

USE OF SYNCHRONIZATION IN HATCHING OF POULTRY EGGS

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Abstract

The essence of the synchronization is the reduction of hatching window to a minimum, so that the main mass of the chicks hatched in the same time just before picking them up from the cabin. For this at 19 days of incubation it is necessary to open the flap of the machine and the fresh air is forced to enter, and CO₂ level at the same time lowers to the level of 0.2%. Thus there are created favourable conditions for a longer stay in the egg for the embryo. In this mode, the egg is incubated for 24 hours. Then, at 20 day of incubation, the damper is closed, CO₂ level raises to 0.55% and the chicks begin to hatch intensively. The hatcher is set up so that the flap is entirely dependent on CO₂ level, so than higher is CO₂ level, the more opens the valve and more air goes into the cabinet. As a result of hatching synchronization process it was possible to mention that the time of first appearance of chicks was 19 days and 12 hours in the experimental group and 19 days and 22 hours in the control group from the beginning of incubation period.

Key words: eggs, hens, hatching period, synchronisation.

INTRODUCTION

The increase in poultry meat consumption is associated with a number of key factors, first and foremost, it is a growing population and the need for protein of animal origin, as well as lower prices for chicken products as compared with the prices of competitive meats.

One of the important technological aspects of poultry production is eggs incubation on proper carrying out of which is largely dependent on both economic efficiency of breeding farms themselves, and maintenance performances, growth and development of poultry during its subsequent growth.

Modern incubation is a high-tech process, implementing the most advanced technical solutions to achieve the biological sciences, information technology and provides highly accurate and flexible regulation of micro-climatic conditions, allowing to receive high levels of egg hatchability. In such circumstances, further progress in the field of incubation is seen on the one hand in the automation and robotics of all links of the process chain and control of the process of eggs incubation, on the other hand - in-depth study and taking into account the biological characteristics of the eggs caused by genetic, age, morphological and climatic factors (Тагиров et al., 2009).

The industrial incubation of eggs is of a great importance in poultry reproduction. During the time of intensification of poultry brunch had increased the capacity of Incubation Park and the volume of eggs incubation.

New specialised incubators provide incubation of eggs of large lots, higher rates of hatching index and reduced labour costs (Кочин И. И., et al., 2004).

The main problem of hatching management is to receive a large number of homogeneous strong day - old chicks. The viability is the main criterion of health that originates in embryo and directly relates to performances and endurance of individual batches of chickens.

Results of eggs incubation, depend on the compliance of technologic processes and requirements. The main goal of every farm is to get healthy and strong chicks. Modern technologies involve the introduction of a variety of ways to improve the quality of day old chick.

The scientific novelty of the study was that the synchronization of chicks hatching was performed in developing the programs for the first time that is practiced in a country incubation station.

MATERIALS AND METHODS

The experiment was carried out in industrial conditions of hatching station Servalim SRL, of

Floreni Holding. As a biological object of study were eggs of Cobb 500 cross brought from Wimex firm, Germany.

There were studied the incubation quality index of eggs laid by hens of breeding flock of 50-55 weeks old. There were carried out six experimental series.

The eggs incubation was done in the hatching machine Smart Set Pro 77 and the chicks hatching was done in the machines Smart Hatch Pro 4.

Each group consisted of 82.944 eggs. The conditions of eggs incubation were similar for all the series. The eggs were incubated accordingly to the hatching programme (Table 1).

Table 1. Eggs hatching programme

Time of setting change (d/h)	Temperature, °F	Relative humidity, %	CO ₂	AMF	Rotation
-0,05/0,08	77.0-81.0	60	0.40	Off	0
0.00	100.4	60	0.40	Off	2
1.00	100.2	60	0.40	Off	2
2.00	100.0	60	0.40	Off	2
3.00	99.9	55	0.40	On	2
4.00	99.9	55	0.40	On	2
5.00	99.9	55	0.40	On	2
6.00	99.9	55	0.40	On	2
7.00	99.8	55	0.40	On	2
8.00	99.8	50	0.40	On	2
9.00	99.7	50	0.40	On	2
10.00	99.5	50	0.40	On	2
11.00	99.2	50	0.40	On	2
12.00	98.8	50	0.40	On	2
13.00	98.5	45	0.40	On	2
14.00	98.3	45	0.40	On	3
15.00	98.0	45	0.40	On	3
16.00	98.0	45	0.40	On	3
17.00	98.0	45	0.40	On	3
18.00	98.0	45	0.40	On	3

Before loading the incubator we determined the quality parameters of hatching eggs, such as weight, diameter of air chamber and index format.

Before loading all the eggs were disinfected in special fumigation chamber at an air temperature of + 21°C using Vapcophore drug based on iodine for 40 minutes.

The eggs were transferred into the setter for preheating for 7 hours at + 25°C, and then the eggs were introduced in the incubation mode.

After the transfer of the eggs at 18 days of incubation for the experimental group the synchronization mode was used, and the eggs from the control group continued to be incubated at normal mode.

The essence of the synchronization is the reduction of hatching window to a minimum, so that the main mass of the chicks hatched in the same time just before picking. For this at 19 days of incubation it is necessary to open the flap of the machine and the fresh air is forced to enter, and CO₂ levels at the same time lowers to the level of 0.2%. Thus there are created favourable conditions for a longer stay in the egg for the embryo. In this mode, the egg is incubated for 24 hours.

Then, on 20th day of incubation, the damper is closed, CO₂ level raises to 0.55% and the chicks begin intensively to hatch.

The hatcher is set up so that the flap is entirely dependent on CO₂ level, so than higher is CO₂ level, the more opens the valve and more air goes into the the cabinet. All hatched chicks were evaluated on a scale Pasgar Score.

