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THE INFLUENCE OF THE BREEDING SYSTEM ON THE HATCHABILITY OF HEN MEAT RACES' REPRODUCTION

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Abstract

During the present study, we have determined the values associated with the quantity and quality of the seminal material, influencing the hatchability and finally the biological and economic efficiency of the reproduction activity.
The conducted research was organized on a period of two years, the material being represented by commercially available hybrids of ROSS 308, 25 roosters and 250 hens. The study took place for three different control ages (25, 35 and 45 weeks) along the production cycle (week 19 - week 64).
The work took place in three different units, each corresponding to a different experiment (A - with analyzed parameters under the standard and using bedding made of chopped straws, B - with parameters that have been raised over the standard limits and using rice hulls as bedding, and C - with parameters at the producer's recommended level, and bedding made of wood shavings).
It was observed that the highest hatchability appeared associated with 25th week (67.39 %) and 45th week (87.89%) of experiment C and 35th week (89.89%) of experiment B.
The obtained results, although not statistically significant, appear to favor the use of classic bedding made of wood shavings, and of the technologically standard microclimate parameters, a situation in which the hatchability rate recorded the highest values.

Key words: *reproduction, hatchability, fertility.*

INTRODUCTION

According to Henk Vaarkamp, 2010 (Breeding and Reproductive Technologies), the reproduction is defined as the selection and mating of animals by humans, with the main purpose of changing the traits of the next generation in such a manner as to correspond to the initial purpose of the process.
The reproduction traits are especially important for the efficiency of the domestic animals' breeding, at least from two points of view: first because a part of them influences the biological efficiency of the reproduction process, through the production of offspring in high numbers, creating the premises for the artificial selection (and touching the objective of improvement the genetic traits of a certain population); and the second is that this group of traits influences directly the economic efficiency though a high number of animals, for exploitation. These two aspects of efficiency are interdependent in the poultry sector, because these species have a series of reproduction represent at the same time the main product.

MATERIALS AND METHODS

The reproduction ability of a male is appreciated by the number of females that have been recorded as being impregnated following the insemination, or after the necessary number of copulations has been achieved, in order to obtain a fecundation. *For poultry*, the roosters' capacity for reproduction can be quantified through the number of hatched eggs.
The technological factors (temperature, humidity, density, light intensity and extent) can affect the roosters' fecundity. Similar to a decrease in the fecundity of hens, in roosters a significant decrease of semen parameters could be observed, when certain conditions of microclimate-related stress are achieved.
Taking into account the latter, the *research in this study* have had as the main objective the investigation of the reproduction's efficiency

for ROSS 308 roosters, under the influence of several microclimate factors, such as light intensity and stocking density, as well as of other traits, which, when corroborated, would determine the reproductive capacity of roosters, which would further influence the hatchability and finally the biological and economic efficiency of the reproductive process.
For these reasons, the team designed three types of experimental series:

- Series A, which has as a main purpose the investigation of the influence of several microclimate factors set to parameters which would be under the standard limits, as well as using chopped straws as bedding material, on roosters' reproductive capacity;
- Series B, which investigated the effect of the parameters for microclimate factors such as light intensity and stocking density, set above the standard limits as well as using rice hulls as bedding material, on the traits which would determine the reproductive capacity of roosters;
- Series C, which investigated the influence of setting the light intensity and stocking density parameters within the standard limits, as well as using a classic bedding material of wood shavings, on the reproductive capacity of roosters.

The experiments took place for a period of two years, in three different poultry breeding units, each unit corresponding to a different set of experimental series: Avicola Călărași, S.C. Agrafood S.A. and Avicola Focșani.
The experimental groups were set to 25 roosters and 250 hens.
The investigation took place for three weeks (week 25, week 35 and week 45) during the production cycle (19-64 weeks).
In order to study the variation of hatchability, which would present a *binomial repartition*, the team used the following statistical methods:

- a comparison between the frequencies, based on a normal approximation;
- Fisher test for a comparison between the binomial proportions, known as the "Fisher's exact test";
- "Chi" square test, with Yates' correction for continuity applied on binary contingency tables (Dragomirescu, 1999).

