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RESEARCHES ABOUT INFLUENCE OF BREEDING TECHNOLOGY ON EJACULATE pH OF BROILER BREEDER ROOSTERS

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Abstract

Researches are part of a large study to analyze semen material and breeding efficiency of broiler breeding hybrid parents. Study aimed to analyze influence of some microclimate factors (light intensity, bird's density and sex percentage) and litter material on semen quality (semen pH) in ROSS 308 broiler breeding males. Three experimental groups were formed (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) and in each trial 25 roosters and 250 laying hens from the ROSS 308 commercial hybrid were used. Researches were performed during a two years period with 3 control weeks (25, 35 and 45) during breeding period (19-64 weeks). Ejaculation pH has been between 7.30 ±0.08 in week 25 – trial A and 7.70 ± 0.10 in week 35 – trial B. Results about semen pH would seem to support usage of microclimate technological parameter values under standard recommendations and a litter made of chopped straws which would produce the lowest level of stress and so it would perturb the least reproduction of ROSS 308 broiler breeding males.

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

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; Bunaciu, 1977; Sexton, 1986, 1987, Jarinkovicova et al., 2012).

PH is concentration of hydrogen ions released by dissociation acids from sperm. Sperm pH in birds is close to blood pH and it is not significantly variable by specie (Peters et al., 2008, Hani et al., 2016). Sperm reaction is very important at membrane level where metabolically changes are taking place. Sperm reaction is different by level of genital apparatus segment. Adding of cloacae seminal plasma is slightly alkalinizing the sperm and so semen pH is varying from an ejaculation to another based on fluid quantity added.

PH, sperm concentration and metabolism are closely related (Orunmuyi et al., 2013, Almahdi et al., 2014). PH is having an influence on superficial tension, viscosity and absorption values. Viscosity increases direct proportional with temperature and sperm concentration and inverse proportional with pH (Dumitrescu, 1978; Fujihara, 1985). Hydrogen ions are influencing enzymatic reactions and they are able to accelerate or delay chemical processes (Bunaciu, 2009). During conservation perm reaction is evidently changing and becomes slightly alkaline.

MATERIALS AND METHODS

Broiler breeder farm are one of the most important link in poultry meat production chain. In this activity is imperative to understand basic reproductive physiology of both sexes to be able to apply management rules about feeding, maintenance, lighting programs and sanitary and veterinary management.

So, researches from this paper aimed to study efficiency of reproduction in ROSS 308 hybrid roosters concerning influence of some microclimate factors (light intensity, bird's density and sex percentage) and some other

characters which determine together rooster's semen quality influences hatchability and finally biologic and economic efficiency of reproduction.

So considering the goal aimed works were performed during two years in three houses, one for each trial: Avicola Călăraşi, S.C. Agrafood S.A. and Avicola Focşani, on 25 roosters and 250 partner hens in 3 control weeks (25, 35 and 45) during production period (19-64 weeks).

In trial A aiming influence of some microclimate factors at sub-standard values on characters determining semen quality following microclimate parameters are considered:

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

Trial B analyzed effect of microclimate parameters above limits on characters which determine semen quality and microclimate parameters considered were:

- 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 analyzed influence of keeping microclimate parameters at standard value on semen quality and microclimate parameters were:

- 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.

During production period was analyzed *semen quality* (ejaculation pH) found with a pH-meter. 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

Semen quality is influenced by many factors (genetical type, season, age, feeding, maintenance system, etc.) but only litter type and microclimate factors were taken into account to evaluate and compare results about semen quality (ejaculation pH).

Semen pH appreciation is particularly important especially if artificial insemination is practiced or when biologic material (gene) banks are founded when conserving roosters sperm by freezing is needed.

There is a relationship between semen quality and its pH. As good a sperm is in aspect and mobility of spermatozoa as acidic its pH is.

Obtained values for pH of ejaculation from individuals in trial A are inside normal limits for species concerned and a low variability is noticed during all three control weeks (Table 1 and Figure 1). During first two weeks these tended to migrate to neutral zone probable in correlation with the other sperm qualitative parameters.

