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

FINAL RESEARCH REPORT

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1. RESEARCHES PURPOSE

Exploitation of birds in accordance with the principles of super-system, controlledenvironment in the halls, it was as a result of increasing demand for poultry products.

Currently, over 75% of existing flocks of laying hens kept in battery cages across the globe are techniques that allow for high yields, close to the top of the genetic potentialof hybrids use, and conducted all due to technological factors.

However, in recent years is increasing pressure from animal welfare organizations, which urges the abandonment of industrial systems-intensive exploitation of birds inbattery cages in closed halls, although they have increased demands for poultryproducts.

In this context, socio-economic, poultry specialists have been forced to focus onstudying various alternatives for the farming systems and translate them into viabletechnical and economic exploitation, but to reproduce and elements of the naturalhabitat of birds living In order to ensure the welfare condition.

2. BIOLOGICAL MATERIAL

The biological material was represented by two of the most acclaimed hybrid layinghens, respectively, "Lohmann Brown (genotype A) and" Hisex Brown (genotype B).

Hybrid "Lohmann Brown" was created based on four lines of pure-bred Rhode Islandand is an early bird, which carries 40% lay at the age of 20 weeks and 93% lay (lay tip)in the 28th week life, the average is 337.5 eggs shelf / bird in 60 weeks of operation.

Hybrid "Hisex Brown is regarded as a bird calm and suitable for battery. In the 60weeks of operation, achieved an average of 339 eggs per bird, laying a maximum intensity of 94%, in a total consumption of 46 kg feed per bird and a mortality of 6.6%.

3. EXPERIMENTAL DESIGN

The plan of the project were organized two groups of experiments, one for each of the two genotypes studied, each group experiences (genotype) were performed by three experiments, distinguished by the operating system and technology.

Experience I: Response evaluation and anatomic-morpho-physiological production of genotype A / B to the conditions provided by the system increase BP-3 battery cage dimensional change. "

• Lots Lc-Lc-1A and 1B. Birds have been operated in accordance with the super-system, the classical type Battery BP-3. In his popular four hens provided a density / cage of 2000 cm^2, 500 c m^2 of cage returns per bird.

• Lots Lexp Lexp-1A and-1B. Super-type growth, the BP-3 battery cage area increased to 3000 c m^2. Were housed in each cage every five hens, cage back 600 c m^2 per bird.

• Lots Lexp Lexp-2A-2B. Super-type growth, the BP-3 battery cage area increased to 6000 c m^2. In each cage were housed six hens each, returning 1000 c m^2 cage / bird.

Experience II: Response evaluation and anatomic-morpho-physiological production of genotype A / B to the conditions provided by growth in cages open system (without netting front). "

• Lots Lc-Lc-1A and 1B. Super-type growth in Battery BP-3 unchanged, ensuring the popular density of 4 hens / cage of 2000 c m^2 (500 c m^2/hen).

• Lots Lexp Lexp-3A and-3B. Intensive type operation, the BP-3 battery without front nets, ensuring freedom of movement in the birds with bedding of battery lines. Each pair of battery cages have acquired distinct functions: those on one side of the line battery no. 1 were for feeding and watering, and those on the opposite side (no battery line. 2) to lay and rest.

Experience III: "Evaluation of morpho-productive response to physiological and anatomical the genotype A / B to the conditions provided by the system to increase the hall with access to outside paddocks.

• Lots Lc-Lc-2A and 2B. Operation of intensive type with permanent litter growth in an environmentally controlled warehouse, the density was 6.0 cap./ m^2 at brooding.

• Lots Lexp Lexp-4A and-4B. Operation in semi system with permanent litter growth and access in an outdoor paddock, the density was 7.5 cap./ m^2 at brooding.

4. APPLIED WORKING METHODS

During the research were followed indicators specific to this morpho-productive categories of poultry, including eggs produced quality and evolution of biochemical blood parameters and meat quantity and quality resulting from the slaughter of birds, based on the following working methods:

- dynamics of body weight (g)-weighing individual birds in control groups;
- dynamics of egg production (eggs / bird), the weekly production record of each lot;
- laying intensity (%)-calculated weekly, based on the production of eggs per batch and the average herd;
- food consumption: total (kg / batch / period), average daily (g / head / day), indicating the conversion (nc g / egg)
- health of birds (%)-effective and causes the outputs of generating weekly;
- egg weight (g), electronic weighing balance;
- morphological abnormalities (%)-identifying and reporting the total production of the control period: malformed shelled eggs, eggs without yolks, eggs shelled, eggs with two yolks, eggs with cracked shell;
- mineral shell thickness (mm)-clock comparator device;
- mineral shell breaking strength (kgf/cm^2) pressure-resistance method;
- chemical composition of eggs (g): egg white (dry, protein), egg (dry matter, protein, fat), nuts (minerals);
- microbial load of the mineral crust ($germs/cm^2$) serial-dilution method;
- Blood-determination with the analyzer ABX Micros ABC VET;
- Slaughter yield (%) weight-ratio of live birds and carcasses results;
- cut parts weight (%) reporting weight-cut components to carcass weight.

Indicators of quality of eggs have been established in the four main phases of the laying curve (20-started the week, peak-to 28-week, plateau-week ending 37th and 80th week) .

