ABSTRACT

Most of the Romanian poultry breeders trend to over assess the real value of the technologies and of the imported biological material. Although nobody criticise the great qualities of the avian genetics provided by the world producers (Lohmann, Ross, Hissex etc.), it is less known that these hybrids have been designed for certain climatic conditions and peculiar social conjunctures.

Those hybrids could achieve the projected yield performances mostly under the conditions of the area where they have been produced, knowing that in other geographic areas there are certain soil quality differences, which lead to different qualities of fodders, consequently to other production levels. Then the lack of fowl shelters climate control – where the halls exist – negatively influences the flock health status and their productions. There are also other factors which could produce poor results in intensively poultry breeding.

Within the same conjuncture, it should be noticed that there are many intermediate channels connected to the aviculture field, which deal exclusively with the genetic material imports from certain specialised companies; often, these interfaces do not have poultry competencies, the only criteria used in the biological material selection being of financial nature – the business revenue.

Considering these facts, it was found that in the poultry farms from our country there is a huge variety of laying hybrids, most of theme being imported without an appropriate control.

According to our knowledge, the studies related to the yield adaptability of the laying hybrids to the conditions existing in or country are poor, quoting just certain morpho-productive indices, which generally characterise the genetic material.

This is the reason we considered in this paper, to establish the technical and economical efficiency achieved under the exploitation of 3 (three) hen laying hybrids, one of them being produced in Romania (”Rosso-SL”) the others being imported („Lohmann Brown” and „Hisex Brown”).

In order to achieve the ultimate goal of this dissertation, meaning the contribution at the knowledge of the laying hybrids yield potential, under production conditions, 3 (three) experimental series have been setup, as it follows:

- **Series I,** entitled *"Comparative researches concerning the performances of the "Roso-SL" and "Lohmann Brown" laying hybrids, exploited under production conditions",* has included 2 experimental groups (Lc-1 and Lexp-1):
  - ✓ control group (Lc-1) – it comprised 17.280 laying hens, belonging to the Romanian „Roso-SL" hybrid;
  - ✓ experimental group (Lexp-1) - it comprised 17.280 laying hens, belonging to the „Lohmann Brown" hybrid.
- **Series II**, entitled *"Comparative researches concerning the performances of the "Roso-SL" and "Hisex Brown" laying hybrids, exploited under production conditions",* has been setup to comprise 2 experimental groups (Lc-2 and Lexp-2):
  - ✓ control group (Lc-2) – it comprised 17.280 laying hens, belonging to the Romanian „Roso-SL" hybrid;
  - ✓ experimental group (Lexp-2) - it comprised 17.280 laying hens, belonging to the „Hisex Brown" hybrid.
- **Series III** *"Verifying of the production performances achieved by the best laying hybrids, during the previous experimental series",* tried to check the best experimental version, studied within the previous series and also included 2 experimental groups (Lc and Lexp):
  - ✓ control group (Lc) - it comprised 17.280 laying hens, belonging to the „Lohmann Brown" hybrid;
  - ✓ experimental group (Lexp) - it comprised 17.280 laying hens, belonging to the „Hisex Brown" hybrid.

The superintensive husbandry system principles have been used during the 3 experimental series to assess the performances. The groups method, combined with the periods method have been used as experimental technique.

Fowl have been accommodated in halls without windows (blind), each one having a surface of 1200 m^2 and being endorsed with B.P.-3 pyramidal cage batteries. The brooding density reached 4 hens/classic cage of 2000cm^2, meaning a surface of 500cm^2 cage floor/hen.

Results achieved during the experimental series I

The researches focused on the establishing of yield efficacy of the „Roso-SL" and „Lohmann Brown" hybrids, reared within the intensive system.

The environment temperature in the husbandry halls seasonally varied, due to the lack of climate control equipments. Thus, at the "Roso-SL" hybrid (Lc-1 group), although the specified temperatures should fall between +18÷+23^{0}C, the real values in the used hall were found 1,64^{0}C less than the lower limit, respectively 1,25^{0}C more than the upper limit. In the „Lohmann Brown" hybrid (Lexp-1 group), the recommended temperature is about +22÷+24^{0}C, while the assessed values in the hall were 5,64^{0}C below the minimal, respectively 0,97^{0}C over the maximal limits.

