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Increasing Egg-Laying Qualities of Quails by Changing Light Regime.

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ABTRACT

The article presents the results of experimental studies on the effect of changes in the light regime in the egg laying quails of local population grown under conditions on the south and south-east of Kazakhstan. The results from the perspective of the study of productive and biological features of quail, depending on growing conditions and breeding areas represent new data for growing of poultry. The first comprehensive research established and identified factors that unlock the potential of quail local population, improve the genetically mortgaged productivity. The optimal duration of daylight hours during the use of additional lighting for pullet and quail is installed.

Keywords: quail, egg-laying qualities, light regime.

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INTRODUCTION

Quails, like many other domestic birds, are a valuable sources of dietary meat and eggs. In many countries, the egg and the meat of this bird are very popular.

It has been a positive trend at the process of production of poultry products in Kazakhstan in recent years, and its further expansion provides lead mainly by improving the productivity of the birds and the introduction of advanced technologies that are used. The need for expanding the range of agricultural production and the quality of quail production causes an increased interest in the industry of birds.

The significance of the research lies in the fact that the direction of the poultry in the country – quail production is a new industry that puts forward the need for a deep and comprehensive study of the issues of breeding them in new natural - climatic conditions [1]. Getting high-quality product from the quails and the further development of these species depends entirely on solving a number of problems connected with the study of their biological and physiological characteristics, the development of innovative feeding methods, organization and content of the new technology to ensure cost-effectiveness.

A major role in the increase of high quality poultry products should play quail production as a branch of the most precocious animal [2].

In addition to factors, such as the conditions of detention in increasing livestock of bird breeding, the main issue is to obtain the eggs that are subject to further incubation. Production technology of hatching eggs is a whole system of knowledge – it contains rational methods of reproduction, cultivation, maintenance and feeding of breeding birds and it is based on the use of genetics, selection, biology, physiology, animal science and other sciences [3].

Considering all these facts, it might be concluded that research related to the study of productivity and biological characteristics of the birds in the ontogeny becomes more urgent and necessary.

MATERIALS AND METHODS

In recent years, a number of scientists expressed their opinions about dramatic changes in light conditions may have a significant impact on the behavior and productivity of birds [4-9]. We have developed some scientific and experimental series of studies in order to examine the sharp change in light conditions on the performance of quails' eggs and response timing to light. The object of research is the Japanese quail of local population, as well as quail imported from Russia and China [10].

Under supervision, there were 1628 heads of quail contained in a typical poultry house with a limited-range paddock. In a preliminary study period - for 15 days, the gross daily output of eggs was taken into account, which was equal to 16.5%, with an average population of quail that was equal to 1602. On the eve of the inclusion of additional lighting on 15th of October, the gross harvest of eggs from hens equaling to 1551 amounted to 260 units (16.8 %).

From October 16, the house began to utilize additional lighting. The duration of lightning per day is 16 hours, light intensity 4W per 1m^2 of floor space. Feed rations, as well as other terms of care and maintenance were the same as in the reference period.

RESULTS AND DISCUSSION

Studies on the use of artificial light in the first 6 days have shown that the level of egg production has not increased, but vice versa it decreased slightly; the average daily collection of 1548 laying hens amounted to 237 eggs, that is 15.3%.

On the 7th day of the research the initial level of egg production has recovered and the daily collection of 1570 laying hens amounted to 264 hens eggs that equals to 17%. A marked increase in egg production from the use of additional lightning began to observe from 12-day, which was 27 of October. By 31 of October, the average daily collection reached 320 eggs, that was 21.2% more compared to prior time before the use of light

exposure. By the 25th day of the experiment the daily collection reached 394 eggs with an average population of 1,515 quails, which means an increase compared to the beginning of experience has reached 47%.

We have raised the question: whether the increase in quails' eggs could be not as the result of exposure to light, but due to other factors, such as the completion of birds' molting [11]. This doubt did have some reasons because in this research we did not have appropriate control group. In order to get answer for this specific question, starting from 10th of November additional lighting has been suspended.

The result is affected immediately: from the first day of turning off artificial lighting, there was a marked decline in egg production, if in eighth and ninth of November daily collection out of 1493 hens was 345-350 quails' eggs, on 10th of November this number dropped to 330, and on November 11 - up to 231 eggs, even though the quail population remained about the same.

