



Research Article

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# Assessment and Characterization of Egg Quality of South African and Indigenous Breeds



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## Abstract

The total number of 80 eggs, 40 from local Ethiopian chickens and 40 from South African breeds poultry farm were used to determine and compare the quality of eggs of indigenous chickens purchased from market with fresh eggs of South African breeds. The important external egg quality traits evaluated in this study were egg weight, egg length, egg width, shell thickness shell weight and shape index. The internal egg traits evaluated for quality in this study include yolk color, yolk width, yolk height, albumen height, yolk weight, yolk index and Hough unit. Egg weight and egg length were significantly higher in South African breeds as compared to the indigenous ones. However, the indigenous breeds outperform the South African breeds in Yolk color, and Yolk index. Generally, the eggs of both South African breeds and indigenous chickens are not too poor in quality. But some improvements are required for local hens to make the quality best.

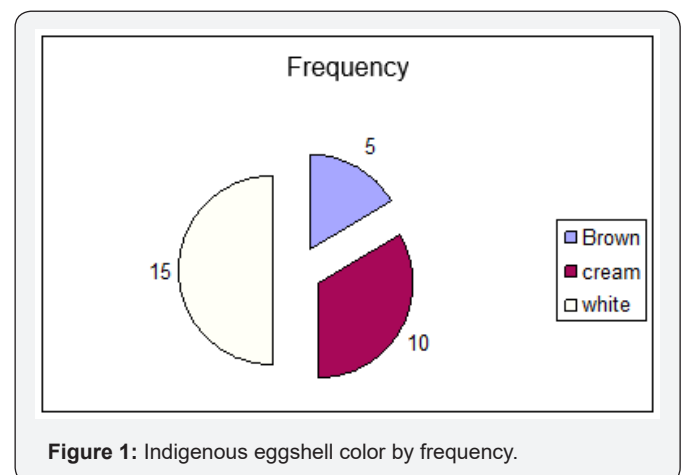
**Keywords:** Weight; Length; Width; Shell thickness; Shell weight; Shape index

## Introduction

Animal production in general and chicken production in particular plays important socioeconomic roles in developing countries [1]. Nearly all rural and peri-urban families in developing countries keep a small flock of free-range chicken [2]. Approximately 80% of the chicken populations in Africa are reared in free scavenging systems [3]. According to Sonaiya [4], smallholder farming families, landless laborer's and people with incomes below the poverty line are able to raise chicken with low inputs and harvest the benefits of eggs and meat via scavenging feed resources. In most African countries, the rural chicken population accounts for more than 60% of the total national chicken population. The proportional contribution of poultry to the total animal protein production of the world by the year 2020 is believed to increase to 40%, the major increase being in the developing world [5]. However, most communities lack the required husbandry skills, training and opportunity to effectively improve their household chicken production [6].

In Ethiopia, chicken is widespread and almost every rural family owns chicken, which provide a valuable source of family protein and income [7]. The total chicken population in the country is estimated at 38.1 million [8]. The majority (99%) of these chickens are maintained under a traditional system with little or no inputs for housing, feeding or health care. The most dominant chicken types reared in this system are local ecotypes, which show a large variation in body position, color, comb type and productivity [9,10]. The greater part of the feed for village

chicken is obtained through scavenging, which includes the household cooking waste, cereal and cereal by-products, pulses, roots and tubers, oilseeds, shrubs, fruits and animal proteins [11]. Nearly all rural and peri-urban families in the developing world keep household poultry (Figure 1).



**Figure 1:** Indigenous eggshell color by frequency.

In East Africa over 80% of human population live in rural areas and over 75% of these households keep indigenous chickens and Ethiopia is not exception to this situation [12]. Recent estimates put the poultry population in Ethiopia at around 34.2 million with native chicken of no descriptive breeds representing 94.4%, hybrid chicken 3.92% and exotic breeds of chickens mainly kept

in urban and peri-urban areas 0.64%. The total national annual poultry meat and eggs production is estimated at 72, 300 and 78 000 metric tons, respectively and indigenous poultry contribute almost 99% of the national egg and poultry meat production. Indigenous poultry birds are well adapted to harsh environment of free range and they produce eggs and meat at least possible cost (Table 1).

