

function as phosphates. They help to tie up mineral ions such as Mg^{++} and Ca^{++} in solution, making it possible for the surfactants to be free to do their work of removing dirt (Outwater, 1996). Table salt is a food additive used in cooking. Chemically it contains sodium and chlorine

Eggs cooked with these chemicals are bought and consumed by the unassuming public with the hope that they are eating whole egg with all the nutrients compositions intact. To the best of our knowledge, there is yet no scientific data on the possible effects of these additives on the nutritional composition of eggs. This is the main focus of this research.

2.1 Materials and Methods

2.1.1 Sample Collection and distribution

Guinea fowl and Quail eggs were sourced from Fidgimor Poultry Farm, Abakaliki. High-breed chicken egg samples were sourced from Ebonyi State Poultry Farm, Nkaliki, Abakaliki, while native chicken eggs were sourced from a neighbour. .A total of sixty eggs were used and consisted of fifteen eggs from each bird. Eggs from each bird species were divided into five groups: A, B, C, D and E, with three eggs in each group. Eggs in groups A, B, C, and D were boiled with omo, klin, table salt and alum, respectively. Group E eggs served as the control group

2.1.2 Sample preparation.

All the eggs were properly washed with tap water to remove debris and dirt. The cooking time for the eggs was standardized at 12 minutes. Cooked eggs were peeled to remove the shell. The egg yolk and albumin were grounded in a mortar using a pestle. The ground sample was immediately used for the various analyses.

2.1.3 Determination of Fatty Acid Profile

Fatty acids (linoleic acid, oleic, palmitic, mystric and stearic acid) were determined using HPLC method as described by Nikolova-Damyanova, (1997). All chemicals used were of analytical grade and HPLC grade and they were purchased from BDH, except where otherwise stated.

3.1 STATISTICAL ANALYSIS.

Data were expressed as mean±SD and analyzed statistically using One Way Analysis of Variance (ANOVA). The minimum level of significance was expressed at $P<0.05$.

4.1 Results

The results are presented in Figures 1-5. Our results showed that the effects of the chemicals on the fatty acids were species dependent. All the fatty acids were adversely affected by the treatments, though however, in some cases, the effects were not significant ($P<0.05$). For instance, in quail egg (*Corturnix delegorgei*), alum had no significant ($P<0.05$) effects on myristic acid and stearic acid, whereas it had significant ($P<0.05$) effects on the other three fatty acids (palmitic,

oleic and linoleic acids). Detergents and table salt significantly ($P<0.05$) reduced the concentration of all the fatty acids (Figure 1). The detergents had more devastating effects on the fatty acids compared to either alum or table salt. Among the species of eggs tested, the effect was least on the fatty acids of quail eggs.

In the *Gallus varius* (native chicken) egg (Figure 2), the concentrations of linoliec, oleic, myristic and stearic acids were significantly ($p<0.05$) reduced by table salt and klin detergent. Omo significantly ($p<0.05$) reduced strearic acid concentration. Table salt and klin detergent had more devastating effects on the fatty acids of the eggs when compared to other chemicals

In the *Gallus gallus domesticus* (high breed chicken) egg (Figure 3), linoleic acid, and oleic acids were significantly ($p<0.05$) reduced by omo and klin detergents, while palmitic, and myristic were significantly reduced by all the chemicals. Stearic acid was reduced by all the chemicals except alum. The detergents had more destructive effects on the fatty acids than table salt and alum. Similarly, in *Numida meleagris* (Guinea fowl) egg (Figure 4), the concentration of linoleic acid was significantly ($p<0.05$) reduced by salt; oleic, palmitic and myristic acids by klin while Stearic acid was reduced by omo detergent.

Comparing the fatty acid contents of the eggs, generally, the fatty acids varied among the different egg species (Figure 5). Oleic acid was highest in guinea fowl (*Numida meleagris*) egg, and lowest in native fowl *(Gallus varius)* egg; linoleic acid was most abundant in quail egg (*Corturnix delegorgei*), and lowest in native chicken. Similarly, palmitic acid was highest in guinea fowl (*Numida meleagris*) and least in native fowl *(Gallus varius)*; while myristic acid was most abundant *Gallus varius* (native chicken) egg, it was lowest in quail (*Corturnix delegorgei*) egg. Stearic acid was most abundant in high-bred chicken (*Gallus gallus domesticus)* and lowest in guinea fowl egg (*Numida meleagris*). Our results are in consonant with some findings of Roux *et at* (2006).

5.1 Discussion

Presently, the reasons for the above results are not yet clearly understood. However, some explanations may be offered here based on the nature of the egg shell, the components of the chemicals used and the fatty acid itself.

