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Chemical Analysis and Consumer Preference of Selected Poultry Egg Types in Zaria, Nigeria

***Olugbemi, T.S., *Sule, A., *Orunmuyi, M., *Daudu, O.M. and **Olusola, O.O.**

*Department of Animal Science, Ahmadu Bello University, Zaria.
**Department of Animal Science, University of Ibadan, Ibadan.

***Corresponding author:**

Abstract

The chemical composition, cholesterol content and consumer evaluation of eggs from Japanese quails, guinea fowls, local chickens, and exotic chickens (Isa Brown) were determined. A total of one hundred eggs, twenty five from each of species were used to determine the chemical composition, cholesterol content and sensory evaluation (Five eggs for chemical composition, cholesterol content and twenty for sensory). On a dry matter basis, the local chicken had a significantly (P<0.05) lower value of 23.20% than other species. The exotic chicken ranked highest with a mean value of 38.39%. The mean values recorded for ether extract showed no significant difference (P>0.05) amongst the four species. The ash content of the local chicken was significantly (P<0.05) lower (4.33%) than that of Japanese quails, guinea fowl and exotic chickens with values of 4.84, 4.87 and 5.15 per cent, respectively. Values obtained for the nitrogen free extract also showed the local chicken to be significantly (P<0.05) lower (47.54%) than the other species whose values ranged between 51.39 – 52.06%. The exotic chicken had a significantly higher cholesterol value of 243.8 mg/dl while the values for the guinea fowl and the local chicken did not significantly (P>0.05) differ while the Japanese quail eggs had the least cholesterol value of 80.60 mg/dl. Smell and texture were not significantly (P>0.05) influenced by egg type however the guinea fowl and local chicken eggs were the most preferred in terms of colour and the quail with respect to taste. The lower cholesterol content of quail eggs perhaps gave it the potential of topping the consumers list of preference and wider acceptability. It is also evident that consumer's preference for one egg type over others might not be absolutely based on nutritional considerations but on psychological perceptions.

Keywords: *Chemical composition, cholesterol, consumer preference, poultry eggs*

Description of Problem

Poultry are a category of domesticated birds kept by humans for the purpose of eggs, meat or feathers. These include chickens, quails, turkeys, ducks, geese, pigeons, ostrich and pheasants. Different strains of chickens are used for table egg production. The egg is one of the most nutritious and versatile of human foods and is a major source of protein and cholesterol in our diet (1,2). 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, egg weight, shell quality, yolk index, albumen index, Haugh unit and chemical composition (3). The concentration of egg cholesterol may differ from one flock of birds to the other. Today's consumers are better educated and hence, more updated on issues regarding health and food safety and quality (4). Consequently, consumers are leaning towards food products that benefit their well-being. The choice of one egg type over another by consumers has sometimes been attributed to one being sweeter than the other however, these assertions have not been correlated to the nutritional values of these preferred egg types. This study aimed to analyse the composition of selected poultry eggs, determine consumer's preference for the selected poultry egg types and assess possible correlations with the nutritional contents.

Materials and Methods

Location

The studies were conducted at the Biochemistry Laboratory, Department of Animal Science, Ahmadu Bello University, Zaria and Pathology Laboratory, Teaching Hospital, Shika, Ahmadu Bello University, Zaria, Nigeria.

Experimental Procedures

Proximate Evaluation

Exotic chicken (Isa Brown) and Japanese quail eggs were obtained from the Department of Animal Science Teaching and Research Farm, Ahmadu Bello University, Zaria. The local chicken eggs and guinea fowl eggs were obtained from the open market. The proximate analysis of five eggs per treatment was carried out using the methods of (5).