The air relative moisture recommended by the hybrids producers is about 60-70% in „Roso-SL" respectively about 60-79% in „Lohmann Brown". The measured values revealed the link between this microclimate factor and the variations of the atmospheric air humidity variations, varying seasonally. Thus, in the hall which accommodated the Lc-1 group („Roso-SL" hybrid), the moisture was 3.89% lower and 18.37% higher than the standard values, while in the hall hosting the Lexp-1 group („Lohmann Brown" hybrid), the same microclimate factor was 4.29% below the lower limit and 9.96% over the maximal one.

Pollutants concentration increased as flock turned old but the measured values were close enough between both halls; however, in the hall which accommodated the Lexp-1 group, certain higher levels of pollutants occurred, as a consequence of a better flock liveability, thus a higher fowl amount. Thus, the ammonia level in the hall hosting the Lc-1 group ("Roso-SL" hybrid) reached 0.003-0.029% and 0.004-0.032% in the Lexp-1 group hall ("Lohmann Brown" hybrid), while the carbon dioxide proportion was found at levels of 0.25-0.45%, respectively of 0.252-0.457%. The assessments related to sulfure hydrogen concentration showed levels of 0.036-0.078% in hall no.1 ("Roso-SL"), respectively of 0.038-0.083% in hall no. 2 ("Lohmann Brown").

Body weight of the studied fowl evolved in accordance with the standard curves of the tested hybrids. Most significant are the weights recorded at the end of the experiment (fowl of 80 weeks old), which reached 2237.99±51.61 g in Lc-1 group and 2120.83±44.57 g in Lexp-1 group, compared to 2240 g in "Roso-SL" hybrid standard and to 1943-2147 g in "Lohmann Brown" standard.

Both hybrids reached the maximum laying intensity during the 28th week of fowl age, meaning 91.71% in "Roso-SL" hybrid (Lc-1 group) and 92.17% in "Lohmann Brown" hybrid (Lexp-1 group).

The achieved eggs yield, were lower in "Roso-SL" (324.02 eggs/hen) and higher in "Lohmann Brown" (336.59 eggs/hen).

Feed intake level was correlated to the eggs yield. The best values have been noticed the group with the highest yield - Lexp-1 group, "Lohmann Brown" hybrid (feed conversion=166.47

g/egg; mean intake =134.28 g/hen/day, while the poores ones have been calculated for the Lc-1 group – "Roso-SL" hybrid (feed conversion=179.28 g/egg; mean intake =137.36 g/hen/day).

The lowest flock casualties, meaning 6.07%, have been recorded by the Lexp-1 group ("Lohmann Brown"), while the highest ones, of 7.87%, by the Lc-1 group ("Roso-SL").

The eggs presenting morphologic anomalies have been found in lower proportion during peak production (1.08÷1.41%) and somehow higher when laying ended (2.27÷2.69%), but, always higher in the "Roso-SL" hybrid than in the "Lohmann Brown" one.

Eggs weight progressively increased, from the laying onset (46.91÷47.08 g) till its ending (68.47÷68.77 g).

Eggshell thickness at the eggs issued from the "Lohmann Brown" hybrid (Lexp-1 group) was measured at 0.362÷0.448 mm, while for those produced by the "Roso-SL" (Lc-1 group), this parameter reached just 0.351÷0.440 mm.

Eggshell breaking strength was higher in the eggs with thicker shell, meaning the Lexp-1 group (0.332÷0.350 kg f/cm^2), compared to 0.327÷0.345 kg f/cm^2 as found in Lc-1 group.

Concerning the eggs structure, it was found that albumen participation in whole eggs decreased from 57.70÷57.97% during laying onset till 56.74÷56.88% towards its ending. Conversely, yolk participation increased from 30.40÷30.43% till 32.99÷33.05%. the eggshell participation was diminished as eggs became heavier, still having higher levels in Lexp-1 (10.21÷11.87%).

The eggs chemical composition was found within normal limits, both in Lc-1 group ("Roso-SL"), and Lexp-1 group ("Lohmann Brown" group).

Related to the economic efficacy of the studied hybrids exploitation, it was found that in Lexp-1 group - "Lohmann Brown" hybrid, it was obtained the highest revenue, meaning 89799 lei/hall, compared to just 41696.2 lei/hall, realised at the Lc-1 group – "Roso-SL" hybrid.

