THE INFLUENCE OF CONDITIONS OF PRE-INCUBATION OF EGGS ON THE FINAL RESULTS OF THE INCUBATION PROCESS

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Abstract

Preparation of eggs for incubation (pre-incubation) is the operation that gradually moves from storage temperatures to those specific to normal embryonic development, in order to improve the final results of the incubation process and the quality of the chicks obtained. Four batches of eggs (600 eggs/batch) were subjected to artificial incubation, differentiated by temperature, relative humidity and the duration of pre-incubation (batch Lc =+26….+28°C, 60-65%, 12 hours; Lexp-1=+28….+30°C, 65-70%, 10 hours; Lexp-2=+30….+32°C, 70-75%, 8 hours; Lexp-3 = +32….+34°C, 75-80%, 6 hours). The ratio of clear eggs was 4.33-4.67%, resulting in a fertility rate of 95.33-95.67%. The conditions of pre-incubation of the eggs set their mark on the embryonic mortality rate (4.00-7.33%) and of the technological losses (2.67-4.00%), indicators that generated different levels of hatching (88,67% at Lexp-2; 87.33% at Lexp-1; 86.33 at Lexp-2; 84.0 at Lc) and hatchability (93.01% at Lexp-2; 91.29% at Lexp-2 1; 90.56 to Lexp-2; 88.11 to Lc). The conclusion of the study was that the pre-incubation of the eggs for 8 hours at temperatures of +30...+32°C and relative humidity of 70-75%, allows to improve the hatching capacity of the eggs obtained from the parents of the Ross-308 hen hybrid.

Key words: Ross-308 parents, eggs, pre-incubation, hatchability, hatching

INTRODUCTION

The incubation sector plays a very important role in the poultry industry [7], as it valorizes the production of breeding farms (hatching eggs) and provides in sufficient quantities the biological material for the production farms [9, 12].

The activity of the incubation stations is carried out following well-developed technological flows [14], which allow to obtain very high levels of hatching and chickens/buds 1 day old of the highest quality [2].

This phenomenon is the result of the implementation in the poultry practice of the results of the scientific research of profile [4] and of the use of high performance work equipment [14].

For example, new methods (including new substances) for egg decontamination have been introduced into practice [5, 10], negative aeroionization and gamma radiation are used to stimulate embryonic development [12], but also pseudo-asphyxiation with carbon dioxide for triggering mass of the hatch [3] etc; more recently, technologies have been developed to stimulate hatched chicks by feeding them to the hatchery [6], but also from hatching directly in the breeding halls [12].

Also, incubation devices have been created, that provide at the optimum level the necessary factors for embryonic development [11] and most operations in incubation stations have been automated (the sorting of eggs and their correct placement on the incubation sites is done with the help of video cameras etc.) [13].

However, at the level of the incubation stations, further attention is paid only to the physical factors that ensure the normal development of the embryos [11] and less to those that must be ensured when the eggs/chickens are stored or during the pre-incubation stage of the eggs [2, 12].

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Starting from the above, it was considered appropriate to carry out a study regarding the influence of the microclimate factors provided during the pre-incubation, on the results of the incubation process on the eggs obtained from Ross-308 parents.

MATERIAL AND METHOD

The determinations were made on 2400 hatching eggs from breeding poultry - heavy breed hens (Ross-308 parents) aged 44 weeks.

The eggs were divided equally into four batches (600 eggs/batch=4 incubation sites/batch), differentiated by the level of physical factors ensured during the pre-incubation operation, as follows:

- Lc batch: temperature=+26….+28°C; relative humidity=60-65%; duration=12 hours;
- Lexp-1 batch: temperature=+28….+30°C; relative humidity=65-70%; duration=10 hours;
- Lexp-2 batch: temperature=+30….+32°C; relative humidity=70-75%; duration=8 hours;
- Lexp-3 batch: temperature=+32….+34°C; relative humidity=75-80%; duration=6 hours.