Table 1. Average values of ejaculate pH for first experience series

Week	n	$\bar{X} \pm s_{\bar{X}}$	s	c.v.%
25	25	7.40 ± 0.08	0.42	5.68
35	25	7.30 ± 0.08	0.42	5.79
45	25	7.50 ± 0.05	0.27	3.59

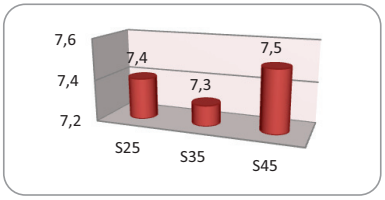

Figure 1. Average values of ejaculate pH for first experience series

Differences observed between average values of pH during the three control weeks were statistically tested (Student test, Table 2) and are not significant being caused by chance or individual variation.

Table 2. Testing the significance of differences observed between the three weeks in terms of pH of ejaculat, first series

Specification	S25	S35	S45
S25	-	0.42^{NS}	1.05^{NS}
S35		-	1.52^{NS}

Values for ejaculation pH from individuals inside trial B (Table 3, Figure 2) are revealing pH values of species with a low heterogenity of observations during the three observation weeks as in trial A.

Table 3. Average values of ejaculate pH for second experience series

Week	n	$\bar{X} \pm s_{\bar{X}}$	s	c.v.%
25	25	7.70 ± 0.10	0.48	6.24
35	25	7.50 ± 0.12	0.58	7.78
45	25	7.60 ± 0.09	0.45	5.98

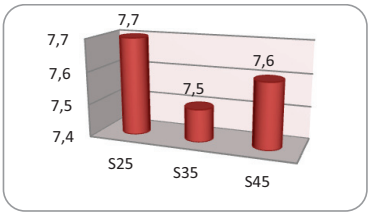

Figure 2. Average values of ejaculate pH for second experience series

Student Test (Table 4) is revealing statistically significant differences of pH value between weeks 25 and 35 other differences being caused by chance or individual variation with no statistical significance.

Table 4. Testing the significance of differences observed between the three weeks in terms of ejaculat pH, second series

Specification	S25	S35	S45
S25	-	1.71^{*}	0.93^{NS}
S35		-	1.32^{NS}

PH values in trial B were higher aiming to basic zone so we could expect to a lower semen quality. Considering that individuals received the same feeding condition and it was the same genetic type this time results seem to emphasize an unfavorable influence of technological parameters values and litter type (rice hulls) on sperm quality.

PH values in trial C (Table 5, figure 3) are found inside normal limits with lower variability among all trials most probable due to environmental conditions at standard values and usage of a classical wood shavings litter.

Table 5. Average values of ejaculate pH for third experience series

Week	n	$\bar{X} \pm s_{\bar{X}}$	s	c.v.%
25	25	7.60 ± 0.03	0.17	2.27
35	25	7.50 ± 0.05	0.26	3.52
45	25	7.60 ± 0.05	0.24	3.19

Noticed differences between average values of semen pH during the three control weeks of adult period were tested for statistical significance (Table 6) and they were found not significant statistical.

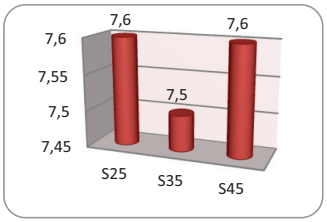

Figure 3. Average values of ejaculate pH for third experience series

Table 6. Testing the significance of differences observed between the three weeks in terms of ejaculate pH, third series

Specification	S25	S35	S45
S25	-	0.57^{NS}	1.05^{NS}
S35		-	0.76^{NS}

Differences observed between averages registered in the three trials are revealing some important aspects of rooster's semen quality (Figure 4). On one side lowest pH values were obtained inside trial A where apparently usage of some technological parameters under standard values and a chopped straws litter would have a favourable influence on roosters reproductive capacity by diminishing pH value which is correlated as known with a better value of the other quality indexes. On the other side highest pH values were obtained in week 25 of life when physiological processes on which spermatogenesis is based probable are not at the peak. Thirdly using some microclimate parameters above standard technological values has a negative influence on semen pH and very possible on the other quality indexes because of stress. It is well

known that stress affects firstly functions linked to adaptation process including reproduction. Although we noticed that in all three trials pH values are inside normal limits so biological and economical efficiency of houses should not be a problem.

