THE EFFICIENCY OF THE SANITATION MEASUREMENTS OF INCUBATION EGGS ON THE OBTAINED HATCHING PERFORMANCES

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Abstract

The research was done on a batch of 1344 incubation eggs, descending from the meat chicken commercial hybrid „COBB-500"; out of these 4(four) work modules were made, each containing 336 eggs, respectively A, B, C and D module. The eggs included in the A, B and C modules were decontaminated with a new abstergent substance of Romanian nature named Sodium dichloroisocyanurate, 0,6g ‰ a.s. solution(A module), 0,4 g ‰ a.s. solution (B module), respectively 0,2 g ‰ a.s. solution (C module) while the D module eggs have not been decontaminated. The decontamination technique is regulated and consists of immersing the eggs in decontamination solution, in temperature stages, to assure the mineral shell dilatation and the closing of the pores, so that this solution does not get inside the egg. The decontamination efficiency was assessed by bacteriological exams, both quantitative and qualitative. Decontaminated eggs were incubated alongside contaminated ones, rating the specific incubation indexes. Incubation egg sanitation constitutes a determinant factor, both by assuring a high level of hatching and by the ulterior health state of the chicks. The analyzed chicken eggs displayed a constant germ contamination, but with very wide variation limits, covered between 31 and 382 germs/cm^2. The hatching percentile of eggs varied between 89.43% for the C module and 92.48% for the A module.

Key words: sanitation, incubation, hatching

INTRODUCTION

Highly performing aviculture requires the existence of a powerful incubation sector that should valorise the great results given by breeder farms. [8]. Among the factors that could decisively influence the hatching performances, as well as chickens rearing ones, eggs sanitation is a key one, though both high hatching levels and full healthy day old chickens.

Certain eggs sanitation techniques are recommended by scientific literature, some of them being more or less effective. It seems that the situation is still controversial [2], [3], [4], [5], [6], [7], [8], [9].

New researches were required, in order to significantly improve performances in fowl eggs hatcheries, some of them related to the decontamination of eggs, hatcheries and of their annexes. The researches on this paper focused on the same topic. Thus, the efficacy of a new eggs decontaminant substance, of Romanian origin, was tested, under different concentrations.

MATERIAL AND METHODS

The researches have been applied on 1344 incubation eggs, issued from "COBB-500" hybrid breeders; 4 investigation modules were established, each comprising 336 eggs: modules A, B, C, and D.The eggs from A, B and C modules have been decontaminated with a new substance, synthesised into the Animal Hygiene Laboratory – Iasi Veterinary Medicine Faculty, Romania, named sodium dichloroisocyanurate, concentrations of 0-6g ‰ a.s. (module A), 0.4 g ‰ a.s. (module B), and 0.2 g ‰ a.s. (module C), while eggs from module were not decontaminated.

Decontamination technique

3 pools, made of non oxidative fabric, were used for eggs decontamination. These pools were endorsed with submerse electrical

resistances, in order to prepare required temperature in water or decontamination mixtures.

Edible water was introduced in the 1st pool and warmed till +32°C. Eggs were attached to plastic package and immersed in water, in order to remove any impurities from shell. 2nd pool was filled with water, then warmed at +35°C. Eggs were passed through this pool, in order to be rinsed. The 3rd pool comprised the decontaminating solution, under different concentration, as given by trial schematics (A, B and C). +38°C temperature was provided. Eggs lasted 2 minutes in each pool.

Eggs were dried to the environmental temperature (+18° +19°C), after decontamination.

Research methodology was in accordance to the scientific literature.

RESULTS AND DISCUSSIONS

Results of the quantitative microbiologic exam

Certain results of the microbiologic investigations – counting of colony formatting units - are presented in table 1.