By November 15, the daily collection has decreased to 132 eggs, and by the end of November out of 1476 hens, we have received 36 eggs, which means we have dropped down by five times less. There was still time to check whether the egg production will be increased if we transfer them to content with supplementary lighting. For this reason starting from fourth of November electric light was re-enabled in full compliance with the regime of lighting and feeding.

During the first 11 days comparing to the first period of research, increase of egg production has not occurred, and the average daily collection out of 1431 hens amounted to 55 eggs. Nevertheless, starting from the 12th day egg production began to rise rapidly, to December 18, it was equal to 127 units, and after seven days from this day, it reached 450 pieces. The average daily amount for the period from 15 to 31 December (out of 1380 quails) equaled to 314.5 units. Moreover, in January in this aviary, average egg production reached 536 eggs (almost 40% of egg production).

Therefore, based on these results, we can confidently say that the light factor had a stimulating effect on the increase of egg production. At the same time, it was found that the latent period of light exposure lasts 12-13 days. We have seen this pattern in the previous experiments as well. In all cases, the effect of light exposure occurs after a certain period, namely after 12-14 days. In most cases, pullets have shown the reaction 3-4 days earlier than older quails.

We studied the effectiveness of additional lighting effects on egg production of laying quails at different duration of daylight. There were four groups of quails participating in this experiment, each of which consisted of two subgroups: local quail and imported quail delivered from abroad. In the first group, length of daylight by using supplemental lighting was equal to 21 hours, whereas in the second group it was equal to 15 hours and 40 minutes. The third group was under normal circumstance of the natural duration of the day and this group served as a control, and for the fourth group the length of daylight was reduced to 8 hours by dimming the house (Table 1).

Table-1: Average egg production of experienced quails, contained under the various conditions of the light regime, pcs. (A- The total number of received eggs, pcs; B- Average egg production, pcs).

Months	I group				II group			
	Local		Imported		Local		Imported	
	A	B	A	B	A	B	A	B
I	299	7,5	187	8,5	300	8,4	138	6,9
II	485	12,1	256	11,2	416	10,4	206	10,3
III	370	10,6	271	13,6	480	12,0	208	10,4
IV	320	902	152	7,6	284	8,0	172	8,6
V	192	6,6	84	4,2	240	6,7	57	4,4
VI	201	7,3	160	8,9	262	8,2	115	8,8

VII	136	7,6	121	8,4	342	10,4	99	8,2
VIII	200	11,1	100	8,0	198	11,1	95	8,0
IX	136	8,0	90	7,0	133	3,0	94	7,8
X	123	7,2	60	4,6	146	5,0	55	4,6
XI	196	11,6	50	4,5	204	8,3	54	4,5
XII	227	13,4	107	9,0	232	13,1	97	8,1
Average per year	240	9,3	137	8,0	269	8,7	116	7,8
Months	III group				IV group			
	Local		Imported		Local		Imported	
	A	B	A	B	A	B	A	B
I	139	3,5	44	2,2	88	2,2	26	1,3
II	331	8,3	91	4,6	525	6,3	103	51
III	355	8,8	138	6,9	236	5,9	144	7,2
IV	241	6,9	194	9,7	296	8,0	140	7,0
V	266	7,5	183	9,2	357	9,4	71	3,7
VI	227	7,3	124	8,0	268	8,4	87	5,4
VII	132	5,5	62	4,1	200	5,7	60	4,6
VIII	211	11,7	57	4,8	200	11,1	58	4,4
IX	162	9,0	84	7,0	153	9,0	68	5,2
X	69	3,3	69	6,3	60	3,5	16	1,6
XI	86	4,2	12	1,1	19	1,1	2	0,2
XII	96	7,0	36	3,1	52	2,9	33	3,0
Average per year	193	6,9	91	56	182	6,1	67,3	4,2

As it can be seen from the data shown in Table 1, daylight of less than 13 hours has no effect on increasing egg production. The greatest effect in the pullets' groups was reached by daylight lasting 14 and 15 hours, whereas in older quails groups' greatest effect equals to 16-houred daylight.

Over four and a half months of autumn and winter seasons, the average egg-laying quails -pullets who were under 12-hour light day was 24.3 eggs, which means it was even slightly lower than in the control group, where the egg production of laying hens was 25.8 eggs . In the house where daylight duration was 13 hours, the average egg production was 41.7 eggs, whereas in the group where daylight length was 14 hours it was equal to 53.1 eggs, and in the house with a daylight length of 15 hours it was equal to 53.0 eggs. During daylight of length between 14 and 15 hours, pullet egg production was 27% higher than in the house with 13 hours of daylight; comparing to houses, where daylight length was 12 hours, it was two times higher.

