

The Differences in Egg Quality of White Leghorn and Naked Neck Chicken

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ABSTRACT

Evaluation of egg quality characteristics and influencing factors are very important to note. One of the factors that affect the quality of the egg is the breed of chicken. The research objective was to compare some parameters of egg quality between White Leghorn (WL) and Naked Neck chicken. Number of eggs collected were 49 eggs from WL and 59 eggs from Naked Neck. All variable egg quality was measured using an egg multi tester EMT-5200. For egg white grading, it was used the standards of the USDA (grade AA, A, and B). The average of egg weight was significantly ($P < 0.05$) influenced by the breeds. Thickness of eggshell were significantly different ($P < 0.05$) between WL and Naked Neck chicken (0.46 ± 0.05 vs 0.43 ± 0.04 mm). Haugh units (HU) were significantly higher in WL (67.64 ± 9.97) compared with Naked Neck chicken (57.62 ± 11.69). The percentage of the characteristics of the egg white on a WL chicken more on grade A (47.68%) while the Naked Neck chicken on grade B (59.18%). More yolk color WL chicken on score 4 (52.54%) and Naked Neck chicken on score 5 (48.98%). It can be concluded that, egg weight, eggshell thickness, HU, and the percentage of egg white on WL chicken showed superior than Naked Neck chicken.

Key Words: Breed, Egg Quality, Chicken

INTRODUCTION

Evaluation of egg quality characteristics and influencing factors are very important to note. One of the factors that affect the quality of the egg is the breed of chicken, which does not only affect the weight of the eggs but also against other egg characteristics, such as shell eggs (Zita et al. 2009; Hanusová et al. 2015).

White Leghorn are good layer hens with the average egg production of 280 eggs per year and sometimes reaches 300-320 eggs and begin to lay eggs at the age of 18 weeks, with minimum egg weight of 55 g. The advantage of White Leghorn chicken are able to adapt to all environmental conditions.

Naked Neck chicken are another breed of chicken that naturally do not have feathers on the neck and considered to be one of the local chicken genetic resources in Indonesia. Naked Neck chicken allegedly came from Transylvania, Romania and spread all over the world brought by the Dutch East India Company around the 17th century (Ramsey et al. 2000). According to Islam & Nishibori (2009), Naked Neck chicken had a good heat regulation mechanism, good adaptation to tropical environments and low nutrient requirement, and resistant to disease, as well as superior compared to the normal fluffy chickens in terms of growth, egg production, egg and meat quality. For example, in South Africa, based on Norris et al. (2007) studies showed that the growth rate of Naked Neck chicken was better (0.169 kg/week) compared with Venda chicken (0.138 kg/week) which is local chicken in South Africa. Naked Neck chicken raised at IRIAP was obtained from Bandung area, based on above argument, the research was conducted with the objective to compare egg quality from different breed of chickens.

MATERIAL AND METHODS

Samples of eggs

White Leghorn and Naked Neck chicken used in this study were maintained in Chicken House of Indonesian Research Institute for Animal Production. Each breed of chickens was placed in groups in wire cages consisting of 6 chickens (5 females: 1 male). The age of chicken were in the period of laying. The chicken were fed commercial layer ration with the amount of 90-100 grams per head per day. Drinking water provided *ad-libitum*.

The number of eggs collected from the chickens that are raised at IRIAP facilities were 49 eggs from White Leghorn chicken and 59 eggs from Naked Neck chicken. For quality analysis only eggs stored less than 3 days were used for samples.

Measurement of eggs quality

All variable of egg quality was measured automatically using an egg multi tester EMT-5200 (Robotmation, Co., Ltd., Tokyo, Japan).

Eggs grading

The standard egg grading used in this research was of Department of Agriculture (USDA) (2000), in which the standard of three grade were AA, A, and B. The AA egg quality has Haugh Unit (HU) score of 72 or more. The A egg quality has HU score of 60-71. The B egg quality has HU 31-59.

Statistical analysis

Data were analyzed using T-test analysis using SPSS 17.0. Meanwhile, the grade and color of egg yolks were analyzed descriptively (percentage).

RESULTS AND DISCUSSION

The quality characteristics of chicken eggs have been investigated in several studies (Roberts 2010; Kocevski et al. 2011; Catli et al. 2012; Hanusová et al. 2015). The results of the quality characteristics of eggs from White Leghorn and Naked Neck chicken were presented in Table 1.

Table 1. Egg quality of two breeds of chicken

Variables	White leghorn	Naked neck	Statistic test
Egg weight (grams)	61.24±5.44	37.66±7.37	P<0.05
Thickness of eggshell (mm)	0.46±0.05	0.43±0.04	P<0.05
Haugh unit (HU)	67.64±9.97	57.62±11.69	P<0.05

Egg weight is genetically linked to the three main components, namely eggshell, albumen, and egg yolks. Weight of egg was one of the most important variables not only for consumers, but also for eggs producers (Genchev 2012). In this study, the average of egg weight was significantly (P<0.05) influenced by the breed of chicken. Egg weight of White Leghorn chicken were heavier than Naked Neck chicken. Size of egg weight is

influenced by genetic factors, age of the chicken, season, climatic conditions, nutrition, and individual chicken. The eggs weight of White Leghorn chicken is almost equal to the results of Lukanov et al. (2015) (61.58 g), whereas Naked Neck chicken is lighter than the results of the study Rajkumar et al. (2009), Isidahomen et al. (2013) and Usman et al. (2014) who got the egg weight between 52.70-57.52 g. Weight of egg gradually increased with increasing age of chickens and showed a positive correlation between egg weight and age (Rajkumar et al. 2009). Yousif & El-Tayeb (2011) stated that the weight of the eggs had a strong and positive relationship with the other egg components (albumen, yolk and shell weight).