The incubation of the eggs was performed in a Petersime-168 apparatus, with the corresponding splitter, at the physical parameters specific to the category of eggs used, during which a single biological control was performed (at the age of 18½ days of the embryos).

The indicators followed were evaluated based on the methodology specific to the incubation stations, namely:

• eggs with dead embryos - were identified by mirage ovoscopy and related to the number of eggs in the batch;

• the clear eggs were identified by mirrored ovoscopy and related to the number of eggs of the batch;

• fertility - the value of the percentage ratio between clear eggs and introduced eggs decreases from 100;

• the technological losses (cracked eggs, dead chickens and non-viable chickens) - were identified when sorting the hatched chickens and decreased from the number of eggs of the respective batch;

• hatchability - the percentage ratio between total viable chickens and fertile eggs;

• hatching-the percentage ratio between total viable chickens and eggs introduced.

The resulted data were processed statistically, calculating the arithmetic average, the standard error of the arithmetic average and the coefficient of variation, as well as the significance of the differences between the averages.

RESULTS AND DISCUSSIONS

The clear eggs (infertile). The proportion of clear eggs was at a level of 4.33% in the Lexp-1 batch and 4.67% in the other studied batches, which is normal if one considers that the eggs came from the same breeding compound. .

At the level of batches, a very good homogeneity of the studied character was found, the coefficient of variation being 3.32-3.79% (tab. 1).

Table 1 The ratio of the clear eggs (infecundity) (%)

Batch	Statistical estimators		Anova comparisons
Lc	$\bar{X} \pm s_{\bar{x}}$	4.67±0.53	Lc vs L-1: $\hat{F}$ < F crit. α=0.05 (NS)
	V%	3.79	Lc vs L-2: $\hat{F}$ < F crit. α=0.05 (NS)
Lexp-1	$\bar{X} \pm s_{\bar{x}}$	4.33±0.49	Lc vs L-3: $\hat{F}$ < F crit. α=0.05 (NS)
	V%	3.46	L-1 vs L-2: $\hat{F}$ < F crit. α=0.05 (NS)
Lexp-2	$\bar{X} \pm s_{\bar{x}}$	4.67±0.47	L-1 vs L-3: $\hat{F}$ < F crit. α=0.05 (NS)
	V%	3.32	L-2 vs L-3: $\hat{F}$ < F crit. α=0.05 (NS)
Lexp-3	$\bar{X} \pm s_{\bar{x}}$	4.67±0.48	
	V%	3.40	

Fertility. In accordance with the weight of the infertile eggs, the fertility of the studied eggs was equal in the batches Lc, Lexp-2 and Lexp-3 (95.33%) and slightly higher in the batch Lexp-1 (95.67%), levels that did not generated statistical differences in batches.

The batches were characterized by a very good homogeneity, the coefficient of variation being 2.43-2.90% (tab. 2).

Table 2 The fertility percentage (%)

Batch	Statistical estimators		Meaning of differences
Lc	$\bar{X} \pm s_{\bar{x}}$	95.33±0.40	Lc vs L-1: $\hat{F}$ < F crit. α = 0.05 (NS)
	V%	2.90	Lc vs L-2: $\hat{F}$ < F crit. α = 0.05 (NS)
Lexp-1	$\bar{X} \pm s_{\bar{x}}$	95.67±0.45	Lc vs L-3: $\hat{F}$ < F crit. α = 0.05 (NS)
	V%	2.43	L-1 vs L-2: $\hat{F}$ < F crit. α = 0.05 (NS)
Lexp-2	$\bar{X} \pm s_{\bar{x}}$	95.33±0.38	L-1 vs L-3: $\hat{F}$ < F crit. α = 0.05 (NS)
	V%	2.63	L-2 vs -3: $\hat{F}$ < F crit. α = 0.05 (NS)
Lexp-3	$\bar{X} \pm s_{\bar{x}}$	95.33±0.39	
	V%	2.74	

Eggs with dead embryos. Following the biological control at the time of the eggs transfer to the hatchery were found eggs with dead embryos, whose proportion was 7.33±0.79% in the Lc batch, compared to only 5.00±0.34% in Lexp-1, 4.00±0.28% in Lexp-2 and 5.33±0.43% in Lexp-3.

