

# **The Effect of Using Infrared Lamps on Growth Parameters in Jumbo Brown Quail Youth at 1- 42 Days of Age**

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## **Abstract**

In order to determine the effect of using infrared lamps in raising the Jumbo youth meat quail as a source of heating and lighting during the 1-42 days of age, an experiment was organized on a total number of 300 quail chickens, divided into three equal groups (100 chicks/ group), respectively two sources of electric heating and electric lighting (control batch – 100 W power incandescent lamps, experimental batch I – 100 W infrared lamps and experimental lot II - infrared lamps in the 0-3 weeks of growth and incandescent lamps in the period of 4-6 weeks of growth). Average live weight at the age of 42 days was of 216.55 g/head in control group, of 185.56 g in experimental group I and of 248.55 g/head in experimental group II, 12,87 % higher compared to the control batch and with 25,34% compared to experimental group I, the differences between the three groups being very significant. The average consumption of compound feeds was of 1344 g c.f./head in control group, of 855 g c.f./head in experimental group I and of 1310 g c.f./head in experimental group II, the differences between the three groups being very significant. In view of the inferior results recorded in the case of experimental group I, it can be stated that the use of infrared lamps for the entire growing period of 42 days to Jumbo meat quail youth has negative effects on the weight gain of the chicks, especially in the second part of the growth. The superior growth performance of the experimental group II, compared to control and experimental group I, shows that the combined use of infrared lamps in the 0 - 3 week growth period and incandescent lamps during the 4 - 6 week period has positive effect on growth parameters, especially on the live weight of the chicks at the age of 42 days.

**Keywords:** growth, infrared lamps, meat, quail, youth.

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## **1. Introduction**

The growth of quail youth requires especially small spaces with the use of local heating sources. The most common sources used to heat the chicks are incandescent lamps and infrared ones. If in terms of the effect of incandescent lamps on the growth of quail chicks there are more studies, in the case of infrared lamps the studies are very limited and there are no clear recommendations for the use of infrared lamps in the growth of quail youth. It is worth mentioning that they are used simultaneously with the reduction of vertical

space with insulating materials from a thermal point of view (ex. glass wool), both types of lamps provide the thermal comfort needed to raise quail chicks. Thus, it remains to be studied the effect of the light intensity of these lamps on the parameters of growth of the quail chicks.

Light is one of the most important microclimate factors in raising birds. It affects important endocrine metabolic processes and influences birds throughout the day and especially through the variations of the day length, intensity and spectrum [1].

In the breeding of poultry for meat production, lighting programs with duration of 24 or 23 hours are used in order to maximize the growth increase and the consumption of compound feed. However,

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the incidence of metabolic problems arises from the use of these lighting programs in addition to the use of shorter lighting times [2,3,4].

Light intensity is a directional quantity that characterizes the distribution of light flux in space. Lux is the unit of measurement that represents the degree of illumination of a surface in the international system of units. A degree of illumination of 1 lux is when a luminous flux of one lumen is evenly distributed over an area of 1 sqm [5].

Luminous flux is the total amount of light emitted by a light source and is measured in lumens. An incandescent bulb with a power of 100 watts has a luminous flux of 1600 lumens [6].

Infrared light [7] is an electromagnetic radiation with a wavelength between 700 nm and 1000 nm (1 mm), longer than of the visible light (400 - 700 nm) and a frequency between 300 GHz and 430 THz, less than visible light (430 - 790 THz). Thus, exposure to infrared light sources can slow down molecular biochemical processes, especially in the neuroendocrine system and in adult bodies.

The aim of the present research was to determine the effect of exposure to infrared lamps compared to the exposure to incandescent bulbs of the quail youth from the population of Jumbo meat between 1 and 42 days of growth.

## **2. Materials and methods**

Research was carried out on a total of 300 Jumbo quail chicks divided into three equal groups (100 chicks /group). The chicks in the control group were maintained using normal incandescent lamps for heating and lighting during the 1-6 weeks of growth (2 lamps of 100 W), in chicks in experimental group I, infrared lamps were used during the period of 1-6 weeks of growth (2 lamps of 100 W), and in experimental group II, infrared lamps were used during the period of 1-3 weeks of growth (2 lamps of 100 W) and normal incandescent lamps during the 4-6 weeks of growth (2 lamps of 100 W).

The height at which the lamps were placed was 20 cm from the ground in the first two weeks of growth, 30 cm from the ground in the 3-4 weeks of growth, and 60 m from the ground in the 5-6 weeks of growth.