RESULTS AND DISCUSSIONS

The reproductive capacity of an animal, called *fertility*, is sometimes expressed through the use of *fecundity*, which in turn is used when related to the coupling of gametes; or using the word *prolificity*, which denotes the number of offspring, or *natality* (birthrate), which designates the process at population's level (the average number of offspring for each female or 100 females). In poultry, the use of *natality* is improper, in turn the *hatchability* being preferred.
The birthrate is a population's trait which refers to the degree at which this is adapted to the environment, more precisely the degree in which the population is adapted to the exploitation technology.
It is, next to the descendants' survival, the point to which it can be observed the effect of natural selection, which would eliminate the unsuitable ones, especially considering the reproductive capacity, through this decreasing the natality (Drăgănescu, 1984).
In table 1 and figure 1, there were included the values of the hatchability recorded through the three experimental series, for the 25th week.

Table 1. Hatching ability in the 25th week

Specification	Fertile eggs	Total viable chicken	Hatching ability %
A	37	18	48.65
B	70	41	58.57
C	46	31	67.39

By analyzing the data included in Table 1 and Figure 1, it can be observed that the highest value for hatchability for the 25th week was recorded for the experimental series C (67.39%). Thus, it seems that choosing the standard values for technological parameters and the use of a classic bedding material of wood shavings would have a favorable influence on hatchability.
In order to validate this observation and to test the statistical significance of the differences between the hatchability parameters recorded for the 25th week on the three experimental series, table 2 includes the results of "Chi square" test, with Yates' correction.

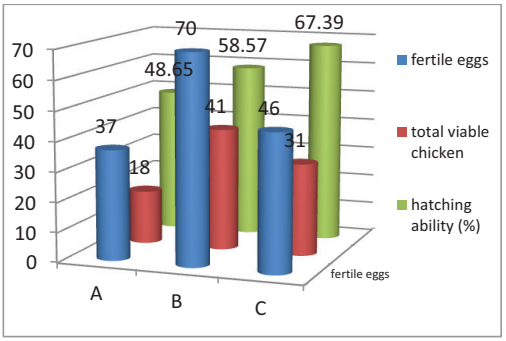

Figure 1. Hatching ability in the 25th week

Table 2. Comparison of hatching ability using χ^2 test with Yates correction between experimental series, 25th week

Specification	Fertile eggs	Viable chicken	Total	χ^2
A	a=37	b=18	a+b=55	0.13^{NS}
B	c=70	d=41	c+d=111	
Total	a+c=107	b+d=59	a+b+c+d=166	
A	a=37	b=18	a+b=55	0.49^{NS}
C	c=46	d=31	c+d=77	
Total	a+c=83	b+d=49	a+b+c+d=132	
B	a=70	b=41	a+b=111	0.09^{NS}
C	c=46	d=31	c+d=77	
Total	a+c=116	b+d=72	a+b+c+d=188	

By analyzing the results included in Table 2 and reading the table value using a degree of freedom and a significance level of 0.05, the conclusion is that there are no statistically significant differences between the hatchability values for the three experimental series for the 25th week.

In Table 3 and Figure 2 there were included the recorded hatchability values for the three experimental series on the 35th week.

Table 3. Hatching ability in the 35th week

Specification	Fertile eggs	Total viable chicken	Hatching ability %
A	170	138	81.17
B	178	160	89.89
C	194	171	88.14

By analyzing the data included in table 3 and figure 2 it can be observed that the highest value for the hatchability in the 35th week was recorded for experimental series B (89.89%).

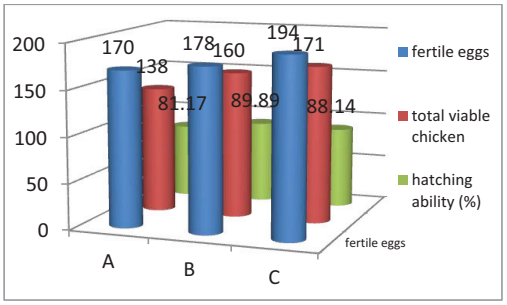

Figure 2. Hatching ability in the 35th week

It appears that setting the values for the technological parameters above the standard limits, as well as using rice hulls as bedding material would have a positive influence on hatchability.