These levels lead to very significant differences between the control batch and the three experimental batches, as well as significant differences between the Lexp-2 batch and the other two experimental batches.

The studied character was homogeneous at the level of batches, the values of the coefficient of variation being 4.60-8.94% (tab. 3).

Table 3 The ratio of eggs with dead embryos (%)

Batch	Statistical estimators		Meaning of differences
Lc	$\bar{X} \pm s_{\bar{x}}$	7.33±0.79	Lc vs L-1: $\hat{F}$ > F crit. α=0.001 (***)
	V%	4.60	Lc vs L-2: $\hat{F}$ > F crit. α=0.001 (***)
Lexp-1	$\bar{X} \pm s_{\bar{x}}$	5.00±0.34	Lc vs L-3: $\hat{F}$ > F crit. α=0.001 (***)
	V%	8.94	L-1 vs L-2: $\hat{F}$ > F crit. α = 0.05 (*)
Lexp-2	$\bar{X} \pm s_{\bar{x}}$	4.00±0.28	L-1 vs L-3: $\hat{F}$ < F crit. α=0.05 (NS)
	V%	7.22	L-2 vs L-3: $\hat{F}$ > F crit. α = 0.05 (*)
Lexp-3	$\bar{X} \pm s_{\bar{x}}$	5.33±0.43	
	V%	7.14	

Technological losses. The hatching results in viable chicks, but also the so-called technological losses (cracked eggs, dead chickens and non-viable chickens), which normally should not exceed 2.5%.

From the obtained data it was found that this indicator was exceeded in all batches, with levels of 2.67±0.11% in the Lexp-2 batch, of 3.33±0.15% in the Lexp-1 batch, of 3,67±0.16% in Lexp-3 and 4.00±0.17% in the control batch.

Significant statistical differences were identified between Lc vs Lexp-1 and Lexp-1 vs Lexp-2 comparisons and respectively, distinctly significant for Lc vs Lexp-2 and Lexp-2 vs Lexp-3 comparisons.

The homogeneity of the studied characteristic was good, the values of the coefficient of variation being between 4.83% (Lexp-1) and 9.02% (Lc) (table 4).

Table 4 Technological losses (%)

Batch	Statistical estimators		Meaning of differences
Lc	$\bar{X} \pm s_{\bar{x}}$	4.00±0.17	Lc vs L-1: $\hat{F}$ > F crit. α = 0.05 (*)
	V%	9.02	Lc vs L-2: $\hat{F}$ > F crit. α = 0.01 (**)
Lexp-1	$\bar{X} \pm s_{\bar{x}}$	3.33±0.15	Lc vs L-3: $\hat{F}$ < F crit. α = 0.05 (NS)
	V%	4.83	L-1 vs L-2: $\hat{F}$ > F crit. α = 0.05 (*)
Lexp-2	$\bar{X} \pm s_{\bar{x}}$	2.67±0.11	L-1 vs L-3: $\hat{F}$ < F crit. α = 0.05 (NS)
	V%	6.31	L-2 vs L-3: $\hat{F}$ > F crit. α = 0.01 (**)
Lexp-3	$\bar{X} \pm s_{\bar{x}}$	3.67±0.16	
	V%	7.54	

The hatchability. It is an technical indicator for evaluating how the incubation activity was carried out, the hatchability was at levels of 93.01±0.36% in the eggs of the Lexp-2 batch, of 91.29±0.38% in the eggs of the batch Lexp-1, 90.56±0.41% in the Lexp-3 batch and only 88.11±0.33% in the eggs of the control batch.

From a statistical point of view, significant differences were identified between Lexp-1 and Lexp-2 batches, distinctly significant between Lexp-3 and Lc and Lexp-2 and respectively, very significant between Lc batch and Lexp-1 and Lexp-2 batches.