The porous nature of the egg shell may have allowed some of the chemicals (table salt, alum, and detergents) to sip into the interior of the egg during cooking (Hoyo *et al*..1999) and interact with components of the egg, which includes the fatty acids. For instance, the carboxy group (-COOH) of the fatty acids is easily attacked by Na^+ (from the salt or alum), K^+ and Al^{3+} (from the alum), and EDTA (from the detergents). This displacement reaction may lead to the formation entirely new products resulting in the reduction of the amount of fatty acids itself detectable by the instrument used for the analysis. In addition, the presence of K^+ or Na^+ in alum can displace the H or OH to give an entirely new product with a high molecular weight. All these will result in reduction of the amount of fatty acids in the samples and consequently reduce the nutrient value of the eggs.

Generally, the effect of the chemicals on the fatty acid contents of guinea fowl egg was far less than found in the other eggs. This could be attributed to the thickness of its egg shell.. The thick and hard shell may not have allowed much of the chemicals to sip into the eggs thereby reducing the effects on the nutrient components of the egg.

In conclusion, our results have demonstrated that these eggs studied here are very rich in biologically essential fatty acids; but cooking them with detergents, salt or alum, as is currently being practised in many towns in Nigeria, destroys these physiologically important biommolecues and hence reduce the nutritional quality of the eggs. We advocate that these practices should be discouraged by the relevant agencies in Nigeria.

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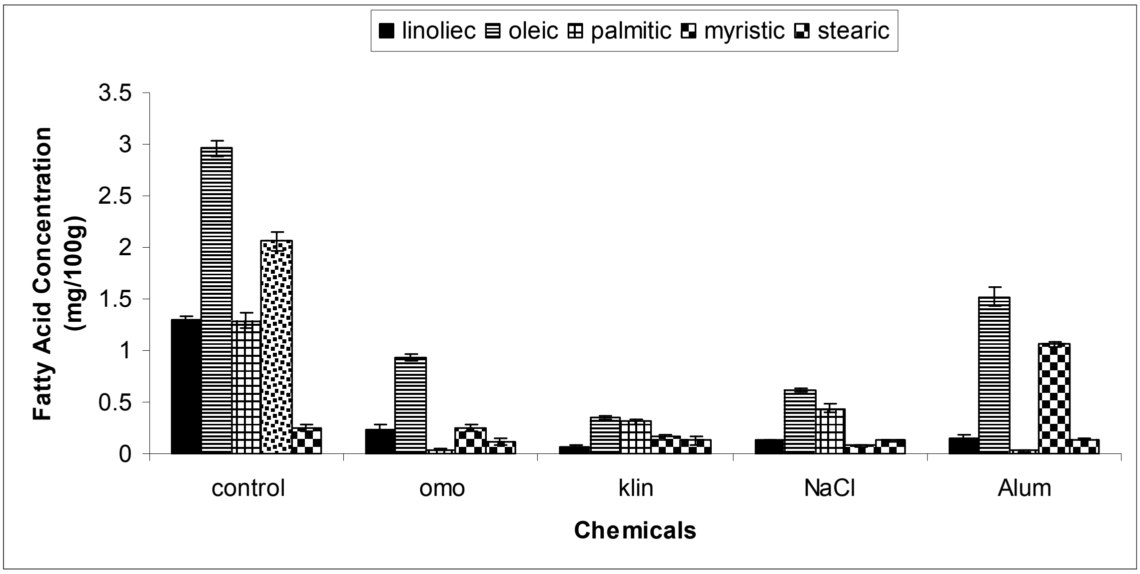

Figure 1: Effects of omo, klin, table salt and alum on fatty acid profile of cooked eggs of quail (Cortunix delegorgei). There was significant (P<0.05) reduction of fatty acids by the chemical, specially the detergents and table salt.