Results achieved during the experimental series II

This series focused on the comparative study of the technical and aconomic performances achieved by the "Roso-SL" and "Hisex Brown" laying hybrids, exploited under the high intensive husbandry system.

The thermal comfort values, provided by both halls did not significantly differ between them, being comprised between +16.44....+24.97°C, in hall no. 1 ("Roso-SL" hybrid) and between +16.48....+25.05°C, in hall no. 2 ("Hisex Brown" hens).

Air relative moisture in the studied halls was related with the humidity variations of the outer air, oscillating from season to season. The lowest moisture levels (56.11% in hall 1 and 57.12% in hall 2) have been observed during the warm season (August), while the highest ones

were recorded during the cold season (88.37% in hall 1 and 88.84% in hall 2), meaning in the 2nd week of February.

Pollutants concentration gradually increased as flocks turned old without the occurrence of any major difference between halls. However, the higher amount of hens from hall 2 led to more pronounced microclimate degradation, therefore higher pollutants levels, for the ammonia (0.0014-0.0327%), carbon dioxide (0.180-0.333%) and sulphur hydrogen (0.0258-0.0711%).

Body weight dynamics evolved in accordance with the standard curve specified in hybrids documentation standard. Thus, at the end of the experiment, (80th week of fowl life), the average body weights reached 2239.98 g in "Roso-SL" (standard=2240g) and 2063.78 g in "Hisex Brown" (standard=2065 g).

In “Hisex Brown” hybrid, the rigorous selection for organic resistance, applied at bloodline levels, induced lower mortality rate, of just 5.43%, comparing with the situation found in "Roso-SL" hens, whose mortality reached 6.70%.

Although both groups reached the maximal laying intensity in optimal age (28 age), this was lower than the standard performances of the used biological material, being 3.79% lower in "Roso-SL" hybrid and just 0.79% less in "Hisex Brown". Naturally, the eggs yield was lower than the theoretic potential, meaning less 4.09% in "Roso-SL" and 3.71% in "Hisex Brown"'.

Overall the studied period, the best performances related to feed consumption (138.7 g/hen/day-mean intake and 173.43 g/egg-feed conversion ratio) have been realised by the fowl in the experimental group (“Hisex Brown"); these values have been 0.72%, respectively 3.24% lower than these from "Roso-SL" hens (control group).

Proportion of eggs with morphologic anomalies was lower during peak of production (0.87-1.06%) and higher toward ending (2.22-2.44%), being always more reduced at the eggs issued from "Hisex Brown" hens.

Eggs weight increased as fowl turned old, reaching a maximum level at the end of experiments (80th week of life), meaning 68.51 g in "Roso-SL" eggs and 68.67g in "Hisex Brown" eggs.

Shell thickness reached 0.350-0.440 mm in "Roso-SL" eggs and 0.358-0.446 mm at the "Hisex Brown" ones.

Eggshell breaking strength has been correlated with its thickness, being better (0.330-0.349 kgf/cm^2) at the eggs produced in the experimental group ("Hisex Brown" hybrid), compared with those issued from the control group ("Roso-SL" hybrid), in which the same parameter reached just 0.328-0.345 kg f/cm^2.

Concerning the eggs structure it was found that albumen participation has been preserved at relatively constant levels (56.90-57.97% in Lc-2 group and 56.84-57.85% in Lexp-2 group),

while the yolk proportion increased in both groups, meaning 30.30-32.97% in Lc-2 and 30.33-32.99% in Lexp-2; mineral shell decreased its participation from 11.73-11.82%, at the beginning, till 10.13-10.17% when laying was ended.

Eggs chemical composition filled in normal limits, both in Lc-2 group (“Roso-SL” hybrid), and in Lexp-2 group (“Hisex Brown" group).

The economic efficacy has been calculated basing on the achieved technical performances, concluding that the incomes from the "Hisex Brown" hybrid were 32.03% higher than those from the Romanian hybrid.

Results achieved during the experimental series III

This experimental series comprised a comparative study of the production performances realised by the hybrids with the best technical and economical evolutions from the previous series, meaning the “Lohmann Brown and “Hisex Brown” hybrids.

Ambient temperature did not significantly varied between both halls, being comprised between +17.31....+25.88°C in the hall hosting the “Lohmann Brown” hybrid (hall 1) and between +17.24....+25.25°C, in the hall with “Hisex Brown” hens (hall 2). Comparing with the recommendations for both hybrids, the recorded differences were relatively high, without reaching levels which could affect fowl health status.

