

*Full Length Research Paper*

# Comparative evaluation of internal and external qualities of eggs from quail and guinea fowl

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Accepted 24 September, 2010

The quality characteristics and proximate composition of the eggs of quail and guinea fowl were compared. The eggs of the two species had an oval conical shape with blunt and pointed ends. The shape indices of both the eggs had no statistical difference. As very well apparent, guinea fowl eggs (46.65g) were much heavy than the Quail eggs (10.34g). Proportion of yolk to total egg weight was higher in quail (31.4%) than guinea fowl (30.6%) Similarly, albumen content was higher in quail (61.2%) than guinea fowl (55.9%), however the ratio of yolk to albumen was higher in guinea fowl (0.55) than quail (0.52). The portion of shell to the total egg weight was higher in guinea fowl (13.5%) than in quail (7.3%). Similarly, the guinea fowl eggs showed much thicker shell (462.8 $\mu$ m) as compared to quail egg (174.8  $\mu$ m). The moisture content, crude protein, crude fat and crude ash of whole eggs were 74.47%, 12.77%, 10.83% and 1.10% for guinea fowl egg and 74.26%, 11.98%, 11.91% and 1.04% for quail eggs, respectively, with no statistical difference ( $p>0.05$ ) between species. No species difference in the proximate composition of albumen and yolk was found except in the crude ash content of albumen which was which was significantly higher in quail egg

**Keywords:** Guinea fowl, quail, egg and proximate composition

## INTRODUCTION

Eggs are highly versatile food containing many essential nutrients. Eggs of most species of birds may have similarities in nutritional composition and potential food usage, however, information on egg quality characteristics and utilization of egg for food and other purposes have been limited mostly to chicken eggs. Egg quality is composed of those characteristics of an egg that affects its acceptability to consumers such as cleanliness, freshness, egg weight, shell quality; yolk index, albumen index, Haugh unit and chemical composition (Stadelman, 1977; Song et.al. 2000). Chicken egg has been very well studied for its external and internal qualities as well as for its composition, however such information are not so abundantly documented in other poultry species. Hence, this study examines the quality characteristics and chemical composition of eggs of two poultry species which have economic value such as Quail and Guinea fowl.

## MATERIALS AND METHODS

The eggs of quail and guinea fowl used for this study were collected from Centre Songhai, Porto-Novo, Benin Republic. The eggs were collected on the day of lay. These birds were raised under farm condition on the chicken specific diets i.e. starter, grower and layer diets. with a diet suitable for Chickens.

### Evaluation of egg quality

Egg weight was measured with a Mettler PC 2000 balance after washing and drying with towel to remove contaminants from shell. Shape index was calculated from the ratio EL / ED after measuring egg length (EL) using a caliper and egg diameter (ED) was derived from the expression  $ED = EC / \pi$ , where  $\pi$  was 3.1416. Egg circumference (EC) was measured using a thread and a ruler. Shell Surface Area (SSA) was determined from the expression according to Carter (1975):  $SSA = 3.9782 \times SW^{0.7062}$ , where SW = Shell weight.

The egg was broken gently by using a scalpel and its contents were taken on the flat glass plate. The height of yolk and thick albumen were measured by using spherometers. Haugh unit was calculated as per Haugh (1937) by using the following equation:  
 $HU = 100 \log (H - G^{0.5} (30 W^{0.37} - 100) / 100 + 1.9)$   
Where HU = Haugh Unit, H = Albumen height in cm, G = 32.2 and W = egg weight in grammes

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**Table 1:** means of some parameters of guinea fowl and quail eggs

