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DETERMINATION OF SOME MINERAL NUTRIENTS IN SALWA EGGS COLLECTED FROM SOKOTO, NIGERIA

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Abstract
Some mineral nutrients were determined using AAS in Salwa eggs collected from Sokoto, Nigeria. The results of this study demonstrate that eggshells and whole egg content have distinct mineral profiles. Notably, eggshells contain significantly higher levels of iron (600.0 ± 25.1 ppm) and calcium (331.0 ± 0.5 ppm) compared to whole egg content. In contrast, whole egg content has higher levels of selenium (1.20 ± 0.4 ppm), magnesium (131.3 ± 2.5 ppm), and sodium (2.13 ± 0.11 ppm) compared to eggshells. The high iron and calcium content in eggshells suggests potential applications in agriculture, nutrition, or industry, such as using eggshells as a natural source of calcium for animal feed or as a soil amendment. The presence of essential micronutrients like zinc and copper in both eggshells and whole egg content highlights the nutritional value of eggs. The findings of this study can inform the development of new products or applications that utilize eggshells and whole egg content, potentially reducing waste and promoting sustainable practices. Further research is needed to explore the practical applications and benefits of utilizing eggshells and whole egg content in various industries.

Keywords:
Sirt1, Circadian clock, COVID-19, Immunity, Health.

Introduction

Verily, humans relied on food substances to fuel their biological processes (metabolism) for growth, health, reproduction and development. Amid the rising rate of modernization, there is rising consumption of foods that are unhealthy (ultra-processed) that lead to hypertension, anemia, diabetes, cancer, and malnutrition among other detriments (Kihara et al., 2019; Michigan WIC Program, 2022; Abubakar et al., 2024). Other factors such as poverty, environmental problems, poor healthcare, and many more are factors that make public health nutrition in developing areas (like Sokoto) more critical; therefore, the need for consumption of healthy foods such as poultry (which include Salwa) is more intensified (Friday et al., 2011; Tunsarikam et al., 2013; Akter et al., 2020; Sarkingobir et al., 2023; Choi et al., 2025). Poultry or Salwa is a good source of minerals or micronutrients that are healthy and support life without leading to unhealthy results such as diabetes, hypertension, etc. Minerals generally perform similar functions to the body like the vitamins, therewith, they are involved in numerous biochemical processes. Minerals are micronutrients needed by the body in minute amount in order that the body perform functions (Mohammed et al., 2017; Mir et al., 2022). Some minerals are major minerals because they are comparatively needed in much amount compared to their counterparts, for instance, Calcium, sodium, magnesium, potassium, phosphorus, sulphur, etc. Other groups of minerals are needed comparatively by the body in lesser amount, despite their vital roles, for instance, selenium, iron, zinc, iodine, copper, etc (Sarkingobir et al., 2020; Moreira et al., 2024; Ozturk et al., 2024). Considering the fact that, the best and healthy source of nutrients (minerals) that should be relied upon by the humans is the organic or natural foods, such as poultry products like the ones source from Salwa (Tunsarikam et al., 2013), it is good to monitor the levels of minerals in Salwa eggs. Another driving force is, there is concern that, the consumption of excess minerals is dangerous or problematic to health. The objective of this paper was to determine the levels of mineral nutrients in Salwa egg collected from Sokoto.

Materials and Methods

Salwa eggs were carefully brought from Sokoto Central Market. 2g of each egg sample (containing whole egg) were used after separating the egg content with the shell. The 2g of the egg content were stored, and treated according to the standard procedures reported in Umar et al. (2022). Then atomic absorption spectroscopy (AAS) was utilized to measure the levels of mineral micronutrients in egg content (Calcium, magnesium, sodium, iron, zinc, copper, and selenium).

Results and Discussion

Table 1: Levels of mineral micronutrients in Salwa egg collected from Sokoto

Mineral micronutrient	Egg shell (ppm)	Egg content (ppm)
Fe	600.0 ± 25.1	26.5 ± 0.5
Zn	12.1 ± 3.1	6.0 ± 1.2
Cu	4.06 ± 0.1	3.8 ± 0.5
Se	1.0 ± 0.02	1.20 ± 0.4

Key= values are expressed as mean ± standard deviation

Iron is important for making hemoglobin, myoglobin, that are responsible for oxygen transport and storage respectively. Insufficiency of iron lead to anemia, irritability, increased rate of infection, and other effects. Zinc is useful for many enzymes and insulin. It helps in making proteins, help in the metabolism of vitamin A; and deficiency of zinc may cause nausea, vomiting, and diarrhea. Selenium is a great element that

prevent cancer, and help in improving immune system functioning; likewise, copper is beneficial for it's vital role in many biochemical enzymes (Mohammed et al., 2017).

