Middle-East Journal of Scientific Research 22 (10): 1493-1498, 2014
ISSN 1990-9233

DOI: 10.5829/idosi.mejsr.2014.22.10.21482

Stochastic Incubation Regimes and Management Principles

[1]Y.A. Kolosov, [2]A.P. Pahomov, [1]V.I. Lachin, [2]S.V. Gvetadze,
[2]KY. Solomencev, [2]M.E. Maenko, [1]L.S. Usatenko and [2]M.V. Rabinskij

[1]Don State Agrarian University, Russia
[2]Platov South-russian State Polytechnic University (Npi), Russia

Abstract: Researches of thermos table and variable temperature regimes incubation processes, showing the need to introduce new modes of the incubator without significant replacement of the original equipment. This article discusses the new unstable modes and management principles of their implementation.

Key words: Agriculture · Animal breeding · Incubation · Nonstationarity · Vitality · Termokontrast · Automatic control.

INTRODUCTION

One of the ways to improve the efficiency of poultry egg incubation is the further improvement of the incubation process, which has not fully exhausted. The reason for this claim is 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. At the same time, the natural incubation provides nearly 100% hatchability of eggs. What can explain such a significant difference of the two types of incubation?

While a number of issues in the poultry industry and animal husbandry may be selected or technological methods of [1-14]. First of all, this refers to the grounds with low nasleduemosti because of their high dependence on environmental factors. In these cases, to improve the performance of farm animals need a combination of selection and technological methods.

MATERIALS AND METHODS

Among the most important physical factors that characterize the process of incubation was low, since it determines the effect on the intensity of metabolism and speed the development of embryos. The literature data and the results of our research thermal nests bird-Clickers, indicate that the temperature of the eggs, incubated under natural conditions, changes in a relatively wide range, because the mother hen turns and root eggs, leave the nest for food intake and defecation. Study of the effect of temperature on performance of incubators and the subject of the works. In many of these works are the significant difference conditions and thermal modes of natural and artificial incubation [1, 4, 6, 7].

Because in our country each year in incubators are billions of eggs, incomplete their hatchability results in economic in team as from underproduction and reduction of its life and the excessive consumption of electric power consumed by the incubators. Therefore, further improvement of the structures and modes of operation of these technological devices is an important task.

Further work is planned in accordance with the Republican (Feed General) target scientific and technical program "research and development in priority directions of development of scientific-technological complex of Russia in 2014-2020 years." Its results are directed to "develop and implement technological process of SI incubation eggs to increase hatchability on all types of birds at up to 7%, labor productivity in the 1.5 -2 times. Experimental-industrial validation of results of theoretical research and research-based recommendations repeatedly was carried out at workstations incubatory [15-19].

Corresponding Author: Y.A. Kolosov, Don State Agrarian University, Russia.

RESULTS AND DISCUSSION

As is well known, the main and most responsible process of poultry reproduction is cu Barcia eggs of birds, which is characterized by withdrawal and the viability of whole animals. The analysis of literary sources showed that the impact of incubation affected more than 30 different parameters and factors. You can combine CSS criminalization in the following groups: breed and age of laying hens (RO) and feeding regimes (to PC), physic-chemical and biological parameters of hatching eggs (FGF), storage conditions and handling nkubacionnaâ predi last (SIMI), electromagnetic and acoustic effects on egg (EMA), composition and parameters of the gas environment during storage and incubation of eggs (g), the sanitary condition of the equipment and the sanitary conditions of incubation (OS) the ventilation flaps and eggs in trays under incubation (PZÂ) and finally, terms, conditions and modes of the incubation, which is determined by, first of all, the three main parameters-temperature incubation and lead the cabinets (Q), its relative humidity (W) and air exchange. In assessing the impact on the result of incubation (RI) of individual parameters and factors you must, of course, takes into account not only the level of each of them, but also their combination and interaction.

