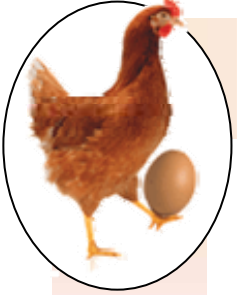

2009

RESEARCH REPORT

"Ion Ionescu de la Brad" Iaşi University of Agricultural Sciences and Veterinary Medicine

Project type: **PN-II-ID-PCE-2007-1**

Grant no.: **681/350**

Project budget: **1,000,000 lei**

Topic:

"STUDY OF THE YIELD FEATURES, BEHAVIORAL AND ANATOMO-PHYSIOLOGICAL ADAPTABILITY OF SOME LAYING HYBRIDS WITHIN THE CONDITIONS OF DIFFERENT RAISING ALTERNATIVE SYSTEMS"

STAGE 2009
- single stage -

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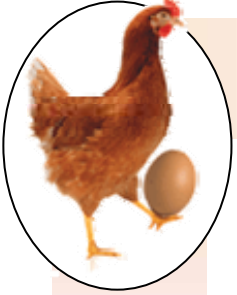


2009

RESEARCH REPORT

SYNTHESIS OF THE RESEARCH REPORT FOR THE 2009 STAGE (SINGLE)

1. RESEARCHES GOAL

Operation of hens superintensive system in the industrial complex type has been imposed due to increasing consumer demand for poultry products on market.

This technique allows the exploitation at very high yields, close to the genetic potential of birds following the conveyance of ambient factors, the practice of nutritional science and use of ultraspecialized biological material.

On laying hens, it is estimated that more than 75% of existing flocks in the world are operated in batteries, as superintesive rearing system. However, during recent years, there is increasing pressure from animal welfare organizations, which urges waiver-intensive industrial systems operating in isolated spaces; in hens, the problem is represented by the battery cages, deployed in environmental controlled halls.

In this socio-economic conjuncture, poultry specialists were forced to focus on studying various alternatives for poultry farming and translate them into technical and economical viable systems, which should replicate those elements of the natural habitat of birds, till the limits of the productive potential which they possess.

2. THE BIOGICAL MATERIAL

To complete the first phase goal of 2009, we still worked on the commercial hybrid "Lohmann Brown, acquired at the age of 18 weeks from a farm specialized in the rearing of replacement pullets. Period of two weeks from pullets purchase was considered as acclimatizing period. The hybrid we used was created in Germany, from four lines of pure-breed Rhode Island (male cocks hybrids = roosters A x female B and female hybrid female= roosters C x females D). Hybrids "Lohmann Brown" are very precocious, reaching an intensity of 40% lay at the age of 20 weeks, while laying peak is reached at the age of 28 weeks (93%). In 60 weeks, "Lohmann Brown produces on average 337 5 eggs.

Under Objectives 2 and 3, the biological material was the commercial hybrid "Hisex Brown, raised since the age of 18 weeks until the 80th week, and including the first two weeks that were considered for acclimatization.

"Hisex Brown is a quiet bird, tailored to the battery cages and is credited with a production of 339 eggs per bird, while the laying maximum intensity reaches 94%.

In the 60 weeks of usage, the hybrid "Hisex Brown has a total consumption of 46 kg feed / bird and a mortality rate of 6.6%.

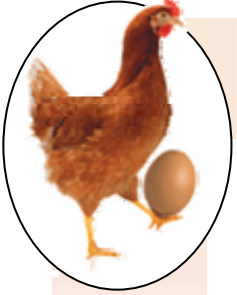
3. EXPERIMENTAL DESIGN

The 2009 of the research contract entitled "Study of the yield features, behavioral and anatomo-physiological adaptability of some laying hybrids within the conditions of different raising alternative systems" comprised 3 goals, with their subsequent activities:

The 1st goal included the finalising of the activities related to the behaviour of genotype A – "Lohmann Brown". As in the previous stage (2008), certain technological solutions were used, as following:

- accommodation and rearing in size-modified cages;
- accommodation and rearing in opened cages
- accommodation and rearing on permanent litter, at ground, in halls providing externat access.

