Scientific Papers. Series D. Animal Science. Vol. LX, 2017
ISSN 2285-5750; ISSN CD-ROM 2285-5769; ISSN Online 2393-2260; ISSN-L 2285-5750

THE INFLUENCE OF THE BREEDING TECHNOLOGY ON THE HEN MEAT RACES' REPRODUCTION

Minodora TUDORACHE[1], Ioan CUSTURĂ[1], Ilie VAN[1], Elena POPESCU-MICLOȘANU[1], Paul ANTON[2]

[1]University of Agronomic Sciences and Veterinary Medicine of Bucharest, Faculty of Animal Science / Faculty of Veterinary Medicine, 59 Marasti Blvd, District 1, Bucharest, Romania
[2]Aviagen Romania

Corresponding author e-mail: minodoratudorache@yahoo.com

Abstract

The research conducted on this paper has had as main objective a study on the reproduction efficiency of ROSS 308 male line, under the influence of several microclimate factors such as the light intensity and the density of the flock, as well as other factors, which, if corroborated, would determine the fecundity capacity of the roosters.
Three experiments have been constructed (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).
The observations have been made and the records have been taken during the production cycle (week 19 - week 64), over a period of 3 weeks (25, 35 and 45 weeks of age), for two consecutive years, on a group comprising 25 roosters and 250 hens, for each experimental series.
The results show the highest fertility rate for the experimental series C, over all the control weeks (50 %, 95, 1 %, 93, and 4 % respectively).
The differences, although not statistically significant, can turn the conditions of experimental series C very popular, making the wood shavings classic bedding a favorite, along with several technologically standard microclimate parameters. Overall, the fertility would register higher values (with 3-5 %), for which the economic efficiency would be making a difference (although not from a scientific point of view).

Key words: *reproduction, fecundity, fertility.*

INTRODUCTION

Meat breeds reproduction farms represent one of the most important part of the poultry meat production chain. For this activity, the comprehension of the basic knowledge regarding the physiology of the reproduction process is extremely important in order to apply the management practices of feeding, maintenance, lighting programs and veterinary aspects.
The mating behaviour can contribute or reduce the stock fertility. In hens, the rooster will monopolize the mating process in a group of hens. The frequency of the mating was initially determined based on the rooster's libido, while the fertility was associated with the sex ratio (Craig et al., 1977). The mating behaviour is influenced not only by the roosters' aggressiveness, but also by the interactions between one rooster and another, and the sex ratio. In roosters, fertility is even harder to measure with precision, this being expressed by the fertile eggs' percentage after the mating (Drăgănescu, 1979; Drăgănescu and Grosu, 2003).

MATERIALS AND METHODS

During the domestic breeding, through an optimal administration of the reproduction processes, the aim is to enlarge the stock, while being able to improve the stocks through genetic selection. The domestic animals' cyclogram for reproduction, a fundamental step is represented by the mating process itself or the artificial insemination, which is performed based on the reproduction process' proportion, on animals with a normal fertility level. The understanding of the issues on this matter would require a profound knowledge of all factors defining and influencing the fertility in animals, as a prerequisite for a biologically and

economically efficient insemination. Thus, through a correct evaluation of the characteristics which define the reproductive capacity of the roosters and the efficiency of the reproduction expressed as a point of view above, the team has designed three experiments:

- Series A had the main goal of evaluate the influence of certain microclimate factors, for which the values were set under the standard limits (stock density and light intensity) and the use of chopped straw as bedding material, on the quality of the semen as well as of other characteristics on which the roosters' reproductive capacity is based on.
- Series B had as a main objective the effect of breeding in an environment where all the parameters were set at values above the standard limits, while using rice hulls as bedding material, on the indicators of the quality of semen, as well as on other characteristics on which the roosters' reproductive capacity is based on.
- Series C was designed with the aim of establishing the measure in which maintaining a certain value of lighting intensity as well as of stock density while using wood shavings as bedding material, on the indicators of the quality of semen, as well as on other characteristics on which the roosters' reproductive capacity is based on.