PARAMETERS	SPECIES	
	Guinea Fowl	Quail
Shape index	79.57 ± 2.71 <sup>a</sup>	78.93 ± 3.75 <sup>a</sup>
Egg weight (g)	46.65 ± 1.79 <sup>a</sup>	10.34 ± 0.93 <sup>d</sup>
Shell thickness (:m)	462.8 ± 39.1 <sup>a</sup>	174.8 ± 15.5 <sup>c</sup>
Shell surface area (cm <sup>2</sup> )	73.13 ± 1.90 <sup>a</sup>	25.97 ± 1.50 <sup>d</sup>
Yolk index	0.53 ± 0.03 <sup>a</sup>	0.46 ± 0.05 <sup>b</sup>
Albumen height	5.74 ± 0.42 <sup>a</sup>	3.50 ± 0.67 <sup>b</sup>
Haugh unit	80.87 ± 3.14 <sup>a</sup>	84.19 ± 4.91 <sup>a</sup>
Yolk weight	14.26 ± 0.74 <sup>a</sup>	3.25 ± 0.40 <sup>d</sup>
Albumen weight	26.08 ± 0.92 <sup>a</sup>	6.33 ± 0.59 <sup>d</sup>
Shell weight	6.31 ± 0.65 <sup>a</sup>	0.76 ± 0.01 <sup>d</sup>

Mean ± Standard deviation. Means in the same row not sharing a common superscript letter differ significantly (P>0.05)

Subsequently, yolk was separated from albumen and weighed. Shell weight was measured after removal of remaining albumen with water and subsequent sun drying for six hours. The weight of albumen was calculated by subtracting the weights of yolk and shell from the weight of whole egg. Shell thickness was measured with a micrometer screw gauge in  $\mu\text{m}$ .

#### Analytical Methods

Moisture content was determined by drying at 100 – 102°C for 16 – 18 hours as described by AOAC (1990). Crude protein was estimated by multiplying 6.25 to nitrogen content obtained through semimicro-kjeldahl method. Crude fat and ash were analysed by Soxhlet extraction and 550° C muffle furnace, respectively.

#### Statistical Analysis

Results were analysed by analysis of variance (ANOVA), and means were compared by Duncan's Multiple Range Test (Duncan, 1955).

## RESULTS AND DISCUSSIONS

### External egg qualities

Generally eggs of birds have oval shape with small differences among species. Despite its small differences, egg shape is considered as an important factor in characterizing bird species. In this study the eggs of quail and guinea fowl showed similar conical shape with blunt and pointed ends (Figure 1).

The shape of egg is expressed in terms of the shape index and the shape indices of quail and guinea fowl eggs were 79.93 and 79.57 respectively with no statistical difference (Table 1). The shape indices in the present study were higher than those reported by some authors for Chicken (give values) (Powrie, 1977; Baek, 1990).

The weights of guinea fowl and quail eggs and their components are shown in table 1. Guinea fowl egg

weight was much higher than that of quail and was basically due to vast difference in the size of these two species. The absolute weights of albumen, yolk and shell were also significantly higher in guinea fowl as compared to the quail and this difference was obviously due to much higher egg weight in guinea fowl. The proportions of yolk and albumen to the weight of whole eggs were higher in quail than guinea fowl, although the proportion of shell to weight of whole egg was higher in guinea fowl (table 2). These results agree with the findings of Song et.al. (2000) in quail and Singh et al., 1993, Song et al., 2000) in guinea fowl.

The shell of the guinea fowl egg (462.8 :m) was approximately 2.5 times thicker than that of quail egg (174.8 :m). The shell thickness of quail eggs was close to the earlier reports of (1980) and Nagarajan et.al. (1991). Similarly in guinea fowl, similar shell thickness has also been reported by Singh et al., 1993, Sachdeva et al., 2006).