Goals 2 and 3 had genotype B in the assessment of productivity, ie the "Hisex Brown" hybrid.



Three experiments were held, distinguished by the rearing system and technology; the first two experiments was used the same control group (LC-1B), whom were applied the principles superintensive husbandry system - rearing in classical BP-3 type battery; and for the 3rd experiment another control group (LC-2B) was used, under the conditions of the intensive system of farming - rearing on permanent litter.

Experience: "The morpho-productive assessment and behavioral response of genotype B (hybrid Hisex Brown) to the conditions provided by the system battery cages increase in dimensional change (Table 1)

Experiment I: "Evaluation of the morpho-productive and behavioural response of the B genotype ("Hisex Brown" hybrid) at the conditions provided by the husbandry system which included size modified cage batteries" *(tab. 1).*

Table 1

Experimental design for experiment I

Notice	Experimental group		
	Lc-1B	Lexp-1B	Lexp-2B
Husbandry system	Superintensive	Superintensive	Superintensive
Brooding density	4 hens/cage of 2000 cm^2	5 hens/cage of 3000 cm^2	6 hens/cage of 6000 cm^2
Cage type	standard	modified	modified
Surface of cage floor/hen (cm^2)	500	600	1000
Innitial flock (cap.)	432	435	432
Cages amount	108	87	72
Cages size (cm)	L=40; w= 50	L=60; w= 50	L=120; w= 50
Cage surface (cm^2)	2000	3000	6000

Lexp-1B group – hens accommodated in B.P.-3 battery, with cages modified at 3000 cm^2 floor surface; brooding density 5 hens/cage, 600 cm^2/hen.

Lexp-2B group –hens accommodated in B.P.-3 battery, with cages modified at 6000 cm^2 floor surface; brooding density 6 hens/cage, 1000 cm^2/hen.

Experiment II: "Evaluation of the morpho-productive and behavioural response of the B genotype ("Hisex Brown" hybrid) at the conditions provided by the husbandry system which included opened cage batteries" *(tab. 2).*

Table 2

Experimental design for experiment II

Notice	Experimental group	
	Lc-1B	Lexp-3B
Husbandry system	Superintensive	Intensive
Brooding density	4 hens/cage of 2000 cm^2	4 hens/cage of 2000 cm^2
Cage type	standard	Modified
Surface of cage floor/hen (cm^2)	500	500 cm^2 in resting+nesting cage and 500 cm^2 in feeding and watering cage
Innitial flock (cap.)	432	432
Cages amount	108	108
Cages size (cm)	L=40; l= 50	L=40; l= 50
Cage surface (cm^2)	2000	2000

Lexp-3B group – accomodated in B.P.-3 battery, with unchanghed cages, whose front panels were removed, providing movement fredom across the entire hall floor.

Meantime, the cages from each battery lines were resetricted to certain limited features (feeding and watering on a side and laying+resting on the opposite side).

Experiment III: "Evaluation of the morpho-productive and behavioural response of the B genotype ("Hisex Brown" hybrid) at the conditions provided by the husbandry system which included access to external paddocks *(tab. 3).*

Table 3

Experimental design for experiment III

Groups	Lc-2B	Lexp-4B
Husbandry system	Intensive	Semi-intensive
Rearing and exploiting technology	permanent litter	permanent litter, poles panels for sleeping and free acces to an external paddock
Surface of compartments	252 m^2	252 m^2
Brooding density	6.0 hens/m^2	7.5 hens/m^2
Innitial flocks	1512 hens	1890 hens
Feeding space	10 cm/hen	
Watering space	3 cm/hen	
Nests	1 nest/5 hens	

Lexp-4B group–was reared in compartment II, according to the semi-intenisve system, on permanent litter and having free acces to an external paddock. House floor was covered by a litter of minced hay, 15 cm thick. Acces towards paddock was granted through 4 small doors. Wateres and feeder have been disposed both inside the compartment and otside, on the paddock surface (under a covered area).