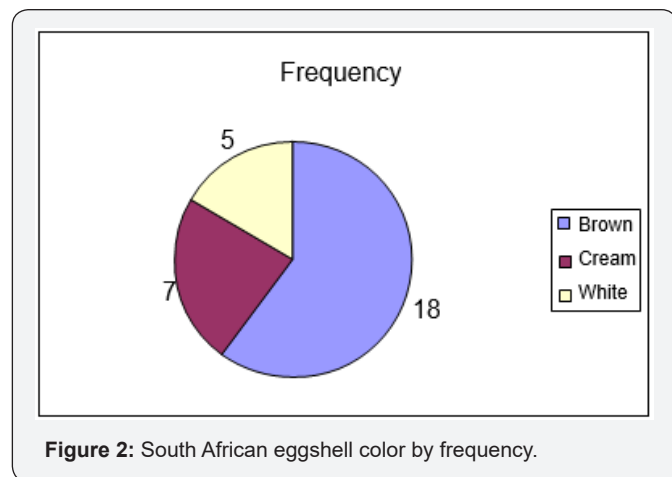
**Table 1:** External quality of eggs from local and South African breeds.

Variables			
breed	Egg weight (mean± SE)	Shell weight (mean ±SE)	Shell thick (mean ±SE)
ind	37.93 ± 069 <sup>b</sup>	4.13 ± 0.098 <sup>b</sup>	2.62±0.075 <sup>b</sup>
South Africa	51.53 ± 0.69 <sup>a</sup>	5.77±0.098 <sup>a</sup>	3.16±0.075 <sup>a</sup>

P<0.0001 significant

### Significance of the Study

Evaluation of the external and internal quality of chicken eggs is important because of consumer preferences for better quality eggs. It is generally agreed that all characteristics of egg quality have a genetic basis. Egg quality has been defined by stadelman [13] as the characteristics of an egg that affect its acceptability to the consumers [14]. The hatchability of poor-quality eggs is low and therefore, this study result in the improvement of quality of eggs and Consumers also be the beneficiary of this study due to their preference for better quality eggs (Figure 2).



**Figure 2:** South African eggshell color by frequency.

### Objectives

General objective

- To assess and characterize the quality of egg produced by indigenous and South African breeds.
- Specific objectives.
- To evaluate and compare the quality of fresh eggs of indigenous chickens with fresh eggs of South African chickens.
- To recommend the gaps for future works.

### Materials and Methods

#### Data Collected

Important data was recorded from the egg quality evaluation of South Africa and local chicken's eggs in this study are:

- External egg quality parameters:
  - Egg weight (gm), (by using digital balance)
  - Shell thickness (mm), (by using digital caliper)
  - shell weight (gm), (by using digital balance)
  - Egg shell color (visual observation)
- Internal egg quality parameters:
  - Albumen weight(gm), (by using digital balance).
  - Yolk weight (gm), (by using digital balance).
  - Yolk color (by using color fun, ranged 1-15).

#### Data Collection Method

**External and Internal Egg Quality Parameters Measurement:** A total 80 eggs fresh (40 South African breeds' poultry farm, 40 from 10 households of farmers) collected to laboratory. Then each egg was individually weighed by using sensitive balance and carefully broken onto a flat plate. The albumen and yolk were carefully separated and weighed using the balance, the shell weight also weighed by the same balance. Egg shell thickness was measured at the small, middle and large size of the shell by using calibrated micrometer screw large and the average value of them was taken. Yolk color also measured using reach color fun.

#### Data analysis method

All the measured parameters were analyzed by statistical analyze system (SAS, 1988) with software.

