COMPARATIVE ANALYSIS OF THE QUALITY CHARACTERISTICS, PROXIMATE COMPOSITION AND CHOLESTEROL CONTENT OF SOME AVIAN EGGS IN SANGO-OTA, OGUN STATE

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ABSTRACT

Since inception, eggs have been a source of a natural balance of essential nutrients and minerals which is of great importance to human health. The quality characteristics, proximate composition and cholesterol level of the eggs of guinea fowl, quail and local fowl in Sango Ota,were investigated. Eggs of the three different species have a similar ovalish conical shape with blunt and pointed ends, showing the shapes indices of (73.03±2.78-80.43±2.71mm) with no statistical difference. Egg weight was heaviest in guinea fowl (40.56±1.79g) followed by local fowl (34.90±1.25g) and quail (9.71±0.93g).The shell thickness of the eggs was thickest in guinea fowl (462.8um), followed by local fowl (241.5um) and quail (174.8um). The contents of moisture, crude protein, crude fibre and crude ash of the whole eggs were in ranges of (74.26-74.50%), (11.98-12.77%), (10.83-12.01%) and (1.02-1.10%) respectively with no statistical difference among the species. Albumin was high in moisture content (87.46-87.83%) which was quite different from yolk. Yolk showed relatively low level of moisture (49.71 -50.37%) and high level of fat (31.48-32.32%),crude protein (15.12-15.74%) and crude ash (1.52-1.86%).The cholesterol content of the yolk was highest in local fowl egg(22.40mg/yolk),followed by guinea fowl (15.85mg/yolk) and quail (12.96mg/yolk).The results showed that the three eggs have a natural balance of essential nutrients and minerals, which is a good source of food for a healthy body .

KEYWORDS: Quality characteristics, proximate composition, avian eggs, Cholesterol

INTRODUCTION

The poor nutritional status of individual in Nigeria has been attributed to low food production, purchasing power, socio-cultural factors and nutritional education (Akinwumi *et al*, 1979); Eggs are excellent sources for nutrition with all vitamins present except vitamin C. Eggs are laid by female animals of many different species including birds, reptiles, amphibians and fish. Bird eggs have been valuable foodstuffs since prehistory in both hunting societies and more recent cultures where birds were domesticated. There is evidence that wild birds were included in the diet of primitive people long before the development of agriculture. Eggs have always had a primary place in mythologies, religions and cultural practices worldwide and have typically been regarded as symbols of rebirth, renewal, beginnings and fertility. The variety of bird eggs enjoyed in many cultures includes duck, goose, quail, chicken, turkey, and ostrich eggs (Saleh et al., 1991).

Investigation of the cholesterol contents in eggs of duck, guinea fowl, quail, local fowl reared in various part of Nigeria, showed that most of the eggs have high protein value compared to other nutrient, the local fowl egg was shown to have the highest content of egg protein while quail egg has the least content in egg protein, the vitamins were investigated also and thiamine was found in an appreciable amount in the four species. This indicates that the selected avian species have considerable amounts of vitamins, minerals and protein which are contributory to the nutrient need of the populace (Emmanuel et al., 2011).

Thus, the egg may supply all essential amino acids for human (FAO,2010) and provide several vitamins and minerals ,including retinol , vitamin A, riboflavin, folic acid, vitamin B6, chlorine, iron, calcium, phosphorus and potassium(USDA 2005). According to USDA (2007)

more than half the calories found in eggs come from the fat in yolk. Calcium and phosphorus are important in bone, teeth and muscle metabolism (Dosunmu, 1997), while Iron (Fe) is an essential trace element for hemoglobin formation, normal functioning of central nervous system and energy metabolism (Ishidahomen et al., 2014).

In the past centuries, eggs have been a source of protein, carbohydrate, cholesterol, calories and fat which are of great importance to human health. Since it is an excellent source of diet in the foods of Nigerians, it is imperative to determine the quality characteristics, proximate composition and cholesterol content in the egg yolk, egg white and whole egg of quail egg, guinea fowl egg and local fowl egg and its importance to human health. The objective of this study is to evaluate the quality characteristics (freshness, color, shell thickness, weight) of these selected eggs, proximate composition of the eggs, the cholesterol level of the eggs and compare the quality characteristics, proximate composition and cholesterol levels of each of the eggs. Protein standards for eggs is 12.6% and the fat level is 9.0% as reported by FAO, 2010.

Experimental Procedure

The eggs (local fowl egg, quail egg, and guinea fowl eggs) were randomly collected from poultry farm in Sango Ota in Ogun state. The eggs were kept in the refrigerator at 7^0C to maintain its freshness. The eggs were used within 7 days.

The proximate analysis of samples was carried out using methods described by AOAC, (2003). The cholesterol content was determined using method described by Huang et al.(1991) and the egg quality was evaluated using method described by Amer(1992). Statistical analysis was carried out, data obtained from the analysis were subjected to non- parameter test such as the mean and the standard deviation so as to show the significant differences in treatment mean.

RESULTS AND DISCUSSION

Table 1. Egg shape of Guinea fowl, Quail and Local fowl egg

Species	N	Length (L) (nm)	Breadth (L) (nm)	B/L x 100
Guinea fowl	10	46.85 ±1.25	37.68±0.77	80.43±2.71
Quail	10	28.96±1.05	23.16±0.96	79.97±2.78
Local Fowl	10	49.17±1.85	35.91±0.43	73.03±2.78

Mean ± standard deviation. N is the number of eggs

Table 2. Weight and shell thickness of egg

Species	Weight	Shell thickness
Guinea fowl	40.56±1.79	462.8±39.1
Quail	9.71±0.93	174.8±15.5
Local fowl	34.90±1.25	241.5±35.0

Mean ± standard deviation.

