

The Physical Quality of Local Chicken Eggs (*Gallus Gallus Domesticus*) in the Traditional Markets of Purworejo Regency, Central Java

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ABSTRACT

This research was conducted to determine the physical quality of local chicken eggs marketed in Purworejo Regency, Central Java. The method in this research is direct survey and monitoring. Samples were purchased from traders in the Baledono market, Kongsu market and Suronegaran Market, as many as 8 samples each. The observed variables were egg length, egg width, egg index, egg volume, egg weight, type of weight, height albumen, albumen width, albumen index, haugh unit, yolk colour, yolk height, yolk index, weight of yolks, air cavities high, shells thickness and weight of shell (g). The results of this study showed an egg length of 52.41 ± 0.59 (mm), egg width 40.22 ± 0.43 (mm), egg index 76.87 ± 0.89 (mm), egg volume 40.48 ± 0.82 (ml), egg weight 42.90 ± 0.87 (g), specific weight 1.06 ± 0.00 , albumen height 0.51 ± 0.19 (mm), albumen width 7.71 ± 0.19 (mm), albumen index 0.07 ± 0.03 , haugh unit 77.09 ± 1.66 , egg yolk colour 9.46 ± 0.31 , egg yolk height 15.34 ± 0.27 (mm), egg yolk width 43.84 ± 0.67 (mm), egg yolk index 0.35 ± 0.01 , egg yolk weight 16.63 ± 0.53 (g), air cavity height 3.38 ± 0.23 (mm), skin thickness 0.42 ± 0.02 (mm), and Shell Weight 3.39 ± 0.07 (g). Physical quality does not show a significant difference between market origin. Chicken eggs sold in traditional markets in Purworejo Regency on the quality III SNI 3926-2008 (Indonesian national standard for egg consumption), are still suitable for consumption.

Keywords: quality, local chicken eggs, traditional markets

1. INTRODUCTION

Local chicken is a bird species that has been known throughout Indonesia which is classified as not a type of chicken (not race/free) to distinguish it from commercially modified genetically modified chickens such as Cobb, Lohmann, Ross, Hubbard, etc. [1]. The local chickens are currently widely used as meat producers, but not a few who make local chicken as an egg producer to meet the needs of community animal protein.

The Local chicken eggs have advantages compared to pure chicken eggs which have a more savoury taste, higher egg yolk weight, higher vitamin E content and higher protein content. The local chicken eggs are usually used as medicine, and only a small portion is consumed as side dishes, while the local chicken eggs used for hatching eggs are obtained directly from breeders.

The local chicken eggs for food are usually sold in markets, especially traditional markets. Marketing eggs in the market takes a long time from farmers to consumers. Therefore, eggs sold in traditional markets are usually not new eggs. The average eggs at retailers are more than 7 days old, showing a decrease in physical quality due to the long distribution of eggs to retailers [2]. Physical quality of eggs that do not meet quality standards can be detrimental to consumers, because egg storage is low and eggs tend to rot.

Longer storage time for eggs results in lower weight and high egg white [3]. During storage, egg weight and egg height are reduced. The length of time for local eggs to consumers will reduce the physical quality of eggs. Eggs are easily damaged so it requires special treatment so that the quality and shelf life is longer [4].

Purworejo is one of the districts in the province of Central Java, which has 16 sub-districts. Traditional markets in Purworejo sub-district that always sell local chicken eggs are Suronegaran market, Kongsu Market and Baledono market. Traditional markets are markets built by the government, the private sector, cooperatives, or the non-government sector with businesses in the form of kiosks, shops, booths and tents, managed by small, medium and cooperative cooperatives, with small scale companies and small capital, and with the buying and selling process through bargaining [5]. Traditional markets lack comfort and low order [6]. The existence of this traditional market must be considered by the regional government of Purworejo Regency, so that Purworejo District Regulation Number 6 of 2014 concerning the protection and empowerment of traditional markets, structuring and mastery of modern markets. Consumers are still interested in buying agricultural, fishery and livestock products in traditional markets, so they need to maintain the quality of the goods being marketed.

To maintain food safety, studies on the quality of chickens circulating in the traditional markets of Purworejo Regency are needed. This study aims to determine the physical quality of native chicken eggs which are marketed in Purworejo Regency, Central Java.

2. MATERIALS AND METHODS

2.1. Materials

This experimental study was conducted in April 2019 - July 2019. The sample in this study was local chicken eggs taken at traditional markets in Purworejo Regency. The determination of traders is done randomly and each traditional market is taken 8 eggs. The eggs are then taken to the Muhammadiyah University Purworejo laboratory for physical quality analysis.