Quail, which located under 16-hours of daylight time during four and half months of autumn and winter seasons give eggs in average 10% more than their peers who were under 14-hours of daylight time. Average egg production of quails with 14-hours of daylight time was 27.6% higher than in the control group, whereas the egg production of laying hens contained in a 16-hours of daylight time was 40% higher (Table 2).

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Table-2: Impact of additional lighting on the viability of quails-laying hens.

Months	Pullets				Quails			
	Experimental group		Control group		Experimental group		Control group	
	Died		Died		Died		Died	
	Head	%	Head	%	Head	%	Head	%
October	10	0,5	2	1,0				
November	5	0,3	1	0,5				
December	12	0,6	2	1,0				
January	4	0,2	1	0,5	6	0,5	1	0,7
February	4	0,2	2	1,2	4	0,3	0	-
March	6	0,3	1	0,6	5	0,4	1	0,7
April	3	0,2	1	0,6	6	0,5	1	0,7
May	3	0,2	1	0,6	9	0,8	1	0,7
June	3	0,2	0	-	1	0,1	0	-
July	4	0,3	1	0,6	4	0,4	1	0,8
August	3	0,3	0	1,4	3	0,3	1	0,8
To primary livestock,%	57	2,6	14	7,0	38	3,1	6	4,0

The results of these studies show considerable interest in terms of another respect. In the process of research there were questions, regarding elongated light exposure used in the autumn-winter period, that might reduce egg production in subsequent seasons and in general to the premature wear of the birds' organisms. Experiments' data carried out under experimental and production conditions showed that productivity in the subsequent periods of the experiment and the state of birds' organisms are at a level of physiological norm and significant deviations were not noted.

In the spring-summer period (from first of April until first of July), quail egg production in all experimental groups (except the group with a duration of daylight equal to 14 hours) was at good level and even slightly higher than in the corresponding control groups. Moreover, in case of comparing the level of productivity of all the experimental groups for the entire period of experiment that is seven and a half months, it was higher than control groups' level of productivity. Thus, during this period, the average egg production of pullets contained at 14-hour of daylight time was 46.3% higher than the average egg production of control groups. In absolute terms, these numbers equal to 97.6 and 67.4 units, respectively. Egg production of quails kept at 16-hour of daylight time was higher than the egg production of control groups by 26.1%.

Experimental tests of the effect of different lighting modes held for a long time confirmed that the level of egg production in illuminated groups was higher not only in autumn and winter seasons, but in spring and summer seasons too. The results of these studies are shown in Tables 3 and 4, respectively.

In order to determine the effectiveness of the 15-hour daylight time for pullets and 16- hour daylight time for quails following series of experiments were conducted. For this experiment, the lay pullets of one-year age in amount of 2204 and laying hens in amount of 1218 were selected. In the same poultry house, which contained experimental groups, the corresponding control analogs were isolated.

The experiment lasted for 11 months for pullets (from 10th of October till 01st of September of the following year), and for quails it lasted for 8 months. The duration of daylight time has been set to 15 hours for the pullets, and for quails, this was set to 16 hours. Intensity of illumination is 4 Watts/m2 of floor of the house. Terms of feeding and maintenance (except for the light mode) in all groups were the same.

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Table-3: Results of the study of the influence of additional lighting at different daylight modes.

Age of birds	Duration of daylight time, hours	from 19th of November till 01st of April			from 01st of April till 01st of July			Total for 7.5 months			The average of monthly egg, pcs.
		The amount of birds	Received eggs, pcs.	Average egg production, pcs.	The amount of birds	Received eggs, pcs.	Average egg production, pcs.	The amount of birds	Received eggs, pcs.	Average egg production, pcs.	
Pullets: Control group		907	23,4	25,8	945	39,1	41,2	926	62,5	67,4	9,0
Experimental group	12	980	23,9	24,3	poultry house was used by pullets						5,4
	13	925	38,6	41,7	905	37,9	41,5	915	76,5	83,6	1,4
	14	868	46,1	53,1	954	42,9	44,8	911	88,9	97,6	13,0
	15	950	50,2	53,0	poultry house was used by pullets						
Quails: Control group		997	25,7	25,7	838	28,8	34,0	918	54,5	59,4	7,9
Experimental group	14	1020	33,4	32,8	878	23,4	26,8	949	56,8	60,0	8,0
	16	1045	37,5	36,0	958	37,5	39,1	1001	74,9	74,9	10,0

