

Summary of doctoral dissertation MSc Magdalena Dykiel entitled:
**IMPACTS OF EXTENSIVE HOUSING SYSTEMS FOR SELECTED HEN
BREEDS AND LINES ON EGG QUALITY AND BIRDS' WELFARE**

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The main objective of the study was to evaluate the influence of housing systems (indoor, free-range and organic) and the hen's genetic origin on egg quality and the welfare of layers. In order to achieve this main objective specific goals which were to provide answers to questions of how and to what extent has the system of housing and hen's genetic origin impacted on the following were defined:

- Shell's physical characteristics (thickness, density and resistance) and the egg's content (height of protein, Hough index, weight of yolk and colour intensity);
- Egg's nutritional value (vitamins A and E content, cholesterol content and fatty acid profile);
- Egg's functional properties (pH, foamability, egg protein's foam stability);
- Cleanliness and shell's microbial quality, and
- Egg's storage quality.

Other specific goals of the study included assessing the level of welfare of hens of various breeds as well as hybrids held in all the housing systems covered by the study.

With intent to achieve the set objective three trials were conducted, which covered 1200 hens in total, including the native green-legged partridge (Z-11), Rhode Island Red hens (R-11) and Sussex (S-66), that are under protection in Poland as well as the Araucana hen breeds that is very common in amateur farms and the Hy-line Brown breed.

The study concerning the quality of eggs from each housing system involved evaluating the physical properties of eggs in their 26th, 42nd and 56th week of layers' life as well as in the 14th, 28^t and 42nd day of storage. There were 2160 eggs in all. The eggs' quality assessment covered the egg's and yolk weight (g), shape index (%), percentage of yolk, protein and shell in egg; property of shell i.e., intensity of colouration (%), weight (g), thickness (μm), density (mg/cm^2), resistance (N); physical properties of egg content i.e., height of thick protein (mm), Hough index (HU), yolk's colour intensity; concentration of hydrogen ions (pH), protein and yolk as well as the presence of meat and blood stains in egg content.

In each of the trials, the level of welfare of layers was in the 20th, 36th and 56th week assessed based on results from observation of layers behaviours, plumage condition while the assessment also included frequency of use of paddocks in case of free-range and organic housing system.

The results obtained confirm that the layers housing system affected the eggs quality properties such as the weight, shape, intensity of yolk colouration, the protein and yolk's pH, profile of fatty acids, including vitamin A content of the egg's yolk.

No impacts of the layers' housing system on the shell's intensity of colouration, protein's height, Hough index, presence of meat and blood stains, the egg's functional properties (foamability, foam leakage and foam stability) as well as the level of cholesterol and vitamin E in the yolk were observed.

Eggs from free-range and organic farming noted higher share of dirty eggs, shells with more microbial contamination than in the in littered indoor facilities.

No impacts of the layers housing system on the eggs' storage quality, measured as the rate of weight loss as well as changes to the height of protein and Hough's index were observed.

The raising of layers under free-range and organic systems enhances the maintenance of high levels of welfare for layers as can be deduced from the lack of agonistic behaviours, greater share of comfortable behaviours, better conditions of plumage from layers held in these housing systems than in littered indoor facilities.

The hen's genetic origin had significant influence on the colour and weight of laid eggs from each of the housing systems. Hy-line Brown hens laid heavier eggs than native breeds of hens.

The impact of hens origin on the eggs content features (height of protein, value of Hough index and the presence of meat and blood stains) was observed. The highest amount of meat and bloodstains were observed in eggs from hens with brown shells, namely R-11 and Hy-line Brown layers regardless of the system of farming.

The impact of the hen's genetic origin on cholesterol content of an egg's yolk was not observed.

The hen's origin, however, have impacts on the vitamins A and E content of egg yolks in organic farming system. The highest content of vitamin A and E was found in egg yolks from Z-11 hens.

Since native breeds of hens benefited most from paddocks than hybrid hens under free-range and organic farming and exhibited more comfortable behaviours, besides being characterized by a better plumage.

Key words: egg quality, housing system, hen's welfare.

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