in Tashkent and Kokand centers. For example, studies conducted at the Tashkent Agricultural Scientific Center have shown that increasing the egg turning frequency by 2–3 times significantly affects the optimality of embryo development and hatching percentage. Also, an increase in the number of dead embryos was observed in the region as a result of temperature and humidity below the norm . These indicators reveal problems specific to regional conditions. [7] Studies conducted by Uzbek scientists have often been conducted with control and simple experimental groups . In particular, experiments conducted on farms in the Tashkent and Samarkand regions have shown that: higher than normal temperature and humidity, as well as low rotation frequency, reduce the percentage of chicks hatching and lead to impaired embryonic development. To date, step-by-step optimized dynamic incubation has not been scientifically fully tested in the conditions of Uzbekistan.

The object of the research is - Incubating poultry eggs (chicken eggs).

Subject of the study Incubation regimes (temperature, humidity, turning frequency) and their effect on embryo development .

Methods of the study. Zootechnical, biological, laboratory and biometric-statistical methods were used in carrying out this research work. **Ovoscopy (on days 7, 14, 18)** The condition of the embryo inside the egg was observed using an ovoscope. This method determines the level of embryo development, the condition of blood vessels and dead embryos. Ovoscopy results **Live embryos and dead embryos number** converted into percentages.

Eggs were turned at a fixed frequency for each group. In experimental group 1, a stepwise modified turning frequency was used, which served to reduce embryo adhesion to the shell.

Procedure for conducting experiments: For the purpose of conducting research , similar signs (analogs) were used according to the method of S. Brody, A. Ya. Borisenko et al. (1984)

Chicken eggs of the same breed, with an average weight of 58-60 g, without external defects, were used. 30 eggs were incubated in each group. They were divided into four groups: control, experimental group I, and experimental group II. The study was conducted in automatic incubators designed for poultry incubation. The incubation period was 21 days. The experiments were conducted in laboratory conditions, under constant temperature and humidity control.

Table 1.

General description of the experimental groups

Groups	Number of eggs	Incubation mode	Description
Control	30	Normative	Classic incubation mode
Experiment 1	30	Progressive	Step-by-step optimized mode
Experiment 2	30	Regressive	With deviation from the norm

The effect of egg turning frequency on embryonic development

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Regular egg turning during incubation is an important factor for normal embryo development. Turning ensures even distribution of nutrients within the egg, prevents the embryo from sticking to the shell, and promotes proper blood vessel formation. The study investigated the effect of egg turning frequency on embryo development, ovoscopy results, and hatching quality.

In the control group, eggs were turned 4-6 times a day and a classic incubation regime was used. In experimental group I, the frequency of turning was increased to 7-8 times and a stepwise optimized incubation regime was used. In experimental group II, eggs were turned only 2-3 times a day and a deviation from the standard regime was observed.

The results of ovoscopy showed that in experimental group I, embryo development was more active, blood vessels were well developed, and embryo movements were clearly observed. Although normal development was noted in the control group, some eggs showed a slowdown in development. In experimental group II, due to the low frequency of turning, embryos stuck to the shell, poor blood vessel development, and embryo death were more common.

Table 2.

The effect of egg turning frequency on embryonic development (M±m, n=30)

Indicators	Control group	CV %	td	Experimental group I	CV %	td	Experimental group II	CV %	td
Day 7 developed embryos, %	86.7 ± 2.1	5.4	–	93.3 ± 1.8	4.2	2.41*	76.7 ± 2.6	6.8	3,12**
Day 14 embryo activity, %	83.3 ± 2.4	5.8	–	90.0 ± 2.0	4.6	2.27*	70.0 ± 3.1	7.5	3,48**
Day 18 live embryos, %	80.0 ± 2.6	6.1	–	88.3 ± 2.1	5.0	2.65*	63.3 ± 3.5	8.2	4,11***
Embryo mortality, %	13.3 ± 1.8	7.0	–	8.3 ± 1.4	5.8	2.14*	30.0 ± 2.9	9.1	4,52***
Output percentage, %	76.7 ± 2.5	5.7	–	86.7 ± 2.1	4.9	2.83**	56.7 ± 3.6	10.2	5,13***
Chick weight, g	41.8 ± 0.7	4.1	–	44.2 ± 0.5	3.3	2.76**	37.6 ± 0.9	5.5	4,87***

Note: *P<0.05; **P<0.01; ** *P<0.001 — level of confidence compared to the control group.*

According to Table 1, it was found that the frequency of egg turning had a significant effect on embryo development and chick hatching rates. During the study, eggs were turned 4-6 times a day in the control group according to the classical regime, while in experimental group I the frequency of turning was increased to 7-8 times, and in experimental group II, on the contrary, it was reduced to 2-3 times.

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According to the results of the study, the percentage of developed embryos on the 7th day of incubation was 86.7±2.1% in the control group, while in experimental group I this figure reached 93.3±1.8%. This was 6.6% higher than in the control group, and the difference was found to be statistically significant (td=2.41; P<0.05). In experimental group II, the percentage of developed embryos was 76.7±2.6%, which was significantly lower than in the control group. The coefficient of variation (Cv%) was 4.2% in experimental group I, indicating that the results were uniform and stable.

The results of ovoscopy on the 14th day showed the same trend. Embryonic activity was 83.3±2.4% in the control group, while it was 90.0±2.0% in experimental group I. This indicator was 6.7% higher than in the control group, and a statistically significant difference was noted (td=2.27; P<0.05). In experimental group II, the embryonic activity was 70.0±3.1%. This indicates that low egg turnover slowed down embryonic development.

Experimental group I also showed superior results in terms of the number of live embryos on day 18. The indicator in this group was 88.3±2.1%, which was 8.3% higher than in the control group (td=2.65; P<0.05). In experimental group II, the percentage of live embryos decreased to 63.3±3.5%. This result confirms that insufficient egg rotation negatively affects the normal development of embryos.

The lowest embryo mortality rate was recorded in experimental group I and was 8.3±1.4%. This was 5.0% lower than in the control group, which was statistically significant (td=2.14; P<0.05). In experimental group II, the highest embryo mortality rate was 30.0±2.9%. This indicates that low egg turnover causes increased embryo mortality.

The highest result in terms of chick hatching percentage was also observed in experimental group I. The hatching percentage in this group was 86.7±2.1%, which was 10.0% higher than in the control group and had a statistically high level of reliability (td=2.83; P<0.01). In experimental group II, the hatching percentage was only 56.7±3.6%. The coefficient of variation of 10.2% indicates that the results in this group were uneven and unstable.

Experimental group I also prevailed in terms of live weight of chicks. The weight of chicks in this group was 44.2±0.5 g, which was 2.4 g higher than in the control group (td=2.76; P<0.01). In experimental group II, the weight of chicks was 37.6±0.9 g, which indicates that the violation of the incubation regime had a negative effect on the development of chicks.

In conclusion, the results of the study showed that turning eggs at an optimal frequency improves embryo development, reduces embryo mortality, and allows for the production of high-quality chicks. In particular, in experimental group I, where the progressive turning regime was used, all main biological and economic indicators were recorded at a high level.

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