2.2. Method

Physical quality parameters observed were: egg length, egg width and egg index, egg volume, egg weight, specific gravity, albumen height, albumen width, albumen index, Haugh unit, egg yolk colour, egg yolk height, egg yolk width, percentage egg yolk, high air cavity, thick skin, and shell weight. Measurement of egg quality according to [7] and [8].

- Egg length and width are measured by callipers.
- Egg index is measured by the formula:
Egg index = a/b
Note: a = egg height (mm)
 b = egg diameter (mm)
- egg volume is measured by inputting the egg into a measuring cup.
- Egg weights are measured by weighing using a digital scale with a sensitivity of 0,01 g.
- egg specific gravity is measured by the formula
Egg specific gravity = a/b
Note:
 a = egg weight (g)
 b = egg volume (ml)
- Albumen index. Albumen index is measured high from thick albumen with thick callipers. Calculate albumen index using the following formula:
Albumen index = a/b
Note:
 a = height of thick albumen (mm)

b = average diameter ($b_1 + b_2$)/2 of thick albumen in mm

- The colour of the yolk is measured by yolk colour
- Egg yolk index (yolk index). the index of the yolk is measured by separating the yolk from the white, then measuring the height and diameter of the yolk with a calliper.
Egg yolk index formula = a/b
Note:
 a = egg yolk height (mm)
 b = egg yolk diameter (mm)
- The height of the air cavity and the thickness of the shells were measured using callipers.
- The weight of the shell is measured using a digital scale with a precision of 0,01.

This study uses a Completely Randomized Design (CRD), with 3 treatments namely Baledono market, Kongsu market, and Suronegaran market, each market takes 8 eggs as replicates.

2.3. Data Analysis

Physical data is analyzed by Anova one-way pattern and when there is a noticeable difference between market groups in the 95% confidence interval, the test is carried out by using the Dunn's New Multiple Range Test.

3. RESULTS AND DISCUSSION

3.1. The Length, Width, and Index of Local Chicken Eggs

The length, width, and index of the local chicken eggs are presented in Table 1. The results of the analysis of variations in length, width, and index of the chicken eggs in the traditional markets of Purworejo sub District did not show any real effect. This is due to the fact that local chicken eggs sold on the market are supplied from small farmers who are kept with relatively the same feed and management.

Table 1 The length, width, and index of local chicken eggs

Parameter	Baledono Market	Kongsu Market	Suronegaran Market	average ^{ns}
Length (mm)	52.25 ± 1.00	51.05 ± 0.39	53.93 ± 1.34	52.41 ± 0.59
Width (mm)	40.18 ± 0.62	39.34 ± 0.45	41.14 ± 1.02	40.22 ± 0.43
Egg Index	77.01 ± 1.35	77.11 ± 1.23	76.50 ± 2.11	76.87 ± 0.89

^{ns} = non-significant

The average egg length in the three egg market volumes in this study ranged from 53.93 – 51.05 cm. The length of local chicken eggs is 4.46 cm [9] while according to [10] the length of Nigerian local chicken eggs is 4.92 – 5.38 cm. the width of the local egg in this study was 40,22 cm, while according to [10] 3.66 – 3.95 cm. Egg index, the average in this study was 76.86. The local chicken egg index is 74.44

[9] while according to the Nigerian Local egg index is 79.69 [10]. Egg index is influenced by the length and width of the egg. egg length and labar in this study had no significant effect so that the egg index also had no significant effect. free-range chicken eggs sold in 3 sub-district markets did not show a significant difference, allegedly eggs supplied

from chickens that had laid eggs for a long time were relatively the same.

3.2. The Volume, Weight of Eggs and The Weight of Local Chicken Eggs

The average volume, egg weight and the weight of the kampong chicken eggs are presented in Table 2. All the change shows there is no noticeable difference between markets in Purworejo district. The results of the analysis of volume range, egg weight and the weight of chicken eggs in Purworejo District market shows no real influence.

