Acta fytotechn. zootechn., 17, 2014(3): 84–86

Original Paper

Egg quality of gene reserve the Czech Golden Spotted Hens

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In Czech Republic, there are two national poultry breeds, Czech Goose and Czech Golden Spotted Hen (CZH), which are under governmental project of gene reserves. In 2012 there were less than 220 CZH both males and females in this program. The aim of this study was to evaluate the egg quality of CZHs included in the project of gene reserves kept in International Poultry Testing in Ustrašice [South Bohemia]. Four flocks of CZHs of four different breeders' origin were used in the observation. They fed the same diets and they were the same age. Eggs for measurement egg quality were collected each two months 30 per flock from December to January next year. The egg weight ranged from 57.0 to 58.0 g (P >0.05). The eggshell strength was relatively high, in all flock higher than 35 N, and the differences among the flocks were no significant (P >0.05). Significantly darker eggshell color expressed as SCI was found in one flock in comparison with the others (P <0.05). There were no significant differences in both yolk weight and yolk color (P >0.05). The weight of yolk was higher than 18 g in all flocks. The yolk proportion was significantly (P <0.05) lower in one flock (31.2 %) in comparison with the rest of flocks (from 32.2 to 32.9 %). Although the egg production in Czech Golden Spotted hens is very unbalanced, the egg quality is very consistent. At feeding the same diets there were no significant difference among the flocks in majority of observed characteristics. Advantage of the eggs is high weight of yolk and consequently yolk proportion.

Keywords: egg weight, eggshell color, yolk proportion

1. Introduction

During the last 50 yr of the 20th century, about 20 % of livestock and poultry breeds have become extinct, and the remainder is at risk. This erosion of unique biodiversity is due to changes in farm practices developed in the West that involve mono-breed, intensive farming systems that are unsustainable. The close symbiotic relationship of Homo sapiens and domestic animals and birds over millennia is changing, resulting in a lost understanding of sustainability among urban communities (Hodges, 2006). In European countries, various governmental, non-governmental, and private organizations try to preserve genetic diversity of livestock in situ (e.g., by stimulating the use of indigenous, rare breeds by farmers; in nature reserves; or in noncommercial farms). In the case of poultry, maintaining in situ populations of the noncommercial (fancy) breeds largely relies on hobby farmers. In addition to in situ conservation, gene banks are being established for ex situ conservation (Wiekders et al., 2006). In the Czech Republic, there are two national poultry breeds, the Czech Goose and Czech Golden Spotted Hen (CZH), which are under governmental project of gene reserves. Despite the financial support for the breeders the numbers of CZHs included in the gene reserves project was no more than 220 both males and females together in 2012 and they were kept by six breeders. The breeders focus their attention mainly on exterior characteristics to the detriment of performance. The laying intensity ranges from 58 to 110 eggs per hen and the egg weight from 51.5 to 56.5 g in years 2007–2012.

The aim of this study was to evaluate the egg quality of CZHs included in the project of gene reserves kept in International Poultry Testing in Ustrašice.

2. Material and methods

In International Poultry Testing, there were housed four flocks of CZHs of four different breeders' origin all included in gene reserves. The sex ratio was the same for all flocks; three males plus twenty females. They had access to roofed outdoor with sand litter. They fed the same diets. All hens were the same age. Eggs for measurement egg quality were collected each two months; 30 per flock from December to January next year. Followed characteristics were evaluated: egg weight, yolk weight, proportion and color, eggshell thickness, weight and proportion, eggshell strength, eggshell color, albumen weight, proportion and Haugh units.

The shell breaking strength was determined on the vertical axis using Egg Force Reader. The color of the yolk was measured using the DSM Yolk Color Fan. The albumen

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Faculty of Agriobiology and Food Resources, 2014
http://www.fapz.uniag.sk/
DOI: 10.15414/afz.2014.17.03.84–86

height was measured using a digital micrometer (TSS EQS, England). Haugh units (HU) were calculated as indicated by Haugh (1937). Shell weight and shell thickness were determined after washing and drying of shells. The shell thickness was evaluated using the micrometer expressed as mean of thickness on equator and both poles. Eggshell color was determined by the L*a*b* Color System using a spectrophotometer (CM-2600d, Konica Minolta, Osaka):

- L* – lightness (value between 0 = black and 100 = white)
- a* – hue as a function of the red-green scale (<0 = green, >0 = red)
- b* – hue as a function of the blue-yellow scale (<0 = blue, >0 = yellow)

Color was expressed by shell color index (SCI) based on the three color parameters calculated with the formula SCI = L* – a* – b*, lower values indicating darker shell color (Cavero et al., 2012). Standard condition for the SCI method were set: measurement gap 8 mm, 10° standard observer, standard illuminant D65 – average daylight including ultraviolet wavelength region. The color of eggshell was measured at the equatorial area.