Cholesterol Evaluation

The cholesterol content of five eggs per treatment was analysed using a commercial diagnostic cholesterol reagent kit (Randox Diagnostic Mannheim GmbH) by the method (6). The blank absorbance reading was obtained by diluting 1000µl of the working reagent with 10µl of distilled water. 10µl of the aliquot was then placed in a cuvette and inserted into a spectrophotometer set at 505nm. The absorbance of the calibrator was obtained by mixing 1000µl of the working reagent with 10µl of the calibrator and 10µl aliquot was taken and put in a cuvette in order to take the reading. To determine the cholesterol content, eggs of the different species were broken and yolks carefully separated into a container from which 1ml of the yolk was taken with a pipette and placed into a beaker after diluting with 1ml of NaCl buffer. A 10µl of the test sample was taken and mixed with 1000µl of the working reagent and absorbance read after incubating for 10 minutes at room temperature 25.^{0}C.

The absorbance of the test sample was then recorded, cholesterol content was calculated using the following formula:

Cholesterol in (mg) =

$$\frac{\text{Absorbance of test sample}}{\text{Absorbance of calibrator}} \text{X Conc. of calib. (mg)}$$

Conc.=concentration
Calib.=alibrator

Sensory evaluation

Twenty five eggs each from quails, guinea fowls, local chickens and exotic chickens were collected from different farms in Samaru, Zaria and a sensory evaluation was carried out. The egg types were put in cold water and brought to boil for 5 minutes, allowed to stay covered in hot water for another 5 minutes after which they were then cooled for two minutes in a bowl of cold water. Egg shells were removed cut into halves when ready to be used for evaluation. The boiled halved eggs were later placed in plates that were coded with numbers ranging from 1 to 40 for each egg type. Forty panellists were used for this assessment and were provided with cool water to rinse their mouths after every sampling. A 5-point hedonic scale (5 = like very much, 4 = moderately, 3 = neither like nor dislike, 2 = Dislike moderately, 1= Dislike very much) was used to judge for colour, smell, taste, texture and over all acceptability. Each panellist was provided with scoring sheets for grading.

Statistical analysis

The data obtained were analysed by General Linear Model (GLM) of Statistical Analysis Systems (SAS, 2002) and significant differences were separated by Duncan's Multiple Range Test contained in the package.

Results and discussion

The result of the proximate composition and cholesterol content of quail, guinea fowl, local chicken, and exotic chicken eggs are presented in Table 1. Dry matter (DM) was significantly ($P<0.05$) lower in the local chicken (23.20%) than those of the quail, guinea fowl and exotic chicken which were 26.77, 27.49, and 28.22%, respectively implying that the local chicken egg has more moisture than the other egg types. The crude protein (CP) content for quail (33.45%), guinea fowl (34.64%) and local chicken (33.08%) eggs were significantly ($P<0.05$) lower than that of the exotic chicken which was 38.39%.

Table 1: Proximate and cholesterol composition of local chicken, exotic chicken, guinea fowl and quail eggs

Parameters	Quail	Guinea fowl	Local chicken	Exotic chicken	SEM
Dry Matter, %	26.77[a]	27.49[a]	23.20[b]	28.22[a]	0.34
Crude Protein, %	33.45[b]	34.64[b]	33.08[b]	38.39[a]	0.42
Ether extract, %	9.50	9.76	9.09	9.97	0.13
Ash, %	4.84[a]	4.87[a]	4.33[b]	5.15[a]	0.08
NFE, %	51.39[a]	52.06[a]	47.54[b]	51.66[a]	0.43
Cholesterol, mg/dl	80.60[a]	190.60[b]	194.00[b]	243.80[c]	1.70

[a,b,c] Means on the same row with different superscripts are significantly different (P<0.05) on each other
NFE: Nitrogen free extract

These values differ from the findings of (4) who reported crude protein values of 12.77%, 11.98% and 12.14% for quail, guinea fowl and exotic chicken eggs, respectively and 12.58 for eggs generally. The differences in crude protein content could be due to possible variations in the nutrient content of feeds eaten as protein content of eggs are a function of dietary intake.