4. APPLIED RESEARCH METHODS

Multiple traits have been investigated throughout the researches, assessed in accordance to certain recognised methods:

- blood traits have been assessed by the ABX Micros VET ABC authomated analysor. Certain smears were done, in order to observe and analyse the figurate cells morphology;
- dressed weight (%)- percentage ratio between carcasses weight and live weight prior to slaughter;
- proportion of cut parts (%)-main trenched parts have been weightd and reported to the weight of originating carcasses;
- body weight dynamics (g)-control weightings in each group;
- eggs yield dinamics (eggs/hen)-weekly, for each group;
- laying intensity (%)-weekly, basing on the weekly flock size and yield values;
- feed consummption: whole intake (kg/group/period); average daily intake (g/hen/day); feed conversion (g feed/egg);
- health status of the fowl: (%) mortalities;
- eggs weight (g)- weighting;
- morphologic anomalies (% eggs with malformed shell; % eggs without yolk; % eggs without shell; % eggs with double yolk; % eggs with broken shell);
- eggshell thickness;
- eggshell braking strength;
- eggs chemical composition*:* albumen (% dry matter, % proteins), yolk (% dry matter, % proteins; % lipids), shell (% minerals);
- microbial load on the shell (germs/cm^2)

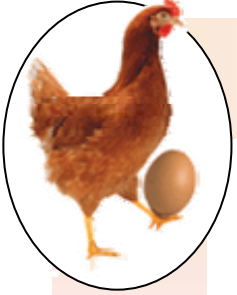
Quality traits have been assessed on the eggs produced during the main stages of laying curve (onset - 20th week; peak-28th week; plateau-37th week and ceasing-80th week).

Main experimental data have been statistically processed.

5. ACHIEVED RESULTS

5.1. Goal no. 1

On blood cell morphology analysis, no changes occurred during the study.



If at the beginning of laying birds (20th week of life), RBC's average was 2.27 x 106/mm^3, while PCV was within the area bounded by the minimum 27.43%-in group LC-2 and maximum of 29.5%-in- group Lexp-1. If MCV parameter revealed a notable difference between the minimum (118.0 µm^3) and maximum (132.3 µm^3) values determined. Regarding MCHC values, differences between the two control groups were 18.9 g/100ml, compared to only 2.5 g/100ml as was between experimental groups. WBC presented a mean value of 20.83 x 103/mm^3 in experimental groups.

At the end of experiments (80 weeks old birds), RBC's was determined in an appropriate quantity of 2.85 x 106/mm^3. Comparing the mean values of PVC's at ages 20 and 80 weeks, its superiority was observed in the right period of time before, this being 33.33% compared to only 28.3% of youth. Average results determined for MCV were lower (119.26 µm^3) at the age of 80 weeks compared to the same parameter values determined at 20 weeks. Field of employment for MCH was less extensive field belonging to the corresponding values determined at 20 weeks, maximum (53.5 pg) was recorded in individuals of group Lexp-4. MCHC values have ranged from a minimum of 43.0 g/100ml in individuals from group Lc-1 and a maximum of 47.2 g/100ml in Lexp-2 group. WBC's limits have evolved from a lower value of 23.6 x 103/mm^3 in LC-2, corresponding to a maximum of 29.7 x 103/mm^3 in group Lexp-1.

Experiment I. *Dressed weight*, established for control group (LC-1) was 65.60%, with 0.02 to 0.42% higher than that achieved in the experimental groups Lexp-1 and Lexp-2. On the *quality of meat produced*, our data showed a participation rate of remnants of 20.67 to 24.47%, from 17.78 to 18.81% of the breast, 34.45 to 35.91% for thighs and shanks, respectively of 12.50 to 13.50% for the wings.

Experiment II. The difference between groups on *slaughter yield* was insignificant. The values we determined were of 65.60% in group Lc-1 and 65.72% in Lexp-3. *Quality of meat production* was higher in birds from group Lexp-3, both for breast (19.25% vs.. 17.78%), for thighs and shanks (36.62. vs. 34.45%) and wings (14.20% vs.. 12.50%), while the chickens from LC-group proved to have predominant proportion of remanants (24.47% vs. 18.75%).