The main experimental data were processed statistically with the ANOVA.

5. ACHIEVED RESULTS

5.1. Results achieved for genotype A ("Lohmann Brown" laying hen hybrid)

Experience I. At 20 weeks (early research), the birds were almost equal weight(1577.82 ± 24.93 g in LC-1A, 1575.31 ± 30.61 g and 1576.49 ± Lexp-1A 35 63g toLexp-2A), except that the extent of their submission to the elderly have emergedgradually, some differences between the groups, printed by growing technologyadopted. Are significant difficulties at the end of the experience as follows: 2083.03 ±66.99 g Lexp-2A, 2087.83 ± 67.95 g Lexp-1A and 2125.13 ± 69.71 g Lc-1A.

For the entire period studied (20-80 weeks), best feed consumption were made by birds in group LC-1A (112.63 g / head / day and average consumption, 145.34 g / egg-index conversion), and the worst of the lot Lexp-2A hens (116.47 g / head / day, respectively, 155.35 g / egg).

Increase in battery classical variant (group LC-1A) has achieved the highest yields, of 325.05 eggs per bird, up from 319.09 eggs per bird in group Lexp-1A and 316.32 eggs / bird in group Lexp-2A. Maximum intensity was achieved at week laying the 28th bird life, with a level of 91.56% in group LC-1A, from 89.97% in group Lexp-1A and 89.88% in group Lexp-2A.

Birds in group-2A Lexp benefited large areas of motion (cm^2/hen 1000), where better health status, reflected in a mortality rate of only 8.22% compared to 9.57%Lexp-1A group (600 cm^2/hen) and 11.66% in group LC-1A (500 cm^2/hen).

Regarding the frequency of morphological abnormalities eggs with the lowest levels were found during the peak of laying (the LC-1A 1.06%, 0.97% from 0.84% Lexp-1A and-2A in Lexp), and the highest end of laying (the LC-1A 2.44%, 2.35% from 2.27% Lexp-1A and the Lexp-2A).

After weighing eggs laid by young birds were found the lowest values of their weight (from 46.83 to 47.01 g). Furthermore, egg weight increased progressively, reaching the highest levels at the end of laying (from 68.11 to 68.37 g), between groups there were no statistically significant differences.

The eggs collected from hens in group LC-1A, we determined the lowest levels for mineral shell thickness, with a minimum of 0.354 ± 0.012 mm (end of lay) and a maximum of 0.440 ± 0.015 mm (beginning of lay) . In group Lexp-2A, lay low intensity allowed the development of a sufficient quantity of minerals to form the shell, whose thickness ranged from 0.358 ± 0.012 mm (end of lay) and 0.443 ± 0.014 mm (beginning of lay).

Measured by 20 weeks of life showed that the birds have better resistance to cracking the shell (0.343 ± 0.009 kg f/ cm^2) was harvested from eggs Lexp-2A group, compared with 0.342 ± 0.010 kg f/ cm^2 to Lexp-1A and 0.340 ± 0.008 kg f/ cm^2 the LC-1A. In the next stage of control, shell breaking strength decreased gradually reaching a minimum of 0.325 to 0.327 kg f/ cm^2 end of lay.Yolk solids was found in smaller quantities at the beginning of laying (from 8.62 to 8.64 g), then progressively increased to a level of 9.56 to 9.58 g, made at the end of laying.Determination of egg proteins revealed a certain balance between the groups, the quantities being determined: 2.65 to 2.90 g in group LC-1A, 2.68 to 2.93 g and 2.67-2-1A lot Lexp , 92 g Lexp-2A. Yolk lipids were determined in smaller quantities at the beginning of laying (from 5.95 to 5.97 g) and finally lay somewhat higher (6.64 to 6.66 g).

The white dry matter content decreased in parallel with the increasing weight of eggs.Thus, early laying levels were 4.30 ± 0.133 g LC-1A, from 4.29 ± 0.149 g Lexp-1A and 4.31 ± 0.100 g Lexp-2A, while those from end of laying only: 3.95 ± 0.115 g LC-1A, 3.96 ± 0.124 g Lexp-1A and 3.97 ± 0.115 g Lexp-2A. The amount of protein from eggs collected at the beginning of egg laying varied between 3.42 ± 0.054 g (group LC-1A) and 3.44 ± 0.033 g (Lexp-1A), then increased gradually, reaching the end of the layingat between 3.49 ± 0.045 g (group LC-1A) and 3.52 ± 0.053 g (group Lexp-2A).

At the beginning of laying, the amount of minerals from the shell eggs obtained ranged from 5.25 ± 0.174 g (group LC-1A) and 5.28 ± 0.147 g (group Lexp-2A) and at the end of laying between 6 53 ± 0.145 g (Lc-1A) and 6.55 ± 0.195 g (Lexp-2A).