Table-4: Results of studies exploring additional lighting effects on egg laying quails

Months	Pullets				Quails			
	Experimental group		Control group		Experimental group		Control group	
	Average monthly amount of birds, pcs.	Average egg production, pcs.	Average monthly amount of birds, pcs.	Average egg production, pcs.	Average monthly amount of birds, pcs.	Average egg production, pcs.	Average monthly amount of birds, pcs.	Average egg production, pcs.
IX	2204	12,4	198	4,9				
X	2176	14,5	197	4,4				
XII	2088	12,2	193	8,0				
I	2046	13,6	190	7,7	1218	11,4	146	4,0
II	1805	13,9	174	9,7	1197	10,9	140	5,8
III	1620	12,6	170	10,0	1165	10,6	138	8,0
IV	1437	9,5	170	02,0	1148	6,6	135	5,8
V	1387	13,5	169	15,3	1137	10,0	132	9,0
VI	1344	13,6	160	14,0	1125	9,4	130	10,6
VII	1323	14,0	157	15,0	1111	11,2	128	10,0
VIII	1052	12,2	148	12,0	1053	8,1	123	9,3
Total for 11 months	1680	12,9	174	10,3	1144	9,8	134	7,8

However, pullets in the experimental group in terms of 11-month egg production were superior comparing to control group's egg-laying hens by 25.7%. Quails in illuminated group in terms of 8 – month egg production were superior comparing to control group's egg-laying quails by 25.3%, and in the winter egg production (January - March) surpassed egg production of control counterparts by 78.3% (32.9 and 17.8 eggs), whereas pullets surpassed by 77.6% (79.4 and 44.7 eggs). In the illuminated groups, the safety of livestock also proved to be relatively higher.

CONCLUSIONS

Thus, as the result of long-term experiments, it was shown that the reaction of quails on the extension of the daylight mode arises only after a certain summation of light effects that must be considered when determining the time of the application of additional lighting. In the context of South-east Kazakhstan, the optimal duration of daylight mode during the period of application of the additional lighting should be considered as follows: for pullets the duration of daylight is equal to 14-15 hours, and for quails it is equal to 15-16 hours. It has also been learned that additional illumination used in the autumn and winter seasons does not cause inhibition of growth and quails development.

REFERENCES

[1] Kyrchenova, N. 2003. Quail - "Golden" bird. *Anim. Husbandry*, 1: 17.

[2] Gavrikova, L.M. 2007. Improving methods of feeding and maintaining of poultry. *Birds and Poultry Prod.*, 1: 35-37.

[3] Pigareva, M.D. and Afanasyev, G.D.1989. *Breeding of quails*. Rosagropromizdat, Moscow.

[4] Santos, T.C., Murakami, A.E., Fanhani, J.C. and Oliveira, C.A.L. 2011. Production and Reproduction of Egg- and Meattype Quails Reared in Different Group Sizes. *Brazil. J. Poult. Sc*.,13(1): 9-14.

[5] Priti, M. and Satish, Sh. 2014. Quail Farming: An Introduction. *Int. J. of Life Sciences*, 2(2): 190-193.

[6] Oprean, L., Nicoara, C. and Lengyel, E. 2010. Stimulation of Egg Production in Japanese Quails by Enriching Feed with Residual Yeast. *Sc. Pap.: Anim. Sc. and Biotech*., 43(1): 310-312.

[7] Genchev, A. 2012. Comparative Investigation of the Egg Production in Two Japanese Quail Breeds – Pharaoh and Manchurian Golden. *Trakia J. of Sc.,* 10(1): 48-56.

[8] Wilkanowska, A. and Kokoszynski, D. 2012. Layer Age and Quality of Pharaoh Quail eggs. *J. of Centr. Eur. Agr.,* 13(1): 10-21.

[9] Hrncar, C., Hanusova, E., Hanus, A. and Bujko, J. 2014. Effect of Genotype on Egg Quality Characteristics of Japanese Quail (Coturnix Japonica). *Slovak J. Anim. Sci.,* 47(1): 6-11.

[10] Serebryakov, A.I. 2010. *Quails: keeping, feeding and breeding*. Selhozprom, Moscow.

[11] Makhatov, B.M., Abrikosova, V.I., Baybatshanov, M.Kh. and Turymbetova, G. 2008. *Biology of quails breeding*. Almaty, Garant.