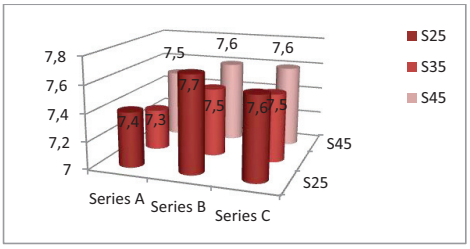

Figure 4. Comparative between the three experimental series on ejaculate pH

Calculated values of Student test shown in tables 7-9 are revealing differences with differed degree of statistical significance between pH averages registered in trial A and those registered in the other two trials excepting week 45 of life. Differences between trials B and C are not significant or zero for weeks 35 and 45.

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

Specification	t test value
A-B	4.37^{***}
A-C	2.86^{**}
B-C	1.46^{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 pH

Specification	t test value
A-B	2.02^{*}
A-C	2.77^{**}
B-C	0
$t_{49;0.05} = 1.68$; $t_{49;0.01} = 2,40$; $t_{49;0.001} = 3,50$	

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

Specification	t test value
A-B	1.58^{NS}
A-C	1.61^{NS}
B-C	0
$t_{49;0.05} = 1.68$; $t_{49;0.01} = 2,40$; $t_{49;0.001} = 3,50$	

So considering the semen pH results seem to plead for usage of values under the technological standard of macroclimate parameters de and a litter of chopped straws condition which would produce lower amount of stress and so would perturb the least ROSS 308 male's reproduction. We emphasize however that this conclusion is only partial and more investigations are necessary to draw correct conclusions.

CONCLUSIONS

1. In trial A are noticed differences with no statistical differences between average values of ejaculation pH in the three control weeks.
2. In trial B calculated values of Student test are revealing significant differences in pH values between weeks 25 and 35 the others being caused by chance or individual variation with no statistical significance. Registered pH values are higher aiming to basic zone of pH so we could expect to a lower semen quality.
3. In trial C observed differences are found not significant statistical.
4. Considering the semen pH it could be recommended usage of values under the technological standard of macroclimate parameters de and a litter of chopped straws.

REFERENCES

Almahdi A.B. et al., 2014. Comparative studies of semen quality on different breed of chicken in poultry breeding center temanggung central Java, International Refereed Journal of Engineering and Science, 3(2).

Bunaciu P., 1977. Însămânţarea artificială a găinilor de reproducţie crescute în baterii, Rev. Creşterea Animalelor, no. 10.

Bunaciu P., Bunaciu Maria, Dojană N., 2009. Reproducţia păsărilor, Ed. Printech, Bucureşti.

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

Dumitrescu I., 1978. Însămâmţările artificiale la animale. Ed. Ceres, Bucureşti.

Fujihara N., 1991. Comparative phisiology of avian semen and spermatozoa. Advances in Reproductive Biology. Coo Yongqing, Zhu Cheng Beijing, 132-155.

Hani N. Hermiz et al., 2016. Evaluation semen caracterization of roosters resulted from different local lines and their crosses with ISA Brown, International Journal of Agricultural Science, Vol. 1.

Jarinkovicova L. et al., 2012. Relationship oj ejaculate quality and selected biochemical parameters of blood in cockerels of three layng lines. Chech Journal Animal Science, No. 57.

Orunmuyi Modupe et al., 2013. Semen quality characteristics and effect of mating ratio on

reproductive performance of Hubbard broiler breeders, Journal of Agricultural Science, 5(1).
Peters S.O. et al., 2008. Semen quality traits of seven strain of chickens raised in the humid tropics, International Journal of Poultry Science, no. 7.
Sandu Gh., 1995. Modele experimentale în zootehnie, Ed. Coral Sanivet.
Sexton T.J., 1986. Effects of dietary protein and season on fertility of turkey semen stored 18 hours at 58C. Poult. Sci., 65, 604–606.
Sexton T.J., 1987. Effect of semen treatments and age of tom on fertility of unstored semen and semen held18 hours. Poult Sci., 66, 1721–1726.
Vacaru – Opriş I. et al., 2002. Tratat de Avicultură, vol II, Ed. Ceres, Bucureşti.