



Ecological bases of using artificial photo mode to improve the reproductive characteristics and growth of Japanese quail (*Japonicus coturnix L.*)

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Abstract

For the first time this work was presented as a brief analysis of the impact of the natural rhythm of activity and rest chickens on sexual activity, morphological parameters of the genital organs, fertilized eggs, height and development. It is proved that the natural rhythm as an external stimulus has positive effect on the central nervous system and the functional state of the endocrine organs. Within fifteen weeks, average daily gain was 0.16g, the average live weight was 5.76g, in the oviparous period of experimental quail testis weight was more than 3.0g, the ovary weight of 0.1g, sexual activity in male was indicated more than 10 -15 pairing per day, fertilized eggs up 6.0%. Thus specified technological indicators are achieved without additional cost of feed.

Keywords: Growth; Development; Photo- Mode; Fertility; Activity; Weight

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Cite this article as: Musayev, A. and Goyushova, R. (2018), "Ecological bases of using artificial photo mode to improve the reproductive characteristics and growth of Japanese quail (*Japonicus coturnix L.*)", *International Journal of Development and Sustainability*, Vol. 7 No. 2, pp. 485-491.

1. Introduction

All vital activity of animals occur against a background (on the basis) of numerous rhythmic processes, such as the daily transition from sleep to wakefulness, daily changes in locomotor activity and behavior. There are longer seasonal and annual rhythms of growth, reproduction, fat storage, ruler, migration, etc.

At the core of these phenomena lie both external and internal causes. External factors include such factors of the environment that are characterized by the greatest regularity of repetition, for example daily and annual fluctuations in light intensity, temperature and etc.

However, the periodicity of the length of the day and of illumination throughout the whole evolution is the most accurately reproducible external time signal. Therefore, under natural conditions, precisely the lighting mode (regime), the ratio of the duration of the day and night, that is the most important synchronizer of daily and annual rhythms of vital activity. At the present time, photoperiodic reactions are found in one or another form in almost all species of animals. As well as rhythms of activity are described for many species of birds in natural conditions. (Slonim, 1971; Musaev, 2000; Musaev and Huseynov, 2007; Musaev, 2011; Rani, 2009; Newton, 2011).

The behavior stereotype was developed as a result of phylogenetic adaptation to the external complex of signals of the medium and is carried out in the presence of these signals. Evolutionary selection selects those signals (signal stimuli) which are very likely to inform (report) that the situation necessary for the manifestation of this reaction has come.

Particular (Individual) chains of reflex reactions are included sequentially as a result of the action of a certain signal from outside, and this/that behavioral program or its part is performed. Phylogenetic adaptation to this serial complex of environmental signals is carried out in the presence of these signals (Slonim, 1971).

Experiments with birds showed that if the daily species of birds are kept in total darkness or in conditions of weak constant illumination, the daily cycle of activity and gas exchange stays for a long time (up to 2-3 months), but the period of fluctuation differs somewhat from 24 hours. As a result, the activity gradually shifts to other than normal daily hours.

The discrepancy of the daily rhythm with the duration of astronomical days opens the possibility of a certain shift in the rhythms of activity in order to synchronize them with the natural change of conditions in each specific area in different periods of the year. Time sensors play the leading role in this, whose influence is facilitated not only by the coincidence of the active period with the most favorable period of time of the day, but also by synchronizing the cycles of various processes at the level of the whole organism, as well as the activities of all individuals of this population (Musaev, 2011).

Taking into account the data of modern neurophysiology and biorhythmology, it should be assumed that the various effects found in the application of rhythmic stimuli are due to the universal, widely spread under terrestrial conditions and bearing, in effect, the activating character of the applied light regime.

Under the influence of intensive prolonged illumination the tonus of the neuromuscular apparatus increases, and as a result, the motor activity increases, which is noted in all animal species.

As it is known, if the light increases motor activity among daylight animals (mammalian and bird environments), then darkness or lack of light has a retarding effect on activity, primarily on motor activity (Ashof, 1984; Gurin, 2003). In this article, for the first time, a brief analysis of the effect of the natural rhythm of activity and dormancy of chicken birds and adequate response of meat breeds of Japanese quails grown in enclosed spaces is conducted.