Table 1 shows the levels of micronutrients in Salwa eggs. The results show that, the levels of iron, zinc, copper, and selenium respectively as follows; 600±25.1 (iron), 12.0±3.1(zinc), 4. 06±0.1(copper), and 1.0±0.2 (selenium). The levels of selenium and zinc are lower than the values obtained in eggs in Sokoto by Umar et al. (2022). However, the levels of minerals micronutrients found in this work are within the limit of Recommended Dietary Allowance (RDA) for adult male human, particularly the RDA for iron, zinc were 1.0mg, and 15mh for iron and zinc respectively (Duruibe et al., 2007). While the copper level determined in this study is within the level of Daily Value (DV) of 2000mcg (Mateljan, 2010).

The levels of iron, zinc, copper and selenium in Salwa egg shell are as follows: 26.5+0.5ppm (iron), 56.0+±3.2 ppm (zinc), 3.8±0.5 ppm(copper), and 1.201±0.4 ppm (selenium).

Table 2: Levels of sodium, magnesium, and calcium macronutrients in Salwa egg

Mineral macronutrient	Egg shell (ppm)	Whole egg content (ppm)
Ca	331.0 ± 0.5	200.51± 1.6
Mg	2.13 ± 0.6	131.3 ± 2.5
Na	1.17 ± 0.1	2.13 ± 0.11

Key= values are expressed as mean ± standard deviation

Calcium is vital for blood clotting, nerves stimulation, muscles contraction, and deficiency lead to poor bone formation effects such as osteoporosis. Sodium is important in ensuring water balance, acid base balance, and muscle contraction; but deficiency lead to nausea, tiredness, and cramp. Magnesium is useful in making bones and muscles. Deficiency of magnesium spur effects such as heart changes, and coma (Abduljaleel et al., 2011; Mohammed et al., 2017).

Table 2 shows the levels of macronutrients, namely, calcium, magnesium, and sodium in Salwa egg contents and shell. Particularly, the levels of calcium, magnesium, and sodium in Salwa whole egg content are as follows: 200.51 ±1.6 ppm (calcium), 131.3±2.5 ppm (magnesium), and 2.13±0.11 ppm (sodium). The concentrations of calcium, magnesium, and sodium determined here are lower than that of reported values in poultry in Kaduna by Mohammed et al. (2017), which might be due to factors such as feed variability, biological variability, and others. The values of calcium and magnesium found in this study are within the RDA as reported in Duruibe et al. (2007) for adult male human. Then, the levels of calcium, magnesium, and sodium in Salwa eggs shell determined are as follows: 331.0±0.5 ppm (calcium), 2.13 ±0.6 ppm (magnesium), and 1.17±0.1 ppm (sodium).

This study determined the levels of mineral micronutrients (Fe, Zn, Cu, Se) and macronutrients (Ca, Mg, Na) in eggshells and whole egg content. The results showed varying levels of these minerals in both eggshells and whole egg content. Notably, eggshells had higher levels of Fe (600.0 ± 25.1 ppm) and Ca (331.0 ± 0.5 ppm) compared to whole egg content. In contrast, whole egg content had higher levels of Se (1.20 ± 0.4 ppm) and Mg (131.3 ± 2.5 ppm) compared to eggshells. These findings provide insight into the mineral composition of eggshells and whole egg content. Meanwhile, the study's findings highlight the varying mineral composition of eggshells and whole egg content. The high levels of iron and calcium in eggshells suggest potential uses for these materials in agriculture, nutrition, or industry (Kihara et al., 2019; Abdelrahman et al., 2022). Conversely, the whole egg content's richness in selenium and magnesium underscores its nutritional value. The results also imply that eggshells, often considered waste,

may be a valuable resource for specific applications. Further research could explore the practical applications of eggshells and whole egg content, such as using eggshells as a natural source of calcium for animal feed or as a potential soil amendment. Overall, the study contributes to a deeper understanding of the mineral composition of eggshells and whole egg content, with implications for nutrition, agriculture, and industry.

Conclusion

The study concludes that eggshells and whole egg content have distinct mineral profiles, with eggshells rich in certain minerals like iron and calcium, while whole egg content contains higher levels of other minerals like selenium and magnesium. These findings can contribute to a better understanding of the nutritional and potential industrial value of eggshells and egg content.

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