THE INFLUENCE OF THE INCUBATION REGIME ON THE TECHNICAL RESULTS OF THE INCUBATION IN GRAY GUINEA FOWL EGGS

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Abstract

The research focused on the technical results of artificial incubation in a poultry species (gray guinea fowl), which is of increasing interest among private breeders. The studied eggs (246 pcs.) Came from three different farms and were divided into six lots (2 lots/farm with 41 eggs/lot); three batches of eggs were subjected to the classic incubation regime (A-1, B-1, and C-1), and the other three to an optimized regime (A-2, B-2 and C-2), differentiated by the level of insurance of the physical factors of incubation and the number of returns applied to the eggs. In eggs subjected to the optimized incubation regime, the share of eggs with dead embryos was lower by 0.81%, and that of viable chicks by 2.44% higher than in eggs incubated according to the classic incubation regime. The hatching percentage, as well as the hatching percentage, were higher by 2.13% and, respectively, by 2.44% also for eggs subjected to the optimized incubation regime. The superiority of the incubation regime proposed by us was also manifested at the level of the quality of hatched chicks, 91.56% of them being of quality I, compared to only 85.36% of quality I chick that was in the classic incubation regime. The conclusion of the study was that the current genetic material of gray guinea fowl existing in our country requires an improved incubation regime, which will ensure at hatching an increased number of viable chickens and especially of high quality.

Key words: gray guinea fowl, incubation, microclimate, technical results, chicken quality

INTRODUCTION

Recently, consumer demand has increased for meat and eggs obtained from guinea fowl, as food alternatives to products from classical poultry species. [5].

Guinea fowl meat is appreciated because it is dietary (135 kilocalories / 100 g), has a high nutritional value (about 23% protein), is rich in unsaturated fatty acids (role in protecting the cardiovascular system), vitamins (E, B1, B6, and B12) and minerals (magnesium, calcium, and iron), with a taste similar to that of the hunting (more delicate and less pregnant) [6, 8].

Guinea fowl eggs have more dry matter (3-5%) and a double vitamin A content compared to chicken; they contain, on average: 13.5% protein, 12.5% fat, 0.8% carbohydrates and 0.9% minerals [1, 3].

In the poultry sphere, eggs are those that ensure the perpetuation of the species, a goal achievable only if they are fertile and are subjected to the incubation process, either naturally or artificially [4, 7, 10].

Normal development of the embryo can take place only under well-defined microclimate conditions, represented by temperature, humidity, and gas concentration, to which is added the position and return of the eggs [2, 11, 12].

All these elements condition the number of chicks obtained from artificial incubation, as well as their subsequent viability [3, 9, 10].

For the above reasons, through this study, we aimed to study the influence of the incubation regime applied to biblical eggs on the technical results of artificial incubation and the quality of the chicks obtained.

MATERIAL AND METHOD

The biological material was represented by 246 hatching eggs from gray guinea fowl

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raised under the conditions of three different farms (82 eggs / farm).

The eggs from each farm were divided into two batches of 41 eggs each, respectively the capacity of an incubator (A-1 and A-2; B-1 and B-2; C-1 and C-2); of the six batches of eggs, three were subjected to the classic incubation regime (A-1, B-1 and C-1), and the other three batches to the optimized incubation regime proposed by us (A-2, B-2 and C -2).

The artificial incubation was performed in identical conditions for all batches of eggs, with the help of the electric incubators model "CLEO 5DTH" (they are equipped with an electronic module for temperature control and an automatic egg return system).

Experimental factors were represented by the level of assurance of microclimate factors during incubation, as well as the daily number of returns applied to eggs (tab. 1).

Table 1: Incubation regime applied to the studied eggs

Specification	Embryonic development period:	
	0-25 days	26-28 days
Classic incubation regime (RI-C)	Temperature =+37,2ºC Relative humidity =60% Returning eggs =6/24 ore	Temperature =+36,2ºC Relative humidity =70% Returning eggs =nu
Optimized incubation regime (RI-O)	Temperature =+37,6ºC Relative humidity =65% Returning eggs =12/24 ore	Temperature =+37,2ºC Relative humidity =75% Returning eggs =nu

The analysis of the incubation process was done through the prism of specific indicators of this type of activity, calculated following the methodology agreed in the poultry research:

$$\underline{Fertility}\ (\%) = 100 - \left(\frac{\mathbf{O.L.}}{\mathbf{O.I.}} \times 100\right)$$

$$\underline{Hatchiness}\ (\%) = \frac{\mathbf{T.P.V.}}{\mathbf{O.F.}} \times 100$$

$$\underline{Hatching}\ (\%) = \frac{\mathbf{T.P.V.}}{\mathbf{O.I.}} \times 100$$

(where: O.I = eggs hatched; O.L. = clear eggs; O.F. = fertilized eggs; T.P.V. = total viable chicks).

