

COMPARATIVE ANALYSIS OF EGG QUALITY PARAMETERS OF GUINEA FOWL AND LOCAL CHICKENS IN BENUE AND TARABA STATES

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ABSTRACT

The study was conducted to evaluate some parameters of external and internal egg quality of local chickens and guinea fowl in Benue and Taraba states. A total of 160 eggs (40 eggs from each breed per state) were collected to study for egg (weight, shape index), albumen (weight, percentage), yolk (weight, percentage) and shell (weight, percentage, thickness, strength) quality. The results showed that the egg weight and egg length of local chickens in Benue were significantly higher ($P < 0.05$) than that of guinea fowl in the same state, whereas difference in egg shape index between these breeds were not significant ($P > 0.05$). Differences in albumen weight, albumen percentage, yolk weight and yolk percentage of the chicken breeds were statistically non-significant ($P > 0.05$). Albumen height was significantly higher ($P < 0.05$) in local chickens in Benue compared with local chickens in Taraba state. The significantly ($P < 0.05$) higher values of yolk height and yolk index were detected in guinea fowl in Benue state than others. The shell weight and proportion were affected by the breed of hens ($P < 0.05$) but there were no significant differences ($P > 0.05$) in egg shell thickness and strength. It was concluded that the breed of chicken and location affected some parameters of exterior and interior quality of eggs. Further were recommended on other breeds of chicken to also determine the quality of their eggs.

Key words: Egg quality, guinea fowl, local chickens.

INTRODUCTION

The livestock industry is an important subsector of the agricultural sector of Nigeria's economy. The role of this sector cannot be over-emphasized considering the importance of animal protein in the diet of people and contribution from this sector to the gross domestic product (Adekaye and Akinrade, 2006). They enumerated livestock types found in Nigeria to include cattle, sheep, goats, pigs, poultry, horses, donkeys and camel. The term poultry refers to all domesticated birds kept for meat or egg production which consist of chicken (domestic fowl), turkey, ducks and geese (Obioha, 1992). Poultry eggs yield desirable products in all parts of the country with no cultural restrictions. Poultry eggs are rank second to cow milk in terms of nutritive value and are the most economically produced animal protein (Ikeme, 1990). Eggs are considered a wholesome diet, since an egg contains adequate amounts of protein, energy, amino acid, vitamins and minerals to satisfy the body needs. Lombin (2001) emphasized that, the FAO/WHO recommended daily intake of 65g of protein out of which 35g (38.8%) should be from animal sources. She further stressed that Nigeria's consumption of protein is now 5g per head per day (14.3% requirement). The need therefore to bridge the gap of protein shortage through good quality eggs cannot be over-emphasized. Eggs have constituted an important part of human diets for centuries because of its high quality protein (Forson *et al.*, 2011). They are known to supply the best proteins besides milk (Vaclavik *et al.*, 2008). It is also rich in amino-acids, carbohydrates, easily digestible fats and minerals, as well as valuable vitamins (Huopalahti *et al.*, 2007). The yolk and white components are all of high biological value and are readily digested (Joel *et al.*, 2010). Eggs play important culinary roles and are therefore prepared into different dishes. There are many types of poultry species' eggs consumable as a protein and amino acid supplement (Trziska, 2000). Nigeria has the highest number of poultry farm in Africa. Nigeria presently produces about 300,000 tons of poultry meat per annum officially and 650,000 tons of eggs (USDA, 2014). A parallel record from Poultry Association of Nigeria (PAN), indicates that Nigeria produces presently above 1.25million tons of egg per year. South Africa is the second producer of eggs in Africa. The question arises whether there are interspecies differences in poultry eggs quality which may affect the nutritive value and quality as human food. In Nigeria, domestic fowl dominated the

poultry industry. Out of 150 million poultry population, 120 million (80%) were indigenous. Domestic fowl constituted 91% of this while guinea fowl, duck, turkey and others were 4%, 3% and 2% respectively (Adenowo *et al.*, 1999). Chicken eggs are the most commonly consumed eggs; they are also an inexpensive single-food source of protein.