Data obtained from this experiment were analyzed using the single factor analysis of variation. Data were followed by LSD test using the software package Unistat 5.1 (UNISTAT Ltd.).

3. Results and discussion

Egg weight, eggshell strength and eggshell color (SCI) are shown in table 1. The egg weight was very balanced among the flocks. The highest difference was 1g and there was not any significant difference (P >0.05). The egg weight was higher than Stanishevkaya and Toritsina (2007) reported for local unselected breed (55 g). Zanon et al. (2006) also published lower egg weight for local light Italian breeds Modenese and Romagnolo (53.7 g and 54.0 g).Turkish breeds (Benizli and Gerze) also lay eggs with lower weight than CZHs (53.94 and 54.30g, Sarica et al., 2006).

The eggshell strength was relatively high, in all flock higher than 35 N, and the differences among the flocks were no significant (P >0.05). Significantly darker eggshell color expressed as SCI was found in one flock in comparison with the others (P <0.05). It means that there were also eggs with brown eggshell but this color is not in agreement with breed standard. The eggshell should be cream-colored. On the other side there were eggs with white eggshell too.

Eggshell weight, proportion and thickness are shown in table 2. There were significant differences in mentioned characteristics between two flocks (P <0.05). The proportion of eggshell from the egg weight ranged from 9.0 to 9.5 % and the thickness form 0.39 to 0.42 mm. Zanon et al. (2006) reported higher eggshell proportion for both local Italian breeds (12.88 and 13.29 %) but the eggshell thickness were lower than in CZHs (0.337 and 0.369 mm).

Yolk quality is shown in table 3. There were no significant differences in both yolk weight and yolk color (P >0.05). The weight of yolk was higher than 18 g in all flocks. As the diet has the highest effect on egg weight and consequently yolk weight and yolk color too, there were not significant differences, because all hens fed the same diet.

Yolk weight of CZHs is relatively high. Stahishevskaya and Toritisna (2007) published weight of yolk in local breeds 18.2 g, in Rhode Island 18.3 g and in Leghorns 17.4 g. Comparison of local and modern breeds revealed, that enlargement of egg weight for 8–10 g was caused by increase of portion of albumen in eggs (Stahishevskaya and Toritisna, 2007).

Table 1 Egg quality of CZHs – weight, eggshell strength and eggshell color

Flock	Egg weight in g	Eggshell strength in N	SCI
	mean ±SE	mean ±SE	mean ±SE
1	57.3 ±0.37^{a}	36.0 ±0.53^{a}	65.7 ±0.93^{a}
2	57.0 ±0.04^{a}	37.1 ±0.43^{a}	64.6 ±0.74^{a}
3	57.1 ±0.50^{a}	35.9 ±0.50^{a}	62.8 ±0.91^{a}
4	58.0 ±0.50^{a}	37.6 ±0.17^{a}	55.3 ±0.98^{b}

a, b indicate statistical significant difference between groups (P <0.05) for the same characteristics

Table 2 Eggshell quality of CZHs

Flock	Eggshell weight in g	Eggshell proportion in %	Eggshell thickness in mm
	mean ±SE	mean ±SE	mean ± SE
1	5.13 ±0.042^{a}	9.0 ±0.08^{a}	0.39 ±0.004^{a}
2	5.42 ±0.038^{b}	9.5 ±0.07^{b}	0.42 ±0.004^{b}
3	5.30 ±0.064^{ab}	9.3 ±0.10^{ab}	0.40 ±0.005^{ab}
4	5.37 ±0.050^{b}	9.3 ±0.09^{ab}	0.41 ±0.098^{ab}

$^{a, b}$ indicate statistical significant difference between groups (P <0.05) for the same characteristics

Faculty of Agriobiology and Food Resources, 2014
http://www.fapz.uniag.sk/
DOI: 10.15414/afz.2014.17.03.84–86

Table 3 Yolk quality of CZHs

Flock	Yolk weight in g	Yolk proportion in %	Yolk color
	mean ±SE	mean ±SE	mean ±SE
1	18.8 ±0.19[a]	32.9 ±0.23[b]	8.0 ±0.12[a]
2	18.5 ±0.26[a]	32.2 ±0.24[b]	7.8 ±0.09[a]
3	18.6 ±0.23[a]	32.5 ±0.23[b]	7.8 ±0.11[a]
4	18.1 ±0.18[a]	31.2 ±0.27[a]	7.7 ±0.11[a]

a, b indicate statistical significant difference between groups (P <0.05) for the same characteristics

