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ABSTRACT
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ABSTRACT

After the domestication of the bird, for ages and ages, the humans have used natural incubation, so that after they tried to enhance the production, by discovering and practicing artificial incubation.

Artificial incubation is the process in which is created a "comfort factor" expressed through optimum environmental conditions, capable to assure normal growth of the bird embryo, from zygote to full developed hatching chick *(Gh., Ştefănescu et al., 1960; I., Vancea et al., 1980; Vacaru-Opriş et al., 2002)*.

In ancients China and Egypt there have been concerns for obtaining chicks through artificial incubation. Nowadays, the artificial incubation has an important role in strengthening the economic – power of the poultry industry, because the quantity and quality of the eggs could not be achieved without practicing the right technology (*Gh., Ştefănescu et al., 1960)*.

Aviculture activities intensification, as a consequence of yield level improvement, as good as the aviculture development within people farms, could not be separated from *(I., Angel et al., 2000)*.

The present research has as an objective the improvement of the incubation process performance.

From the reference literature we have read, we can draw the conclusion that there isn't an frequently used way, further more the research in the matter has showed too little because the stated facts repel only the race of the bird but not at wasn't important like: the nature of the biological material, the shape and size of the eggs: the number of pores in the mineral shell of the egg *(Otrîganiev, G., K., 1982; Hunton, P., 1985; Evstratova, A., M., 1987; Sauveur, B., 1988; Vacaru-Opriş, I. et al., 1993; 1994; 2000; 2002; 2004; Bucşan, Anastasia, 2003; Butler, D., E., 1990; Boruta A. et al., 2002; Costin, M. et al., 1972; Ipek, A., 2002; Petic, M. et al., 2005; Schwägeb, F. et al., 2002; Whitehead, C., C., 1985; Mahmud, A. et al., 2006; Lourens, A., 2007; Okan, Elibol, Sariyuz, S.,K., 2007*).

From these reasons, this study tries to establish the best physical parameters for storage of the studied eggs, issued from the meat hybrids parents "ROSS-308", "COBB-500" and "SHAVER STARBRO", depending on their storage period. This problem has to be dealt with in the quickest because, very frequently in Romania, the eggs used in hatcheries come

from a few number of breeder farms, being brought from big distances and just up to their freshness limit.

The research has been conducted within the S.C."Avi-Top" S.A. Iaşi incubation station and growth farm for chicken broilers.

According to the experimental design, the incubation eggs have been stored for periods of: 3 days, 9 days, 12 days, 15 days and 18 days, obtaining thus 6 experiments, as showed below:

Experiment no. 1: "*The influence of the storage process „A" of incubation eggs on obtained performances at hatching moment and during hatched chickens rearing period".*

Experiment no. 2: "*The influence of the storage process „B" of incubation eggs on obtained performances at hatching moment and during hatched chickens rearing period".*

Experiment no. 3: "*The influence of the storage process „C" of incubation eggs on obtained performances at hatching moment and during hatched chickens rearing period".*

Experiment no. 4: "*The influence of the storage process „D" of incubation eggs on obtained performances at hatching moment and during hatched chickens rearing period".*

Experiment no. 5: "*The influence of the storage process „E" of incubation eggs on obtained performances at hatching moment and during hatched chickens rearing period".*

Experiment no. 6: "*The influence of the storage process „F" of incubation eggs on obtained performances at hatching moment".*

For control groups, the storage conditions of the studied eggs, were those usually used within the incubation stations in Romania. The eggs stocked for 3 and 6 days were submitted under an $+18 \div +20^0$C temperature, while the eggs stored during 9 days were maintained to a temperature of $+16 \div +18^0$C and the eggs kept in storage for 12 or 15 days received a temperature of $+ 14 \div +16^0$C. For an 18 days storage period, the used temperature was about $+12 \div +14^0$C.

For experimental groups, the storage temperatures were assured within next limits:

- 3 days storage = $+ 14 \div +16^0$C;
- 6 days storage = $+ 12 \div +14^0$C;
- 9 days storage = $+ 10 \div +12^0$C;
- 12 days storage = $+ 12 \div +14^0$C;
- 15 days storage = $+ 12 \div +14^0$C;
- 18 days storage = $+ 10 \div +12^0$C.

In all situations, for the experimental and control groups, the air moisture had the same value, of 65 – 70%.

The eggs were turned from the 4th day till the end of the storage period, 3 times a day.

The hatched chicks were reared in several groups, which were similar to those used in egg storage period (control and experimental treatments).

The chicks were reared on an permanent litter system, following the requirements imposed by the "ROSS-308", "COBB-500" and "SHAVER STARBRO" hybrids producers.

The main conclusions we have drawn are listed below:

1. It was proven that the eggs could be stocked for 3 days without any fears in broader temperature conditions that of those used through Romanian (+18 ÷ +20^{0}C); there have been results as good a those above in temperature between +14 ÷ +16^{0}C, with the condition that the air humidity would be 65 – 70%. There is no need to turn the eggs.