It is generally acknowledged that among the factors decisive influence on hatchability of eggs and the viability of the chicks has a real mode of incubation temperature. The study of this effect and featured modes are shown in numerous publications. However, hatchability of chicken eggs in the stable temperature conditions is only at 85%. At the same time when hatching chicken eggs is the hen-rearing high resistance to various diseases. Therefore, one of the possible directions of improving effective efficiency of artificial incubation is a detailed study of the thermal regime of eggs in nest chicken-Clickers (ideal) and playing it in artificial conditions. This approach is consistent with the basic principle of bionics-learning from nature, which for millennia had brought many biological processes to perfection. The main findings of the research studies of thermal conditions of natural incubation are set out below. Eggs in the nest are heated only top contact method-Clickers, which has a relatively constant body temperature equal to 40.42° c. Chicken many times during the day (up to 50 times) flips eggs, perekatyvaet them from the Center to the periphery and slot back, leave the nest for a meal, that is inkubiruemye to the EU testvennyh the eggs constantly subjected to thermal perturbation. Remains constant and the temperature in the nest. She is always below the temperature of the chicken-Clickers and not greater than the temperature of the eggs. The heated air in the nest-no heat source and the environment, absorbing excess physiological heat eggs. This means that the natural process of heat transfer conditions is well away from the egg to the litter and air environment. At the end of the incubation, the mother hen less densely nestles on eggs and leaves the nest. Thus, egg incubation, as in the nest (as opposed to the incubation of Cabinet) complex thermal condition and temperature of the embryo is constantly changing. In the process of evolution of the egg with a developing embryo in it have adapted to such changes in key temperature conditions. The need for embryos in variable temperatures-is the obsebiologièeskoj feature characteristic forms, the evolution of which took place in the specified temperature conditions. Inkubiruemye eggs are subjected to repeated thermal shocks; hatchability is close to 100%.

Temperature fluctuations eggs not only had a negative impact on the development of the embryo, but also contribute to the high withdrawal rate. Such fluctuations zakalivaût the body of the embryo and create favorable conditions for the Exchange processes, providing greater failure of the chick in the postèmbrional'nyj period. By cooling the contents of eggs shrinks more than shell. Through her pores in the egg is sucked air, i.e. enhanced gas exchange of the embryo, the more intense his breathing and metabolism.

Comparison of thermal modes only and artificial in kubacii you can clearly see the difference. The first of these modes can be described as a termokontrastnyj and the second is how heat stable. The absence of artificial incubation of variables (temperature effects on the developing fetus leads to the loss of all of the above positive effects that increase you vodimost' eggs and chicks when they are hatching viability.

Attention to this fact some researchers applying for industrial incubators mode variable temperatures and receiving good results. Lysenko h. e. suggested a cooling of eggs at the beginning of the incubation of 2 times a day, increasing the hatchability at 5.2% which compared with uncoiled vyvodimost'û eggs. Experiments conducted by Tretyakov N.P. and Peltzer s. o. The Bratcevskoj poultry farm (BERR) confirmed high efficiency of

incubating chicken eggs at variable temperatures. Also presented the results of the research of a new method of TAT hatching of poultry with temperature variations since the early days of incubation. This method compared to standard increased hatchability young on 3...5% significant improvement of its quality. The essence of the proposed method was that 2 times a day (morning and evening) in the closet, narrowed inkubiruemymi eggs, vduvalsâ cool air, lowering the temperature inside the Cabinet to 33° C. Length of cooling accounted for 10-15 minutes. When it reaches the specified temperature flow of cooler air in the incubator stopped and shut down heaters. Air temperature recovery time of up to 37.5° c was 30 min.

To improve hatchability and survival of chicks of egg chickens also previously offered with 13 days of incubation once per day to cool the eggs up to 29...30° C on the surface by blowing a stream of air at the incubator of online/offline users heaters. Analysis of 16 different temperature regimes showed that the best (it provides increased hatchability at 2...5%) is the following: the first 3.5 days, such as "universal" in an incubator, supported by stable temperature 38.3° c and later several times a day is a transient cooling of the incubated eggs.