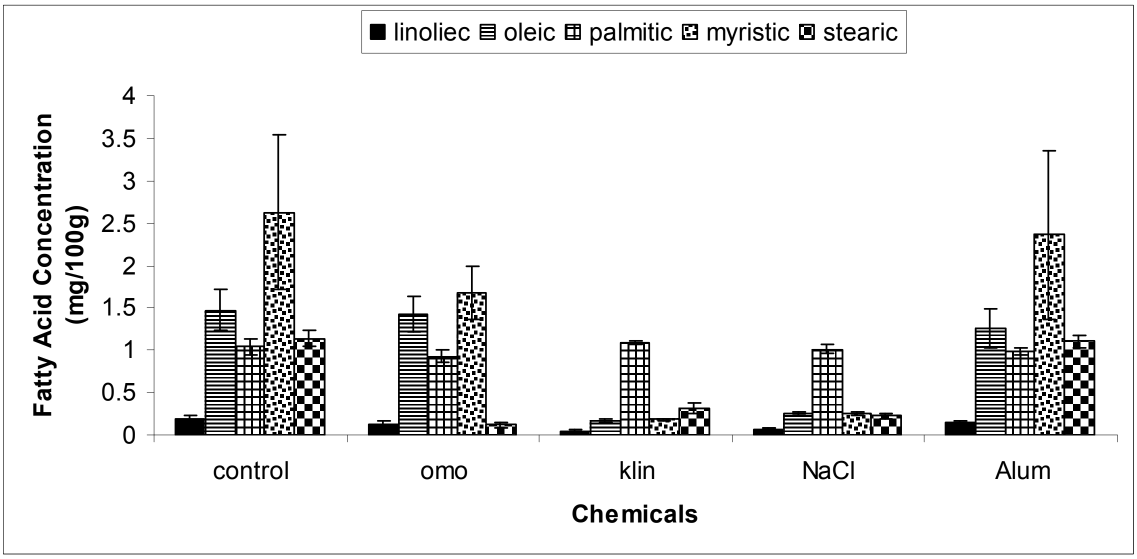

Figure 2: Effects of omo, klin, table salt and alum on fatty acid profile of cooked eggs of native chicken (Gallus varius). There was significant (P<0.05) reduction of fatty acids by the chemical, specially klin detergents and table salt

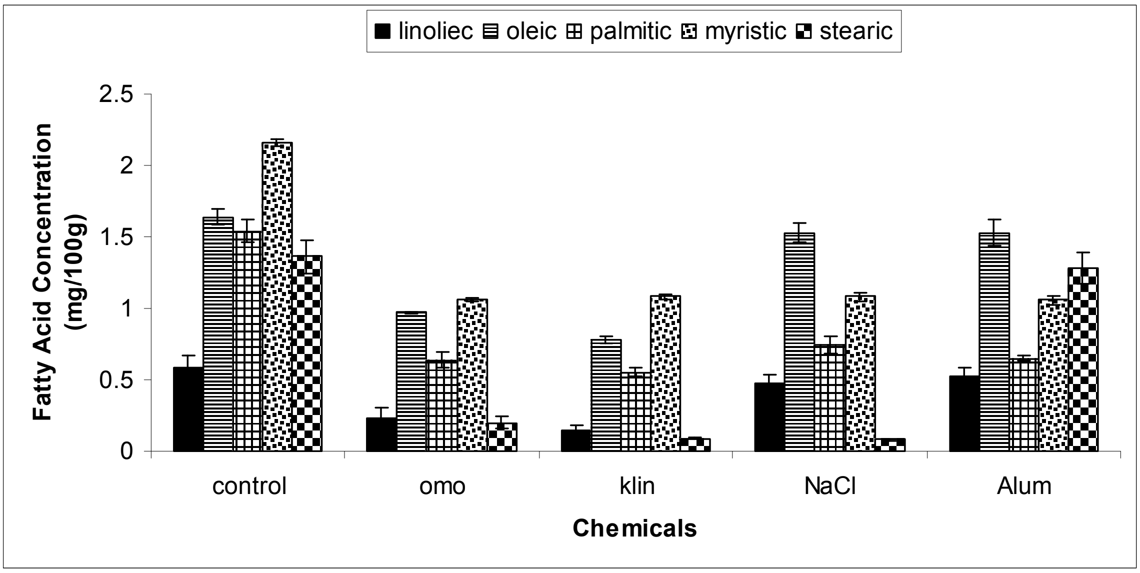

Figure 3: Effects of omo, klin, table salt and alum on fatty acid profile of cooked eggs of high-bred chicken (*Gallus gallus domesticus*). There was significant ($P<0.05$) reduction of fatty acids by the chemical, specially the detergents.