The classification of the chicks - was made according to their weight and external appearance:

- class I: chicks hatched in the first 8 hours, weighing min. 25 g, lively, mobile, with round eyes, bulging and bright. The trunk is compact, long, wide and deep, with well calcified bones. The chick is well on its feet and has dry fluff;
- 2nd class: chickens hatched between 8 and 16 hours, weighing less than 25 g, lively, mobile, with round eyes, bulging and bright. The trunk is compact, long, wide and deep, with well calcified bones. The chicken is well kept on its feet, with the fluff partially dry.

RESULTS AND DISCUSSIONS

Infertile eggs (clear). They are a consequence of problems in the reproductive sector.

For eggs incubated at the parameters specific to the classical regime (RI-C) resulted an average proportion of 17.07% of infertile eggs (21 clear eggs out of 123 eggs incubated); between the three batches of eggs (A-1, B-1 and C-1) there were no differences in the weight of clear eggs, this being 17.07% in each batch (7 clear eggs out of the 41 eggs subjected to incubation artificial).

The ovoscopic examination applied to the eggs subjected to the optimized incubation regime (RI-O) showed an average weight of infertile eggs of 16.26% (20 pieces out of 123 incubated eggs), the lowest proportion being detected in the eggs from group B-2 , only 14.63% (6 clear eggs out of 41 hatched eggs), compared to 17.07% in batches A-2 and C-2 (7 clear eggs out of 41 eggs incubated) (table 2).

Table 2: Percentage of clear eggs

Incubation regime	The batch of eggs	Eggs hatched		Clear eggs	
		Pcs.	(%)	pcs.	(%)
RI-C	A-1	41	100	7	17.07
	B-1	41	100	7	17.07
	C-1	41	100	7	17.07
	Total	***123***	***100***	***21***	***17.07***
RI-O	A-2	41	100	7	17.07
	B-2	41	100	6	14.63
	C-2	41	100	7	17.07
	Total	***123***	***100***	***20***	***16.26***

Fertility rate. Naturally, fertility was better in batches with fewer clear eggs.

Thus, for the eggs subjected to the optimized incubation regime, an average fertility of 83.74% was registered (out of the 123 eggs subjected to incubation, 103 eggs were fertile); at batch level, a fertility rate of 82.93% (34 fertile eggs out of 41 incubated eggs) was obtained for the eggs of groups A-2 and C-2 and 85.36% for those of group B-2 (35 fertile eggs out of a total of 41 incubated eggs).

The eggs to which the classical incubation regime was applied resulted in average fertility of 82.93% (102 fertile eggs out of 123 incubated eggs), given that this appreciation indicator was identical for the three groups (A-1, B-1 and C-1), of 82.93% (34 fertile eggs out of 41 incubated eggs) (tab. 3).

Table 3: Percentage of fertility in studied eggs

Incubation regime	The batch of eggs	Incubated eggs (pcs.)	Fertile eggs (pcs.)	Fertility (%)
RI-C	A-1	41	34	82.93
	B-1	41	34	82.93
	C-1	41	34	82.93
	Total	***123***	***102***	***82.93***
RI-O	A-2	41	34	82.93
	B-2	41	35	85.36
	C-2	41	34	82.93
	Total	***123***	***103***	***83.74***

Eggs with dead embryos. They may be due to problems in the reproductive sector, but more frequently to deficiencies during incubation.

The eggs incubated according to the specifications of the optimized incubation regime resulted in average weight of eggs with dead embryos of only 13.82% (17 eggs with dead embryos out of 123 eggs incubated), with limits between 12.19% eggs with dead embryos determined in group B-2 (5 OEMs out of 41 incubated eggs) and 14.63% eggs with dead embryos as it was in groups A-2 and C-2 (6 OEMs out of 41 incubated eggs).