It should be noted that the development of bird embryos takes place outside the mother's body and is entirely dependent on the temperature conditions of the environment. Study of the influence of periodic ohla_denij on the development of chick embryos during the first few days of incubation was carried out in an incubator "universal" on the Šahtinskoj hatchery-poultry station, which has been supported by the following incubation mode: the temperature of 37.5.37.7°c, relative humidity 47 Nay...50%, rotate the trays was carried out after every 2:0. Since the end of the first day on the 19th inclusive, eggs, cooled as the experimental group and two times a day at regular intervals (at 8 and 8:0 pm). In all the experiments for cooling off the heater, open the cabinet door, left on ventilation and humidification system. One by one the following three exposures were ohla_denij: on first exposure temperature inside the eggs are reduced to 30...29° C for 45 minutes and restored her to normal for 1:30-1:40; the second exposition of cooling was 32° C for 30 minutes and restore to normal temperatures lasted 1:0-1:10; the third exposure for 12...15 minutes include temperature reduced to 34° C and rebuilt it within minutes. In this exposition as fast recovery temperature was achieved by the inclusion of additional heaters, pilot studies, temperatures in the hatchery were within 17...20° C. Measurement of the air temperature around the eggs, as well as their surface and contents.

The best exposition of hold was the third, when within a relatively short time is reached the temperature of 34 inside and 32° C on the surface of the egg. Thus, the generalization of the results of the use of variable - temperature regime, executed by different researchers:

- The periodic cooling of the incubated eggs keep fat metabolism of embryos at a certain level, avoiding the excessive intensification;
- Cooling, promoting the development of the circulatory system, increasing its oxidative capacity, resulting in an increase in hemoglobin and red blood cells in the blood;

Although the researchers corrected the standard thermal conditions of artificial incubation and increased his termokontrastnost'û, he stood still is far from the regime existing in a nest chicken - Clickers. For analytical examination of incubated eggs and thermal synthesis of research results need to have data on the Thermophysical and teploinercionnyh properties of incubation, as well as the conditions of heat exchange with the environment in the egg incubation and nest chicken-Clickers. In the required volume of such information in the literature. For their definition and clarification it is necessary to create the appropriate equipment and to conduct complex research modes and the below listed parameters. Namely, the thermal properties influencing the process of heating and cooling a solid homogeneous substances, as is well known, is the density, heat capacity, thermal conductivity λ and the peraturoprovodnost' Q and fluid and its viscosity. If the analyzed body of heterogeneous (composite), then you must be aware of all these properties of each component and their mixtures. With respect to the incubation of yolk, protein and the shell of the egg and the egg. Values of r, c, λ Q, together with the information on the form and the peraturnom mode of the body allow to calculate the heating of heat transmitted by thermal conductivity and viscosity of poses allowed to judge the possible heat transfer svobodnokonvektivnymi the Kami, the heated volume of the fluid. As noted previously, poultry breeders from data on the thermo physical characteristics of eggs are few and far between.

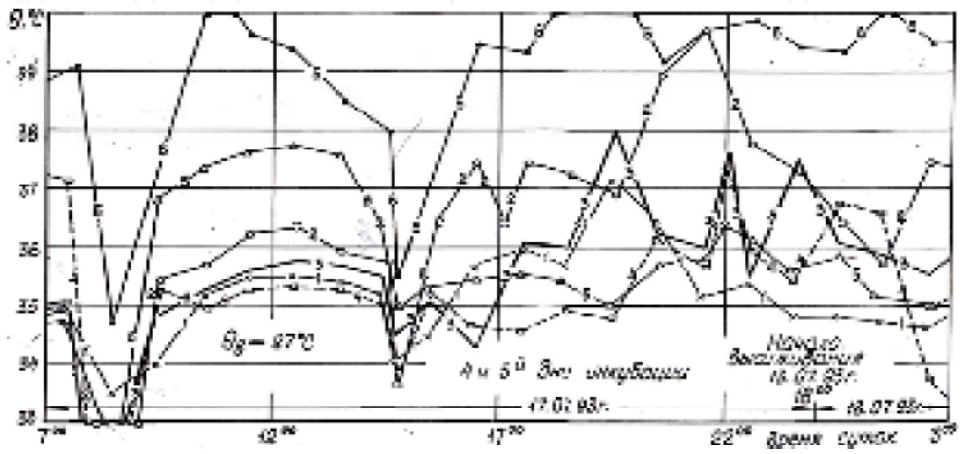

Fig. 1: Graphs the temperature changes at the surface points of control eggs (4-and 5-day incubation)