Table 3. Chemical composition of whole eggs of Guinea fowl, Quail and Local fowl egg.

Species	Moisture%	Crude protein%	Crude fat%	Crude ash%
Guinea fowl	74.47±0.43	12.60±0.38	10.83±0.75	1.10±0.18
Quail	74.26±0.45	11.98±0.58	11.91±0.65	1.04±0.12
Local fowl	74.50±0.73	12.60±0.72	12.01±0.46	1.02±0.10

Mean ± standard deviation.

Table 4. Chemical composition of egg albumin of Guinea fowl, Quail and Local fowl egg.

Species	Moisture%	Crude protein%	Crude fat%	Crude ash%
Guinea fowl	87.46±0.84	10.61±0.36	0.13±0.04	0.79±0.10
Quail	87.82±0.55	10.39±0.50	0.09±0.03	1.00±0.11
Local fowl	87.83±0.61	10.15±0.44	0.15±0.05	0.82±0.07

Mean ± standard deviation.

Table 5. Chemical composition of egg yolk of Guinea fowl, Quail and Local fowl egg.

Species	Moisture%	Crude protein%	Crude fat%	Crude ash%
Guinea fowl	49.80±1.11	15.74±0.35	32.91±0.04	1.86±0.35
Quail	49.71±0.35	15.17±0.19	31.48±0.76	1.79±0.35
Local fowl	50.37±1.03	15.12±0.65	32.32±0.95	1.52±0.41

Mean ± standard deviation.

Table 6. Cholesterol content of egg yolk of Guinea fowl, Quail and Local fowl egg.

Species	Cholesterol content (mg/g yolk)
Guinea fowl	15.85
Quail	12.96
Local fowl	22.40

DISCUSSION

Egg Quality

In general, eggs of birds have oval shape with small difference among species. In spite of its small difference, the shape of egg has been considered as an important factor to characterize species of birds (Song et al., 2000). In this study, eggs of Guinea fowl, Quail and Local fowl showed similar ovality conical shape with blunt and pointed ends, hence they were almost indistinctive with eyesight as far as the shape was concerned solely without respect to size and colour. The shape of an egg can be expressed numerically by the shape index (breadth/length x 100) (Song et al., 2000). The shape indices of Guinea fowl, Quail and Local fowl eggs was within the range of 73.03 – 80.73, as showed in table 1, this is larger than the standard egg of chicken (*Gallus domesticus*) of 0.74nm as reported by Powrie,(1977) and egg of 500 day old Ogol fowl of 72.60nm as reported by Baek, 1990 in which the shape index valve decreased with the age of the bird.

The weight of eggs was highest in Guinea fowl and lowest in Quail, this differs from the result reported by Romanoff and Roomanoff (1949) in which they were 50 and 12 respectively. The thickness of the shell was thickest in Guinea fowl, followed by Local fowl and Quail egg. The egg shell reported in this study is thinner than those reported by Asmundson and Baker (1999) (260µm). on the other hand, the observed shell thickness of Quail egg was close to those reported by Nagarajan et al., (1991) (160µm).

CHEMICAL COMPOSITION

The contents of moisture, crude protein, crude fat and crude ash of the whole egg were in the range of 74.26 – 74.50, 11.98 – 12.77, 10.83 – 12.01 and 1.02 – 1.10 respectively as shown in table 3.The proximate compositions observed were more or less similar to those of local fowl egg (Adeyeye, 2010) where the moisture content, crude protein, crude fat and crude ash contents were 74.57%, 12.14%, 11.5% and 0.94% respectively. From table 4, albumin was characterized to have high moisture content of 87.46 - 87.83% and very low crude fat content of 0.15 – 0.09% which was quite different from the yolk. Compared with albumin, yolk showed relatively low level of moisture 49.71 – 50.37% and high levels of fat 31.48 – 32.3%, crude protein 13.12 – 15.99% and crude ash 1.37 – 1.86% as shown in table 5. There were no species difference in the proximate composition of albumin and yolk except in the crude ash of egg albumin. The proximate composition of the albumin and yolk of Nigerian Quail egg in this study were similar to those of Japanese quail reported by Imai et al., (1998).

Data from table 6 showed considerably variation in the concentration of cholesterol of the egg yolk expressed as mg/g among the species. The highest amount of cholesterol was observed in Local fowl egg while Quail egg has the lowest. The yolk cholesterol content of Guinea fowl egg observed in this study was significantly lower than the values observed by Alex, 2001 which varied from 20.73 – 27.61mg/g yolk with diet manipulation and higher than 12.4mg reported by Turk and Barnett (1971). The discrepancy in cholesterol content of yolk could be due to environmental factors (Bair and Marion, 1988), genetic variation (Dosunmu, 1997) and dietary difference.

CONCLUSION

The analysis of the quality characteristics, proximate composition and cholesterol content of the eggs showed that eggs are good sources of protein, fat and minerals which are contributory to the nutrient need of the populace. Due to the low cholesterol content of Quail eggs observed in this study, people on a low cholesterol diet are recommended to consume more of Quail eggs than other eggs. Further analysis should be carried out on the vitamins and minerals present in these eggs because they are excellent source of diet in the food.

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