Hatchability Performances of Hen Eggs under the Influence of Magnetic Field

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Abstract

Different methods of egg's incubation improving are used in hatching technology nowadays. To find out what is the most efficient method of eggs improving, it is necessary to held experiments in this branch. The eggs (n = 150) were exposed to magnetic field generated by apparatus UEM-3. For the experiments there were used four systems of electromagnetic field: permanent, split, impulsive 8 Hz, impulsive 16Hz, for a period of 5 and 10 minutes for each system. The highest percentage of first quality chickens was received in experimental group 8 (93.40%), where eggs were exposed to the action of magnetic field in system impulsive 16Hz, for a period of 10 minutes. The highest number of chickens had been received in experimental group 3 and it was 129.0 chickens, the eggs were exposed to the action of magnetic field in system split for a period of 5 minutes, while in control group the number of chickens was – 127.0.The lowest value of embryonic death had been found in experimental group 8 (3.2%), where eggs were exposed to magnetic field in system impulsive 16Hz, for a period of 10 minutes, in the control group this index had a value of 7.78%, as well in the experimental group 5 it reached 8.3%, where eggs were exposed to the magnetic field in system impulsive 8Hz for a period of 5 min. The highest values of hatching indices calculated in relation with fertilized eggs were found in experimental groups 8 – 96.8%, and 2 – 95.6%. The negative effect of magnetic field was found in group 5 where the eggs were exposed in system impulsive 8Hz for a period of 5 minutes. The indices in this group had lower values.

Keywords: chickens, embryonic mortality, hatchability, hens eggs, magnetic field.

1. Introduction

Magnetic fields have had many uses in ancient and modern society. Although magnets and magnetism were known much earlier, one of the first descriptions of the magnetic field was proposed in 1269 C.B. by the French scholar Petrus Peregrinus who mapped out the magnetic field on the surface of a spherical magnet using iron needles ("as discussed in Wikipedia [1]"). [1]
During the years, magnetic field was used in different brunches. Many scientists keep studding the influence of magnetic field on organisms and systems. So, the studies concerning the influence of magnetic field in poultry eggs hatching are held too.
The effect of environmental conditions on hatching indices of poultry eggs is sufficiently that new methods for their improvement are sought, among others through exposing the eggs before hatching to an artificially generated magnetic field. In recent years, some attention in scientific research has been paid to the effect of electromagnetic and magnetic fields on living organisms from the aspect of using them in health issues and for improvement of physiological indices, and may be production ones as well ("as discussed by Кольцов Ю., et.al. [2]").It is known the method of poultry stimulation using magnetic field for eggs irradiation. The method allows stimulating the hen embryos ("as discussed by Janawski T.M. and oth. [3]").The research carried

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and on quail eggs on effect of magnetic field on eggs hatchability showed that the highest values of hatching indices calculated in relation to fertilized eggs were found in group where was used magnetic field ("as discussed by Tarasewicz Z., et al. [4]").

The technology of eggs treating using permanent magnetic field does not have any negative impact on productive qualities of chickens. This technology can be used for hatchability rising of hens, ducks, geese and turkey eggs ("as discussed in Ideas and money [5]").

It is considered that an embryo in the incubator is escaped from the earth's magnetic field, so to eliminate this negative phenomenon in order to improve the hatchability is suggested to use electromagnetic field ("as discussed by Курзин H.H., et. al.[6]").

The influence of magnetic field with intensity of 0.07T on the hatching of the Hampshire breed chickens was investigated. The hatchability of eggs that were influenced by magnetic field during the storage of the eggs was increased in comparison with eggs that were not influenced by magnetic field ("as discussed by Toman R., et.al. [7]").

2. Material and methods

The aim the present study was to assess the effect of magnetic field used in hen eggs hatching.

The experiments were conducted at the hatchery station. The studies included three series. Each group involved 150 eggs from the breeding stock of hens. Before setting the eggs into incubator, they were divided into 9 groups: one – control: and eight experimental groups. For eggs activation there was used magnetic field induced by apparatus UEM – 3. There were used four activation systems for period of 5 and 10 minutes.