Eggshell is the hardest part of an eggs. Quality of eggshell is determined by the thickness and structure of the skin (Yamamoto et al. 2007). The quality thickness of egg shell is influenced by various factors including the type of chicken, chicken age, nutrition including protein source, molting status, water quality, heat stress, illness, housing, production systems, and environmental contaminants. Age affect on egg shell formation. When chicken getting older, it will produce thinner egg shell because of the reproductive function of these birds is decreasing because of age. The characteristics of the most important qualities of the egg shell is strength and thickness (Hanusová et al. 2015). There was a significant difference ($P < 0.05$) between the breeds of chicken for eggshell thickness. Eggshell thickness value of White Leghorn and Naked Neck was higher than the results of the study Akinola & Ibe (2014) and Sreenivas et al. (2013), *i.e.* 0.40 and 0.34 mm (White Leghorn chicken) and Rajkumar et al. (2009) *i.e.* 0.39 to 0.40 mm (Naked Neck Chicken).

Although the Haugh unit (HU) is the standard for determining the internal quality of eggs (such as albumen quality and freshness of the egg) (Keener et al. 2006). Internal quality of eggs usually drops with the elapsed time and depending on the egg shell and internal contents, as well as storage environments such as high temperature (Kul & Seeker 2004). Garba et al. (2010) reported that high quality eggs have the HU range 57.95-61.86; while low-quality eggs have a value of less than 40. Haugh units of the White Leghorn higher than Naked Neck chicken. The higher the score HU demonstrate excellent albumen quality. HU of White Leghorn chickens in this study was lower than the results of Lukanov et al. (2015) study who found HU value 75.69. Similarly the value of HU Naked Neck Chicken was lower than the results Rajkumar et al. (2009) who found HU 73.99-76.36.

The percentage of egg whites of the two breeds of chicken shown in Table 2. Quality albumin is one of the most important egg quality standards, because the egg whites occupy 60% of the whole egg. Rajkumar et al. (2009) reported that large proportion of albumen likely influenced by the size of an egg. Albumen characteristics in this study according to USDA standards (2000), in White Leghorn chickens eggs majority had grade A (the albumen is clear and little bit static), while Naked Neck chicken majority is in the grade B, as characterized by the albumen look clear but already watery and it was not static.

Table 2. Percentage grade albumen from two breeds of chicken (%)

Grade albumen	White Leghorn Chicken	Naked Neck Chicken
AA	38.98 (23 eggs)	8.16 (4 eggs)
A	47.46 (28 eggs)	32.66 (16 eggs)
B	13.56 (8 eggs)	59.18 (29 eggs)

One of indicators that can be used to determine the quality of the egg is the color of the yolk. Color of egg yolk are varied in colors ranging from pale yellow to dark orange with a score ranges 1-15. The higher the color yellow. The better the quality of the eggs.

The results showed that the color of egg yolk White Leghorn chickens ranged from 3 to 5, while Naked Neck chicken, its egg yolk color ranging from 3 to 10 (Table 3).

Table 3. Percentage of yolk color score from two breeds of chicken

Yolk color score	White Leghorn	Naked Neck Chicken
3	22.04 (13 eggs)	2.04 (1 eggs)
4	52.54 (31 eggs)	22.46 (11 eggs)
5	25.42 (15 eggs)	48.98 (24 eggs)
7	-	12.24 (6 eggs)
8	-	6.12 (3 eggs)
9	-	6.12 (3 eggs)
10	-	2.04 (1 eggs)

Variations in the color of egg yolk in this study were not caused by the influence of chickens breed, but was more determined by the presence or absence of xanthophyll, which are precursors of vitamin A. If the feed has a lot of yellow plant pigments known as xanthophyll, it will be stored in the egg yolk, resulted in the yolk color becomes more concentrated (World 2013). Xanthophyll are pigment of carotene from food that is fed by chicken. The pigment is transferred into the blood stream and egg yolks. As result a pigments are more deposited in the egg yolk. Approximately 7-11 circles or layers formed by each egg yolk. The total of thickness of the dark and light parts for hoarding 24 hours is approximately 1.5-2.0 mm (Yumna et al. 2014). As stated by Isidahomen et al. (2013) that the egg yolk color was more influenced by environmental rather than genetics factors. The influence of genes is not obvious to score yolk color.

CONCLUSION

According to the results of this study can be concluded that White Leghorn had higher some quality characteristics of eggs (egg weight, shell thickness, and HU) than Naked Neck chicken except the color of egg yolk. Egg yolk color of Naked Neck chicken more varied than WL chickens. The results also showed that the percentage of egg whites were influenced by the breed of chicken, but not the color of egg yolks.

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