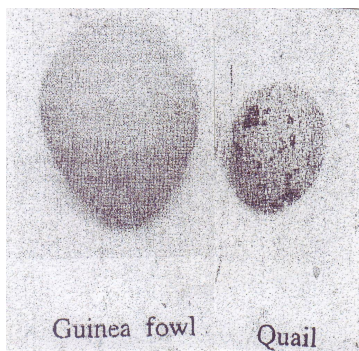
### Interior egg quality

The yolk index, albumen height and haugh unit of the eggs of guinea fowl and quail are shown in Table 1. Yolk index as well as albumin height were significantly higher in guinea fowl than quail, however, haugh unit was not significantly different in both the species. Similar results were reported by Song et.al. (2000). Since yolk index and haugh unit are indicators of internal egg quality and these were high in this study for the eggs from both the species, it can be said that the eggs from these species are of good quality. High internal egg quality of guinea fowl eggs was also reported by Singh et al., 1993, Sachdeva et al., 2006). The higher the haugh unit and yolk index, the more desirable the internal quality of the egg (Ihekoronye and Ngoddy, 1985; Imai et.al. 1986; Ayorinde, 1987; Adeogun and Amole, 2004).

**Table 2:** proportion of egg components to the weight of whole egg (%)

Species	Yolk	Albumen	Shell
Quail	31.4 ± 1.98 <sup>a</sup>	61.2 ± 2.32 <sup>a</sup>	7.3 ± 0.69 <sup>a</sup>
Guinea Fowl	30.6 ± 0.75 <sup>a</sup>	55.9 ± 1.54 <sup>b</sup>	13.5 ± 1.07 <sup>b</sup>

Mean ± standard deviation. Means in the same column not sharing a common superscript letter are significantly different (P>0.05).

**Figure 1:** Photograph of typical egg of Quail and Guinea fowl**Table 3:** chemical composition of whole egg, yolk and albumen of guinea fowl and quail.

Species	Part of egg	Chemical composition (%)			
		Moisture	Crude Protein	Crude Fat	Crude Ash
Quail	Whole egg	74.26 ± 0.45 <sup>a</sup>	11.98 ± 0.58 <sup>a</sup>	11.91 ± 0.65 <sup>a</sup>	1.04 ± 0.12 <sup>a</sup>
Guinea Fowl	Whole egg	74.47 ± 0.43 <sup>a</sup>	12.77 ± 0.38 <sup>a</sup>	10.83 ± 0.75 <sup>a</sup>	1.10 ± 0.18 <sup>a</sup>
Species	Part of egg	Chemical composition (%)			
		Moisture	Crude Protein	Crude Fat	Crude Ash
Quail	Yolk	49.71 ± 0.55 <sup>a</sup>	15.99 ± 0.19 <sup>a</sup>	31.48 ± 0.76 <sup>a</sup>	1.79 ± 0.38 <sup>a</sup>
Guinea Fowl	Yolk	49.80 ± 1.11 <sup>a</sup>	15.74 ± 0.55 <sup>a</sup>	31.91 ± 0.90 <sup>a</sup>	1.86 ± 0.35 <sup>a</sup>
Species	Part of egg	Chemical composition (%)			
		Moisture	Crude Protein	Crude Fat	Crude Ash
Quail	Albumen	87.82 ± 0.55 <sup>a</sup>	10.39 ± 0.50 <sup>a</sup>	0.09 ± 0.03 <sup>a</sup>	1.00 ± 0.11 <sup>a</sup>
Guinea Fowl	Albumen	87.46 ± 0.84 <sup>a</sup>	10.61 ± 0.56 <sup>a</sup>	0.13 ± 0.04 <sup>a</sup>	0.79 ± 0.10 <sup>b</sup>

Means in the same column not sharing a common superscript letter are significantly different (P>0.05)

### Chemical composition

The chemical composition of guinea fowl and quail eggs as shown on table 3 showed no statistical difference (P>0.05) between the species. The proximate compositions were similar to those obtained for chicken eggs (USDA,1983) where the moisture, protein, fat and ash contents were 74.57%, 12.14%, 11.5% and 0.94% respectively. No species difference in the proximate compositions of albumen and yolk was found except in crude ash of egg albumen, which was significantly higher in quail egg. The proximate compositions of albumen and

yolk of quail egg in this study were similar to those reported by some authors (Mahaptra et al., 1986, Imai et.al. 1986 and Song et.al. 2000) for Japanese quail.

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