1.1. The loss of weight in the 3 days were higher in control group Lc_1 (0.83%) than group L_1exp. (0.13%).

1.2. The fertility percent of the eggs was close within groups: 94.60% for Lc_1 and 94.90% - L_1exp., so the final results of the incubation process cant be considered just by analyzing the percent of eggs fertility.

The hatchability percentage of the eggs was 95.91 in groups L_1exp. and 95.6 in group Lc_1; however it was a conversely situation for the hatching percentage: 88.78 in group Lc_1 and 87.76 in group L_1exp.

In the 42nd day, when the chicks from the studied eggs were slaughtered, their body weight was with 0.25% higher in group L_1exp. (1722.83 ± 20.94 g) than Lc_1 (1718.52 ± 27.66 g).

The feed conversion ratio (kg fodder/kg gain) was 1.96 in group Lc_1 and 2.00 in group L_1exp.

The participation of the trenched portions in whole carcass (breast; thigh, drumstick, wings, remained carcass) was better in group L_1exp. than Lc_1.

2. The storage of incubation eggs for six days was successful when the temperature was around +14 ÷ +16^{0}C and air humidity 65 – 70% while turning the eggs 3 times a day, beginning with the 4th day, under an angle of 45^0.

The weight loss suffered by the eggs during the 6 days storage were smaller in group L_2exp. (0.60%) than Lc_2 (1.26%).

From the analysis of the incubation process we can conclude that the fertility of the eggs wasn't that different: 94.90% Lc_2 and 93.88% L_2exp.

Both the hatchability and hatching percents had higher values in group L_2exp. than Lc_2. Thus, hatchability was of 92.99% in experimental group and of 91.61 in control one; hatching percentage was of 85.71 in L2exp and of 85.37 in Lc2.

The quality of the chicks that did hatch from the researched eggs was very good in both groups, for example the percent of first quality chicks was 97.62 in L_2exp. and 97.21 in Lc_2.

At the age of 42 days, the chicks that hatched had weighted around 1799.52 ± 37.01 g in group Lc_2 and 1840.45 ± 38.43 g in group L_2exp., that was 2.27% bigger for L_2exp. in comparison to Lc_2.

The feed conversion ratio reached a level of 1.94 in group Lc_2 and 1.94 in L_2exp.

The participation of the trenched carcass portions was higher in group L_2exp.

3. At the storage of the eggs for 9 days the drop of the temperature from +16÷ +18^{0}C, used in group Lc_3, to +10 ÷ +12^{0}C when experimenting in L_3exp., had determined a low drop of the organic resistance of the embryos, only the strongest survived, becoming chickens of an superior quality. The mortality rate quote reached 2.70% in group L_3exp and 1.38% in Lc_3 .Naturally in group L_3exp the chicks that hatched and those that could be hatched were lese that expected. So the eggs that should be hatched was 95.31% in Lc_3 and 88.85% in L_3exp, the eggs that did hatch were 90.67% in Lc_3 and only 82.24% in L_3exp in the condition in which the fertility of the eggs wasn't that different in the beginning (96.53% in Lc_3 and 95.34% in L_3exp).
4. The weight of the hatched chicks from our study at the age of 42 days was 1740.83± 25.90g in Lc_3 and with 3.65% bigger in L_3exp(1804.47 ± 29.87).
5. The feed conversion ratio was 1.90 in L_3exp and 1.91 in Lc_3.
6. The resulted quantity of meat after the chickens slaughtering was higher in L_3exp than in Lc_3.

From what we have done until now, we draw the conclusion that stocking the eggs for incubation for 9 days should be done at a temperature of +14 ÷ +16^{0}C associated with air humidity of 65-70% and turning of 3 times a day under an 45^0 angle beginning with the 4th day of storage.

For the storage of the eggs for a duration of 12 days the best results were registered when the temperature reached +12 ÷ +14^{0}C and not +14 ÷ +16^{0}C as most of the incubation stations through the country .This temperature limits must be associated with an air humidity of 65-70% and the turning of the eggs 3 times a day ,under a 45^0 angle beginning with the 4th day of storage.

4.1. In 12 days of eggs storage in the parameters mentioned above, we have a weight loss of the eggs of 0.74% in Lc_4 and 0.68% in L_4exp.

4.2. The fertility of the eggs wasn't that different, 94.74% in Lc_4 and 94.94 in group L_4exp.

4.3. The eggs that hatched was 86.11% in group Lc_4 and 4.03% higher in L_4exp., the number of those that should of hatched was higher in L_4exp. than Lc_4.

4.4. The weight of the chicks that hatched from the studied eggs, at the age of 42 days was 1755.45 ± 28.02 g in group Lc_4 and 1790.52 ± 24.38 g in group L_4exp., 2% higher than the first one.