The lower microbial load (112.78 ± 3.908 germs/ cm^2 the LC-1A, 110.49 ± 3.674 germs/ cm^2 to Lexp-1A and 106.31 ± 3.420 germs/ cm^2 to Lexp-2A) was found on the skin eggs harvested from early experience. In parallel with the degradation of the microclimate in the halls used, the number of germs on the shell eggs ever recorded high levels, peaking at the end of laying (152.61 ± 4.960 germs/ cm^2 the LC-1A, 150.11 ± 5.320 germs / cm^2 at Lexp-1A and 146.61 ± 4.984 germs/ cm^2 to Lexp-2A). At each step of control between batches Lexp-2A-1A and Lexp Lc-1A were no significant differences.If young birds, aged 20 weeks, erythrocyte count was 2.19 to 2.73 x 106/mm^3, and for those at the end of laying (age 80 weeks) of 2.9 to 3, 0 x 106/ mm^3. Had hematocrit values determined for the oscillation range between 28.6 to 29.5% (20 weeks) and 31.2 to 32.7% (at 80 weeks) and those for mean corpuscular volume, between 118 0 to 125.6 μ m^3 (20 weeks) and 113.7 to 117.9 μm^3 (80 weeks). The amount of hemoglobin in red blood cells averaged 35.9 to 56.32 pg at 20 weeks and poultry from 43.7 to 53.1 pg at the end of laying, while the average concentration of hemoglobin in red blood cells ranged from 23.4 to 44.8 g/100 ml (begin laying) and from 43.0 to 47.2 g/100 ml (end of lay). Limits for the total number of white blood cells were 2.03 x 103/m m^3 (group Lexp-2A, with the hens for 20 weeks), respectively, 29.7 x 103/m m^3 (group Lexp-1A, with 80 hens weeks).

Return to slaughter the birds in group set Lc-1A was 65.60%, with 0.02 to 0.42% higher than that calculated for birds and lots Lexp Lexp-2A-1A. Regarding the quality of meat production, the data obtained showed a shareholding of 20.67 to 24.47% for the band, the 17.78 to 18.81% for the chest, legs from 34.45 to 35.91% for and from 12.50 to 13.50% for the wings.

The average thickness of muscle fibers was only 29.73 to 39.24 μ meat obtained from group LC-1A, from 30.81 to 40.19 μ in group 1A and 31.47-40.69-Lexp μ-Lexp in group 2A.

Experience II. At the onset of laying, body weight of hens housed in cages open (group Lexp-3A) was similar to those in the control group (1577.22 ± 35.96 g vs. 1577.82 ± 24.93 g Lc -1A), after which their growth rate decreased, due to additional energy consumption, so that at the age of 80 weeks, only weight was 2030.29 ± 69.64 g to 2125.13 ± 69 , 71 g Lc-1A.

Freedom of movement enjoyed by birds reared in open batteries caused a higher consumption of feed, to cover additional energy costs, the group said (Lexp-3A) the average consumption was 120.51 g / head / day (compared to 112.63 g / head / day in LC-1A), feed conversion and the index of 164.38 g / egg (145.34 g / egg Lc-1A).

When birds had access to litter in the area of battery lines (group Lexp-3A), total losses were actually at a level of only 7.46%, 4.2% lower than that recorded in group LC-1A, with birds kept in battery cages unchanged BP-3. In contrast, egg production of hens in group Lexp-3A was only 311.34 eggs / poultry, lower by 4.22% than those housed in conventional battery (Lc-1A). Laying peak was reached again in the 28th week of bird life, with an intensity of only 88.35% in group Lexp lay-3A, from 91.56% in control group.Regarding the proportion of morphologically abnormal eggs, made records showed levels of 1.27 to 1.41% at the beginning of laying it on top of 1.06 to 1.21%, from 1.35 to 1.40% in the plateau and 2.44 to 2.68% at the end of laying. And the birds from this experience, egg weight improved from a control step to another, but without showing differences between the groups, so for example, the weight began laying eggs harvested was 46.98 ± 1.30 Lc-1A g group and 46.78 ± 1.28 g in group Lexp-3A, while those at the end of laying of 68.51 ± 1.56 g in group LC-1A and 68.50 ± 1.76 g in group Lexp-3A.

Although hens kept in battery cages open (group Lexp-3A) had a lower egg production of the classic battery (group LC-1A), egg shell thickness was higher, ranging between 0.369 ± 0.012 mm (end of lay) and 0.448 ± 0.013 mm (beginning of lay). It is natural and mineral shell breaking strength was good in egg batch outlined above (Lexp-3A), both at the beginning of laying (0.348 ± 0.006 kg f/c m^3) and at the end of (0.337 ± 0.008 kg f / c m^3).

In terms of quantity of yolk dry matter was lower at the start of laying (from 8.62 to 8.65 g), but increased in the next control period (8.95 to 8.99 g peak laying and 9.14 to 9.18 g on the set), finally reaching the levels of 9.56 to 9.61 g. lay no egg protein content was not found statistical differences between groups, quantitative proteins varied between 2.65 ± 0.035 g (beginning of lay) and 2.90 ± 0.050 g (end of lay) in group LC-1A, respectively, from 2.66 ± 0.044 g (beginning of lay) and 2.92 ± 0.039 g (end of lay) in group Lexp-3A. The amount of lipids in the yolk was 5.97 ± 0.092 g in group LC-1A and

5.99 ± 0.076 g Lexp-3A, if harvested at the beginning of laying eggs, respectively, of 6.66 ± 0.111 g in group LC-1A and 6.69 ± 0.085 g Lexp-3A, at the end of the laying of eggs deposited.The amount of egg white solids dosage was higher in eggs collected at the beginning of laying (from 4.30 to 4.32 g), but decreased in parallel with increasing age of birds, recording the lowest levels at the end of the laying (3.95 to 3.99 g). The white protein amounts were kept relatively uniform over the reporting period and no statistically significant differences between groups (3.42 to 3.49 g in group LC-1A and-3A Lexp 3.43 to 3.51 g group).