The aim of the study is to increase the average daily gain, sexual activity and egg fertility, by changing the periodicity of the light regime. The task of the study is to study the effect of the natural rhythm of activity and rest on the growth and sexual system of Japanese quails grown in enclosed spaces.

2. Material and method of investigation

The growth and development of Japanese quails were studied in the vivarium of the Biology Faculty of the Baku State University. 300 birds were kept in the experimental and control groups. Four cycles of tests were carried out. Control quail were kept in the developed light regime (Greganov, 2007). The experimental groups were kept in the changed periodicity of astronomical days: the first daytime - 8 hours: the first night - 4 hours: the second day - 8 hours: the second night - 4 hours (Musaev, 2007; Musaev, 2011). Daily and annual fluctuations of the lighting regime, the ratio of the duration of the day and night are the most accurately reproduced by an external time signal. They are the most important synchronizer of diurnal and annual rhythms of vital activity.

In natural conditions, due to seasonal changes in the length of the day, the time of daily activity shifts. During the active part of the day, the intensity of bird activity is usually phase. In chicken birds during the period of feeding chicks and driving broods are most active in the morning hours, then their activity decreases and again raises. The periodicity of the light and night rhythm was controlled automatically by means of a time relay. As in nature, the beginning and end of the light regime was provided smoothly: sunrise and sunset in the rooms had a duration of 30 minutes. In each group, depending on the increase of age, the composition and amount of feed were identical.

The daily growth of the quail was studied from the diurnal age to the beginning of the egg-laying period. At the end of each week the quails were weighed and the average of daily weight gain was set. The percentage of survival of the quail in each group was set taking into account the number of daily dying quail.

Comparatively studied reproductive properties (sexual activity, morphological parameters of the genital organs, fertilization of eggs). In both groups (300 eggs each) after the incubation, fertilization was determined by the number of hatched quail. The intensity of copulation in the period of oviposition in the control groups was calculated from the number of matings at the beginning, middle and end of the light part of the day (16 hours) during one hour.

In the experimental groups, the intensity of mating was considered in the beginning, middle and end of two light periods (8 hours each) for one hour. The age-related changes in testes and ovary weight in the

experimental and control groups were studied before the onset of puberty (up to 49 days), at the beginning of oviposition and during mass oviposition.

3. Results

The size of the testes is directly related to fertilization, when low fertility is associated with small testes. Therefore, it is important that the technology of production at any stage does not hinder their development.

Suspension of mass growth in postembryonic development is observed during the formation of mating activity of males in both groups of quail. Especially important in the period after the peak of productivity is the maintenance of live weight and the overall physical shape of the cock, which will ensure a slowdown in the rate of decline in fertility.

Table 1. Reproductive indicators of eksperimrntal and control quail

Tecnological indicators	Pilot batch		Ispektion lot	
Live weight,g	227,9		222,4	
Weight of testes,g	Thrity	Day mass,g	Thrity	Day mass,g
	30	0,3	30	0,3
	49	2,6	49	2,35
	60	5,57	60	3,41
	90	7,2	90	6,3
	120	7,6	120	7,4
Number of incubated eggs, pcs	200		200	
Fertilly of eggs, %	91		85	
Preservation, %	98,3		98,3	

When studying the age-related changes in gonads, it was revealed that the testes weight at the beginning of oviposition is greater in the control groups by 0.25 g. During the period of mass oviposition, testes weight is more in test groups by 2.9 g. The results show that the development of testes between the age of 1- 3 weeks occur mainly at the cellular level. During this period, the physical development of the testes is

insignificant, but an important division of the sertoli cells that determine the fertilization potential of the rooster occurs. After reaching 5 weeks, the physical growth of the testes is accelerated. Before the onset of puberty, the individual variability of the relative weight of the gonads in the quail of both groups remains low. In experimental 2.73 g, in control 2.6 g. The increase in the relative weight of the testis begins in the control groups between 37-45 days, in the experimental 42-49 days.