MATERIALS AND METHODS

The study was conducted in Benue and Taraba state. Freshly-laid egg samples from birds of two (2) different genotypes (domestic chicken and guinea fowl) were obtained between September and October 2018 from poultry keepers in Benue and Taraba States, Nigeria. The eggs were analyzed for different parameters of egg quality. At laying time the domestic fowl were approximately 28 weeks and guinea fowl were approximately 32 weeks old. The birds' genotype was Pearl (guinea fowl) and normal feathered (domestic chicken). Both the domestic chicken and guinea fowl had outdoor access all the year round Fed with cereal, hay, clover, vegetables, green crops and cereal-based mixed fodder with several additives daily. The egg samples were thoroughly washed with distilled water in the laboratory. The yolk and albumen were separated by breaking a small part of the egg shell at one end and separating the egg albumen from the yolk. Forty (40) eggs each from both local chickens and guinea fowl were used for the study. Freshly laid eggs were collected at 26, 34, 42, and 50 wk. For each examination, 40 eggs were randomly selected from each group to measure the internal and external characteristics. Time interval between the eggs being laid and measured was less than 24 hours. The eggs were stored at room temperature before measurement.

RESULTS AND DISCUSSION

The result of the comparative analysis of egg quality of guinea fowl and local chickens in Benue and Taraba states is presented in table 1, 2, 3 and 4.

Table 1: Effect of Breed on Egg Parameters

Parameters/ Breed	Benue State		Taraba State	
	Local chicken	Guinea fowl	Local chicken	Guinea fowl
Egg weight (g)	58.69±3.64 ^a	56.74±3.58 ^c	57.96±3.59 ^b	57.78±3.67 ^b
Egg length (cm)	5.83±1.14 ^a	5.71±1.13 ^{bc}	5.79±1.14 ^b	5.78±1.13 ^b
Egg width (cm)	4.34±1.08	4.27±1.07	4.31±1.10	4.32±1.09
Egg shape index (%)	74.44±0.44	74.78±0.35	74.43±0.31	74.74±0.36

Table 2: Effect of Breed on Egg Albumen Parameters

Parameters/ Breed	Benue State		Taraba State	
	Local chicken	Guinea fowl	Local chicken	Guinea fowl
Albumen weight (g)	34.87±3.85	33.07±3.68	34.23±3.88	34.12±3.79
Albumen percentage (%)	59.41±3.96	58.29±3.88	59.05±3.95	58.75±3.94
Albumen height (mm)	55.86±2.42 ^a	55.07±2.46 ^b	54.72±2.39 ^b	55.11±2.44 ^{ab}
Albumen width (mm)	78.25±0.78	78.63±0.65	78.06±0.68	78.48±0.72
Albumen index (%)	71.39±2.14 ^a	70.04±2.08 ^b	70.09±2.13 ^b	70.22±2.09 ^{ab}

Table 3: Effect of Breed on Egg Yolk Parameters

Parameters/ Breed	Benue State		Taraba State	
	Local chicken	Guinea fowl	Local chicken	Guinea fowl
Yolk weight (g)	17.83±1.08	17.93±1.66	18.07±1.64	18.23±1.68
Yolk percentage (%)	30.38±0.85	31.60±0.87	31.17±0.89	31.39±0.82
Yolk height (mm)	17.25±1.17	17.97±1.09 ^a	17.12±1.14	16.73±1.07
Yolk width (mm)	41.26±0.68	40.98±0.59	41.22±0.64	41.14±0.67
Yolk index (%)	41.81±0.69	43.85±0.79 ^a	41.53±0.75	40.67±0.61
Yolk colour (⁰ LR)	9.65±0.95		9.49±0.99	9.57±0.88

Table 4: Effect of Breed on Egg Shell Parameters

Parameters/ Breed	Bauchi State		Gombe State	
	Local chicken	Guinea fowl	Local chicken	Guinea fowl
Shell weight (g)	5.99±0.33 ^a	5.74±0.33 ^b	5.67±0.32 ^b	5.43±0.33 ^b
Shell percentage (%)	10.21±0.65 ^a	10.11±0.61 ^a	9.98±0.62 ^{ab}	9.40±0.60 ^b
Shell thickness (µm)	371.45±24.29	368.82±24.42	364.39±24.27	361.58±24.22
Shell strength (N cm ⁻²)	30.44±5.62	29.81±5.39	29.27±5.48	30.18±5.53

The result of the egg parameters is presented in Table 1. The result showed that there were significant differences in egg weight and egg length while there were no significant differences in some of the parameters such as egg width and egg shape index. The study showed significantly ($P<0.05$) lower egg weight of guinea fowl in Benue in comparison with local chicken, followed by guinea fowl in Taraba. Eggs from local chickens in both states gave higher values compared to guinea fowl.