Table 2 The volume, weight of eggs and the weight of local chicken eggs

Parameter	Baledono Market	Kongsi Market	Suronegaran Market	average ^{ns}
Egg Volume (ml)	41.76 ± 1.82	38.69 ± 0.85	40.98 ± 1.37	40.48 ± 0.82
Egg weight (g)	44.27 ± 1.93	40.99 ± 0.92	43.44 ± 1.47	42.90 ± 0.87
Weight type	1.06 ± 0.00	1.06 ± 0.00	1.06 ± 0.00	1.06 ± 0.00

^{ns} = non-significant

The volume of chicken eggs in this study ranged from 38.69 to 41.76 cm³. Egg weight in this study ranged from 40.99 – 44.27 g. The local chicken egg weighs 34.66 g [9]. Egg weight in this study was classified as small eggs. Egg weight categories based on the national standardization body are small eggs (> 60 g) [7]. Egg weight is influenced by genetics, age, large chickens, egg production stage and nutrition. The egg specific gravity in this study was 1.06 ± 0.00. the specific gravity of the Kedu chicken is [11]. The results of the analysis of various types of chicken eggs in the Purworejo Regency market showed that there was no real effect because the chickens that used the same strain were local chickens (*Gallus domesticus*). The difference in the layers of the eggshell is determined by genetics, diet, age and ambient temperature [11]. The type of egg is influenced by a thick shell, whereas the thickness of the eggshell increases, the type of weight will increase as well,

and the larger the egg the smaller the value of the type. Egg specific gravity is also affected by egg storage for a long time, temperature, time of egg weight and calcium content.

3.3. Albumen High, Albumen Width, Albumen Index and Haugh of The Local Chicken Eggs

The average Albumen high, albumen width, albumen index and Haugh unit of the local chicken egg are presented in Table 3. The results of the analysis of various internal qualities of eggs in the market Purworejo district show no noticeable effect on the height, width, index of albumen and Haugh units.

Table 3 The average albumen high, albumen width, albumen index and Haugh unit of the local chicken egg

Parameter	Baledono Market	Kongsi Market	Suronegaran Market	average ^{ns}
Albumen High (mm)	0.48 ± 0.43	0.53 ± 0.31	0.51 ± 0.26	0.51 ± 0.19
Albumen width (mm)	7.67 ± 0.30	7.33 ± 0.16	8.12 ± 0.47	7.71 ± 0.19
Albumen Index	0.06 ± 0.06	0.07 ± 0.05	0.06 ± 0.05	0.07 ± 0.03
Haugh Unit	75.44 ± 3.67	79.06 ± 2.59	76.75 ± 2.44	77.09 ± 1.66

^{ns} = non-significant

The local chicken albumen height in this study was 0.51 mm, this result was lower than what was reported [10] which was 0.531 mm. the albumen width of the local chicken eggs in this study was 7,71 mm, while according to [10] 9.19 mm. The albumen index is the ratio of egg white height to egg white width. The local chicken albumen index in this study was 0.07. The longer the egg's shelf life, the wider the albumen diameter so that the albumen index will be smaller. Changes in egg whites are caused by gas exchange between water and egg contents through the egg pores and water evaporation due to prolonged storage, temperature, humidity and egg porosity. During storage, high viscous egg white will decrease rapidly, then decrease slowly [3]. The local chicken albumen index in this study

was 0.69. The albumen index in this study is categorized as quality III, ranging from 0.05-0.091 [7].

Haugh unit of the local chicken unit in this study was 77.09, this result is higher than that reported (Tanganyika) [8] which is 74.00. Haugh's units in 3 traditional markets in Purworejo Sub-district were not significantly different. This is supported by the results obtained from the analysis of different albumen indexes that are not real, where the Haugh Unit value is influenced by the height of the albumen. a decrease in albumen height caused by damage to the structure of the ovomucin gel causing a decrease in Haugh units [12].

3.4. The Colour, Height, Width, Index, Weight and Percentage of Egg Yolks

The average colour, height, width, index, weight and percentage of egg yolk are served on Table 4. All the change

shows there is no noticeable difference between markets in Purworejo district. The results of the analysis of the egg variety in Purworejo District market show no real influence on weight, height, width, egg index and percentage of egg yolks.

Table 4 The colour, height, width, index, and weight of egg yolks

Parameter	Baledono Market	Kongsi Market	Suronegaran Market	average ^{ns}
Colour yolk	9.50 ± 0.46	10.12 ± 0.67	8.75 ± 0.37	9.46 ± 0.31
Yolk High (mm)	15.04 ± 0.32	15.16 ± 0.52	15.70 ± 0.58	15.34 ± 0.27
yolk Width (mm)	43.69 ± 1.03	42.94 ± 1.54	44.90 ± 0.82	43.84 ± 0.67
yolk Index	0.34 ± 0.01	0.35 ± 0.02	0.35 ± 0.02	0.35 ± 0.01
Weight of egg yolks (g)	17.25 ± 1.18	15.56 ± 0.86	17.07 ± 0.60	16.63 ± 0.53

^{ns} = non-significant

The average color of egg yolk in this study was 9.46. The value of egg yolk in this study is below the reported results of [9] 10.55. Egg yolk is influenced by feed, the higher the protein, energy and mineral content in the ration the better the quality of the yolk. egg yolk color due to the presence of feed pigmentation such as zeaxanthin and lutein, and age of hens [8].