The quantities of minerals from the shell eggs obtained revealed somewhat higher values in group Lexp-3A (5.30 ± 0.175 g-laying began and ended 6.64 ± 0.192 g-lay) and slightly reduced to Lc-1A group (5.25 ± 0.174 g-laying began and ended 6.53 ± 0.145 g-lay), but without statistically significant differences found between the mean lots.

Instead, the eggs of lot Lexp-3A, eggshell microbial load was much higher mineral (range 148.62 ±6.100 germs/ cm^2- lay onset and 258.94±13.99 germs/ cm^2 at end) due to gradual degradation of the litter of battery lines. The hens kept in battery traditional (Lc-1A), the number of germs was significantly lower (112.78 ± 3.908-laying began and ended 152.61 ± 4.960-lay), which led to very different statistical significant between the two groups.

The hens in group Lexp-3A (increase in BP-3 battery without nets front), hematological analysis performed on blood collected at age 20 and at 80 weeks revealed the following values: 2.14 vs. 2.9 x 106/m m^3 for erythrocyte count, vs. 28.28. 37.7% for hematocrit, 132.3 vs. 127.2 μ m^3 for mean corpuscular volume, 57.0 vs. 50.7 pg for the average amount of hemoglobin in red blood cells, 43.2 vs. 46.2 g/100 ml and mean erythrocyte hemoglobin concentration of 20.0 vs. 23.7 x 103/m m^3 for the total number of white blood cells.Poultry slaughter yield calculated for the two groups showed similar values for 65.60% in group LC-1A and 65.72% in group Lexp-3A. In terms of quality, meat production was greater in birds from group Lexp-3A in both breast (19.25% vs. 17.78%) and the legs (36.62% vs. 34 , 45%) and wings (14.20% vs. 12.50%), in contrast, Lc-1A carcasses lot of stuff predominated (24.47% vs. 18.75%).

Meat birds in group-3A Lexp recorded an average thickness of muscle fibers between 31.02 and 44.81 μ-μ-wing chest, indicating the lower qualitative features obtained from LC-1A.

Experience III. Similar experience, weight or semi-intensive poultry operated joined the standard curve, but its lower limit. Thus, the average weight of pullets at the time was channeling the 1603.04 ± 15.61 g in group LC-2A and 1602.87 ± 12.87 g in group Lexp-4A and the end of the experience of 1953 89 ± 47.22 g Lc-2A and Lexp 1959.88 ± 44.84 g-4A.

The best indicators for feed consumption (average consumption = 125.95 g / head / day, indicating conversion = 188.29 g / egg) were done by birds nesting high in the hall provided with permanent (group LC-2A) and the less convenient (129.96 g / head / day, respectively, 200.38 g / egg) of hens housed in the hall with bedding and access to outdoor paddock (group Lexp-4A).

If Lc-2A lot, even if the birds have enjoyed the convenience provided by the litter, they have been exposed to the microenvironment of a specific action harmful elements closed halls, so that at the end of the experiments showed a 11.08% mortality. In birds with access to the paddock for (Lexp-4A), health status was good, reflected in a ratio of actual output of only 7.36%.Number of egg production was low, only 283.48 eggs per bird in group LC-2A and 273.40 eggs per bird in group Lexp-4A, with 12.79% and 15.89% with underperformance battery hens in classical (group LC-1A). Maximum intensity of laying was 78.11% in group LC-2A and 75.33% in group Lexp-4A, lower by 14.69% and 17.73% than that obtained with the system superiintensiv (group Lc -1A).

Setting the share of total egg production with morphological abnormalities revealed achieved levels of 0.81 to 2.33% in hens housed in the hall provided with bedding (group LC-2A) and from 0.81 to 1.97% for the maintained in the hall with access to outdoor paddock (group Lexp-4A).

Weightings have shown that weight just started laying eggs was greater than 0.07 to 0.11 g in hens kept in battery traditional (Lc-1A). In the next stage of control, weights were lower due to additional energy consumption required by growth conditions provided, so for example, at the end of laying, egg weight was 67.82 ± 1.273 g in group 2A and Lc- 67.61 ± 1.542 g in group Lexp-4A, compared to 68.11 ± 1.557 g as was the reference group (Lc-1A).

