

PhD Dissertation

“Contributions on the identification and improvement of the avian genetic resources from Bihor county”

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ABSTRACT

The avian genetic diversity is an indispensable tool for the functioning of the national programs established for designing poultry hybrids with certain specializations. Therefore, any source of avian biologic material should be identified and preserved as a depot till is needed.

Knowing the situation in the field it imposed for some regional or county studies within the Western side of the country, in order to know the breeders of pure breed fowl and to identify the main avian populations – establishing their aptitude or discrepancy to the breed standard and the monitoring of the production and reproduction performances, as well.

The main idea was to establish a database concerning the avian patrimony for the specified area, then completed with similar data from the other regions of the country, in order to constitute a national catalogue of avian biological material in its pure state, which could provide the complete and competent information for all interested social categories, from the specialists dealing with the top of the aviculture pyramid (genetists, improvers, manager etc.) till those private farmers, passionate by pure breed fowl.

This paper presents the experimental results or the case studies which have been run in 5 farms of pure breed fowl situated on the Bihor county area. The provided data brought new and valuable informations concerning the history of the breed within the specified area, following meanwhile those aspects related to: breed phenotype exteriorization and fulfilling of the national and international standards, the morpho/productive traits, the reproduction performances and certain particular technological elements, used in pure breed fowl breeding in the North/West of the country.

The own researches has been grouped in 2 groups, as it follows:

Group I, which included studies of the species: *Gallus domesticus* (domestic chicken Leghorn and Hamburg breeds), *Meleagris gallopavo* (domestic turkey, Bronzed variety), *Anser anser* (domestic goose – White Rhine Dutch breed), *Anas platyrhynchos* (domestic duck –Pekin breed).

Group II, which comprised studies on the species: *Numida meleagris domesticus* (domestic Guinea fowl, grey variety), *Coturnix coturnix japonica* (Japanese quail) and *Phasianus colchicus colchicus* (common hunting pheasant).

The studied farms had the following territorial spreading:

- a) during the Ist group of researches: one in Oradea and four across the Bihor county (Biharia, Oșorhei, Tileagd and Salonta places).
- b) during the în IInd group of researches: in Oradea and four across the Bihor county (Marghita, Tileagd, Nucet and Salonta).

The appropriate working methodology, as recommended by the specialty literature, was used in order to achieve the results (Sauveur B., 1988; Vacaru-Opriș I. et al., 2000, 2002), and the biological and logistic materials, as well.

Thus, several studies have been set+up in 5 farms of pure breed fowl from Bihor county (conventionally assigned with C1, C2, C3, C4 and C5 notations) considering the following aspects:

- a) **knowledge of phenotypic breed traits;**
- b) **the morpho-productive and reproduction indexes** acquired by the fowl:
 - body weight of the youth and mature birds;
 - feed intake and conversion in youth and laying hens;
 - flock casualties and their reasons;
 - sexual maturity reaching moment;
 - eggs yield and laying curve;
 - quality of the incubation eggs:
 - i. eggs weight;
 - ii. shell thickness;
 - iii. shape index;
 - iv. Haugh index.
- c) incubation process analysis:
 - % infertile eggs;
 - % eggs fertility;
 - % eggs with dead embryos after each control and cumulated;
 - % hatchability;
 - % hatching percentage;
 - weight of the new hatched chicks and their classifying on quality classes.
- d) knowledge of the **breeding and husbandry technologies** applied in studied farms;
- e) trends in flocks improvement, criteria and techniques of selection in studied farms.

During the studies of the Ist research group, 5 farms have been analysed, trutured as follows: 81♂ and 290♀ from *Gallus domesticus* species, Leghorn and Hamburg breeds; 11♂ and 80♀ from *Meleagris gallopavo* species, Imprved Bronzed breed; 22♂ and 90♀ from *Anser anser* species, White Rhine Dutch breed; 15♂ and 90♀ from the *Anas platyrhynchos* species, Pekin breed.

Concerning the **body weight**, the following average performances have been recorded:

Leghorn breed:

Youth: age 20 weeks - 2240,5 g in ♂, 1604,0 g in ♀

Adults: age 18 months - 2647,2 g in ♂, 1834,8 g in ♀

Hamburg breed:

Youth: age 20 weeks - 1708,5 g in ♂, 1566,0 g in ♀

Adults: age 18 months - 2009,5 g in ♂, 1834,1 g in ♀

Improved Brozed breed:

Youth: age 30 weeks - 16,60 Kg in ♂, 9,61 Kg in ♀

Adults: age 54 weeks - 21,0 Kg in ♂, 9,7 Kg in ♀

White Rhine Dutch breed:

Youth: age 33 weeks - 5988,2 g in ♂, 4333,4 g in ♀

Adults: age 52 weeks - 6439,8 g in ♂, 4715,5g in ♀

Pekin breed:

Youth: age 18 weeks - 2852,5 g in ♂, 2366,5 g in ♀

Adults: age 65 weeks - 3551,1 g in ♂, 2982,5 g in ♀

The daily feed intake has been found within normal limits for the studied populations, being influenced by age and physiological status.