Table 1.
Efficacy of sanitisation operations on the studied incubation eggs

No.	Module A			Nr. crt.	Module B			Nr. crt.	Module C		
	CFU* amount		iR**		CFU* amount		iR**		CFU* amount		iR**
	Untreated eggs (module D)	Treated eggs (0.6 g ‰ a.s.)	%		Untreated eggs (module D)	Treated eggs (0.4 g ‰ a.s.)	%		Untreated eggs (module D)	Treated eggs (0.2 g ‰ a.s.)	%
1	109	1	99.08	1				1			
2	47	0	100.0	2	142	0	100.0	2	209	0	100.0
3	118	0	100.0	3	159	0	100.0	3	33	0	100.0
4	372	0	100.0	4	47	0	100.0	4	141	1	99.29
5	165	1	99.39	5	112	0	100.0	5	195	3	98.46
6	99	0	100.0	6	205	1	99.51	6	72	0	100.0
7	132	0	100.0	7	59	0	100.0	7	163	1	99.38
8	198	1	99.49	8	271	3	98.89	8	154	1	99.35
9	151	0	100.0	9	84	0	100.0	9	76	0	100.0
10	207	1	99.51	10	128	0	100.0	10	85	0	100.0
11	219	0	100.0	11	163	0	100.0	11	260	4	98.46
12	81	0	100.0	12	154	0	100.0	12	42	0	100.0
13	324	0	100.0	13	96	0	100.0	13	144	0	100.0
14	31	0	100.0	14	82	0	100.0	14	173	0	100.0
15	61	0	100.0	15	105	0	100.0	15	99	0	100.0
16	298	0	100.0	16	110	0	100.0	16	56	0	100.0
17	78	0	100.0	17	48	0	100.0	17	28	0	100.0
18	184	0	100.0	18	253	0	100.0	18	143	0	100.0
19	256	0	100.0	19	139	1	99.27	19	95	1	98.93
20	161	0	100.0	20	151	0	100.0	20	74	0	100.0
21	125	0	100.0	21	194	0	100.0	21	58	0	100.0
22	304	0	100.0	22	69	0	100.0	22	212	2	100.0
23	117	0	100.0	23	88	0	100.0	23	129	0	100.0
24	95	0	100.0	24	125	0	100.0	24	77	0	100.0
25	264	1	99.62	25	173	0	100.0	25	81	2	97.53
26	158	0	100.0	26	42	0	100.0	26	356	0	99.10
27	74	0	100.0	27	206	0	100.0	27	102	0	100.0
28	159	0	100.0	28	190	0	100.0	28	190	0	100.0
29	247	0	100.0	29	114	1	99.12	29	81	0	100.0
30	382	0	100.0	30	78	0	100.0	30	154	0	100.0
99.08-100.00				98.89-100.0				97.53-100.0			

**CFU = Colonies formating units*
***iR = index of Reduction*

Very high values were found for the experimental module A, where the active compounds concentration was 0.6 g ‰ a.s., in the eggs that were not decontaminated, the values ranging from 31 till 382. The payload on the shell of the decontaminated eggs decreased to zero, except 5 samples with

insignificant amount of microorganisms (one colony for each assay).

Reduction Index presented high values, within the 99.08% - 100.0% range.

In module B, concentration of decontaminant substance did not pass over 0.4 g‰ a.s. High rate of microbial contamination was maintained, with high differences between samples, the variation limits oscillating between 42 and 271. Conversely, the microbial payload of the eggs which were decontaminated was practically insignificant, most of the samples being germs free. However, just four samples were found with single or double colonies. Reduction index remained at high values, between 99.12% and 100.0%. These interesting and promising results confirmed the data published by other authors [2], [3], [7].

In C module, the active substances from decontaminant mixture had the lowest concentration - 2 g ‰ a.s. Even in these conditions, microbial destruction was found at high levels but lower than in other modules (A or B). Thus, the amount of physiological active cells which developed in the Petri dishes inoculated with biological material taken from contaminated eggshells varied between 33 and 356, while for the samples taken from decontaminated eggs, it severely reduced, just nine samples proving to be positive. In these situations, amount of colonies formatting units was low. They did not pass over four colonies per dish. Reduction index oscillated between 97.53% and 100.0%.

Results of qualitative bacteriologic exam

Bacteriologic investigations were done qualitatively, on samples taken from eggshell surface of those eggs that were not decontaminated, the results being interesting enough to have practical importance.

Isolation and identification of Salmonella genus germs were run on selective Istrati Meitert and XLB environments [1]. Both cultural environments that were inoculated with biological material form the initial suspensions remained sterile because no colonies were developed. This fact proved that incubation eggs were not contaminated with Salmonella germs, issuing thus from healthy flocks, free of such germs, with high epidemiologic relevance.

