
THE EFFECT OF TEMPERATURE, HUMIDITY REGIMES, AND EGG TURNING FREQUENCY ON EMBRYONIC DEVELOPMENT DURING POULTRY EGG INCUBATION

Khaitboev Ulugbek Norboy ugli

Master's Student at the Tashkent Branch of Samarkand State University of
Veterinary Medicine, Livestock and Biotechnology

Tulaganova Umida Tolibjon qizi

Master's Student at the Tashkent Branch of Samarkand State University of
Veterinary Medicine, Livestock and Biotechnology

Yangiboev Abdimalik Eshmurodovich

Doctor of Agricultural Sciences (DSc) at the Tashkent Branch of Samarkand State
University of Veterinary Medicine, Livestock and Biotechnology

Kholbutaev Ilyosjon Rustam ugli

Candidate of Agricultural Sciences (PhD) at the Tashkent Branch of Samarkand
State University of Veterinary Medicine, Livestock and Biotechnology

Abstract:

This study investigates the influence of incubation temperature, humidity regimes, and egg turning frequency on embryonic development, hatchability, and post-hatch performance of broiler chickens. Three experimental groups were established using 900 fertilized Cobb-500 eggs. Hatchability, embryo mortality, chick weight, and yolk absorption were assessed. Optimal development was observed at 37.8°C, relative humidity of 55–60% during the first 18 days and 65–70% during the last 3 days, with eggs turned five times per day. Deviations from these parameters reduced hatchability and chick quality.

Keywords:

Incubation, emperature, humidity, egg turning, embryo development, hatchability, poultry.

Introduction

An egg turning frequency of 24 times per day during incubation provided high hatchability rates. In contrast, the turning frequencies of 12, 6, and 3 times per day showed significant losses in hatchability. Therefore, it is essential for research centers and incubator manufacturers to standardize the egg turning frequency to 24 times. Egg turning involves several aspects such as turning frequency). Commercial setters usually operate with a turning frequency of 24 times per day until the 18th D of incubation (Freeman and Vince, 1974). However, in some studies,

the setters were programmed to turn the eggs at a frequency of 12 times per day during the incubation process. For example, in a study by Leandro et al. (2000), 3 commercial incubators equipped with an automatic egg turning system were used to turn eggs every 2 h. In this sense, there is still no standardization by the manufacturers of incubators and research centers with regard to the turning frequency.

Incubation is a critical stage in poultry reproduction. Temperature and humidity are the most significant environmental factors affecting embryogenesis. Proper egg turning ensures uniform heat distribution, prevents adhesion of the embryo to shell membranes, and supports normal development. Deviations from optimal conditions lead to reduced hatchability and poor post-hatch performance.

Materials and Methods

A total of 900 fertilized Cobb-500 eggs were divided into three groups of 300 eggs each:

Group	Temperature (°C)	Humidity (%)	Egg Turning Frequency (per day)
I (Control)	37.8	55–60 (days 1–18), 65–70 (days 19–21)	5
II	38.5	50–55, 60–65	3
III	37.2	60–65, 70–75	7

Few studies have evaluated the effects of a turning frequency of 12 times per day on the incubation yield. For example, in a study by Robertson (1961a), no significant difference was shown between the hatchability of eggs turned 12 and 24 times, although a mean difference of 3.25% was obtained to the detriment of 12 times. According to the author, although no statistical support was available, it probably constitutes a real difference, and from a practical point of view, it would be advantageous to turn eggs 24 instead of 12 times. Other studies have evaluated the use of fewer turning frequencies (8, 6, 4, 3, 2, and 1 time per day) during incubation. The researchers noted that the highest turning frequency used resulted in better incubation results. Optimum turning frequency has been demonstrated to be 96 times daily, although 24 times daily has been accepted as the most practical under commercial circumstances, owing to the relatively small differences between 24 and 96 times (Freeman and Vince, 1974).

Embryonic development was monitored by candling on days 7, 14, and 18. Hatchability, chick weight, and yolk absorption were recorded.

Results

Indicator	Group I	Group II	Group III
Hatchability (%)	91.6 ± 0.8	84.3 ± 1.2	86.7 ± 1.0
Early Embryo Mortality (%)	3.5 ± 0.4	7.8 ± 0.7	5.6 ± 0.6
Late Embryo Mortality (%)	4.9 ± 0.3	7.9 ± 0.6	7.7 ± 0.4
Chick Weight (g)	42.1 ± 0.6	40.3 ± 0.5	41.0 ± 0.5
Yolk Absorption (%)	97.2 ± 0.4	93.8 ± 0.6	95.1 ± 0.5

Key observations:

Optimal embryonic development was achieved at 37.8°C, moderate humidity, and 5 turns/day. Higher temperature or reduced turning frequency negatively affected chick quality. Yolk absorption was highest in the control group with standard incubation conditions

Conclusion

Optimal embryonic development is achieved at 37.8°C, 55–60% humidity (days 1–18), 65–70% humidity (days 19–21), and five egg turns per day. Deviations from these parameters reduce hatchability and chick quality. These findings are applicable to commercial hatcheries to enhance efficiency and chick viability.

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