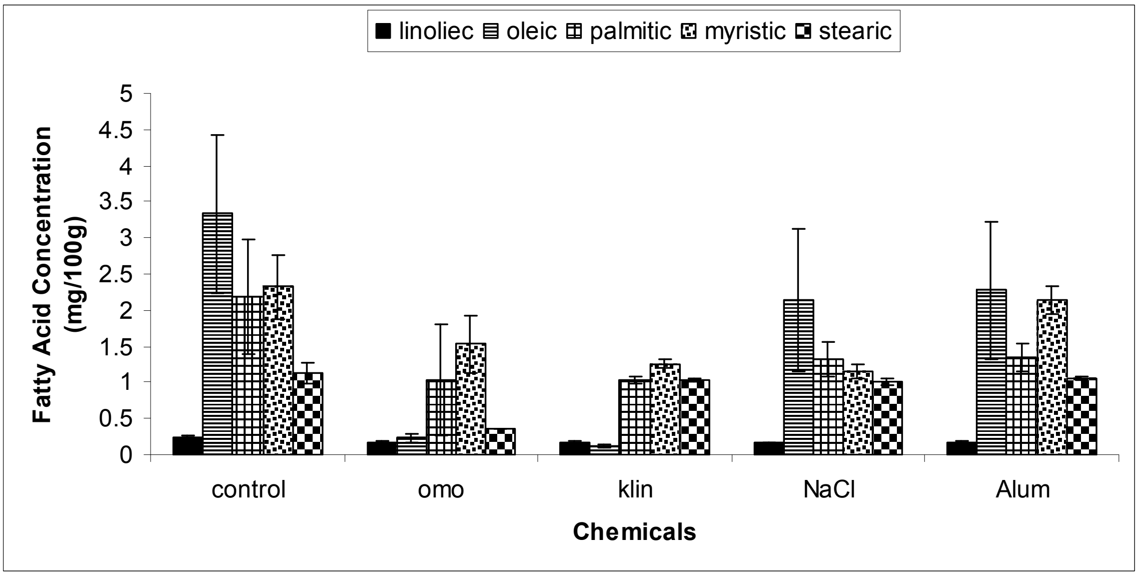

Figure 4: Effects of omo, klin, table salt and alum on fatty acid profile in cooked eggs of Guinea fowl (*Numida meleagris*). There was significant ($P<0.05$) reduction of fatty acids by the chemical, specially the detergents.

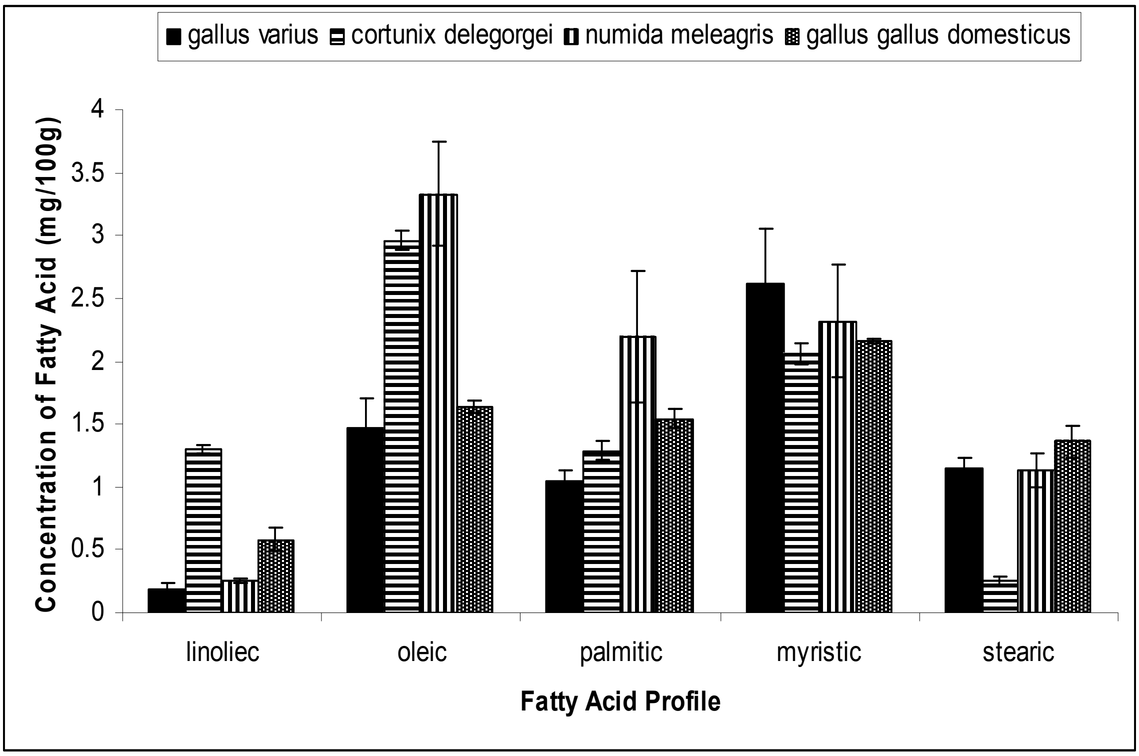

Figure 5: Comparison of the fatty acid levels in eggs of different bird species
This shows varied concentration of fatty acids in eggs of different bird species.