Experiment III. Calculating the *yield at slaughter*, showed a value of 64.81% in hens housed on permanent litter (group LC-2) and 64.86% in those who had access to outdoor paddock (Lexp-4). *Meat production quality* was better in group Lexp-4 for breast (19.05%), thighs and shanks (38.40%) and wings (14.27%), while in group LC-2, the proportion of remnants was predominat (18.78%).

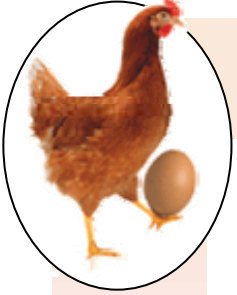
5.2. Goal no. 2

After conducting specific research on goal no. 2 (Evaluation of genotype B morpho-productive response to the provided rearing conditions), it resulted a series of conclusions, grouped into three series of experiments presented below.

Experiment I. *Production of eggs* from birds raised in classical batteries (group LC-1B) was 324.17 pcs., compared to only 316.32 pcs. as was obtained in group Lexp-1B, respectively to 314.98 pcs. as in the group Lexp-2B. Birds components of the three groups have reached maximum *intensity lay* in the 28th week of life, but with values lower than the theoretical potential of hybrid (94%), being only 90.95% in group LC-1B, 88.28% in group Lexp-1B and 87.61% in group Lexp-2B.

The *proportion of morphologically abnormal eggs* was 1.57% in group LC-1B, with 0.11% higher than Lexp-1B and 0.18% than in group Lexp-2B. Although *egg weight* did not differ significantly between groups, it showed an average value of only 59.36 g in group LC-1B, from 59.49 g in Lexp-1B and 59.47 g in Lexp-2B.

Shell thickness was negatively correlated with laying intensity, being at an average of 0.386 mm at the highest production hens eggs (LC-1B), compared to 0.390 mm as found in birds with the lowest egg production (Lexp-group 2B). Mineral shell thickness has led to



its *break strength values* that were, on average, of 0.329 kgf/cm^2 LC-1B, of 0.331 kgf/cm^2 in Lexp-1B and of 0.333 kgf/cm^2 in Lexp-2B.

Chemical constituents of yolk showed no significant differences between groups, but rose slightly from one stage to another control. The *chemical composition of the albumen* was kept relatively constant from one stage to another control, as no *amount of minerals in shell* did not differ significantly between groups. In group LC-1B was determined on *average microbial load of the shell* of 138.90 germs/cm^2, higher with 1.87-7.83 germs/cm^2, than the experimental groups (Lexp-1B and Lexp-2B).

Body weight of birds in the three groups located close enough to the standard curve of the used hybrid (Hisex Brown); the differences at the end of experiment, compared to theoretical performance were only 0.21 g in those from group LC-1B, of 1.22 g in group Lexp-1B and of 4.88 g in group Lexp-2B.

Productivity of the birds influenced *feed consumption*, the best conversion index (150.29 g / egg) was achieved by the group LC-1B, and the most inconvenient (161.42 g / egg) by the group-Lexp 2B.

Experiment II. Maximum *intensity of laying* was achieved by the hens in control group (LC-1B) - 90.95%, respectively just 87.25% in group Lexp-3B. Eggs yield has been differentiated between groups, being of 324.17 eggs per bird in group LC-1B and only 313.54 eggs per bird in group Lexp-3B.

In opened cages hens (group Lexp-3B), average *proportion of eggs with morphological abnormalities* was 1.75%, compared to only 1.57%, as was found in chickens reared in unchanged battery (group LC-1B). *Eggs weight* in the hens of LC-1B group was 59.36 g, very close to that of eggs in group Lexp-3B (59.35 g).

Mineral shell thickness ranged from 0.346 to 0.438 mm in group LC-1B (with an average of 0.386 mm/experimental period) and between 0.349 to 0.441 mm in group Lexp-3B (average 0.389 mm). *Egg shell breaking strength* recorded an average value of 0.329 kg f/cm^2 in LC-1B and 0.331 kgf/cm2 in Lexp-3B.

In terms of *chemical constituienţilor of yolk*. there were not found significant differences between the two groups. Similar situation was and *chemical composition of the white*. The quantity of *mineral salts in shell* although not varied significantly between groups but was higher in eggs laid by the birds with free access in the hall (Lexp-3B).