The experiments were applied in three different units, each one corresponding to one of the described series: Avicola Călărași, S.C. Agrafood S.A. and Avicola Focșani, while the observations and the recording of the results were performed for a period of 3 weeks (25, 35 and 45) during the production cycle (19-64 weeks), for two years, on a group of 25 roosters and 250 hens, for each designed experiment.
In order to study the variation of fertility, which presents a binomial repartition, the team used:

- 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

For the poultry industry, roosters' fecundity is extremely important, any variation of this parameter having repercussions on the *biological and economic efficiency*.
Taking into consideration the high number of factors capable to influence the associated with the reproductive capacity of roosters, in order to verify the existence of any factor which would influence the values of the technological parameters and the type of bedding material, the team tested the significance of the observed differences between the fertility rates recorded on the three experiments, in control weeks.
In Table 1 and Figure 1 there were included the values of the recorded fertility rates for 25th week of study.

Table 1. Fertility rates and specific values for the 25th week

Specification	Eggs placed	Clear eggs	Fertile eggs	Fertility %
A	76	39	37	48.7
B	151	81	70	46.3
C	92	46	46	50.0

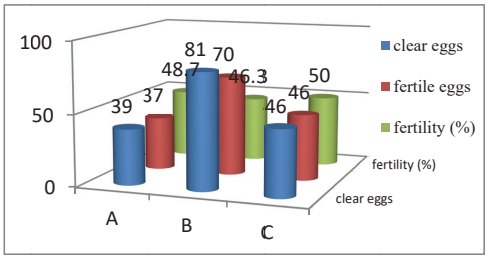

Figure 1. Fertility rates and specific values for the 25th week

Through the analysis of the data presented above, the conclusion is that the highest value of the fertility rate for the 25th week is recorded in series C. It appears, at a first glance, that the standard values of the technological parameters and the use of a classic bedding material (wood shavings) would have a considerably favorable influence on the reproduction efficiency.
By analyzing the data included in Table 2, the table value read while using 1 degree of freedom and a significance level of 0.05 would show the existence of differences which are not statistically significant between the fertility

rates recorded during the three series of experiments in the same week of study. Since these results are confirmed through two different tests, the team can infer pertinently on the influence of the technological parameters and the type of bedding material on fertility. Thus, it is shown that the inexistence of several significant differences between the three series, and as a consequence, the variation of the fertility rate among the three experimental series is determined by a different cause (individual variation, sampling error).

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

Specification	Fertile eggs	Clear eggs	Total	χ^2
A	a=37	b=39	a+b=76	0.04^{NS}
B	c=70	d=81	c+d=151	
Total	a+c=107	b+d=120	a+b+c+d=227	
A	a=37	b=39	a+b=76	0.002^{NS}
C	c=46	d=46	c+d=92	
Total	a+c=83	b+d=85	a+b+c+d=168	
B	a=70	b=81	a+b=151	0.18^{NS}
C	c=46	d=46	c+d=92	
Total	a+c=116	b+d=127	a+b+c+d=243	

Table 3 and figure 2 show the recorded values of the fertility for the three experimental series, for the 35th week.

Table 3. Fertility rates and specific values for the 35th week

Specification	Eggs placed	Clear eggs	Fertile eggs	Fertility %
A	185	15	170	91.9
B	193	15	178	92.2
C	204	10	194	95.1

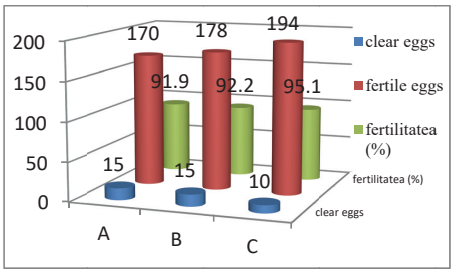

Figure 2. Fertility rates and specific values for the 35th week

Through an analysis of the data included in Table 3 and figure 2, it is observed that the highest value of the fertility rate for the 35th week was recorded for the same experimental series: C, which again leads to the conclusion that the standard values of the technological parameters and the use of a classic bedding material is favorable to an increase of the reproduction efficiency. In order to validate this observation, the results presented in table 4, the table value read at a degree of freedom as well as a significance of 0.05, would show the existence of certain differences without a statistical significance between the mating rates recorded between the three experimental series, for the 35th week (a null hypothesis would be accepted according to which all three experiments would not differ from on another from the efficacy point of view). Since these results show no significance, the team reached the conclusion that for the 35th week as well, the influence of the technological parameters as well as of the type of bedding material on the fertility rates would not present any statistical significance, the observed differences being caused by other factors, especially the sample error, which in return does not influence the obtained results.