The experiments were held accordingly to the experimental scheme (Table 1).

Table 1. Experimental scheme

Experience	Activation system of magnetic field								
	control	Experimental group, nr.							
		permanent		split		impulsive8 Hz		impulsive 16 Hz	
		1	2	3	4	5	6	7	8
		Exposition, min.							
First	-	5	10	5	10	5	10	5	10
Second	-	5	10	5	10	5	10	5	10
Third	-	5	10	5	10	5	10	5	10

All the eggs of the experimental groups were exposed to activation with magnetic field.

In the first group magnetic field was used in permanent system, in the second group magnetic field was used in split system, in third group magnetic field was used in impulsive 8 Hz system and in fourth group magnetic field was used in impulsive 16 Hz system.

The eggs of the control group were not activated.

During the incubation period there was organized the eggs biological control. Also there were determined critical periods during eggs incubation.

After incubation process was completed, the hatching indices were calculated. All hatched chickens of each group were divided into quality classes.

The results were analyzed statistically using computer program. ("as discussed by Плохинский Н. А. [8]").

3. Results and discussion

The most important index that determines the efficiency of eggs hatching is hatchability, but it depends on several factors such as embryonic growth, embryonic mortality which set the critical stages of incubation. All these factors directly or indirectly influence the outcome of technology incubation and quality of obtained chickens.

The first studied index in experiments was the number of chickens on quality classes (Table 2).

Table 2. The number of chickens received per three experiences, % ($\bar{X} \pm Sx$)

Indices	Control	Experimental groups							
		1	2	3	4	5	6	7	8
		5/	10/	5/	10/	5/	10/	5/	10/
Total chickens: heads	127.0	124.0	132.0	129.0	124.6	122.0	124.67	121.0	127.68
	±	±	±	±	±	±	±	±	±
	1.0	4.33	1.16**	3.46	7.31	8.74	5.53	4.9	0.88
First quality: heads	97.67	106.33	108.33	109.7	103.3	102.67	106.33	100.67	122.33
	±	±	±	±	±	±	±	±	±
	2.73	8.41	6.23	6.23***	1.48	1.98	7.51	6.23	2.03***
%	76.90	85.1	82.06	84.20	82.80	83.78	85.63	83.10	93.40
Second and third quality: heads	29.30	18.33	23.67	20.30	21.00	19.33	18.33	20.33	8.67
	±	±	±	±	±	±	±	±	±
	3.18	4.80	3.49	2.33	6.03	3.8*	4.05	2.96	0.88***
%	23.10	14.90	17.94	15.80	17.20	16.22	14.37	16.90	6.60

*B_1 = 0.95; **B_2= 0.99;***B_3= 0.999

The data presented in table 2 showed that the highest number of chickens was received in experimental group 2, where was used magnetic field for a period of 10 min., and this index was 132.0 chickens, than in third experimental group – 129.0 chickens. This index was 127.68 chickens in the experimental group nr. 8.

The number of chickens of first quality was received in all experimental groups, and varied between 100.67 and 122.33 chickens.

There had been determined three critical periods during the eggs incubation and had been studied the embryonic mortality. The results of embryonic mortality are presented in table 3.

Table 3. The embryonic mortality, %

Periods	Control	Experimental groups							
		1	2	3	4	5	6	7	8
Eggs with dead embryos at:									
the beginning of the period: eggs	2.33	2.33	2.33	2.0	4.0	3.33	3.0	1.33	1.0
	±	±				±	±	±	
	0.67	0.33				1.3	1.0	0.33	
%	1.7	1.73	1.67	1.5	3.1	3.1	2.23	1.0	0.7
at 3-7 days: eggs	2.0	-	-	0.3	2.33	1.7	0.3	3.0	1.0
	±	-	-		±			±	
	1.0	-	-		0.33			1.0	
%	1.5	-	-	0.3	1.73	1.3	0.2	2.3	0.7
at 19-21 days: eggs	6.33	5.0	3.67	4.67	3.67	6.67	6.0	3.67	2.3
	±	±	±	±	±	±	±	±	±
	0.88	2.0	0.88*	1.2	1.76	1.68	1.73	1.45	0.33***
%	4.57	3.77	2.63	3.43	2.67	4.9	4.67	2.83	1.73

