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STUDIES ABOUT INFLUENCE OF BREEDING TECHNOLOGY ON EJACULATE VOLUME OF BROILER BREEDER ROOSTERS

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Abstract

Study aimed to analyze influence of some microclimate factors (light intensity, bird's density and sex percentage) and litter material on semen quality (ejaculation volume) in broiler breeding males. Researches are part of a large study to analyze semen material and breeding efficiency of broiler breeding hybrid parents. Researches were performed during a two years period on ROSS 308 commercial hybrids with 25 roosters and 250 laying hens and three control weeks (25, 35 and 45) during breeding period (19-64 weeks). Three experimental groups were formed as one for each trial (A - with analyze parameters sub-standard and litter made of chopped straws; B - with analyze parameters above standard and litter made of rice hulls and C - with analyze parameters at the level recommended by the manufacturer of biological material and litter made of wood shavings). Ejaculation volume has been between 0.74 ±0.04 ml in week 25 - trial A and 1.20 ± 0.06 ml in week 45 - trial C. Results of trial B experiments are above the other ambient conditions with the exception of ejaculation volume in week 45. Results would seem to support usage of technological parameter values above standard recommendations and a litter made of rice hulls.

Key words: *litter, roosters, density, light intensity, ejaculation volume.*

INTRODUCTION

Bird's usual spermatogram is varying according to some factors among whom the most significant are: specie, race, age, management, feed, breeding usage regime (Vacaru Opriș, 2002; Dumitrescu, 1978, Jarinkovicova L. et al., 2012).

Ejaculation volume is having a slight rise at the beginning of breeding season in all bird species and races at it is decreasing afterwards according to organism's aging and physiological resources depleting process curb. Decrease is different for each individual (Bunaciu, 2009; Peters S.O. et al., 2008).

Average ejaculation volume in roosters is varying between 0.5 and 1.0 ml, but volumes under and above these values are constantly obtained (Parker et al., 1940; Sturkie and Opel, 1976; Orunmuyi Modupe et al., 2013; Almahdi A.B. et al., 2014)). Average ejaculation volume in main bird species (Lake, 1978) is being as following: Cornish roosters 0.35 ml (values between 0.1 and 0.9 ml), Leghorn roosters 0.15 ml (values between 0.05 and 0.3 ml), mixed races roosters 0.2 ml (values between 0.08 and 0.5 ml).

Roosters estimated sperm quality is related with individual fertilization capacity (Wishart and Palmer, 1986, Hani N. Hermiz et al., 2016).

MATERIALS AND METHODS

Roosters fecundity is directly depending by seminal material's qualities (volume, concentration, mobility etc. - Bunaciu, 1978). Technological factors (temperature, humidity, density, light intensity and period, litter quality etc.) might affect rooster's fecundity. There is a significant decrease of seminal material parameters in roosters in some stress conditions due to microclimatic factors similar to female fecundity dropping.

Researches were performed during a two years period on ROSS 308 commercial hybrids to study influence of some microclimate factors (light intensity, bird density and sex

proportion) on semen quality in broiler breeders (hen). Studied parameter was analyzed in three different experimental situations (three experiment series):

- trial A with some microclimate factors at sub-standard values and litter made of chopped straws;
- trial B with analyze parameters above standard and litter made of rice hulls;
- trial C with analyze parameters at standard values and litter made of wood shavings.

Work was done in three houses, one for each experimental trials: Avicola Călăraşi, S.C. Agrafood S.A. and Avicola Focşani and observations and records were performed in three control weeks (25, 35 and 45) during production period (19-64 weeks) during two years on 25 males and 250 females from each experimental group.

Microclimate parameters of trial A experiments considered have been:

- litter: chopped straws;
- sub-standard light intensity: 30 lux;
- sub-standard bird density: 3 males/m^2;
- sex proportion substandard: 25 weeks - 8 birds, 35 weeks - 7.5 birds, 45 de weeks - 6.5 birds.

For trial B experiments microclimate parameters considered have been:

- litter: rice hulls;
- light intensity above standard: 70 lux;
- bird density over standard: 5 males /m^2;
- sex proportion above standard: 25 weeks - 9 birds, 35 weeks - 8.5 birds, 45 weeks - 7.5 birds.

Trial C had following microclimate parameters:

- litter: wood shavings;
- light intensity standard: 40 lux;
- bird density standard: 4 males/m^2;
- sex proportion standard: 25 weeks - 8.5 birds, 35 weeks - 8 birds, 45 weeks -7 birds.

Poultry were kept in uniform conditions in the three houses (corresponding to the three experimental groups), on permanent litter (large captivity), in upgraded houses, with feed and water delivered according to the technical book of the hybrid. Birds analyzed in the three trials had the same feeding conditions to assure compatibility of results.

During production period was analyzed *semen quality* (ejaculation volume) by direct assessment in the collecting bowl.