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

Specification	Fertile eggs	Clear eggs	Total	χ^2
A	a=170	b=15	a+b=185	0.05^{NS}
B	c=178	d=15	c+d=193	
Total	a+c=348	b+d=30	a+b+c+d=378	
A	a=170	b=15	a+b=185	1.168^{NS}
C	c=194	d=10	c+d=204	
Total	a+c=364	b+d=25	a+b+c+d=389	
B	a=178	b=15	a+b=193	0.941^{NS}
C	c=194	d=10	c+d=204	
Total	a+c=372	b+d=25	a+b+c+d=397	

In Table 5 and figure 3 there were included the fertility rate values for the three experimental series for the 45th week.

After analyzing the data included in table 5 and figure 3, it was concluded the highest value for the 45th week of study was again recorded for the experimental series C. This seems again to support the opinion that choosing the standard values of technological parameters and the use of a classic bedding material has a favorable influence on the reproduction efficacy.

Table 5. Fertility rates and specific values for the 45th week

Specification	Eggs placed	Clear eggs	Fertile eggs	Fertility %
A	144	19	125	86.8
B	158	18	140	88.6
C	168	11	157	93.4

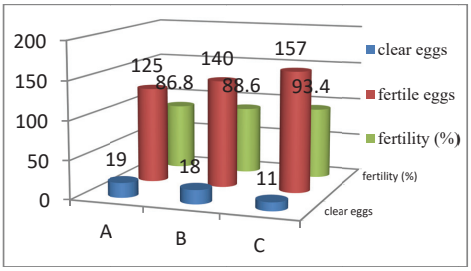

Figure 3. Fertility rates and specific values for the 45th week

After analyzing the data included in Table 5 and figure 3, it was concluded the highest value for the 45th week of study was again recorded for the experimental series C. This seems again to support the opinion that choosing the standard values of technological parameters and the use of a classic bedding material has a favorable influence on the reproduction efficacy.

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

Specification	Fertile eggs	Clear eggs	Total	χ^2
A	a=125	b=19	a+b=144	0.09^{NS}
B	c=140	d=18	c+d=158	
Total	a+c=265	b+d=37	a+b+c+d=302	
A	a=125	b=19	a+b=144	3.21^{NS}
C	c=157	d=11	c+d=168	
Total	a+c=282	b+d=30	a+b+c+d=312	
B	a=140	b=18	a+b=158	1.80^{NS}
C	c=157	d=11	c+d=168	
Total	a+c=297	b+d=29	a+b+c+d=326	

As observed below, by analyzing the results included in Table 6, the table value being read with a degree of freedom and a significance level of 0.05, it is concluded that there are no significant differences from a statistical point of view between the values of the fertility rate recorded during the three experimental series, in the 45th week (it would be accepted a null hypothesis according to which the conditions of the different experimental series would not differ from one another concerning the efficacy).

Thus, it can be concluded that for the 45th week as well, the influence of the technological parameters and the type of bedding material chosen to be used, on the fertility rate does not present any statistical significance, the observed differences being caused by various other factors, mainly the sample errors, which are known not to influence the obtained results.

CONCLUSIONS

The results obtained during this study would suggest the fact that the different types of microclimate, the sex ratio and the type of bedding material do not influence significantly the characteristics associated to the reproduction efficiency. Most probably, these traits are controlled by far more complex mechanisms.

Also, the results of the present study would suggest that, at least for the team's chosen experimental conditions, the use of values set above the standard limits and the rice hulls as bedding material would have a certain negative effect, associated to stress, on the reproduction process and consequently on the fertility rate.

Although the results are not statistically significant, they could favor the conditions chosen for experimental series C, using a classic wood shavings bedding material as well as standard values for the technological parameters. As such, the fertility would record higher values, of over 3-5 %, in comparison to the rest, a very important success for the economic efficiency at the farm level (though not from a scientific point of view as well).

REFERENCES

Drăgănescu C., 1979. Ameliorarea animalelor. Ed. Ceres, Bucureşti.

Drăgănescu C., Grosu H., 2003. Ameliorarea animalelor. Editura AgroTehnica, Bucureşti.

Dragomirescu L., 1999. Lucrări practice de biostatistică. Editura Ars Docendi, Bucureşti.

Hocking P.M., R. Bernard, 2000. Effects of age of male and female broiler breeders on sexual behavior, fertility and hatchability of eggs. Br. Poult. Sci., 41:370-377.

Ruth Helen McGovern, 2002. Reproduction in male broiler breeders, Athens, Georgia.