At the level of batches there was a good homogeneity of the analyzed characteristic, the values of the coefficient of variation being of 4.46-7.52% (tab. 5).

Table 5 The hatchability percentage (%)

Batch	Statistical estimators		Meaning of differences
Lc	$\bar{X} \pm s_{\bar{x}}$	88.11±0.33	Lc vs L-1: $\hat{F}$ > F crit. α = 0.001 (***)
	V%	7.52	Lc vs L-2: $\hat{F}$ > F crit. α = 0.001 (***)
Lexp-1	$\bar{X} \pm s_{\bar{x}}$	91.29±0.38	Lc vs L-3: $\hat{F}$ > F crit. α = 0.01 (**)
	V%	5.59	L-1 vs L-2: $\hat{F}$ > F crit. α = 0.05 (*)
Lexp-2	$\bar{X} \pm s_{\bar{x}}$	93.01±0.36	L-1 vs L-3: $\hat{F}$ < F crit. α = 0.05 (NS)
	V%	4.46	L-2 vs L-3: $\hat{F}$ > F crit. α = 0.01 (**)
Lexp-3	$\bar{X} \pm s_{\bar{x}}$	90.56±0.41	
	V%	5.81	

The hatching. It is a general indicator of evaluation of the incubation process, because it is calculated as a ratio between the viable chicks obtained and the eggs introduced to the incubation.

And in this case, the best result was also registered in the Lexp-2 batch (88.67±0.46%), followed in descending order by Lexp-1 with 87.33±0.55%, by the Lexp-3 batch with 86.33±0.51 and the control batch with 84.0± 0.52%.

Statistically, significant differences were identified between Lc and Lexp-1 batches, distinctly significant in comparisons between Lexp-3 and Lc and Lexp-2 batches, and very significant in comparisons between Lc and Lexp-1 and Lexp-2 batch.

The homogeneity of the studied characteristic was quite good at batch level, the values of the coefficient of variation being of 6.38-9.94% (tab. 6).

Table 6 The hatching percentage (%)

Batch	Statistical estimators		Meaning of differences
Lc	$\bar{X} \pm s_{\bar{x}}$	84.00±0.52	Lc vs L-1: $\hat{F}$ > F crit. α = 0.001 (***) Lc vs L-2: $\hat{F}$ > F crit. α = 0.001 (***) Lc vs L-3: $\hat{F}$ > F crit. α = 0.01 (**) L-1 vs L-2: $\hat{F}$ > F crit. α = 0.05 (*) L-1 vs L-3: $\hat{F}$ < F crit. α = 0.05 (NS) L-2 vs L-3: $\hat{F}$ > F crit. α = 0.01 (**)
	V%	9.94	
Lexp-1	$\bar{X} \pm s_{\bar{x}}$	87.33±0.55	
	V%	7.12	
Lexp-2	$\bar{X} \pm s_{\bar{x}}$	88.67±0.46	
	V%	6.38	
Lexp-3	$\bar{X} \pm s_{\bar{x}}$	86.33±0.51	
	V%	8.85	

CONCLUSIONS

From the resulted data it was found that the weight of the clear eggs fluctuated within restricted limits (4.33-4.67%), a normal aspect if one considers that the eggs came from the same batch of parents; Naturally, the fertility of the eggs was very close between the four batches (95.33-95.67%).

The pre-incubation regime applied to the experimental batches generated a lower rate of embryonic mortality (4.00-5.33%) and technological losses (2.67-3.67%), compared to the situation in the control batch, in which the proportion of eggs with dead embryos was 7.33%, and the proportion of technological losses of 4.0%.

The final analysis of the incubation process showed that the eggs of the Lexp-2 batch obtained the best levels of hatching (88.67%) and hatching (93.01%), higher by 1.34-4.67% and respectively, with 1.72-4.90% compared to the other batches.

In conclusion, it can be stated that the pre-incubation of the eggs for 8 hours at temperatures of + 30…+32°C and relative humidity of 70-75%, allows to improve the hatching capacity of the eggs laid by the Ross-308 breeding hens.

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