The values obtained in this study were similar to those recorded by Zanon *et al.* (2006), who published egg weight for local light Italian breeds Modenese and Romagnolo (53.7g and 54.0g). For guinea fowl, hen egg weight was balanced from 57.0 to 58.0g (Anderle *et al.*, 2014). For example, Turkish breeds Benizli and Gerze lay eggs with weight 53.94 and 54.30g (Sarica *et al.*, 2006).

The study also recorded a similar average egg shape index from 74.43% for local chickens in Taraba state to 74.78 % for guinea fowl in Benue state. The values in this study were lower than those reported by Singh (2000) who recorded higher egg shape index (75.46%). Egg shape is influenced by genetic factors and individual traits, and is determined in the oviduct. The egg shape index ranges between 57 % and 92 %, but it is believed that values under and below 74 % are a cause for higher incidence of cracked and broken eggs (Narushin, 2005; Popova-Ralcheva *et al.*, 2009).

Albumen Parameters

The result of the albumen parameters is presented in Table 2. There were significant differences in albumen height and albumen index while there were no significant differences in albumen weight, albumen percentage and albumen width. The values obtained in this study were lower than those reported by Anderle *et al.* (2014) reported albumen proportion for local chicken from 58.4 to 60.1 %. In the present study it has been observed that local chickens in Benue state have significantly ($P<0.05$) higher albumen height than local chickens in Taraba. Albumen percentage was significantly higher ($P<0.05$) in local chickens in Benue compared with guinea fowl in Benue, local chicken in Taraba and guinea fowl in Taraba. The difference in albumen height observed is in agreement with the results of Monira *et al.* (2003) who reported different albumen heights for different breeds, but Haunshi *et al.* (2011) observed non-significant differences in albumen height among Vanaraja and White Leghorn breeds of chickens.

Yolk Parameters

The results of the yolk parameters are presented in Table 3. The results showed that there was no significant difference in yolk weight and yolk percentage among chicken breeds. Guinea fowl in Benue showed significantly ($P < 0.05$) higher yolk height and yolk index than local chicken in Benue, local chickens in Taraba and guinea fowl in Taraba. The yolk weight of chickens breed was from 17.83 g (local chickens in Benue) to 18.23 g (guinea fowl in Taraba). Stahishevskaya and Toritisna (2007) published similar weight of yolk in local breeds, 18.2g, in Rhode Island 18.3g and in Leghorns 17.4g. In this study, the yolk percentage range from 30.38% for local chickens in Benue to 31.60% for guinea fowl in Benue state. Anderle *et al.* (2014) reported yolk proportion for Czech Golden Spotted hens from 31.2 to 32.9 % and Zanon *et al.* (2006) found yolk proportion 34.69% in Modenese and 32.35% in Romagnolo. Haunshi *et al.* (2011) observed significant differences in the yolk index of different breeds of chickens. The colour of yolk was almost uniform in all the breeds of chickens, this could be due to the fact that the birds received the same compound poultry feed.

Egg Shell Parameters

The weight, percentage, thickness and strength of egg shell are presented in Table 4. In shell weight and percentage, there was significantly ($P < 0.05$) lower value for guinea fowl in Taraba compared with local chickens in Benue and guinea fowl in Benue. There were no significant differences ($P > 0.05$) in egg shell thickness and strength among local chickens in Benue, guinea fowl in Benue, local chickens in Taraba and guinea fowl in Taraba state. Zanon *et al.* (2006) reported higher eggshell proportion for both Italian breeds Modenese and Romagnolo (12.88 and 13.29%) compared with the result in this experiment. The proportion of eggshell from the egg weight in Czech Golden Spotted hens ranged from 9.0 to 9.5 % (Anderle *et al.*, 2014). Shell percentage can be used to estimate the eggshell quality (Mertens *et al.* 2006).

CONCLUSION

Based on the results obtained in this study, it can be concluded that the breed of chicken and location affected some parameters of exterior and interior quality of eggs considered. This effect is most pronounced in egg weight, egg length, quality of albumen, yolk (height, index), egg shell weight and percentage.

RECOMMENDATIONS

From the study conducted, it can be concluded that, layers should be fed with high quality diets to improve the quality of their external and internal egg parameters. Proper management practices should be carried out in a layers house to ensure the laying of eggs with high quality parameters. Further research should be carried out on other breeds of chicken to also determine the quality of their eggs.

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