Feed conversion ratio at the laying fowl presented the following average values across the entire production period: 194.1 g feed/egg, in Leghorns; 255 g feed/egg, in Hamburg breed, 586 g feed/egg in Improved Bronzed breed; 858 g feed/egg, in White Rhine Dutch breed; 543 g feed/egg, in Pekin breed.

Although the **flock casualties** had quite high values, being comprised between 2.2% (rasa Hamburg) – 22.7% (Improved Bronzed turkey), they have not been caused by pathologic reasons, and dew to some technological accidents, to some feeding errors and to culling, as well.

The **average age of the secual maturity onset** was of 139.8 days, in Leghorn breed, of 141.8 days, in Hamburg breed, of 211.7 days, in the turkey breed, of 241.3 days in geese, respectively of 176 days, in Pekin ducks.

The **average value of the laying intensity** during peak moment reached: 82.5% in Leghorn, 70.0% in Hamburg fowl, 64.7% in turkey, 57.9% in geese and 80.1% in Pekins.

The **average eggs yield** for each producing female/laying cycle was of 229 eggs in Leghorn, 163.3 pcs. in Hamburg breed, 74.2 buc. in Improved Bronzed breed, 41.4 pcs in White Rhine Dutch; 98.9 pcs. in Pekin ducks.

Incubation eggs quality, represented by certain indexes – weight, shell thickness, shape index, Haugh index – recorded values in accordance to the scientific literature, when the average of each taxonomic studied populations has been considered.

Eggs fertility was found well in most cases, excepting for the turkey ones, which was below the recommendations, leading to a lower hatchability level.

Dead embryos percentage, identified and calculated at the Ist and IInd controls was higher in waterfowl, mainly due to the incubation technique, imperfectly adapted to the specific embryonic development of these populations.

Hatching percentage was higher in the eggs produced during laying peak, certain average values being recorded: 81.5% in Leghorn, 81.0% in Hamburg, 66.5% in turkey, 69.4% in goose, respectively 68.6% in duck.

Classifying of day old chickens gave more than 93.5% belongings to the Ist class, while those in thje IIIrd class did not exceed 0.9%.

During the studies comprised into the 2nd research group, 4 categories of domestic fowl have been analysed, as it follows:

- 40♂ and 212♀ from *Numida meleagris* species (farms Oradea, Tileagd și Nucet);
- 245♂ and 750♀ from *Coturnix coturnix japonica* species (farms Oradea, Marghita, Tileagd);
- 28♂ and 175♀ from *Phasianus colchicus colchicus* species (farms Marghita, Tileagd, Salonta);

Concerning the morpho/productive and reproduction indexes, the results are listed below:

a) in **Grey Guinea fowl** populations:

- average body weight at the ending of youth growing period (28 weeks) reached 1965.2 g in males and 1795.1 g in females;
- average body weight at the ending of the assessment period (65 weeks) in mature fowl was of 2536.0 g in males and 2294.8 g in females;
- feed intake was of 62.4 g/capitis/day in cockerels and of 58.0 g/capitis/day in pullets, calculating average feed conversion ratios of 5.27kg feed/kg gain in males and 5.33 kg feed/kg gain in females;
- for mature fowl, daily inake reached 122.72 g feed, thus the FCR was calculated at 194.89 g feed/produced egg.
- flock casualties were situated between 10.1-13.8%;
- sexual maturity was reached at the age of 207.7 days;
- eggs yield (avg. pcs./capitis) has been calculated at 161.6 eggs, for a period of 37 weeks;
- laying intensity presented a certain dynamics: 26.5% during the ascendant curve (29 weeks), 86.5% during laying peak (35 weeks), 62.3% during plateau (45 weeks) and 57.9% during descending phase (65 weeks);
- incubation eggs quality has been assessed through several parameters, the experimental results indicating the variation limits listed below (laying onset...laying ending):
 - egg weight: from 43.9g till 46.6 g;
 - shell thickness: from 0.500 mm till 0.470 mm;
 - shape index: from 75.5% till 77.4%;
 - Haugh index: from 77.7% till 75.3%.
- the statistical analysis of the incubation process revealed the following limits for the main indexes:
 - fertility: between 88.5% and 91.9%;
 - amount of dead embryos: between 19.1% and 21.7%;
 - hatchability: between 75.8% and 78.5%;

- hatching percentage: between 68.0% and 70.9%.
- according to the classifying of the newly hatched chickens it was found that 94.75% belonged to the Ist class, 3.41% to the II nd class and 1.84% to the IIIrd class.

b) In **Japanese quail** populations:

- average body weight at the end of youth rearing (6 weeks) reached 109.2 g in males and 132.8 g in females;
- mean live weight at the ending of the assessment period for mature specimens (34 weeks) reached 128.8 g in males and 148.6 g in females;
- feed intake was of 13.7 g/capitis/day in cockerels and of 14.65 g/capitis/day in pullets, calculating average values for the FCR of 4.62kg feed/kg gain in males and 4.93 kg feed/kg gain in females;
- for mature fowl, the average feed intake reached 21.97 g feed, meaning a value of 23.01 g feed/ produced egg as FCR.
- flock casualties ieşirile were situated between 12.9-13.3%;
- sexual maturity has been reached at the age of 44.7 days;
- eggs production (average/capitis) has been calculated at 142 eggs, for a period of 30 weeks;
- laying intensity passed through several values, according to the laying moments: 25.3% during onset (9 weeks), 86.5% during peak (19 weeks), 70.98% during plateau stage (24 weeks) and 56.83% during descendant curve (36 weeks);
- quality of the incubation eggs (oscillation limits at laying onset and ending):
 - egg weight: from 9.2g to 10.6 g;
 - shell thickness: from 0.128 mm to 0.089 mm;
 - shape index: from 81.3% to 83.2%;
 - Haugh index: from 83.3% to 79.5%.
- Incubation process analysis revealed certain limits for the main known parameters:
 - fertility: between 86.4% and 91.1%;
 - amount of deat embryos: between 9.2% and 10.6%;
 - hatchability: between 89.1% and 90.1%;
 - hatching percentage: between 77.0% and 82.0%.
- after classifying of the new hatched chickens, it was found that 95.3% filled into the Ist class, 4.4% in the IIInd one and 0.3% in the IIIrd class.

c) in **Common hunting Pheasant** populations:

- the average live weight at the end of the youth rearing (45 weeks) was of 1232.5 g in males and 889.7 g in females;
- the average body weight at the ending of the assessment period for mature fowl (57 weeks) reached 1381.9 g in males and 1002.8 g in females;
- feed intake reached 53.25 g/capitis/day in cockerels and 47.95 g/capitis/day in pullets, meaning average FCR values of 10.42 kg feed/kg gain in males and 9.49 kg feed/kg gain in females;

- for mature fowl, a daily feed intake of 96.18 g feed has been recorded, meaning a FCR value of 208.88 g feed/egg.
- flock casualties were situated within the 6.9-11.1% interval;
- sexual maturity was reached at approximately 320.3 days;
- eggs yield (avg./capitis) was calculated at 37.8 eggs, for a period of 12 weeks;
- laying intensity presented a specific dynamic curve: 6.9% during onset period (46 weeks), 75.4% during peak (50 weeks), 58.3% during plateau (53 weeks) and 24.8% during the descending period (57 weeks);
- incubation eggs quality was revealed by certain indexes, such as those listed below, with values comprised between laying onset and its ending:
 - egg weight: from 28.9g till 32.1 g;
 - shell thickness: from 0.415 mm till 0.375 mm;
 - shape index: from 77.9% till 79.1%;
 - Haugh index: from 76.1% till 77.6%.
- statistical analysis of the incubation revealed the following situation:
 - fertility: between 73.2% and 76.5%;
 - dead embryo amount: between 6.4% and 7.2%;
 - hatchability: between 90.1% and 91.6%;
 - hatching percentage: between 65.8% and 69.6%.
- the classifying of the new hatched chickens indicated the following repartition: 94.0% Ist class, 4.5% IInd class and 1.2% IIIRD class.

According to the researchers we carried out, there have been issued certain recommendations:

- the avian genetic pool should be diversified, through the introduction of some new valuable colour varieties/bloodlines;
- it imposes to artificially select the studied flock towards eggs yield and growing speed;
- we suggest the introduction of certain valuable individuals in population, in order to improve some bad traits, which produce undesirable effects especially in the incubation process;
- the frequently usage of the males breeders which give well fertility levels, in order to improve this trait in the similar populations from Bihor county area;
- feeding of the pure breed fowl should be done in accordance with the requirements of the reproduction fowl, ensuring a well balanced feed intake, both quantitative and mostly qualitative;
- it would be great if breeders would use the complete mixed feeds or of the concentrate mixtures with proteic/vitaminic/mineral nuclei, especially adjusted for each fowl category;
- it is recommended to improve the storage conditions of the feed resources, in order to prevent their contamination with mycetes, fact which could increase morbidity incidence through disfavorable mycotoxins action onto fowl health status;

- it imposes to adjust the incubation technique, mainly for the palmipedes, guinea fowl and pheasants populations, in order to better adapt to their incubation specific.

Finally, it could be stated that in most of the situations, the recorded performances were lower than the standard of the analyzed fowl or they were found within the lower limit of the standard variation interval.