In the case of eggs in which the classical incubation regime was used, the average share of eggs with embryos was slightly higher, of 14.63% (18 eggs out of the 123 eggs subjected to incubation), all three batches having the same percentage of eggs with dead embryos, 14.63% (6 OEMs from 41 incubated eggs) (table 4).

Table 4: Embryonic mortality in studied eggs

Incubation regime	The batch of eggs	Eggs hatched		Eggs with dead embryos	
		pcs.	(%)	pcs.	(%)
RI-C	A-1	41	100	6	14,63
	B-1	41	100	6	14,63
	C-1	41	100	6	14,63
	Total	***123***	***100***	***18***	***14,63***
RI-O	A-2	41	100	6	14,63
	B-2	41	100	5	12,19
	C-2	41	100	6	14,63
	Total	***123***	***100***	***17***	***13,82***

Viable chicks hatched. By cumulating the total losses during incubation (clear eggs + eggs with dead embryos + non-viable chicks), the number of viable chicks was obtained.

According to the obtained data, the optimized incubation regime (RI-O) favored a better embryonic development, materialized in a percentage of 69.11% viable chicks (85 viable chicks from 123 incubated eggs), the losses during the incubation being only 30.89%. The highest percentage of viable chicks resulted from the eggs of group B-2, of 70.73% (29 chicks from 41 incubated eggs), while the eggs of groups A-2 and C-2 recorded the same share of viable chicks, 65.85% (28 chicks out of 41 hatched eggs).

The classical incubation regime (RI-C) ensured a satisfactory proportion of viable chickens, of 66.67% (82 chickens out of a total of 123 eggs subjected to artificial incubation), with limits ranging between 63.41% viable chickens established at group A-1 (26 chicks out of 41 incubated eggs) and 65.85% viable chicks as found in groups B-1 and C-1 (28 chicks out of 41 incubated eggs) (tab. 5).

Table 5: Proportion of viable chicks hatched from studied eggs

Incubation regime	The batch of eggs	Incubated eggs (pcs.)	Clea eggs (pcs.)	Eggs with dead embryos (pcs.)	Unviable chickens (pcs.)	Total losses		Viable chickens	
						pcs.	%	pcs.	%
RI-C	A-1	41	7	6	2	14	34.15	26	63.41
	B-1	41	7	6	1	13	31.71	28	65.85
	C-1	41	7	6	1	14	34.15	28	65.85
	Total	***123***	***21***	***18***	***4***	***41***	***33.33***	***82***	***66.67***
RI-O	A-2	41	7	6	1	13	31.71	28	65.85
	B-2	41	6	5	1	12	29.27	29	70.73
	C-2	41	7	6	1	13	31.71	28	65.85
	Total	***123***	***20***	***17***	***3***	***38***	***30.89***	***85***	***69.11***

Percentage of hatchability. In eggs incubated according to the optimized incubation regime, the highest average hatching was obtained, of 82.52% (85 viable chicks hatched from 103 fertile eggs), with very small differences between groups (82.35% for eggs of groups A-2 and C-2; 82.86% in the eggs of group B-2).

The hatchability of eggs subjected to the classical incubation regime was 76.47% in group A-1 (26 viable chicks out of 34 fertile eggs) and 82.35% in groups B-1 and C-1 (28 viable chicks out of 34 eggs fertile), resulting in an average value of only 80.39% (82 viable chicks obtained from 102 fertile eggs) (tab. 6).

Table 6: Percentage of hatching in the studied eggs

Incubation regime	The batch of eggs	Fertile eggs (pcs.)	Viable chickens (pcs.)	Hatchiness (%)
RI-C	A-1	34	26	76.47
	B-1	34	28	82.35
	C-1	34	28	82.35
	Total	***102***	***82***	***80.39***
RI-O	A-2	34	28	82.35
	B-2	35	29	82.86
	C-2	34	28	82.35
	Total	***103***	***85***	***82.52***

Hatching percentage. In the case of eggs to which the optimized incubation regime was applied, the best hatching capacity was obtained, the average value being 69.11%; Specifically, out of the 123 eggs subjected to artificial incubation, a number of 85 viable chicks resulted. In first place were eggs from group B-2 with a hatching rate of 70.73% (29 viable chicks out of the 41 eggs incubated), followed by eggs from groups A-2 and C-2 with 68, 29% hatching (28 viable chicks out of 41 hatched eggs).