The temperature provided by both types of lamps, next to each other in the breeding area was the specific one for quail chicks (35°C in the first

week of growth, 32°C in the second week, 28°C in the third week of growth and 24°C in the 4-6 weeks of growth).

To determine the light intensity of the lamps, a luxmeter was used (a mobile phone application downloaded from Google play entitled "Lux Meter – Application", that uses multiple sensors on the screen surface of the mobile phone).

Thus, an average light intensity was determined of 6191 lux for infrared lamps, and for normal incandescent lamps the average intensity was 4237 lux.

In the case of both types of lamps, the lowest light intensity was determined under the lamps (2778 lux for infrared lamps and 1030 lux for normal incandescent lamps) and the highest light intensity was 50 cm away from the lamps (15000 lux for infrared lamps and 7980 at normal incandescent lamps). At the top of the infrared lamps the average light intensity was 623 lux in the case of infrared lamps, while at the top of the incandescent lamps the average intensity was 5230 lux, which means that the infrared lamps strongly direct the luminous flux at the bottom and especially towards the edges. It should be noted that the measurements were made on the back of the chicks, except for the measurements at the top of the lamps.

The combined feeds and their nutritional values were the same for all three groups, corresponding to the two growth phases, respectively phase I: 0-3 weeks of growth and phase II: 4-6 week of growth. The combined fodder was purchased from a specialized producer [8].

The research took place within the quails' farm Ioniță T. Lucian, Gherghița Individual Enterprise, Prahova County, Romania.

To test the difference between the averages, the Student test was used, and the statistical data processing was done using Microsoft Excel 2010 program.

## **3. Results and discussion**

Average live weight (Table 1, Figure 1) during 0 - 21 days period recorded approximately the same growth trajectory in all three groups analysed, the differences between them being insignificant.

At 28 days, the mean weight in experimental group I was  $138.55 \pm 2.34$  g, with 13.41 % lower compared with experimental group II ( $160.00 \pm 2.45$  g) and with 7.63 % lower compared with

control group ( $150.24 \pm 2.04$  g), the difference between three groups being very significant. At the age of 35 days, the mean weight in experimental group I was of  $165.78 \pm 2.45$  g/head, with 19.48 % lower compared with experimental II group ( $205.85 \pm 2.34$  g/head) and with 10.65 % lower compared with control group ( $185.53 \pm 2.03$  g/head), the differences between the three groups being very significant. At 42 days, the average live weight in experimental I group was of  $185.56 \pm 3.34$  g/head, with 25.34 % lower compared to the experimental II group ( $248.55 \pm 3.48$  g/head) and with 14.31 % lower compared with control group ( $216.55 \pm 3.12$  g/head), the difference between the three groups being very significant.

A nutrition study conducted in India [9] on a flock of Japanese meat quails mentions the following average growth performance in the control group: live weight at 1 day was 8.47 g, at 1 week was 25.78 g / head, at 2 weeks it was 53.46 g / head, at 3 weeks it was

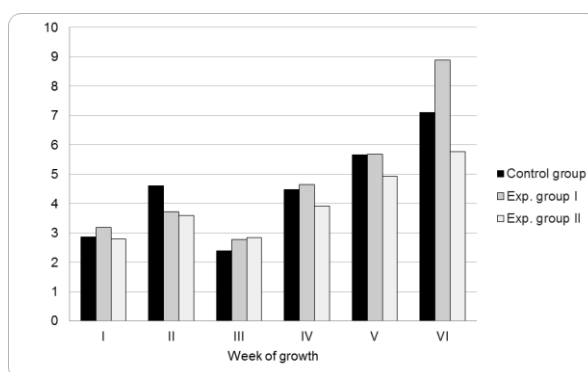
109.68 g / head, at 4 weeks it was 162.91 g / head, and at 5 weeks it was 209.72 g / head. The performances are close to those recorded in the present experiment in experimental group II.

In a genetic selection experiment performed on several variants of Japanese quail made in India [10] the authors mention on the brown quail variant an average live weight at the age of 1 day of 8.28 g / head, at 2 weeks of 59.87 g / head, at the age of 4 weeks of 140.46 g / head, and at the age of 6 weeks a live weight of 195.28 g / head. It should be noted that the live weight at the age of 2 weeks determined by the authors is similar to that established in this experiment in all 3 analysed groups, and the live weight at 4 and 6 weeks determined by the authors is similar to that recorded in this experiment in the experimental group, probably because of the differences in the maintenance conditions of the chicks.