Air relative moisture has been influenced by the hens amount in both halls and especially by the variations of outer air humidity, reaching the lowest levels during the warm season – August (7.51% in hall 1 and 57.06% in hall 2) and the highest ones (89.59% in hall 1 and 89.09% in hall 2) during the cold season (February);

Pollutants concentration reached levels of 0.0037-0.0344% for ammonia, of 0.259-0.469% for carbon dioxide, respectively of 0.0381-0.0852% for sulphur hydrogen. The greater amount of hens in hall 1, populated with “Lohmann Brown” hybrid, induced more pronounced degradation of hall microclimate.

Appliance of feeding in accordance with the producers specifications and the periodic control of body weight dynamics, allowed the maintenance of this parameter within the standard body weight curves of the studied hybrids.

In “Lohmann Brown” hybrid, mortality rate on the entire studied period reached just 5.38%, meaning 0.84% lower than that of the group in “Hisex Brown".

Although the eggs yield between both groups was close enough (337.24 eggs/hen in Lc and 335.90 eggs/hen in Lexp), the differences from their theoretic potential were just of 0.26 eggs/hen in “Lohmann Brown”, compared to 13.1 eggs/hen in “Hisex Brown” group.

Average laying intensity achieved in the 60 laying weeks reached 80.40% in “Lohmann Brown” hybrid, compared to 79.97% in “Hisex Brown” hybrid.

Over the entire experimental period (20-80 weeks), the “Lohmann Brown” hens (Lc goup) achieved feed consumption levels of just 133.30 g/hen/day-average daily intake and 167.78 g/egg – feed conversion ratio, compared to 134.13 g/hen/day-daily mean intake and 169.84 g/egg-feed conversion, values obtained by the “Hisex Brown" fowl (Lexp group).

Proportion of eggs with morphologic anomalies was lower in “Lohmann Brown” hens (0.72-2.16%), than in "Hisex Brown" ones (0.75-2.22%).

Eggs weight followed an ascendant trend from the beginning till the end of laying, knowing that, in all situations, it was better in “Lohmann Brown” hens (47.07-69.02 g), than in "Hisex Brown" ones (47.05-68.95 g).

Eggshell thickness has been diminished as hens turned old; although there have not occur statistical differences, in “Lohmann Brown” the shell was cu 0.001-0.004 mm thicker than that measured in "Hisex Brown" eggs.

Shell breaking strength similarly evolved with its thickness, progressively decreasing toward the end of hens exploitation period, when recorded the lowest levels (0.332±0.0049 kgf/cm^2 in Lc eggs and 0.330±0.0055 kgf/cm^2 in Lexp eggs).

The participation of the albumen in the structure of the studied eggs was 0.22-0.79% higher in those produced by “Hisex Brown” hens, while yolk participation was 0.15-0.17% better in the eggs produced by “Lohmann Brown” hens, as well as the participation of the eggshell (+0.05-0.08%).

Eggs chemical composition did not significantly differ between groups, while the values assessed for each element were comprised within the limits specified by the scientific literature.

Concerning the economic efficacy in exploitation of the studied hybrids, the computations indicated a netto revenue of 110722,5 lei in “Lohmann Brown” hens, which was 19.14% higher than that obtained in “Hisex Brown” hybrid husbandry (89532 lei/series).

Main conclusions and advisory

The results achieved during the three experimental series which documented the present PhD dissertation allowed us to state certain main conclusions, listed below.

In all analyzed situations, the level of **microclimate factors** has been influenced by the outer atmospheric conditions, which oscillated by season, as well as by the amount of hens in halls, straight linked to the casualty level. Thus, even if the environmental temperatures in the studied halls did not reach dangerous levels for fowl health status, they had wide oscillations, with minimal values of 16.36-17.31^{o}C and with maximal points of 24.25-25.88^{o}C. Quite similar

situation has been observed for the relative air moisture, which varied between 56.11 and 89.59%. Concerning the pollutants concentration from the halls used in 6 the groups accommodation, should be specified that the ammonia level varied between 0.0011-0.0344%, the carbon dioxide between 0.175-0.469%, while the sulphur hydrogen between 0.254 and 0.0852%.

In each of the three tested laying hybrids, the **body weight** was maintained on the standard curve specified for each hybrid, phenomenon explicable through the fact that there have been respected the requirements of producers companies, concerning feed qualities and feeding technique.