Determination of shell thickness in eggs from Lexp-4A group showed better levels, both at the beginning of laying (0.452 ± 0.008 mm) and at the end of (0.341 ± 0.009 mm), compared to the LC-group 2A (0.434 ± 0.011 mm at the beginning of laying and 0.322 ± 0.011 mm at the end of lay). In correlation with shell thickness and its resistance to breaking mineral was better in group Lexp-4A (0.330 ± 0.007 kg f/c m^3 end lay and 0.341 ± 0.008 kg f/c m^3 early laying) in group-Lc 2A, pressure resistance ranged from 0.328 ± 0.008 kg f/c m^3 (end of lay) and 0.340 ± 0.009 kg f/c m^3 (beginning of lay).Yolk dry matter content did not differ significantly between groups, so for example, LC-2A group (increase of litter), determined quantities varied between 9.31 ± 0.238 g-laying began and 9.85 ± 0.273 g- Finally lay, and in group Lexp-4A (litter growth and access to outdoor paddock), from 9.38 ± 0.252 g-laying began and ended 9.94 ± 0.290 g-laying. The amount of yolk protein showed 2.98 ± 0.027 g limits (beginning of lay) and 3.13 ± 0.047 g (end of lay) from eggs collected from group LC-2A, respectively, of 3.01 ± 0.024 g (beginning of lay) and 3.18 ± 0.042 g (end of lay), the group Lexp-4A. At the beginning of laying, egg lipids were found in amounts of 6.33 ± 0.085 g in group LC-2A and 6.37 ± 0.086 g Lexp-4A, the next stage of control, their levels increased progressively finally reaching values lay at 6.72 ± 0.099 g in group LC-2A and 6.76 ± 0.100 g in group Lexp-4A.

The amount of egg whites solids collected from birds reared in intensive and semi was higher at the beginning of laying (from 4.29 to 4.30 g), but decreased towards the end of the production cycle of birds, reaching the end of lay at levels of only 4.07 to 4.09 g. The protein content of the white has remained relatively uniform during the period analyzed, recording values from 3.44 to 0.46 g at the beginning of laying of 3.46 to 3,49 g peak of laying the plateau from 3.49 to 3.51 g and 3.51 to 3.54 g at the end of laying.

If the lot with birds reared on litter (LC-2A), the quantity of minerals from the shell eggs ranged from 5.45 ± 0.143 g (beginning of lay) and 8.11 ± 0.215 g (end of lay), whilefrom hens housed in open bay outdoor paddock (Lexp-4A), the quantities determined were somewhat higher, ranging between 5.67 ± 0.162 g (beginning of lay) and 8.44 ± 0.283 g (end of lay).The highest microbial load was highlighted at the mineral shell eggs laid by birds Lexp-4A group, increased access to the paddock in the hall outside (179.39 ± 6.485 germs/ cm^2 early laying and 312.37 ± 11.321 germs cm^2 at the end of lay). The group stayed in the hall with bedding (LC-2A), the degree of contamination of the shell was slightly reduced, with a minimum of 172.24 ± 5.437 germs/ cm^2 (the beginning of laying) and a maximum of 295.37 ± 10.705 germs/ cm^2 (end of lay). At the beginning and peak of laying between the two groups were statistically significant differences identified, the next stage (platform and end), the differences were significantly distinct type.

Intensive poultry farming (LC-2A) and of the semi (Lexp-4A) did not rise to major differences in the haematological values. As such, the RBC was 2.04 to 2.26 x 106/m m^3 at the beginning of laying and 2.40 to 2.90 x 106/m m^3 at the end of laying, and the set for PCV, 27 0.43 to 27, 58% at the beginning of laying and 30.3 to 35.7% at the end of laying. When MCV and MCH values determined in young birds (from 132.0 to 132.2 µ m^3 respectively, from 56.57 to 58.10 pg), were higher than those of birds at the end of laying (113.8 - µ m^3 127.4, respectively, from 51.5 to 53.5 pg).

Calculating the yield at slaughter showed a value of 64.81% for permanent litter reared hens (group LC-2) and 64.86% in those who had access to outdoor paddock (Lexp-4).The carcasses from group Lexp-4 was found a chest high percentage (19.05%), pulp (38.40%) and wings (14.27%), while in group-2 Lc prevailed stuff (18.78%).

Setting the mean thickness of the muscle fiber showed a fine meat from poultry from Lc-2A group (31.09 to 42.36 μ) than those in group Lexp-4A (32.62 to 46.41 μ).

5.2. Results achieved for genotype B ("Hisex Brown" laying hen hybrid)

Experience I. In all phases of control, body weight of the birds' Hisex Brown was lower than the theoretical curve, at the end of the experiment, the weight of hens was lower than the standard by 0.21 g in group LC-1B, 1, 22 g in group Lexp-1B and 4.88 g in group Lexp-2B.

Food consumption was influenced by the energy needs directed to daily activities and productivity of birds, so that the best conversion index (150.29 g / egg) was made by hens housed in conventional battery (group LC-1B), and the less convenient (161.42 g / egg) than those who received the largest growth area in the cage (group Lexp-2B).

The mortality rate of birds registered in battery BP-3 maintained unchanged (group LC-1B) was 12.08%, 1.97% higher than those housed in modified cages, variant I (group Lexp-1B) and to 2.37% compared to hens housed in cages modified-version II (group Lexp-2B).