**Table 1.** The evolution of the average live weight of quail chicks from the three groups during the period of 1 - 42 days of growth (g)

Quail chicks age	Control group	Experimental I group	Experimental II group
1 day	$9.36 \pm 0.23$ ns	$9.54 \pm 0.34$ ns	$9.48 \pm 0.65$ ns
7 days	$28.55 \pm 0.49$ ns	$27.44 \pm 0.54$ ns	$29.32 \pm 0.44$ ns
14 days	$51.85 \pm 1.32$ ns	$55.23 \pm 1.02$ ns	$58.85 \pm 1.24$ ns
21 days	$110.32 \pm 1.45$ ns	$108.36 \pm 1.22$ ns	$111.55 \pm 1.45$ ns
28 days	$150.24 \pm 2.04$ ***	$138.55 \pm 2.34$ ***	$160.00 \pm 2.45$ ***
35 days	$185.53 \pm 2.03$ ***	$165.78 \pm 2.45$ ***	$205.85 \pm 2.34$ ***
42 days	$216.55 \pm 3.12$ ***	$185.56 \pm 3.34$ ***	$248.55 \pm 3.48$ ***

Note: \*\*\* - very significant difference between values in the same row; ns - insignificant difference



**Fig. 1:** The evolution of the average live weight of quail chicks from the three groups during the period of 1 - 42 days of age

In a study conducted in Ukraine [11] regarding the influence of light on the growth of two groups of quail chicks, in one of the groups was used as a source of lighting and heating an incandescent bulb with a power of 60 W and 24 hours duration. At the age of 21 days, the average live weight determined by the author was of 114.80 g/head, at 28 days was 127.10 g/head, at 35 days of 178.70 g/head, and at 42 days of 224.80 g/head. Performances are close to those recorded in this study in the control group, which used an incandescent bulb with a power of 100 W.

In a study conducted in Romania [12] on two batches of quail chicks of which a group of meat quails were used for lighting incandescent lamps with a power of 100 W in the batch of meat quails. The average weight at the age of 42 days was of 244.94 g/head, similar to that established in the present experiment in experimental group II.

In a study conducted in Brazil [13] on several batches of meat quail chicks, an average live

weight was established in the control group at the age of 42 days of 243.34 g/head, similar to that recorded in the present experiment in experimental group II.

In a nutrition experiment conducted in South Africa [14] on several batches of Jumbo meat quail chicks, the average weight at 42 days is indicated between 207.30 g/head and 223.60 g/head.

If in the first three weeks of growth there were no significant differences in the evolution of the average weekly gain, during the period of 4-6 weeks of growth there were very significant differences between the three groups (Table 2).

The mean weight gain over 1 - 6 weeks in experimental group I was of 29.34 g/week, with 26.36 % lower compared with experimental II group (39.84 g/week) and with 15.06 % lower compared with control group (34.54 g/week.) and with 13,30 % lower at control group compared to experimental II group.

**Table 2.** Evolution of the average weekly gain in quail chicks from the three groups during the 1-6 weeks of growth (g)

Week of growth	Control group	Experimental group I	Experimental group II
I	19.19	17.90	19.84
II	23.30	27.79	29.53
III	58.47	53.12	52.70
IV	39.92	30.20	48.45
V	35.29	27.23	45.85
VI	31.02	19.78	42.70
Average I - VI	34.54 ± 5.20***	29.34 ± 4.70***	39.84 ± 4.68***
Total I - VI	207.19	176.02	239.08

Note: \*\*\* - very significant difference between values in the same row

Average consumption of compound feeds (Table 3) during 1 - 42 days of growth was lower in experimental group I (18.55 g/head) with 20.08 % compared with experimental group II (23.21 g/head) and with 13.60 % compared to the control group compared to the control group (21.47 g/head). The total consumption of compound feed during the period of 1- 42 days was of 779.10 g c.f./head in experimental group I, of 974.82 g c.f./head in experimental group II and of 901.75 g c.f./head in the control group.

In the same study conducted in Ukraine [11] in the batch that used 60 W incandescent bulbs, the average consumption of compound feeds during the 1-6 weeks of growth was of 18.92 g /head, value slightly lower compared to that established in the present experiment in the control group.