4.5. The feed conversion ratio was 1.92 in Lc_4 and 1.94 in group L_4exp.

4.6. The flock loss was 5.92% in Lc_4 and 5.04 in group L_4exp.

4.7. Because the weight of the chicks in the 42 days was higher in L_4exp., the meat production was better in group L_4exp. for example the slaughtering efficiency for the males was 80.98 ± 0.56% for L_4exp. and 80.16 ± 0.53% in group Lc_4; for the females 80.60 ± 1.26% in L_4exp. and 80.06 ± 0.56 in group Lc_4.

At the same time, participation of the chest filled in whole carcass was:

For the males:

510.80 ± 3.68 g in group L_4exp.;

483.60 ± 16.82 g in group Lc_4

For females:

434.40 ± 21.31 g in group L_4exp.

419.60 ± 11.31 g in group Lc_4

The present data has proven that for the storage of the eggs for 12 days the +12 ÷ +14^{0}C temperature is better than +14 ÷ + 16^{0}C used through the country. At the same time, we assured a 65 – 70% air humidity and the turning of the eggs 3 times a day, under an 45^0 angle beginning with the 4th day.

5. In the experiment concerning the conditions of storage of the incubation eggs for 15 days it was proven that the best results have been obtained under the same conditions as for the 12 days period: +12 ÷ +14^{0}C and not +14 ÷ +16^{0}C as the specialists recommend. Air humidity and eggs turning values are the same as before.

At the storage of the eggs for 15 days the weight loss suffered were 0.76% in group Lc_5 and 0.51% in group L_5exp.

The fertility ratio wasn't that different, 93.88% for Lc_5 and 94.22% in group L_5exp.

The percent of the hatchability was 90.61 in group L_5exp. in confront to 89.86 from Lc_5.

The hatching percent was higher in group L_5exp. (85.37) than Lc_5 (84.35).

The weight of the hatched eggs from the study at the age of 42 days was 1993.60 ± 25.22 in group L_5exp. and 1947.68 ± 25.35 g in Lc_5 2% higher in group L_5exp. than Lc_5.

The feed conversation ratio was 1.93 in group L_5exp. and 1.97 in group Lc_5.

The quantity and production of the meat after the sacrifice of the chicks was at a higher level in L_5exp. The participation of the chickens breast in the whole carcass, for the males was

531.60 ± 62.10 g in group L_5exp. and 526.00 ± 42.82 g in Lc_5; for the females was 456.80 ± 19.39 g in group L_5exp. and 456.40 ± 17.45 in group Lc_5. At the same time the meat/bones ratio was 3.62/1 ± 0.05 in group L_5exp. and 3.59/1 ± 0.02 in Lc_5.

All of the arguments are reading for the storage of the eggs at a temperature of +12 ÷ $+14^0$C, associated with an air humidity of 65 – 70% and the rolling over of the eggs 3 times a day under a 45^0 angle beginning with 4^{th} day of storage.

6. Our trials of stocking the eggs for 18 days at temperature between +10 ÷ $+12^0$C weren't successful and heather the one between +12 ÷ + 14^0C, even if the air humidity was 65 – 70% and the eggs were turned 3 times a day under a 45^0angle beginning with the 4^{th} day of storage.

The weight loss suffered by the eggs in the 18 days storage were very high 2.40% in group Lc_6 and 2.52% in L_6exp.

The eggs fertility didn't influence the results, being almost equal 94.56 – Lc_6 and 94.22 – L_6exp.

The hatchability level of the eggs was very low in both groups, 24.46% in Lc_6 and 58.48% in group L_6exp.

These bad results appeared in the moment in which the embryonic mortality reached 65.31% in group Lc_6 and 30.27 in L_6exp.

Due to the bad results, the obtained chicks weren't monitored through their growth. After analyzing the results and based upon them we can make same recommendations which we consider to be useful for the incubation station through the country, regarding the storage conditions of the eggs.

So, the storage of the eggs for a period of:

- 3 days - is indicated to take place at a temperature between +14 ÷ $+20^0$C not as used up until now (+18 ÷ $+20^0$C).
- 6 days - the storage of the eggs at temperature of +14 ÷ $+16^0$C assures that the chicks will hatch and they will grow reasonably.
- 9 days - storage the eggs at temperature between +14 ÷ $+16^0$C, not at +10 ÷ $+12^0$ C which were experimented in group L_3exp. but not +16 ÷ $+18^0$C either, both having bad results.
- 12 days to 15 days - the storage of the eggs is really efficient at temperature +12 ÷ $+14^0$C.
- 18 days - storage at temperature between +12 ÷ $+14^0$C in group Lc_6. and +10 ÷ $+12^0$C at L_6exp. is indicated.

The storage of the eggs for 3, 6, 9, 12, 15 days must be accomplished using an air humidity of 65 - 70%, eggs turning over 3 times a day under a 45^0 angle, beginning with the 4^{th} day.