Birds reared in battery classical (group LC-1B) have achieved a production of 324.17 eggs per capita, while hens kept in battery cages modified BP-3, have made an average of 316.32 eggs per capita (those in group Lexp-1B) and of 314.98 eggs per capita (group Lexp-2B). Maximum intensity was reached at the laying period, the 28-week life of birds, but with lower values of the theoretical potential hybrid (94%) of only 90.95% in group LC-1B, 88, 28% in group Lexp-1B and 87.61% in group Lexp-2B.

On the whole period studied, the average proportion of morphologically abnormal eggs found in group LC-1B was 1.57% of total production, with 0.11% higher than in group Lexp-1B and 0.18% to situation recorded in group Lexp-2B, and this hybrid has submitted several lay eggs abnormal end, especially in category broken shelled eggs (1.13 to 1.33%) and malformed shelled eggs (0.66 - 0.68%).

Egg weight followed an ascending line, from the beginning (46.70 to 46.80 g), by the end of laying (from 67.88 to 68.09 g). Although not significantly different between groups, egg weight recorded an average of only 59.36 g in group LC-1B, compared to 59.49 g Lexp-1B and 59.47 g Lexp-2B.

Mineral shell thickness was negatively correlated with laying intensity, being an average of only 0.386 mm in hens with the highest egg production (Lc-1B), compared to 0.390 mm as found in birds with the lowest production eggs (sample Lexp-2B) in group Lexp-1B, egg shell thickness was 0.388 mm.

Mean values determined for the mineral shell breaking strength were as follows: 0.329 kgf/cm^2 in group LC-1B (0.320 to 0.338 kgf/ cm^2) in group 0.331 kgf/ cm^2 Lexp-1B (0.324 to 0.340 kgf/ cm^2) and 0.333 kgf/ cm^2 in group Lexp-2B (0.326 to 0.342 kgf/ cm^2).

Chemical constituents of yolk are not significant differences between groups, but rose slightly from a control step to another, so for example, protein ranged from 2.49 to 2.50 g (at the beginning of laying) and 2.79 to 2.80 g (end-of-lay), and the fat from 5.93 to 5.96 g (beginning of laying) and from 6.65 to 6.71 g (end of lay). Neither the quantity of mineral salts from the nuts did not differ significantly between groups, the control stages, recorded the following increases: from 5.19 to 5.23 g at the beginning of lay, lay on top 6.06 to 6.11 g, 6 0.24-6, 29 g and 6.38 to 6.42 g plateau lay at the end of laying.In the group with conventional battery reared birds (Lc-1B) microbial load of the shell mineral was, on average, germs/ cm^2 138.90 (120.54 to 159.23 germs/ cm^2), up 1.87 germs/ cm^2 - 7.83 compared with the experimental situation, the limits of variation of the consignment from 118.61 to 157.71 germs/ cm^2 Lexp-1B, respectively, from 110.79 to 152.69 Lexp-germs/ cm^2 in group 2B.

Biochemical determinations showed the influence of growth (in terms of laying intensity achieved) the level of indicators, as for example, birds in group LC-1B, cholesterol showed an average of 148.29 mg / dl, lower by 5.98 to 9.99% than the experimental groups, a situation also applies to triglycerides (192.08 mg / dl vs. 193.1 to 193.92 mg / dl) and calcium (8.76 mg / dl vs . 8.85 to 9.50 mg / dl). Other biochemical indicators showed similar values between groups, with their classification in the normal term for laying hens.

And the hybrid "Hisex Brown, slaughter yield (64.15 to 64.58%) was well below the specific performance of broiler chickens. The best results in cutting carcasses were found in group Lexp-2B (17.57%-chest, thighs and 20.00%, 14.78 chicken drumsticks), and weakest in group LC-1B (16 , 56%, chest, thighs 33.78%, 14.38% lower-leg). Instead, the meat obtained from chickens in group LC-1B was fine, with an average thickness of the muscle fibers of only 35.31 µ, from 35.61 to 35.86 µ as was the experimental groups. Experience II. If the birds raised in battery traditional (Lc-1B group) body weight was located quite close to the standard curve, those kept in cages open (group Lexp-3B), freedom of movement has led to reduction in body weight with 16.46 g (at the end of growth).

Normally, food consumption was higher in birds reared in cages open (Lexp-3B) than those in the reference group (Lc-1B); enlightening in this respect are the values of feed conversion index set for the whole period studied (166.49 g / egg-3B Lexp group and 150.29 g / egg Lc-1A).

The hens with free access to the hall of growth (Lexp-3B), the mortality rate was 9.12%, lower by 2.96% than in group LC-1B, with birds kept in battery classical BP-type 3.

Maximum intensity of laying hens carried by the composition control group (LC-1B) was 90.95%, and the birds in group Lexp-3B, only 87.25%. And egg production was differentiated between the groups, being 324.17 eggs per bird in group LC-1B and only 313.54 eggs per bird in group Lexp-3B.

Of the total eggs laid by hens kept in battery cages open (group Lexp-3B), one with morphological abnormalities were found in an average rate of 1.75%, up from 1.57% in group LC-1B.

The eggs in this study experienced an average weight levels ranged from 59.36 g in sample LC-1B and 59.35 g at the lot Lexp-3B, while the mineral shell thickness was on average 0.386 mm, respectively, 0.389 mm. The average value calculated for the mineral shell breaking strength was 0.329 kg in eggs f/ cm^2 lot LC-1B and to those of 0.331 kgf/ cm^2 lot Lexp-3B.