Flock casualties reached 7.28% in "Roso-SL" hybrid (1.88% more than the maximum admitted), 5.83% in "Hisex Brown" hybrid (0.97% less than the management guide) respectively 5.72% in "Lohmann Brown" hybrid (0.28% less than the maximum admitted).

The tested hybrids reached the **maximal laying intensity** in time, meaning at the age of 28 weeks, but with slight differences between them. Thus, in "Roso-SL" hybrid, the laying peak reached an average value of 91.46%, 3.54% less than the theoretic performance; "Lohmann Brown" had an average value of 92.23%, meaning 0.77% less than the maximal theoretic intensity of the biological material; in "Hisex Brown" the same parameter was of 93.17%, with 0.83% under its potential.

Concerning the eggs yield, there have been found differentiations between hybrids, which meant productions of 325.20 eggs/hen in "Roso-SL", of 335.98 eggs/hen in "Hisex Brown" and of 336.98 eggs/hen in "Lohmann Brown". More suggestive are the differences between the achieved data and the theoretical ones, meaning less productivity, observed through less 0.58 eggs/hen in "Lohmann", -13.02 egg/hen in "Hisex Brown" and -15.11 eggs/hen in "Roso-SL".

The production level also influenced the **feed consumption**. Thus, the best results have been observed in "Lohmann Brown" hybrid, whom daily average intake reached 133.79 g/hen/day, meaning 1.97% lower than in "Hisex Brown" hybrid and 3.55% than that of "Roso-SL". The feed conversion ratio was calculated at 167.13 g/egg, 2.70% lower than "Hisex Brown" and even 7.26% lower than "Roso-SL".

Assessment of **eggs quality** revealed the slight superiority of those produced by the "Lohmann Brown" hens.

Thus, the proportion of eggs with morphologic anomalies was of 1.29% in "Lohmann Brown", of 1.32% in "Hisex Brown", respectively of 2.14% in "Roso-SL".

The average eggs weight reached 60.09 g in the eggs issued from "Lohmann Brown" fowl, of 59.96 g in those produced by "Hisex Brown" and just 59.65 g in "Roso-SL".

Concerning the eggshell thickness of the studied eggs, the average value assessed during the 4 controls indicated levels of just 0.395 mm in "Roso-SL", of 0.405 mm in "Hisex Brown",

respectively of 0.407 mm in “Lohmann Brown”, which led to differentiations related to shell breaking strength (0.339 kgf/cm^2 in “Lohmann Brown” hybrid; 0.337 kgf/cm^2 in “Hisex Brown” and 0.334 kgf/cm^2 in “Roso-SL”.

Concerning eggs structure, the average calculated values indicated higher values for the yolk (31.84%) and for eggshell (11.01%) in the eggs produced by “Lohmann Brown” hens, and higher for the albumen participation (57.49%) in those issued from “Roso-SL” eggs.

The chemical analyis of eggs compounds (albumen, yolk and shell) did not revealed the occurrence of any statistic differences between groups or alterations from the limits indicated by the scientific literature. Thus, the protein content varied between 2.75-3.33 g/egg for yolk and 3.40-3.60 g/egg for albumen. Yolk lipids oscillated between 5.93-6.78 g/egg, while the minerals content from the shell varied between 5.14-8.41 g/egg.

The most suggestive differentiations between groups were those related to the **economic efficiency** of tested hybrids exploitation. From this point of view, the “Lohmann Brown” could be highlighted because its generated average income for both series reached 100260,8 lei, which meant 14.03% higher than that realized by the “Hisex Brown” hens and 51.12% than the income brought by the indigenous “Roso-SL”.

The previously listed conclusions, completed by our know-how in laying hens husbandry allow us to state that the production response of the “Roso-SL” hybrid at the conditions provided by the intensive exploitation system is lower than the performances achieved by other laying hybrids produced worldwide.

Concerning the imported laying hybrids we tested, “Lohmann Brown” is highlighted through better laying persistence, better liveability, very convenient feed consumptions and higher quality of the laid eggs; economically speaking, the “Lohmann Brown” hybrid husbandry proved to be more efficient.

Despite these facts, the importance of “Hisex Brown” hybrid should not be diminished, knowing it is quoted at higher performances than the “Lohmann Brown” hybrid but they could not be achieved in the conditions we experienced.