Phonotypical characterization of groups was performed by classical statistical methods (Sandu, 1995) and study of parameters variation which has a normal repartition was performed using *Student* test to compare average homogeneities of two samples (Sandu, 1995; Dragomirescu, 1999).

RESULTS AND DISCUSSIONS

We are about to point to average value of characters analyzed in the three trials and statistical significance of differences observed between averages to emphasize the possible influence of microclimate factors (birds density, light intensity and sexes percentage) and of litter used on quantitative and qualitative parameters of semen material (ejaculation volume). Observations and records were performed in three control weeks (25, 35 and 45) during the production period (19-64 weeks).

In Table 1 and figure 1 are shown values for ejaculation volume from individuals in trial A during the three control weeks. These values are inside normal limits for species concerned and a high variability is noticed during all three control weeks.

Table 1. Average values of ejaculate volume for first experience series (trial A)

Week	n	$\bar{X} \pm s_{\bar{X}}$ (ml)	s	c.v.%
25	25	0.74 ± 0.04	0.21	29.46
35	25	1.00 ± 0.05	0.27	26.69
45	25	1.08 ± 0.05	0.25	23.13

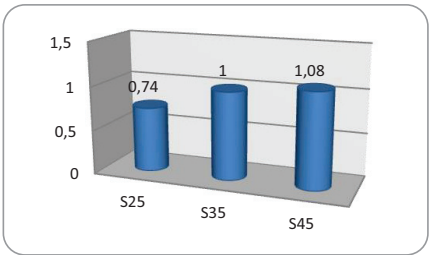

Figure 1. Average values of ejaculate volume for first experience series (trial A)

Data analyze are revealing that ROSS 308 roosters had biggest ejaculation volume (1.08 ±

0.05 ml) in week 45 compared with weeks 35 (1.00 ± 0.05 ml) and 25 (0.74 ± 0.04 ml).
It was tested the statistical significance of differences observed between average values of the character and in Table 2 are shown values calculated by Student test.

Table 2. Testing the significance of differences observed between the three control weeks in terms of volume of ejaculat, first series (trial A)

Specification	S25	S35	S45
S25	-	6.08^{***}	8.07^{***}
S35		-	0.87^{NS}

Calculated values of Student statistics point to highly statistical significant differences between average values of ejaculation volume obtained during the three control weeks excerpting last combination which are showing that between weeks 35 and 45 differences are not significant. As groups had same environmental conditions during whole trial observed differences between weekly averages in trial A could be explain most probable by physiological processes during incomplete spermatogenesis in first weeks of adult period.
Values for ejaculation volume from individuals in trial B from adult period are shown in Table 3 and graph from figure 2.

Table 3. Average values of ejaculate volume for second experience series (trial B)

Week	n	$\bar{X} \pm s_{\bar{X}}$ (ml)	s	c.v.%
25	25	0.82 ± 0.06	0.28	34.56
35	25	1.12 ± 0.05	0.26	22.88
45	25	1.11 ± 0.05	0.26	23.81

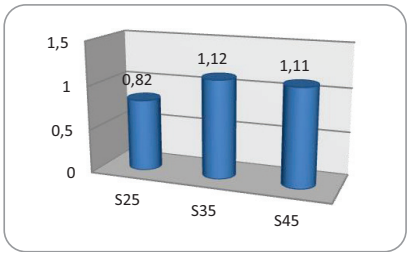

Figure 2. Average values of ejaculate volume for second experience series (trial B)

Ejaculation volume during the three control weeks stays inside normal limits of specie however a high variability is noticed throughout the controlled period and higher in week 25. This heterogeneity of observations might be due to human error because collecting semen from roosters is somehow tricky.
In trial B compared to trial A hierarchy of control weeks is changed. Highest ejaculation volume was obtained in week 35 (1.12 ± 0.05 ml) and the lowest in week 25 (0.82 ± 0.06 ml). Observed differences between averages of analyzed character were tested and found statistically significant (Table 4); there were found differences with different degrees of signifycance between average values of ejaculation volume in the three control weeks of trial B most probable due to physiological processes and with human error not excluded. There are also noticed higher values of ejaculation volume in trial B. Considering the uniformity of feeding condition and usage of the same genetic type higher values could be due to microclimate parameters above standard and a litter of rice hulls.

Table 4. Testing the significance of differences observed between the three control weeks in terms of volume of ejaculat, second series (trial B)

Specification	S25	S35	S45
S25	-	8.56^{***}	11.02^{***}
S35		-	0.76^{NS}

Ejaculation volume values obtained from individuals in trial C in adult period (Table 5, figure 3) has been inside normal species limits with a high variability throughout the production period.