In the chemical constituents of yolk, the tests carried out showed no significant quantitative differences between the averages of two groups, an aspect applies to the chemical composition of the white. Although the quantity of mineral salts in the shell varied significantly among the groups, somewhat higher levels were found in eggs collected from birds with free access to the house (lot Lexp-3B).

The existence of lines of battery litter (group Lexp-3B) led to an increase in the number of germs on the shell eggs harvested, with 34.65% higher than that found in eggs Lc-1B group (212.55 germs/ cm^2 Vs. germs/ cm^2 138.90).

Biochemical analysis of blood collected from hens housed in cages open (group Lexp-3B) showed higher levels of 13.93% for cholesterol, triglyceride by 2.07%, with 23.91% for calcium and 26 17% phosphorus to the system super-operated birds (Lc-1B), otherwise, no major differences were noted between groups.

The calculated values for slaughter yield were 64.58 ± 2.72% in group LC-1B and 64.09 ± 2.09% to Lexp-3B. In group Lexp-3B, the rate of participation of the main anatomical parts was greater than 1.3 to 2.0% in group LC-1B, except stuff (vs. 20.36%. 26.05%). The average thickness of muscle fibers of the 4 muscles examined was 38.31 in group Lexp-3B μ and μ only in Luke 35.31-1B.

Experience III. Technological solutions adopted have led to record body weights below those made by birds in other experiments, so the 80th week of life, the weight of birds in group LC-2B was less than 31.9 g, and those the group with 55.12 g Lexp-4B, than the standard.

Food consumption was much higher than in previous experiences, given the need to compensate for energy costs incurred in travel on larger areas and for thermoregulation, but at the expense of productivity. Specifically, birds raised in hall with permanent litter (group LC-2B) have achieved a production of 282.54 eggs per hen, in lay terms the maximum intensity of 77.42% and an index of feed conversion 191.11 g / egg, while the hens had access to outdoor paddock (Lexp-4B) were closed and weaker results (mean = 272.72 egg production per hen, lay maximum intensity = 74 98%, feed conversion index = 204.05 g / egg).

In contrast, birds in group Lexp-4B, with access to the paddock for the hall (growth semi) the proportion of actual output was only 8.08% to 1.09% lower than for hens housed in the hall with bedding (Lc-group 2B) and 1.04 to 4.0% compared to the other lots of experience.

Morphologically abnormal eggs were found in an average proportion of 1.43% in hens kept in the hall with litter (Lc-2B) and 1.36% for those with access to the paddock for (Lexp-4B). Average weight of eggs collected from group LC-2B was 58.34 g, 1.18% higher than in group Lexp-4B, but instead, the average thickness of the shell mineral was only 0.364 mm in group Lc -2B, compared to 0.381 mm as found in group Lexp-4B, naturally and shell breaking strength was lower in eggs laid by hens kept on litter (group LC-2B), only 0.328 kgf/ cm^2, to 0.330 kgf/ cm^2 in group Lexp-4B.Both in the case of the white and yolk, dispensing chemical constituents showed no significant differences to exist between the mean for each of the two lots of experience.The quantity of minerals from the shell eggs laid by birds with access to the paddock (group Lexp-4B) was higher than that of eggs in group LC-2B, where significant differences between the two groups (6.94 g vs. 6 74 g).

Referring to the load caused by germs on the shell eggs studied this experience, it is noted that they found the highest levels, with an average plot of the LC-2B germs/ cm^2 235.84 and 245.50 germ / cm^2 at Lexp-4B.

In terms of biochemical indicators that are influenced by the rate of egg formation (cholesterol, triglycerides, calcium and phosphorus) have higher levels compared with those determined in previous experiences, but without exceeding the limits.

Between birds reared on litter (Lc-2B) and those who have received additional external access to the paddock (Lexp-4B) were not found differences in slaughter yield (63.85% vs. 63.83%). The batch poultry carcasses obtained from LC-2B was determined a higher rate of participation for breast (18.34% vs 18.27%) and tableware (20.15% vs. 18.14%), while those of group Lexp-4B pulp (38.13% vs. 36.49%) and wings (13.78% vs. 13.30%), differences between the groups were also in the meat quality, assessed in terms of average thickness muscle fibers (at 40.83 μ and 38.36 μ-4B Lexp the LC-2B).

6. CONCLUSIONS AND RECOMMENDATIONS

If hybrid "Lohmann Brown, the classic solution operating in battery type BP-3 (LC-1A) has achieved the highest production of eggs of 325.05 eggs per bird, with 1.83 to 2.69% higher than hens housed in battery cages increased BP-3 dimensional (Lexp Lexp-1A and-2A), with only 4.22% of hens kept in battery cages open (Lexp-3A) and from 12.79 to 15 , 89% of intensively reared chickens (LC-2A) and semi (Lexp-4A).Production of the hybrid numerical "Hisex Brown grew up in classic Battery (LC-1B) was lower than the previous genotyping of only 324.17 eggs per bird, although it was higher than 2.42 to 15.87% alternative variants of growth.