The eggs where the classic incubation regime was used resulted in an average hatching percentage of only 66.67%, ie 82 viable chicks were obtained from the total of 123 eggs subjected to incubation; in this case, the oscillation limits were between a minimum of 63.41% (26 viable chickens out of 41 eggs) as in group A-1 and a maximum of 68.29% (28 viable chickens out of 41 eggs) as determined in lots B-1 and C-1 (tab. 7).

Table 7: Hatching percentage of studied eggs

Incubation regime	The batch of eggs	Incubated eggs (pcs.)	Viable chickens (pcs.)	Hatched (%)
RI-C	A-1	41	26	63.41
	B-1	41	28	68.29
	C-1	41	28	68.29
	Total	***123***	***82***	***66.67***
RI-O	A-2	41	28	68.29
	B-2	41	29	70.73
	C-2	41	28	68.29
	Total	***123***	***85***	***69.11***

The quality of the chicks obtained. The optimization of the incubation regime (RI-O) led to the highest share of quality I chickens, of 91.56% (76 heads out of 85 viable chickens) and the lowest of quality II chickens, of only 10.84% (9 chapters out of 63 viable chickens); from this point of view, the best results were in group B-2 93.10% quality I chickens (27 class I chickens out of 29 viable chickens), followed by group C-2 with 89.29% (25 chickens) class I of 28 viable chickens) and group A-2 with 85.71% (24 class I chickens of 28 viable chickens).

In the group of eggs to which the classic incubation regime was applied, 85.36% class I chickens were obtained (70 heads out of 82 viable chickens) and 14.40% class II chickens (12 heads out of 82 viable chickens). From the eggs of the group, A-1 resulted 84.62% of class I chickens (22 heads out of 26 viable chickens), in group B-1 89.29% of quality I chickens were obtained (25 heads out of 28 viable chickens), and in group C-1 their share was 82.14% (23 chapters out of 28 viable chickens) (tab. 8).

Table 8: Distribution by quality classes of hatched chicks from the studied eggs

Incubation regime	The batch of origin of the eggs	Viable chickens (pcs.)	Distribution of chicks by quality classes (%)			
			class I		class II	
			Cap.	%	Cap.	%
RI-C	A-1	26	22	84.62	4	15.38
	B-1	28	25	89.29	3	10.71
	C-1	28	23	82.14	5	17.86
	Total	***82***	***70***	***85.36***	***12***	***14.4***
RI-O	A-2	28	24	85.71	4	14.29
	B-2	29	27	93.10	2	6.9
	C-2	28	25	89.29	3	10.71
	Total	***85***	***76***	***91.56***	***9***	***10.84***

CONCLUSIONS

The general analysis of the technical incubation indicators for gray sea bass eggs subjected to different incubation regimes resulted in a series of aspects presented below.

The fertility rate was almost identical for the batches of eggs studied, which shows that there were no other influencing factors other than the experimental ones proposed by us (incubation regime); the high value of fertility (an average of 83.33%) indicates the good growing conditions provided to the birds from the three farms where the eggs came from.

The incubation regime proposed by us has shown its beneficial influence on embryonic development and the rate of loss during the incubation process.

Thus, in eggs subjected to the optimized incubation regime, the share of eggs with dead embryos was lower by 0.81%, and that of viable chicks higher by 2.44% than in eggs that were incubated according to the specifications of the classical regime. of incubation.

Under these conditions, the hatching percentage as well as the hatching rate calculated for eggs subjected to the optimized incubation regime were higher by 2.13% and 2.44% respectively compared to the values obtained for eggs incubated after the classical regime.

The data on the quality of hatched chicks also highlighted the superiority of the optimized incubation regime, in which 91.56% quality I chickens were obtained, compared to only 85.36% quality I chickens as a result of the application of the classic hatching regime.

The conclusion of this study was that it requires a reconsideration of the incubation regime applied to gray biblical eggs, adapted to the particularities of the current population raised in our country, in order to improve incubation performance and especially the quality of hatched chicks.

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