The mean values recorded for ether extract showed no significant difference amongst the eggs from the four species. Values for ether extract for the eggs were quail (9.76%), guinea fowl (9.50%), local chickens (9.09%), and exotic chicken (9.97%). These also do not vary greatly from 11.91% and 10.83% cited by (4) for quail and guinea fowl. The ash content of the local chicken was significantly lower (4.32%) than that of all other poultry species. No significant($P<0.05$) differences were observed in the ash content of the exotic chicken, guinea fowl and quail eggs accounting for 5.15%, 4.87% and 4.84%, respectively. These are higher than values obtained by (4) hence implying a greater mineral deposition. The same trend was observed for the nitrogen free extracts values (NFE). The NFE content of the local chicken (47.54%) significantly differed ($P<0.05$) to that of the exotic chicken, guinea fowl and quail which had no significant differences amongst their values of 51.66%, 52.06% and 51.39%, respectively. The cholesterol content of 190.60 mg and 194 mg/dl in the guinea fowl and local chicken eggs, respectively did not differ significantly ($P>0.05$). This is similar to the values of 184 mg and 200 mg/dl cited by (8) for guinea fowl and local chicken eggs respectively. In this study the least value of 80.60mg/dl recorded for quail eggs was the least and significantly differed ($P<0.05$) from all other values. However (9) reported that the cholesterol content of the quail egg yolk (121mg/dl) was very similar to that of the chicken egg yolk (120mg/dl). They also reported that no significant difference was observed when the cholesterol levels of raw and

cooked chicken eggs were compared. In this study, the exotic chicken exhibited the highest cholesterol value of (243.80 mg/dl) which is higher than what was obtained by other authors (10, 11) and this might be probably due to the nature of feed that must have been fed. Cholesterol values of 213 – 247mg/dl have been possible depending on the egg size (12).

A 5-point hedonic scale (5 being the highest and 1 the least value) was used to assess the sensory evaluation as presented in Table 2.

Table 2: Sensory evaluation of the local chicken, exotic chicken, guinea fowl and quail eggs

Components	Quail	Guinea fowl	Local chicken	Exotic chicken	SEM
Colour	3.68^{b}	4.28^{a}	4.10^{a}	3.58^{b}	0.09
Smell	3.85	3.45	3.63	3.80	0.08
Taste	5.00^{a}	4.00^{b}	3.00^{c}	3.00^{c}	0.00
Texture	4.14	3.90	4.08	3.68	0.07
General acceptability	4.15	3.98	4.18	3.78	0.08

$^{a, b, c}$ Means on the same row with different superscripts are significantly different ($P<0.05$) from each other

A yolk colour rated guinea fowl and the local chicken (4.28 and 4.10) respectively to be more yellow than the quail and exotic chicken eggs (3.68and 3.58), respectively. This is attributed to the feed type the birds were fed on as the primary determinant of yolk colour is the xanthophylls (plant pigments) content of the diet consumed (3). There was a significant ($P< 0.05$) preference for the guinea fowl and local chicken eggs in terms of colour and also confirmed report (14) while (15) stated that yellow yolk colour is an important factor for consumer satisfaction.

Smell, texture and general acceptability: No significant ($P>0.05$) differences were observed in sensory evaluation for smell, texture and general acceptability among the eggs. Studies carried out by (16, 17) also revealed that consumers could not detect the difference in smell and texture of hard boiled eggs.

Taste: There was however a significant ($P<0.05$) difference in values obtained for the taste of the various eggs, the quail eggs ranked highest (5.00) significantly differing from guinea fowl eggs, the local and exotic chicken eggs. This probably might be as a result of the different diets fed to the birds. According to (18) feed composition affects the taste of an egg. There was however no significant ($P>0.05$) difference in the consumer acceptability of the different egg types.

Conclusions and Applications

It can be concluded that:

1. The quail egg showed a lot of promise with its low cholesterol

profile and its general acceptability.

2. It was also evident that consumer preference of one egg type over others might not be absolutely based on nutritional considerations but on biases.
3. More enlightenment of the virtues of the quail egg should be carried out with a view of further promoting this egg type.

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