Compared with birds "Lohmann Brown kept in alternative systems, the conventional battery (Lc-1A) had no additional energy expenditure (motion restricted areas and optimal microclimate), hence a low conversion index of only 145, 34 g / egg, 5.31 to 6.89% lower than in groups Lexp Lexp-1A and-2A, with 13.10% compared to the group Lexp-3A and from 29.55 to 37.87% Lexp-LC-2A and 4A. The hybrid "Hisex Brown grew up in Battery BP-3 (LC-1B), the index of conversion was higher, at 150.29 g / egg, but in this case better than the other groups (less than 4 0.12 to 35, 77%).

At the end of the production cycle, the weight of birds reared in the super-system (LC-LC-1A and 1B) was higher by 1.76 to 8.06% (hybrid "Lohmann Brown) and only 0.05 to 2.66 % (hybrid "Hisex Brown") than the hens in the other groups, which means additional revenue generated from the live delivery of poultry to slaughterhouses reformed. In the same context, mention that the yield at slaughter did not differ between experimental variants (hybrid "Lohmann Brown: 65.6% vs. the LC-1A. 64.81 to 65.72%; hybrid" Hisex Brown : 64.58% vs. the LC-1B. 63.83 to 64.39%), which is important for this category of birds, which is recovered only in the form of housing.Birds that have benefited from increased space for movement had a higher proportion of major anatomical regions in carcass composition than those grown in conventional battery (with 0.62 to 1.47% for breast, 0.73 to 3.95 % for 0.62 to 1.77% for legs and wings, where hybrid "Lohmann Brown, respectively, with 0.61 to 1.79% for the chest, legs and from 0.62 to 4.35% for with 0.20 to 1.70% for the wings, where hybrid "Hisex Brown").

In contrast, in birds kept in battery traditional (lots Lc-Lc-1A and 1B) led to higher fineness of muscle fibers (2.27 to 15.98% better with the hybrid "Lohmann Brown, respectively, with 0 0.85 to 15, 66% in hybrid "Hisex Brown"), which corresponds to a high quality meat.

Mortality in control groups Lc-Lc-1A and 1B was 11.66% and respectively 12.08%, up from 0.58 to 4.30%, respectively, with 1.97 to 4, 00% unless the increase in alternative systems, these data indicate that conventional battery operation (500 cm^2/hen) resulted in a "wear" more advanced birds (laying amid high intensity) but also specific diseases hipokineziei prolonged (insufficient space for movement), where a lower proportion of staff retention. Results on the quality of eggs obtained did not reveal differences in farming systemsadopted printed, except for slightly better levels of proteins and lipids in the yolk, egg white protein and minerals from the shell eggs laid by hens kept in the system "freerange "(lots Lc-Lc-2A and 2B). A special case has been registered for the degree of contamination of mineral and shell, the eggs laid by birds that had access to outdoorpaddock was higher by 5.44 to 47.61% for the hybrid "Lohmann Brown" and that With3.93 to 46.61% to "Hisex Brown," compared with other variants of exploitation.

Blood tests carried out on birds studied showed that although biochemical indicatorswere within normal limits, some of whom were influenced by laying intensity achieved, combined to turn the rearing system.Return to the slaughter showed low levels, both the "Lohmann Brown (64.81 to 65.72%) and the" Hisex Brown "(63.83 to 64.58%), but in both cases, the lowparticipation rates of major anatomical regions (chest, legs and wings) in carcasscomposition were determined in birds battery operated classic, smaller, 1.47 to 3.95%in birds "Lohmann Brown and 1, 69 to 4.35% from "Hisex Brown, "compared with theexperimental results achieved.

In terms of quality, meat produced from hens kept in battery cages showed classicfeatures superior to that from hens exploited in other systems, so for example, thehybrid "Lohmann Brown, the average thickness of the muscle fiber set for the fourmuscles analyzed ranged from 34.73 µ (Lc-1A) and from 35.52 to 40.28 µ (othergroups) and the hybrid "Hisex Brown, from 35.31 μ (Lc-1B) and 35.61 -40.83 μ (lotsbred alternative systems).

The results we obtained on the reactivity of hybrid laying hens in alternative systemsprovided the conditions for growth, we have concluded that they showed differentbehavior, both in terms of productive morphological and anatomical fizilogic, due tohow the selection was applied at the level of pure lines, hence the differentialproductive adaptability.

Since most units operating in Romania poultry laying hens in conventional battery typeBP-3, and replacing this system with another would create serious economicimbalances, recommend, at least for the next period, maintaining the system of laying hens in battery maintenance BP-3 having an area of 3000 cm^2 cages increased at a density of five chapters / cage of 3000 cm^2.

The alternative proposed increase allows us to close the productive potential of hybridperformance exploited, with good use of production facilities, at the same time,ensures sufficient freedom of movement of birds (600 cm^2 cage / bird), and byintroducing the space actual growth (cage) of specific accessories (nests, perches,sand baths, etc.) also corresponds to the desire for wealth.

Other variants of operation approved for laying hens (especially the system of "freerange") provides, indeed, the welfare of birds, but have no productive efficiency, reduce the economic returns per unit area and the risk of outbreaks of diseases withdifferent etiologies .

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