When grown in two days and two night rhythms, food activity is high at the beginning and end of each 8 hour light. In the control groups, the nutritional activity grown in 16 hours light is not high. The results of birds in two day and two night rhythms indicate that the main technological indicators are increasing: the average daily gain is 0.16 g, the average live weight is 5.76 g.

In this case, you can hang without additional cost of feed. The current male stretches up, raises his head and, throwing it back, makes a scream. During oviposition, birds are intensively pierced at the beginning of each bright part of the day. Control quail is touted at any time of the day or night. Compared with the expert functions of the supervisory hearings, the torus is seven days earlier. The intensity of copulation in the period of oviposition in experimental groups over a light day of 6-8 mating is greater

At the end of the day (16 hours) in the control groups, the intensity of copulation does not exceed an average of 2 matings in an hour. In the experimental groups at the beginning and end of each light day (every 8 hours), the intensity of copulation is greater by 4-5 pairing. High sexual activity is confirmed by incubation of eggs (Table 1). Experimental eggs have fertilization greater than 6.0% than in control eggs.

4. The discussion of the results

Observing the successive changes in the testis in the experimental quail groups, it was established that in birds, grown in new daily rhythms (LH) in two night hours stimulate the functions of the testis and the metabolic processes in the body of quail are activated.

The results of the conducted studies allow us to state that a new daily rhythm causes a statistically significant increase in growth in quails. The conducted researches made it possible to establish that the natural rhythm of activity and dormancy of chicken birds of influence, as an external stimulus, has a positive effect on the central nervous system of birds and on the functional state of endocrine organs, in particular the pituitary and epiphysis.

It was found that the cycles of action of cortisol, growth hormones (GH), prolactin, gonadotropins are closely related to the rhythm of sleep and wakefulness. It was shown that for a sufficient secretion of growth hormones a normal person needs sleep. Growth hormone secretion increases after Midday episodes of sleep (Anisimov, 2008). It is established that the rhythms of daytime activity and night rest in birds are regulated by the epiphysis.

Hormone mediator, giving the leading signals to organs and tissues, is melatonin. In this case, the nature of the response is regulated not only by the level of the hormone in the blood, but also by the duration of its night secretion. In addition, melatonin provides the adaptation of endogenous biorhythms to the constantly

changing environmental conditions. The degree of intensity of metabolism of melatonin depends on the illumination of the medium. Therefore, under the influence of light, the synthesis of melatonin is inhibited, and in the darkness it increases (Anisimov, 2008; Chernysheva, Nozdrachev, 2006).

In relation to (LH) in chickens, under normal conditions of changing day and night, they are instructed that it is allocated at night. Under the influence of the hormones of the pituitary gland and the epiphysis, the ovary itself becomes a secretory organ and secretes its hormone. Darkness or lack of light in the room lead to underdevelopment of the pituitary gland and hormonal activity. On the contrary, round-the-clock coverage leads to overstretching of the endocrine system as a whole, especially the sex glands (Chopikashvili et al., 2008).

The discrepancy of the daily rhythm with the duration of astronomical days in enclosed spaces opens the possibility of a certain shift in the rhythms of activity in order to synchronize them with the natural change of conditions in each specific area in different periods of the year. The leading role in this process is played by external time sensor, the influence of which contributes not only to the coincidence of the active period with the most favorable time of the day, but also to synchronization of the cycles of various processes at the level of the whole organism, as well as the activities of all individuals of this population (Anisimov, 2008; Chernysheva and Nozdrachev, 2006).

It is known that the behavior stereotype was developed as a result of phylogenetic adaptation to this complex of environmental signals and is carried out in the presence of these signals. Evolutionary selection selects those signals (signal stimuli) which always with a high degree of probability report that the situation necessary for the manifestation of this reaction has come.

5. Conclusions

The conducted researches made it possible to establish that the natural rhythm of activity and dormancy of chicken birds of influence, as an external stimulus, has a positive effect on the central nervous system and on the functional state of endocrine organs.

The received results testify that the new daily rhythm used in poultry farming in two days and two nights is a biological time-resident, corresponding to the way of life of birds, directed to increase the productivity of birds.

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