*B_1= 0.95; ***B_3=0.999

The lowest level of de embryonic mortality was found in group 8(0.7%) at the beginning of eggs incubation; at the second period (3-7 days) this index was not noticed in groups 1 and 2; at the end of hatching period the lowest level of embryonic mortality was in experimental group 8 (1.73%) while in the rest experimental groups this indices varied between 2.63%-4.90%; in control group this index was 4.57%.

The total number of dead embryos during hatching period is showed in figure 1.

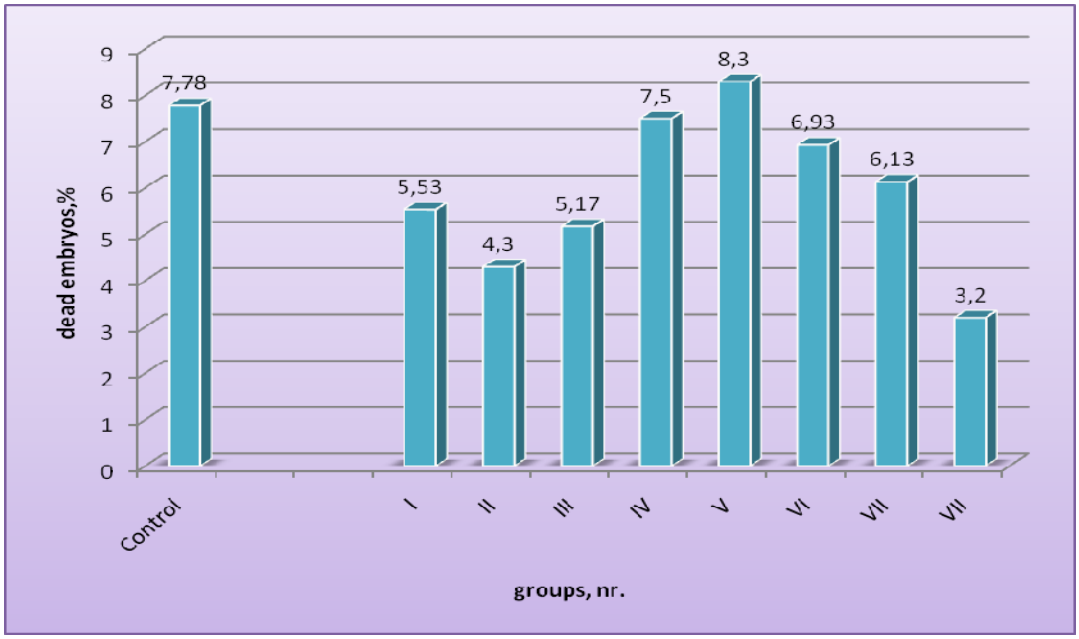

Figure 1. Total number of dead embryos, %

The highest level of embryonic mortality during the eggs incubation period was found in experimental group 3 – 8.3% (being 0.52% higher than in control group). The lowest percentage of embryonic mortality was found in experimental group 8 – 3.2%, this being 4.58% lower than in control group.

In many experimental groups the impacts of magnetic field on biological objects were different, so there was found no improvement in hatchability with an artificially generated electromagnetic field ("as discussed by Bednarczyk M., et al. [9]").

Other authors had mentioned that using the magnetic field on fish embryos, obtained higher incubation results ("as discussed by Formicki K., et.al. [10]").

After the eggs hatching there was determined the hatchability from total and fertilized eggs and is shown in figure 2.