Table 4 Albumen quality of CZHs

Flock	Albumen weight in g	Albumen proportion in %	Haugh units
	mean ±SE	mean ±SE	mean ±SE
1	33.4 ±0.32[a]	58.4 ±0.35[a]	67.6 ±0.93[a]
2	33.8 ±0.37[a]	59.1 ±0.53[a]	75.7 ±0.85[b]
3	34.6 ±0.59[a]	60.1 ±0.75[a]	70.6 ±1.36[a]
4	34.7 ±0.41[a]	59.6 ±0.39[a]	76.3 ±0.94[b]

[a, b] indicate statistical significant difference between groups (P <0.05) for the same characteristics

The yolk proportion was significantly (P <0.05) lower in one flock (31.2 %) in comparison with the rest of flocks (form 32.2 to 32.9 %). Zanon et al. (2006) found higher yolk proportion in one of the local Italian breeds; 34.69 % in Modenese and 32.35 % in Romagnolo was comparable with CZHs. On the other side in commercial white hybrids these authors reported 30.8 % of yolk and even only 26.2 % in commercial brown laying hens. However Turkish breeds lay eggs with even higher weight of yolk (19.38 and 18.94 g) and consequently with higher yolk proportion (35.94 and 34.90 %), on the other side the weights of eggs are lower than in CZHs. Other authors also reported significantly (P <0.05) higher yolk weight of local breed in comparison with commercial layers (Rizzi and Chiericato, 2005).

In albumen quality significant difference were not found (table 4), except Haugh units. In two flocks HU were significantly higher (P <0.05) in comparison with two other flocks.

In conclusion, although the egg production in Czech Golden Spotted hens is very unbalanced, the egg quality is very consistent. At feeding the same diets there were no significant difference among the flocks in majority of observed characteristics. Advantage of the eggs is high weight of yolk and consequently yolk proportion, which is higher than in commercial hybrids.

5. Acknowledgments

The study was supported by AF MENDELU IGA TP 5/2014. Authors thank Mr. Vlastislav Machander, PhD from International Poultry Testing in Ustrasice for cooperation.

6. References

CAVERO, D. et al. (2012) Attractive Eggshell Color as a Breeding Goal. In *Lohmann Information* [Online], vol. 47, no. 2, pp. 15–21. Available at: http://www.lohmann-information.com/content/l_i_47_artikel12.pdf

RIZZI, C. and Chiericato, G.M. (2005) Effect of genotype and storage on some egg quality parameters of laying hens reared according to organic farming production. In *Proceedings of the XVII European Sympoisum on the Quality of Poulty Meat and XI European Symposium on the Quality of Eggs and Egg Products, Golden Tulip Parkhotel Doorwerth, Doorwerth, Netherlands, 23–26 May 2005*. Beekbergen: World Poutry Science Association, pp. 37–43.

HAUGH, R. R. (1937) The Haugh unit for measuring egg quality. In *US Egg Poultry Magazine*, vol. 43, pp. 552–555, 572–573.

HODGES, J. (2006) Conservation of Genes and Culture: Historical and Contemporary Issues. In *Poultry Science*, vol. 85, no. 2, pp. 200–209.

STANISHEVSKAYA, O. Y. and TORITSINA, E. S. (2007) Alteration of hen egg quality as a result of intense selection for egg performance improvement. In *Proceedings of the XVIII European Sympoisum on the Quality of Poulty Meat and XII European Symposium on the Quality of Eggs and Egg Products, Prague, Czech Republic, 2–5 September 2007*. Beekbergen: World Poutry Science Association, p. 109

SARICA, M., SEKEROGLU, A. and KARACAY, N. (2006) Comparative Yolk Cholesterol and Fatty Acid Contents of Turkish Indigenous Hens of Breeds and Layers Hybrids. In *XII European Poultry Conference : Book of Abstracts, Verona, Italy, 10–14 September 2006*. Beekbergen: World Poutry Science Association.

WOELDERS, H., ZUIDBERG, C.A., and HIEMSTRA, S.J. (2006) Animal Genetic Resources Conservation in the Netherlands and Europe: Poultry Perspective. In *Poultry Science*, vol. 85, no. 2, pp. 216–222.

UNISTAT Ltd. UNISTAT Statistical Package [software]. Available at: http://www.unistat.com/

ZANON, A. et al. (2006) Physico-chemical characteristics of eggs from two Italian autochthonous chicken breeds: Modenese and Romagnolo. In *XII European Poultry Conference : Book of Abstracts, Verona, Italy, 10–14 September 2006*. Beekbergen: World Poutry Science Association, p. 203.

DOI: 10.15414/afz.2014.17.03.84–86