

Study of New non - Stationary Regimes and Distribution of Thermal Fields of Biological Objects

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Abstract: Considered a natural incubation temperature, which is in contrast to the artificial, highly termokontrasting, namely the instability of temperature field of eggs is one of the reasons for their increased hatchability at natural incubation and between parameters of thermal effects on the incubation and efficiency of this process there is a certain correlation. To confirm the validity of the hypothesis of a complex research of variable-temperature incubation processes, which demonstrated the need for the development of new or upgrading existing elements and devices of automatic control of the incubator. Used in the present monitoring and control are applied only to fixed temperature regimes. This article discusses new transients and the methods of calculation of their parameters, and special devices for their welfare.

Key words: Agriculture • Transients • Incubation • Breeding • Performance • Termokontrasting

INTRODUCTION

As demonstrated by the experience of research aimed at improving farm animal breeding and incubation of birds [1-20] one of the ways to increase their effectiveness is further improving agricultural processes, which has not fully exhausted. Thus, in the period from 1993 onwards by the South-Russian State technical and Don State Agrarian University jointly with specialists of the agro-industrial complex of the Rostov region are the positive effects of natural modes with the methodology of their technical implementation.

The reason for this claim are the results of the comparison conditions and the effectiveness of the natural and the artificial incubation. So, when the artificial incubation, which is characterized by a stable temperature regime, standardized, for example, hatchability of chicken eggs is 75-80%. In fact, it is often located on a lower level. Therefore, the natural incubation temperatures, unlike artificial, is very termokontrast. Therefore, the hypothesis that the instability of temperature field of eggs is one of the reasons for their increased hatchability at natural incubation and that between the parameters of thermal effects on the incubation and efficiency of this process there is a certain correlation.

To confirm the validity of this hypothesis a complex research of variable-temperature incubation processes, which demonstrated the need for the development of new or upgrading existing elements and devices of automatic control of the incubator. The current monitoring and control are applied only to fixed temperature regimes. This article discusses new transients and the methods of calculation of their parameters and special devices for their welfare.

MATERIALS AND METHODS

To implement a new termokontrast regime of incubation, providing high hatchability of eggs and chicks of birds alive, first of all, you want using known methods for processing of stochastic experimental characteristics, determine the type and parameters of optimal thermal perturbation applied to the hen bird eggs and carry out complex researches in following directions:

- Establishment of a specialized test and research equipment and stands, country-specific study of biological objects and processes;

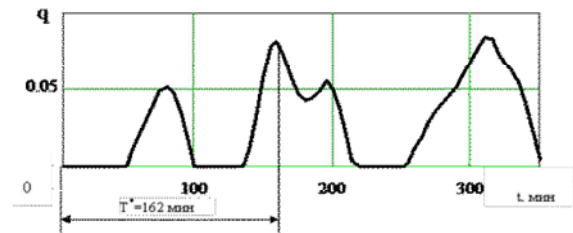
- Theoretical and experimental research of thermal modes of incubated eggs in the nest and incubator, as well as the physical and Thermophysical properties of incubation and its separate components;
- Preliminary selection of parameters of termokontrast mode of incubation, its implementation in industrial conditions and evaluation of hatchability and survival of young birds.

As one of the most common and easily-implemented types of impacts in the termokontrast mode are the harmonics of the air temperature in the receptacle, then there was the challenge of periodic components in the experimental curves. An analysis of literary sources, identify sampling frequencies in experimental data taken in the nest snoopers, appropriately according to the algorithm using maximum likelihood function [12,14-17]. So, as a result of the aggregation of a large array of implementations according to the algorithm using maximum likelihood function $\theta(t)=\theta_0+\theta_1 \sin(\omega t)$ (d.1) experimental curves that characterize the response of an object to the indignation of all the poultry-hen using non-linear statistical methods and defined the period $T^* = 2.7$ h and which respectively amounted to 2,7 ч; 1,2 и 36,4 °C (d.2).

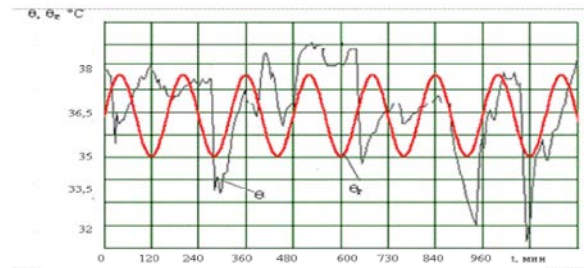
However, as evidenced by the analysis of the practical realization of temperature effects the easiest effect to reproduce the temperature conditions during incubation, is the signal type "jump" (d.3). As a result of aggregation implementations of dynamic temperature changes of the biological object during the incubation period, after their initial aggregation defined parameters changes on dedicated exponential signal $\theta_0+\Delta\theta$ at the initial temperature (θ_0 , respectively, equal to 1.4 and 36.9 (and T and the time period of heating and cooling - 30 and 140 minutes (d.4) and harmonic functional dependency $\theta_r(t) = \theta_0 + \theta_1 \sin(Wt)$ with period $T^* = 2.7$ hours after experimental decomposition temperature characteristic in Fourier series found the constant component and harmonic signal amplitude θ_0 and θ_1 (which respectively 36,4 и 1,2 °C [12,14-17].

RESULTS AND DISCUSSION

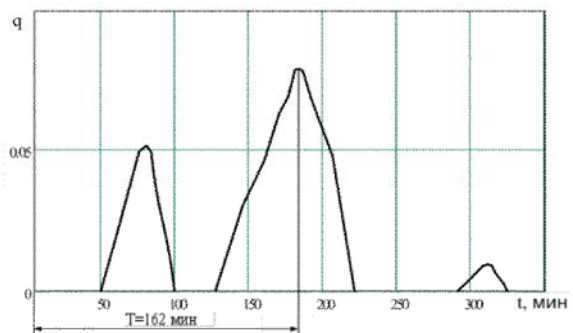
It should be noted that for new incubation processes efficiency of introduction of termokontrasting regime was confirmed at a poultry farm in the Rostov region [18-20] and the proposed new temperature



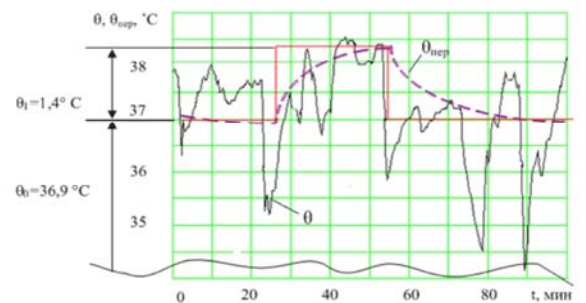
d. 1: Graphics detection algorithm based on $\theta_r(t)=\theta_0+\theta_1 \sin(\omega t)$ in the temperature changes during incubation of eggs



d. 2: Probability charts θ and the harmonic θ_r temperature curves of the biological object



d. 3: Graphics detection algorithm based on $\theta_r(t)$ harmonic, and exponential forms in temperature changes at the surface of chicken eggs in incubation



d. 4: Probability charts θ and received periodic exponential θ_{nep} temperature curves on the surface of biological objects

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