The highest specific consumption of compound feed (Table 4, Figure 2) during 1 - 42 days of growth was recorded at experimental group II (5.70 g c.f./ g gain) with 26.50 % higher compared with experimental group I (4.19 g c.f./g gain) and with 13.51 % higher compared with control group

(4.93 g c.f./g gain), the difference between the three groups being very significant.

A study conducted in the USA [15] regarding the influence of the use of infrared lamps compared to incandescent lamps in chickens, mentions that the

best growth results in terms of average weight and average combined feed consumption are obtained in the case of the batch in which 100 W incandescent bulb was used, in all batches using a lighting duration of 24 h.

**Table 3.** Evolution of the average daily consumption of compound feeds in quail chicks from the three groups during the 1-6 weeks of growth (g)

Week of growth	Control group	Experimental group I	Experimental group II
I	7.88	8.13	7.95
II	15.33	14.78	15.18
III	20.05	21.05	21.44
IV	25.55	20.03	27.15
V	28.55	22.15	32.34
VI	31.45	25.15	35.17
Average I - VI	21.47 ± 3.61***	18.55 ± 2.50***	23.21 ± 4.25***
Total I - VI	901.74	779.10	974.82

Note: \*\*\* - very significant difference between values in the same row

**Table 4.** The evolution of the average specific consumption of compound feeds in quail chicks from the three analysed groups during the 1 - 6 weeks of growth

Week of growth	Control group	Experimental group I	Experimental group II
I	2.87	3.18	2.80
II	4.61	3.72	3.60
III	2.40	2.77	2.84
IV	4.48	4.64	3.92
V	5.66	5.69	4.94
VI	7.10	8.90	5.77
Average I - VI	4.93 ± 0.82***	4.19 ± 0.74***	5.70 ± 0.73***
Total I - VI	29.60	25.15	34.15

Note: \*\*\* - very significant difference between values in the same row

#### 4. Conclusions

Research shows that the best growth performance is in the case of experimental lot II (248.55 g/head at 42 days of age, 239.08 g total gain), lot that was maintained during the 0 - 3 weeks of growth with infrared lamps and during the 4 - 6 weeks of growth with normal incandescent lamps.

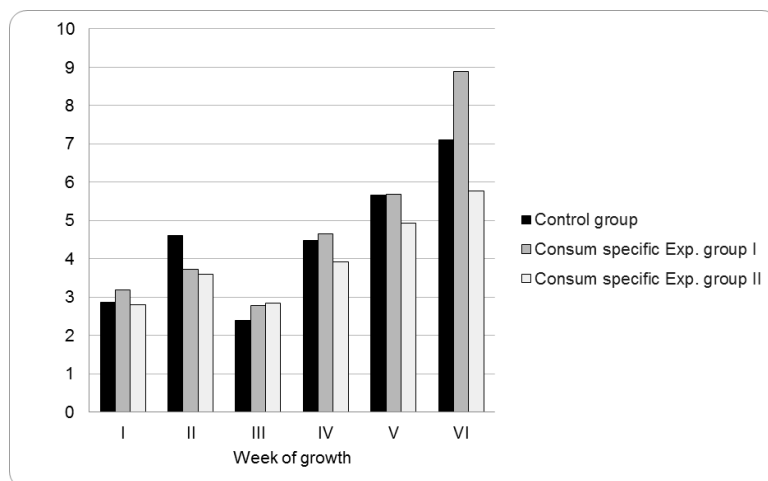
Poor results in the case of experimental group I (185.56 g/head at 42 days of age, 176.02 g total gain), that has been kept with infrared lamps throughout the 6 weeks growth period may be due to the fact that the first signs of sexual maturity in quail (males begin to sing, sexual dimorphism after plumage) appear in the fourth week of growth, and the use of infrared lamps after the fourth week of growth produces changes at the neuroendocrine

level, in the sense that the strong light intensity, correlated with the continuous infrared light, generated by the lamps has negative effects in adult organisms, respectively, it leads to a slowdown in body development.

In view of the results obtained, it can be recommended that infrared lamps be used for heating and lighting in the growth of meat quail youth only until the age of three weeks, from

which age normal incandescent lamps may be used as a heating and lighting source.

However, the disadvantage of both types of lamps is that they produce a very high light intensity (this impediment could be solved by using a rotary voltage variator (commercial name dimmer) of 220 V and power in Watt conveniently chosen with the sum powers of the adjusted lamps).



**Figure 2.** The evolution of the average specific consumption of compound feeds in quail chicks from the three analysed groups during the 1 - 6 weeks of age

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