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HUSBANDRY SYSTEM EFFECTS ON EGG QUALITY PARAMETERS

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Abstract

This experiment was carried out to compare morphological egg quality parameters of brown eggs laid by chickens reared in different production systems: conventional, free-range, and family type production systems. A total of 270 brown eggs were obtained from commercial poultry companies raising Lohmann Brown in a multi-tier cage system and free-range unit as well as families possessing hens in their yards. Differences in egg quality parameters among the production systems were attained using the LSD option at $P < 0.05$. All egg quality parameters differed by the husbandry system, except for albumen index. Eggs from the free-range system had characteristics similar to those from the conventional system. Quality of eggs from the family type system had high coefficient variation. In conclusion, high variability in quality of eggs from the family type system could be related to variations in breed, age, and diet, which are uncontrollable and undeterminable. The most strikingly different egg quality parameter in eggs from the family type production, in comparison with other is yolk colour.

Key words*: egg quality, production system, welfare, organic egg.*

INTRODUCTION

The egg is one of the most consummate foods for human nutrition. Egg protein is of high quality and is easy to digest. Because it contains almost all vitamins an important vehicle to complement the essential vitamin supply to the human. It is also a good source of minerals (Sparks, 2006). The external and internal qualities of eggs are very important for the consumers. The egg production and quality are related with the type of husbandry system (Radu-Rusu et al., 2014). Thus, Ozbey and Esen (2007) reported that the different breeding systems have essential effects on egg production and egg quality characteristics. Similarly, Meng et al. (2014) reported that the hens in the large furnished cages treatment had lower productivity and higher egg quality than those in the small furnished and conventional cages treatments.

Different husbandry systems are available in laying hens breeding such as Free-range, organic, yard, battery cage and furnished cage. Battery cages type is one of the husbandry systems which controversial subject for among advocates animal welfare, animal rights and industrial producers. Thus the European Union banned battery husbandry of chickens from January 2012 for welfare reasons (Leenstra et al., 2014). We aimed to compare morphological egg quality parameters of brown eggs laid by chickens reared in different production systems: conventional, free-range and family type production systems.

MATERIALS AND METHODS

A total of 270 brown eggs were obtained from commercial poultry companies raising Lohmann Brown in a multi-tier cage system and free-range units as well as families possessing hens in their yards.

The egg weight was measured with an electronic balance to the nearest 0.01 g. The egg shape index (%) was determined by equipment developed by Rauch and egg shell strength (kg/cm^2) was measured by special equipment. Egg yolk diameter, albumen length, albumen width (mm) were measured with

digital caliper. The albumen and yolk height (mm) were measure using tripod micrometer.

The yolk (YI) and albumen (AI) indexes were calculated using the following formula as described by Doyon et al (1986):

YI = (yolk height/yolk diameter) x 100

AI = (albumen height/(albumen length + albumen width)/2)) x 100

Individual HU score was calculated using the egg weight and albumen height (Haugh, 1937).

$HU = 100 \times \log (H + 7.5 - 1.7W^{0.37})$, where: H = Height of the albumen (mm), W = Weight of egg (g).

Eggshell thickness was measured after removing the internal membranes of the eggshell. A precision micrometer was used to the nearest 0.01 mm. Measurements were taken at the three regions of the shell and the means were calculated. Egg yolk colour was determined according to Roche yolk colour fan. The all data were analyzed by using PROC GLM procedure of statistical analysis software (SAS v9.4) (SAS, 2013). Differences in egg quality parameters among the production systems were attained using the LSD option at $P < 0.05$.

RESULTS AND DISCUSSIONS

The effects of different housing systems on external and internal quality of egg are presented in Table 1. All egg quality parameters differed by the husbandry system, except for albumen index. The deepest yolk colour is observed in family type system as expected. Shell breaking strength, eggshell thickness, shape index, yolk colour in conventional and free-range systems were similar but significantly ($P<0.05$) differ that of the family type system. Similiarly, Sekeroglu et al. (2010) reported that there was no difference among free range and cage systems.

Egg weight was the highest (62.53 g) in conventional system, intermediate (58.14 g) in free-range system and the lowest (54.02 g) in family type. Similarly stated by Pištěková et al. (2006), we observed significant differences for egg weights among the husbandry systems in the present study ($P<0.05$). Conversely Sekeroglu et al. (2008) reported that weights of eggs were not affected by housing system in a similar study.

Eggshell quality (breaking strength, weight and thickness) could be related to Ca level of shell. It is generally accepted that dietary Ca supplementation should play an important role in maintaining good eggshell quality (Arpášová et al., 2010). High variability in quality of eggshell from the family type system could be related to diet, which is uncontrollable.

Table 1. The quality parameters of eggs obtained from different production systems.

	Production System*		
Parameter	Conventional	Free-range	Family type
Egg weight, g	62.53±0.51a	58.14±0.39b	54.02±0.81c
Eggshell weight, g	7.66±0.07a	7.44±0.09a	6.62±0.11b
Eggshell weight, %	12.28±0.22b	12.81±0.14a	12.31±0.16b
Shell breaking strength, kg/cm^2	2.70±0.12a	2.85±0.10a	2.13±0.12b
Eggshell thickness, mm	0.39±0.002a	0.39±0.003a	0.35±0.04b
Shape index, %	77.74±0.24a	78.01±0.25a	74.55±0.40b
Yolk colour	10.36±0.09b	10.42±0.07b	11.85±0.21a
Yolk index, %	4.19±0.03a	4.08±0.02b	4.06±0.04b
Albumen index, %	0.60±0.02	0.57±0.02	0.60±0.02
Haugh unit	70.10±0.89a	67.81±0.99ab	66.65±1.48b

*Different superscripts among columns differ ($P < 0.05$).

CONCLUSIONS

Eggs from the free-range system had similar characteristics to those from the conventional system. Quality of eggs from the family type system had high coefficient variation. High variability in quality of eggs from the family type system could be related to breed, age, and diet, which are uncontrollable. The most striking egg quality parameter in eggs is yolk colour.

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