Levine cultural environment was used for coliform germs isolation and identification. Their occurrence on eggshells (six samples) is justified, knowing these microoganisms constantly colonise certain parts of fowl digestive tract. They could become biological markers used in etiology diagnostics, knowing their pathologic features prove live organisms contamination with *Escherichia pathologic strains*.

Levuriform or filamentous micromycetes were observed in three samples, cultivated on DDCA special antibiotics environment while their amount was very low in Petri dishes.

Due to their wide spreading area, staphylococci occurrence in Petri dishes was not a surprise, when selective Chapman environments were inoculated with material from not decontaminated eggs. The novelty was given by high amount of positive samples (close to a half from all samples). These microbes could be true infection sources for day old chickens, which will transfer infectious agents in production houses [1], [2].

The incubation results revealed different variation between module D and modules A, B and C.

In D module eggs, biological control run during the 10^{th} incubation eggs showed 6.54 infertility from entire incubated eggs (336 pcs.). Sudden embryonic death reached 2.08%.

Belated embryos mortality was observed at 1.19%. 33 eggs were thus removed prior transfer, which meant 9.82%. Eggs fertility reached 90.18%. Hatchability was calculated at 92.07%, while hatching percentage was found at 83.03.

In module A eggs, treated with sodium dichloroisocyanurate 0.6 g ‰ a.s., the results from the 1^{st} biological control (10^{th} incubation eggs) were of: infertile eggs = 5.37%; sudden mortality = 3.57%. No dead embryos were found during transfer. 30 eggs were removed prior to hatching (8.92%). Eggs fertility reached 91.08%, while hatchability and hatching percentage were calculated at 92.48% and 84.22%, respectively.

In module B eggs, treated with sodium dichloroisocyanurate 0.4 g ‰ a.s., infertile eggs percentage (10^{th} incubation day) was 4.46 (15 eggs), while sudden mortality reached 1.19% (4 dead embryos). 3 embryos were found dead prior to hatching transfer (0.89%). Overall, 22 eggs were removed, meaning 6.54% from the introduced eggs. Fertility was calculated at 93.46%. Hatching process revealed certain values for hatchability – 91.71%, respectively for hatching proportion – 85.71%.

In module C eggs that were treated with sodium dichloroisocyanurate 0.2 g ‰ a.s., infertile eggs during 1^{st} control (10^{th} incubation day) reached 5.65% (19 eggs). Sudden mortality reached 2.67% (9 dead embryos), while the belated one was found at 1.48% (5 dead embryos). Whole amount of eggs removed prior to hatching transfer was of 33 pcs., which meant 9.82%. Eggs fertility reached 90.18%. Hatchability reached 89.43, while hatching percentage was calculated at 80.65%.

Besides those previously presented, we consider that the treatments of eggshell decontaminations, especially that of 0.4 g ‰ a.s. significantly influenced hatching performances.

CONCLUSIONS

1. Analysed hen eggs revealed constant microbial contamination, which varied between wide limits, from 31 to 382 germs /cm^2.

2. Sanitisation operation, including eggs decontamination exerted strong destructive effect which affected whole microbial spectrum from shells. Reduction index reflected the phenomenon, whose values ranged from 97.53 till 100%, as influenced by active substance concentration in the decontaminant mix.

3. Decontaminant substance we used in incubation eggs sanitation technique - the sodium dichloroisocyanurate, in 0.2-0.6 g ‰ a.s. inclusions reduced the microbial load from the shell. The 0.4 g ‰ a.s. and 0.6 g ‰ a.s. sodium dichloroisocyanurate severely reduced microbial loat and interrupted the epidemiologic germs chain.

4. Microbiological exams from initial samples taken from eggshell surface revealed certain germs: coliformes, staphylococci and filamentous micromycetes. Bacterial stains of *Salmonella* genre have not been identified.

5. Eggs hatchability percentage reached 92.07 in module D (untreated eggs); 92.48 in module A (eggs treated with sodium dichloroisocyanurate 0,6 g ‰ a.s.); 91.71 in module B (eggs treated with sodium dichloroisocyanurate 0.4 g ‰ a.s.) and 89.43 in module C (eggs treated with sodium dichloroisocyanurate 0.2 g ‰ a.s.).

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