The literature data and results of research of thermal regime of the nest of a bird-snoopers revealed that the temperature of the eggs, incubated under natural conditions, changes in a relatively wide range, because the mother hen turns and perekatyvaet eggs, leave the nest for food intake and defecation. Therefore, the temperature of the natural as opposed to artificial incubation is quite termokontrastnym. Synthesis of the above natural incubation thermal presented in Figure 1.

So, when the natural warmth to the egg incubation is from body heat conduction and is given to brooding hens into the environment through a porous pad socket thermal conductivity and convection and with the open part of the egg-svobodnokonvektivnym airflow, radiation and moisture evaporating from the surface. In heating and cooling of eggs is forced to flow air fed fan, as well as radiant heat exchange between the eggs and the incubation cabinet

Design. MI Calculation of thermal state of transient incubation eggs requires prior determination of magnitudes characterizing conditions of heat exchange with the environment. The distribution temperature to evaporation is most convenient to surface runoff and heat distributed throughout the area of the outer surface of the egg. His power will be equals to the product of the amount of moisture evaporated on its specific heat of vaporization. Data for the calculation are given in the reference literature and determine the radiation component of heat exchange also is straightforward.

However, the originality of the geometrical characteristics of the various objects allows you to apply for the calculation of heating (cooling) of the ratio given in the lite returnee sources. The largest contribution to the study of heat transfer of poultry eggs have made Lev M.A. and Haskin V.V. some results obtained by these researchers, needed to be clarified, for example, ostrich, quail, pigeon and incubation facilities previously proposed methodology can also be applied to objects.

CONCLUSION

Thus, to improve the efficiency of artificial incubation of birds and livestock advance processes a set of analytical and experimental research related to the definition of:

- Thermophysical properties of biological objects;
- Conditions and parameters of mechanical stress, heat and humidity Exchange with the environment in vivo hatchability and biological objects [14.16, 17];
- Teploinercion output properties of biological objects subjected to external natural perturbation;
- Thermophysical parameters of biological objects;

To perform such research should, in turn, developed appropriate methods and develop special the metering and research equipment. This equipment is required and to study of transient temperature in achieving the ability to create a termokontrastnyh environment, as well as for the experimental testing of the proposed new method of incubation of the eggs of birds and livestock facilities. Thus, we can formulate the following principles of natural regimes to be consistently addressed through further work output and increase the

viability of biological objects of agriculture sector through the development and introduction of a new termokontrastnogo regime of artificial modes of postulates on the results of theoretical and experimental research of The rmophysical and teploinercionnyh properties and the the rmal state of the natural and artificial environment:

- Create a set of special automatic and digital devices as well as research equipment that meets modern requirements on accuracy and performance, for experimental studies of eggs as incubators and incubation facilities.
- Research of Thermophysical biological objects and its individual components, as well as the conditions of heat transfer from the surface to the environment.
- Theoretical and experimental research of dynamic characteristics of biological objects and their transitional modes in natural and artificial environments of their output.
- Study of technological machines and development of recommendations on ways to simulate natural regimes.
- Development of new unsteady natural modes of agro-industrial complex, their experimental and pilot testing, issuing proposals to improve the efficiency of production processes.

The effectiveness of termokontrasting mode of production was confirmed at poultry farms in the Rostov region [18-22] and the proposed new temperature also checked for goose and duck and can prove effective for other types of birds (Turkey, ostrich and quail), livestock and biological objects [9-12].

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