Egg yolk height in this study was 15,34 mm. The high value of egg yolk in this study is below the reported results [13] of 17.06 mm. The yolk diameter of this study was 43,84 mm. The yolk index obtained in this study was quite low at 0,35. The reported yolk index [eke] was 0,42. Fresh egg yolk index ranges from 0.33 – 0.52 [7]. Egg yolk index is a comparison between high egg yolks and egg yolks. Storage of eggs can cause water transfer from albumen to yolk [8]. The osmotic pressure of the yolk is greater than the albumen, so water and albumen move towards the yolk. Continuous removal of water will cause the yolk viscosity to decrease so that the yolk becomes even and then breaks. Water transfer depends on albumen viscosity. Egg yolks will become increasingly soft, so the yolk index will decrease, and the vitellin membrane will be damaged and cause the eggs to break.

Egg yolk weight in this study was 1,63 g. Egg yolk weight in the study was below the reported results [9] 12.83 – 16.00 g and 11.70 g [14]. Factors that influence egg yolk weight are fat and protein content, ovarian development, chicken

weight, age at reaching, feed quality and quantity, disease, environment and feed consumption. The process of egg yolk formation produces different egg yolk weights depending on the genetic ability of each individual bird [15].

The colour, height, diameter, index and weight of local chicken yolk sold in 3 districts in Purworejo showed results that were not significantly different. This shows that local chicken eggs in the three markets are likely to be supplied by farmers who maintain semi-intensive chickens. The feed given to local chickens in intensive care usually comes from food scraps and bran so that the quality of the feed is the same. The yolk index in this study was 0.35 which is the standard egg III, which is 0.33-0.93 [7]. Egg index with quality III is the lowest quality recommended by the Indonesian government for eggs suitable for consumption.

3.5. High Cavity Air, Thick Shells, and Heavy Shells of The Local Chicken Eggs

High average air cavity, thick and heavy shell chicken eggs are served on Table 5. All the change shows there is no noticeable difference between markets in Purworejo district.

Table 5 High cavity air, thick shells, and heavy shells of the local chicken eggs

Parameter	Baledono Market	Kongsi Market	Suronegaran Market	average ^{ns}
Air cavity height (mm)	2.68 ± 0.37	3.67 ± 0.45	3.79 ± 0.29	3.38 ± 0.23
Thickness of Shell (mm)	0.42 ± 0.02	0.42 ± 0.01	0.41 ± 0.01	0.42 ± 0.02
Weight of Shell (g)	3.52 ± 0.17	3.23 ± 0.08	3.45 ± 0.13	3.39 ± 0.07

^{ns} = non-significant

High average air cavity in this study was 3.38 mm. The high value of the air cavity in this study is below the reported results [15] which is 2.40 mm on the local chicken eggs day 0. The results of this study indicate that all eggs sold in the Purworejo Subdistrict market have experienced storage. The size of the air cavity indicates the longer storage time increases. The longer the storage size the greater the air

cavity [16]. The increase in the size of the air cavity is caused by the shrinkage of the egg weight due to water evaporation and the release of gases that occur during storage. As we get older, eggs lose their fluids and content shrinks to enlarge the air cavity [14].

The average thickness of Shell in this study was 0.42 mm. The thickness of the shell according to [9] is 0.34 mm. The

thickness difference from Shell is influenced by the content of calcium and phosphorus. Eggshells are influenced by several factors: age, type of chicken, nutrients, events of organ collapse, stress, and eggshell components. Thin shells are relatively porous and larger, thus accelerating the decline in egg quality due to faster evaporation and decomposition [17].

The weight of this research shell was 3.39 g. The weight value of the shell according to (Arika) is 4.22 g, the weight of the eggshell is influenced by feed consumption, egg weight, and age of livestock [17]. The content of calcium and phosphorus in feed plays a role in eggshell quality, such as thickness, weight, and structure of the eggshell [18]. In this study, the weight of local chicken egg shells sold in three markets in Purworejo Regency did not show a striking difference because most local chickens were widely maintained so that they did not pay attention to the calcium and phosphorus content in the feed consumed.

4. CONCLUSION

The physical quality of local chicken eggs sold in three markets in Purworejo District shows no difference between these markets. The physical quality of the local chicken eggs has decreased to III quality according to Indonesian National Standards, but is still suitable for consumption.

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