In order to test the statistical significance between the values of hatchability parameter for the three experimental series in the 35th week, the results of "Chi square" test were included in Table 4, after applying the Yates' correction.

Table 4. Comparison of hatching ability using χ^2 test with Yates correction between experimental series, 35th week

Specification	Fertile eggs	Viable chicken	Total	χ^2
A	a=170	b=138	a+b=308	0.32^{NS}
B	c=178	d=160	c+d=338	
Total	a+c=348	b+d=298	a+b+c+d=646	
A	a=170	b=138	a+b=308	0.20^{NS}
C	c=194	d=171	c+d=365	
Total	a+c=364	b+d=309	a+b+c+d=673	
B	a=178	b=160	a+b=338	0.003^{NS}
C	c=194	d=171	c+d=365	
Total	a+c=372	b+d=331	a+b+c+d=703	

The result shows that the influence of technological parameters and the bedding material type does not present any statistical significance, the observed differences being caused by other factors, especially the sampling error, which does not influence the results.

Table 5 and figure 3 show the hatchability values recorded for the 45th week, on all three experimental series.

Table 5. Hatching ability in 45th week

Specification	Fertile eggs	Total viable chicken	Hatching ability %
A	125	93	74.4
B	140	120	85.71
C	157	138	87.89

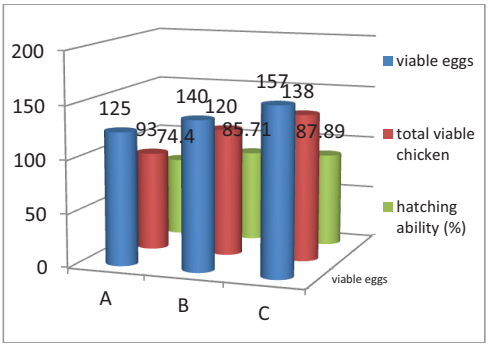

Figure 3. Hatching ability in the 45th week

After a closer analysis of the data included in these, it was observed that the highest value for the hatchability parameters during the 45th week was recorded for the experimental series C (87.89%). Thus, for the 45th week, the standard values of the technological parameters and using a classic bedding material of wood shavings leads to a positive outcome for the hatchability.

When analyzing the results included in Table 6, reading the table value with a degree of freedom and a statistical significance level of 0.05, it is concluded that there are no statistically significant differences between the three experimental series, during the 45th week.

The lack of statistically significant differences between the three designed experiments concerning the hatchability would reveal the fact that the technological parameters and the type of bedding material would only influence the traits until a certain point.

Table 6. Comparison of hatching ability using χ^2 test with Yates correction between experimental series, 45th week

Specification	Fertile eggs	Viable chicken	Total	χ^2
A	a=125	b=93	a+b=218	0.45^{NS}
B	c=140	d=120	c+d=260	
Total	a+c=265	b+d=213	a+b+c+d=478	
A	a=125	b=93	a+b=218	0.70^{NS}
C	c=157	d=138	c+d=295	
Total	a+c=282	b+d=231	a+b+c+d=513	
B	a=140	b=120	a+b=260	0.004^{NS}
C	c=157	d=138	c+d=295	
Total	a+c=297	b+d=258	a+b+c+d=555	

CONCLUSIONS

For the hatchability, the obtained results, although lacking significance from a statistical point of view, seem to favor the use of a classic wood shavings bedding material as well as standard values for the technological parameters, thus facilitating an increase in the hatchability.

During this study, the results show the excellent traits of the ROSS 308 hybrid, its great adaptability, offering very food results concerning the reproduction, no matter the type of bedding material or the values of the technological parameters. Most probably, the limitation for a certain values of reproduction traits would be represented by the nutrition.

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