Table 5. Average values of ejaculate volume for third experience series (trial C)

Week	n	$\bar{X} \pm s_{\bar{X}}$ (ml)	s	c.v.%
25	25	0.80 ± 0.06	0.2765	34.563
35	25	1.10 ± 0.05	0.2517	22.884
45	25	1.20 ± 0.06	0.2857	23.806

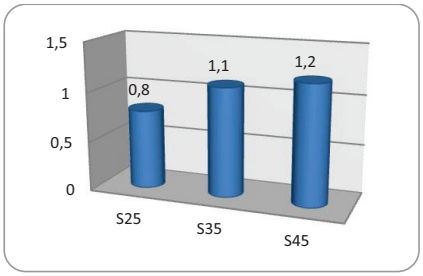

Figure 3. Average values of ejaculate volume for third experience series (trial C)

Hierarchy by control weeks is similar to trial A because ejaculation volume was higher in week 45 (1.20 ± 0.06 ml) and lower in week 25 (0.80 ± 0.06 ml).

There are noticed differences between average values of ejaculation volume with different degrees of statistical significance in the three control weeks of trial C most probable due to physiological picture of each individual plus the human factor (Table 6). There are also noticed higher values of ejaculation volume in trial C in week 45 compared to the other trials and considering the uniformity of feeding condition and usage of the same genetic type higher values could be due to microclimate parameters at standard values and a classical wood shavings litter. We notice however that this superiority might be also obtained by chance (sampling error).

Differences observed between ejaculation volume averages in the three trials (A, B, C) (Figure 4) throughout the control period are tested for statistical significance to validate influence of microclimate parameters, sex proportion and litter type on quality of semen from ROSS 30 roosters.

Table 6. Testing the significance of differences observed between the three control weeks in terms of volume of ejaculat, third series (trial C)

Specification	S25	S35	S45
S25	-	10.27^{***}	11.98^{***}
S35		-	1.86^{*}

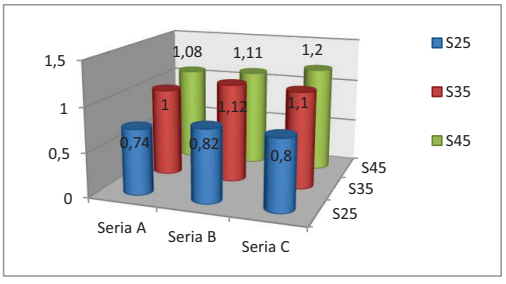

Figure 4. Comparative between the three expreimental series (A, B, C) on ejaculate volume

Calculated values of Student test shown in Tables 7-9 are revealing statistical significant differences between averages of ejaculation volume. There are noticed very significant differences between averages inside trial A and the other two trials excepting week 45.

Results obtained during trial B are superior to the other environmental condition with only one exception of ejaculation volume in control week 45 de. Student test value for this situation (1.96^{*}) although significant is not relevant because sample is highly heterogeneous probable due to human error.

Table 7. Testing of significance for differences between experimental series, 25th week, for ejaculate volume

Specification	t test value
A-B	6.37^{***}
A-C	6.94^{***}
B-C	1.43^{NS}
$t_{49;0.05} = 1.68$; $t_{49;0.01} = 2,40$; $t_{49;0.001} = 3,50$	

Table 8. Testing of significance for differences between experimental series, 35th week, for ejaculate volume

Specification	t test value
A-B	11.73^{***}
A-C	9.67^{***}
B-C	0.79^{NS}
$t_{49;0.05} = 1.68$; $t_{49;0.01} = 2,40$; $t_{49;0.001} = 3,50$	

Table 9. Testing of significance for differences between experimental series, 45th week, for ejaculate volume

Specification	t test value
A-B	1.21^{NS}
A-C	8.21^{***}
B-C	1.96^{*}
$t_{49;0.05} = 1.68$; $t_{49;0.01} = 2,40$; $t_{49;0.001} = 3,50$	

Results seem to plead for usage of values of technological parameters higher that those recommended by standard and a litter of rice hulls.

We notice however that ejaculation volume although important, is not crucial to describe semen. The other characters concerning spermatozoa mobility, concentration, morphological anomalies etc., with critical role in obtaining a good fertility and finally in assuring biological and economical efficiency of reproduction are especially important in describing semen fecundity. So environmental condition in trial B although better are not recommendable yet in practice and more investigations are necessary.

CONCLUSIONS

1. In trial A ROSS 308 roosters have had biggest ejaculation volume in week 45 (1.08 ± 0.05 ml) compared to weeks 35 (1.00 ± 0.05

ml) and 25 (0.74 ± 0.04 ml) and differences are highly significant statistical excepting the combination week 35-week 45.

2. In trial B highest ejaculation volume was obtained in week 35 (1.12 ± 0.05 ml) and the lowest in week 25 (0.82 ± 0.06 ml) with differences with different degrees of significance most probable due to physiological processes and with human error not excluded.

3. In trial C highest ejaculation volume was obtained in week 45 (1.20 ± 0.06 ml) and the lowest in week 25 (0.80 ± 0.06 ml) with differences with different degrees of statistical significance.

4. Superiority of ejaculation volume noticed in roosters from trial B might be assigned to microclimate parameters at values above standard and a litter of rice hulls.

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