RESULTS AND DISCUSSIONS

The eggs weight in the control and experimental groups is almost the same and ranges from 69.9 to 71.9 g in the control group and from 69.5 to 71.9 g, in the experimental group.

The other studied index was diameter of air chamber. Accordingly to the standard the diameter of air chamber must be 18-20 mm, but in our experiences it was larger and it was connected to the eggs age that was 4-7 days.

The eggs of control groups were incubated at normal mode, and for the eggs of the experimental groups was used the synchronization mode. The synchronization programme is shown in the table 2.

Table 2. Synchronization programme

Hatching days	Control group			Experimental group		
	t°F	Humidity, %	CO ₂ %	t°F	Humidity, %	CO ₂ %
18 d. 5 h.	98	55	0.4	98	55	0.4
19	98	60	0.4	98	60	0.2
20	98	75	0.4	98	75	0.55
21	97	60	0.4	97	60	0.3

Table 3. Hatching results in control group

Series of experiments	Total eggs	Chicks		Waste		Chicks with reed knees	
		heads	%	heads	%	heads	%
1	41472	34660	83.57	992	2.39	464	1.12
2	41472	33695	81.25	1310	3.16	465	1.12
3	41472	33970	81.91	962	2.32	497	1.20
4	41472	33700	81.26	1215	2.93	597	1.44
5	41472	34565	83.35	930	2.24	530	1.28
6	41472	34050	82.10	915	2.21	564	1.36
$\bar{X} \pm S\bar{x}$	41472	34106	82.24	1054	2.54	519	1.25
$\bar{X} \pm S\bar{x}$	± 0.00	± 170.6		± 67.9		± 22.1	

Table 4. Hatching results in experimental groups

Series of experiments	Total eggs	Chicks		Waste		Chicks with reed knees	
		heads	%	heads	%	heads	%
1	41472	35320	85.17	600	1.45	132	0.32
2	41472	34185	82.43	747	1.80	232	0.56
3	41472	34660	83.57	962	2.32	165	0.40
4	41472	34200	82.47	808	1.95	265	0.64
5	41472	34715	83.71	795	1.92	66	0.16
6	41472	35050	84.51	810	1.95	132	0.32
$\bar{X} \pm S\bar{x}$	41472	34688	83.64	787	1.90	165	0.40
$\bar{X} \pm S\bar{x}$	± 0.00	± 184.7		± 47.7		± 29.7	

Incubation parameters as temperature and humidity remain unchanged in both the control and the experimental groups. There is changing only CO₂ level in the experimental group, the figure changed at 19 days of incubation from 0.4% to 0.2%. Thus, a decrease of CO₂ levels at 19th days of hatching from 0.4% to 0.2% makes hatcher to open the valve to maintain the level of CO₂ at a given level. Then the air conditioning system manually changes the level of positive pressure from 6 Pa to 9 Pa thus through the open valve gets plenty of fresh air into the cabinet. Then, on day 20 of incubation, the program changes the level of CO₂ from 0.2% to 0.55% and the shutter begins to close creating critical conditions for the embryo breathing and causing to hatch from the eggs.

With this program the machine is operating for several months, and it may be noted that the quality of the chicks was improved - namely, disappeared red knees and all chicks have become more active. The hatching window was reduced from 36 hours to 26 hours so the period of chicks stay in cabinet decreased with 10 hours in the experimental group compare to the control group.

The results of eggs hatching are presented in tables 3 and 4.

Because of reducing the number of defective chicks we got 1.68% more quality day old chicks in the experimental group.

In the control group, the average number of defective chicks was 2.54% the difference was 0.86%. The number of chicks with red knees was 1.25% in the control group and 0.4% in the experimental group.

About the quality of the chickens can be sorted after evaluation on a scale Pasgar Score.

The final results of chickens' quality are shown in Table 5.

Table 5. Quality of chickens

Series of experiments	Control groups	Experimental groups
1	8.0	9.2
2	7.9	8.6
3	7.7	8.8
4	7.6	8.7
5	7.9	8.9
6	7.8	8.5
$\bar{X} \pm S\bar{x}$	7.8 \pm 0.07	8.8 \pm 0.10
$\bar{X} \pm S\bar{x}$		

The table shows that the results of the control and experimental groups differ. Estimates of the experimental group did not correspond to an ideal chicken of 9 points but they significantly differ from control. In the control group, the average score was 7.8 points, but in the experimental group it was 8.8 points.

After eggs hatching the incubation wastes were studied. We have studied the shell. The remaining shell is a valuable source by which is easy to identify deviations from the normal development of the embryo.

The eggs shell in the control group was dirty with meconium, which tells that the hatched chicks were out and stood longer in the cabinet before taking them out (Figure 1 and 2).



Figure 1. Egg shell in control group



Figure 2. Egg shell in experimental group

After crumbling the shell into the hand it was very dry and crumbly. Dry shell is one of the signs that the chicks were hatched very early and waited for a long time their sorting in a cabinet that usually has a big impact on their quality and further growth.

The shell of egg of the experimental group was clean, and was not stained with meconium. Trying to crush the shell and shell membranes they did not crumble and had broken into large pieces and shell membranes remained intact.

CONCLUSIONS

As a result of held research in the conditions of incubation station SRL «Servalim», it is possible to mention that the time of first appearance of chicks was 19 days and 12 hours in the experimental group and 19 days and 22 hours in the control group from the beginning of incubation and it was possible as a result of synchronization of hatching mode.

For achieving the minimum hatch window of incubation it was developed the program that allowed synchronizing the hatching of chicks and thereby reducing the time spent in the hatcher from 38 hours in the control group and to 28 hours in the experimental group that greatly affected the quality of the chicks.

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