### Result and Discussion

#### External Egg Quality

**Table 2:** Internal quality of eggs from local and SA breeds.

Variables			
breed	Albumen weight (gm) mean ± SE	Yolk weight (gm) mean ± SE	Yolk color (1-15) mean ± SE
Indigenous	18.30 ± 0.46 <sup>b</sup>	13.23 ± 0.34 <sup>b</sup>	10.60 ± 0.25 <sup>a</sup>
SA	25.6 ± 0.46 <sup>a</sup>	17.90 ± 0.25 <sup>a</sup>	1.53 ± 0.25 <sup>b</sup>

P value <0.0001 significant

The average weight of eggs from local chickens is 37.93gm and ranges from 31 to 44 and it are significantly lower than SA breed which averages about 51.53gm and ranges from 46 to 60.5gm. The frequency of SA egg shell color was brown (18) most frequent as compared to cream shell color which was found to be (7) and white (5) whereas, white shell color (15) , was most frequent as compared to the cream shell color 10 and brown (5) of

in Indigenous chicken. The average shell weight of eggs was 4.13 gm and 5.77 gm of Local and SA breeds respectively. The eggshell weight of SA was greater than the Local breeds. The mean shell thickness was 2.62 mm in Indigenous whereas, in SA the mean shell thickness 3.16 mm (Table 2).

## Internal Egg Quality

The other most important egg quality traits considered in this study is yolk color, estimated using Roach color fan (1-15). The yolk color of both indigenous and South African breeds eggs was examined by 3 observers and the average value was calculated and recorded. The result showed that average yolk colors of egg from local and South African breeds are 10.60 and 1.53 respectively. The result found on yolk color is significant between the breeds so that indigenous breeds have deep yellow yolk color than South African breeds. The Albumen weight mean of Local breed is 18.30gm while the SA 25.60gm. And also yolk weight mean of local breed is 13.23gm and the South African breed is 17.90gm.

The average weight of eggs found in this study from local chickens was 37.93 that is lower than 51.53 for South African breeds. There are significance differences between two breeds in egg weight. The higher egg weight in SA than local chicken could be attributed to its genetic potential for the production of large sized eggs. In addition, SA is a well-established breed than local chicken and selection for better egg size might have been made generation after generation. There are significant differences in eggshell thickness between South African breeds and Local chicken. That means shell thickness of South African breed is 3.16 and that of the Local is 2.62. The differences might be due to the differences in rearing systems. The main chemical component of eggshell is calcium. Because of the differences in rearing system, the uptake of calcium was varied. The average shell weight of eggs from local hens is 4.13 and of is 5.77gm. This indicates that South African breeds eggs are higher in shell weight than the indigenous eggs. The higher yolk color value of the indigenous chicks indicates that the scavenging feed resource base of egg collected area are rich in xanthophylls, some of which are precursor of vitamin A.

## Conclusion

The external and internal qualities of eggs from both South African breeds and indigenous chickens are evaluated by determining some of egg quality traits. The external egg quality used to determine external qualities of both SA and indigenous eggs include Egg weight, shell thickness, and shell weight. There is also some of the most important internal egg quality traits used to determine internal qualities of eggs. These include yolk color, yolk weight, and albumen weight. For all external traits evaluated in this study, South African eggs are better than indigenous chickens except yolk color. Yolk color was higher for indigenous eggs than South African breeds breed. In this study there was significant difference in as far as Shell color of eggs is concerned between the two breeds means that most shell color frequency in the indigenous Ethiopian breeds are White (15) whereas South

African breeds Brown (18). In addition to this result there were also significant difference in the following traits Egg weight (37.93 and 51.53), Shell weight (4.13 and 5.77), Average shell thickness (2.62 and 3.16), and Average yolk color (10.6 and 1.53) for ingenious Ethiopian and South African breeds respectively. Generally, the eggs of both breeds are not too poor in quality. But some improvements are required for South African breeds in yolk color by releasing or making chickens allowing for external feeding such like grasses for xanthophylls feeds to improve yolk color.

## Recommendations

- More studies are needed to explore other factors like hatchability, growth performance and production.
- South African breeds must feed in high xanthophylls feeds to improve the yolk color quality traits because there is high significant difference in yolk color between the breeds.
- We must improve the genetically makeup of indigenous breeds through cross breeding in order to improve egg weight and others.

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