The existence of littere between batteries lines in group Lexp -3B resulted in a load of germs on shell 34.65% higher compared to LC-1B group (212.55 germs/cm^2 vs. 138.90 germs/cm^2) .

If in those birds raised in conventional batteries (group LC-1B), the *body weight* followed the standard curve, in those raised in opened batteries (group Lexp-3B), freedom of movement led to lower weights and were 16.46 g less, in the final growth cycle, ie in the 80th week of their life.

Naturally, *feed consumption* of the birds kept in opned battery cages (Lexp-3) was weaker than in the hens from the reference group (LC-1B). therefore, feed conversion index was 166.49 g / egg in the experimental group and 150.29 g / egg in the control one.

Experiment III. The system adopted for birds breeding in this series of experiments determines the achievement of the lowest *eggs production*, only 282.54 pcs. in LC-2B group and 272.72 in group Lexp-4B. *Laying intensity* showed its peak in the 28th week of birds life, but with values significantly below the theoretical possibilities of hybrid (94%), only 77.42% in group LC-2B and 74.98% in group Lexp-4B.

Morphologically abnormal eggs were found in an average rate of 1.43% in the permanent litter reared hens (group LC-2B) and of 1.36% - Lexp-4B. *Eggs weight* was 58.34 g in LC-2B hens, 1.18% higher than those obtained from hens in Lexp-4B group.

Mineral shell thickness averaged 0.364 mm only in the eggs collected from hens in group LC-2B, while for the eggs of Lexp-4B group, the same trait had an average of 0.381 mm. Naturally, the *shell breaking strength* was greater in eggs laid by hens with access to

the paddock (group Lexp-4B), of 330 kgf/cm^2, compared to just 0.328 kgf/cm^2 in the eggs found in control group.

The *chemical composition of yolk* and that of the *albumen*, did not show significant differences between the two groups of experience. The amount of *minerals in egshells* of the birds with access to the paddock (group Lexp-4B) was higher than eggs in group LC-2B, hence the significant differences between the two groups (6.94g vs. 6.74g). *Germs load of shell* presented the highest values of the three experiments performed, reaching, on average, 235.84 germs/cm^2 in control group and 245.50 germs/cm^2 in Lexp-4B group.

Technological solutions adopted for this series of experiments led to the development of *body weight* below the previous series. Thus, in the 80th week of bird life, the weight of the LC-2B group was 31.9 g below the standard weight for that age, respectively 55.12 g below standard in Lexp-4B birds.

In these conditions *feed consumption* was significantly lower than that achieved by birds in previous experiences, conversion index being 191.11 g / egg in birds reared on litter (group LC-2B) and 204.05 g / egg in those with access to the outer paddock l (group Lexp-4B).

5.3. Goal no. 3

Goal 3 in 2009 stage considered the "Evaluation of behavioral response of genotype B to growth conditions provided" and it resulted in making the following conclusions:

Conclusions from Experiment I. The *mortality rate* recorded in the birds raised in classic cages battery (LC-1B group) was 12.08%, 1.97% higher than those housed in modified cages I (Lexp-1B) and 2.37% compared to hens housed in cages dimensionally increased - II (group Lexp-2B).

Conclusions from Experiment II. In those hens with free access to the hall floor (Lexp-3B), the *mortality rate* was only 9.12%, lower by 2.96% compared to the control group of LC-1B, with birds raised in conventional batteries, type BP-3.

Conclusions from Experiment III. The proportion of actual *casualties*, set for birds that had access to the outer paddock l (group Lexp-4B) was 8.08%, with 1.09% less than those reared in hall with permanent litter (group LC-2B) and from 1.04 to 4.0% compared to the other studied groups.

CONCLUSIONS

This stage of the contract schedule research activities confirmed that laying hybrids respond well to battery conditions. Therefore recommend to maintain the superintensive system of rearing laying hens in battery BP-3 pyramidal type, but to change dimensions of rearing cages, so as to accommodate a number of five hens / cage of 3000 cm^2 (600 cm^2 cage floor/ bird).