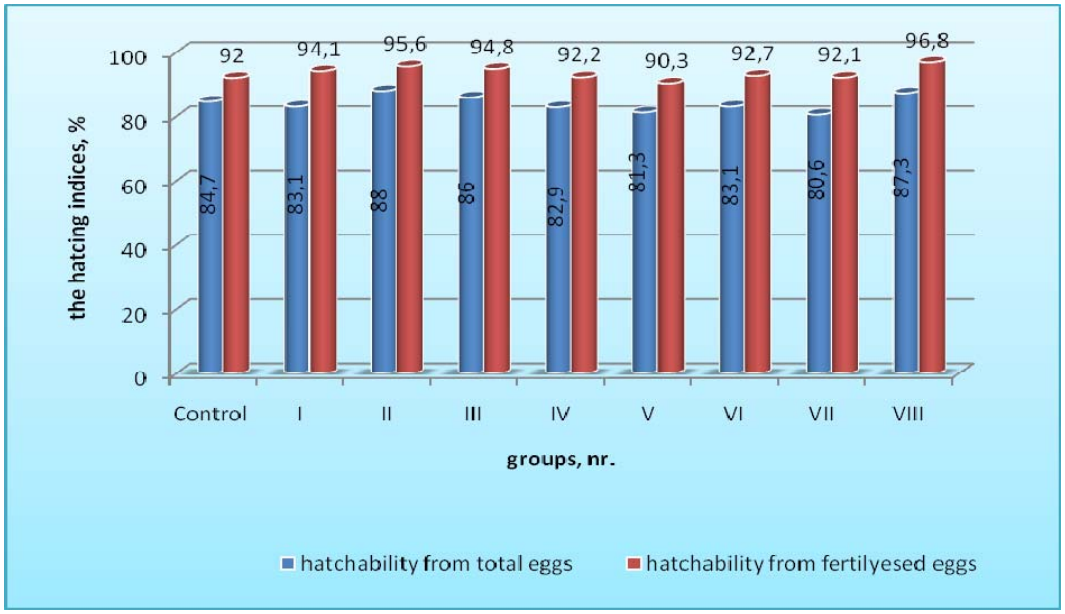

Figure 2. Hatchability from total and fertilized eggs

The hatchability is the most important index that showed the effect of magnetic field on the hen eggs. The data presented in figure 2 showed that the highest level of hatchability was in experimental group 8 (96.8%) where was used the magnetic field (system impulsive 16 Hz, 10 min.) this being 4.8% higher than in control group. The lower level of hatchability in experimental groups was found in group 5 (90.3%), where was used magnetic field (system impulsive 8 Hz, 5 min.) or being 1.7% lower than in control group. It is necessary to mention the value of hatching indices in experimental groups ranged from 92.1% (in experimental group 7) to 95.6% (in experimental group 2), or lower comparing with similar index in the control correspondingly with 0.1% and 3.6%.The data showed the different influence of magnetic field on the eggs incubation process.

4. Conclusions

1. The highest percentage of first quality of received chickens was in experimental group 8 (93.40%), where eggs were exposed to the action of magnetic field in system impulsive 16 Hz, for a period of 10 minutes.
2. The highest number of chickens was received in experimental group 3 and it was 129.0 (the eggs were exposed to the action of magnetic field in system split for a period of 5 minutes), while in control group the number of chickens was – 127,0.
3. The lowest values of embryonic death had been found in experimental group 8 (3.2%), where eggs were exposed to magnetic field in system impulsive 16 Hz, for a period of 10 minutes, in the control group this index had a value of 7.78%, as well in the experimental group 5 it reached 8.3%, where eggs were exposed to the magnetic field in system impulsive 8 Hz for a period of 5 min.
4. The highest value of hatching indices calculated in relation with fertilized eggs had been found in experimental groups 8 – 96.8%, and 2 – 95.6%, while in the control group it was – 92.0%.
5. The negative effect of magnetic field was found in group 5 where the eggs were exposed in system impulsive 8 Hz for a period of 5 minutes. The indices in this group had lower values.

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