-+Mineral Composition of Eggs of Various Chicken Strain

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Abstract— *The study examined the effect of chicken strain on the mineral composition of eggs. Completely randomized design was used in the study. Eggs from each strain (Isa brown, Noiler, Lohmann, Leghorn) were crack opened into a 250ml beaker and homogenized with a stirrer. 5ml of the thoroughly mixed egg sample was digested using acidic digestion method. The digest was then cleaned up using silica jell. From the cleaned sample digest, 1ml was injected in Atomic Absorption Spectrometry (AAS) and the readings were recorded. Data obtained were analyzed using GenStat 20th Edition. Calcium values obtained for Isa brown, Noiler, Lohmann and Leghorn in the study were 0.00140, 0.00192, 0.00100 and 0.00390, respectively; mean values recorded for phosphorus were 6.79580, 7.31580, 5.87760 and 5.96380 correspondingly; mean values obtained for potassium were 0.00458, 0.00028, 0.00092 and 0.00330; values for iron were 0.05342, 0.04726, 0.03704 and 0.03168 and mean values recorded for sodium mean were 1.19078, 0.77600, 4.58860 and 0.92768, respectively. The study maintained that calcium and iron mineral contents of the chicken eggs are similar in the four strains studied, while eggs from Isa brown and Noiler had higher potassium and phosphorous contents, Lohmann had the highest sodium content when compared to the other strains.*

Keywords— Mineral Composition, Chicket Strain, mineral composition of eggs, Isa brown, Noiler, Lohmann, Leghorn.

I. INTRODUCTION

Eggs have been a human food since ancient times. They are one of nature's nearly perfect protein foods and have other high quality nutrients. Eggs are readily digested and can provide a significant portion of the nutrients required daily for growth and maintenance of body tissues. They are utilized in many ways both in the food industry and the home .

Eggs nutrient is dependent on the diet, strain and health of the hen laying the egg (Dvoˇr´ak *et al.*, 2010) The amount of the nutrient present in egg is also dependent on the rearing environment, hen strain and hen age (Dvoˇr´ak *et al.*, 2010; Anderson, 2011; Anderson, 2013). Research showed that egg contain great amount of nutrient like zinc and it concentration present in egg decreased among layer hens in response to environmental stressors, type of housing system and their strain (Sahin *et al.*, 2009). It is believe that there are differences in the nutrient content of eggs reared in Cage-free and free-range rearing which are alternatives to caging systems for laying hens of different stain, and that eggs from free-range and cage-free hens have a higher nutritional quality than eggs from hens held in cage systems (Bejaei *et al.*, 2011). The present study was therefore carried out with the objective to Determine the mineral composition(Ca, K, Na, P, Fe) of eggs from four strains of layers namely; Isa brown, Leghorn, Lohmann and **Noiler and to** Compare the mineral compositions(Ca, K, Na, P, Fe) of the eggs from four strains of layers namely; Isa brown, Leghorn, Lohmann and **Noiler.**

II. MATERIALS AND METHODS

2.1 Location of Study.

The study was carried out at Maeve research laboratory Awka. It is located at temporary site of Nnamdi Azikiwe University Awka. Awka town is located in the South-Eastern part of Nigeria and in the eastern part of Anambra State. It is bounded by Latitudes 6˚11'N and 6˚17'N and longitude 7˚02'E and 7˚08'E.

2.2 Sample collection

Eggs used for this study were procured from Maeve Poultry Farms, Okpuno, Awka Anambra state. The eggs were collected from 24-week old layers, and transported to Maeve Academic Laboratory for mineral component analysis.

2.3 Experimental Design

The experiment was conducted using completely randomized design to test the effect of chicken strain on the mineral composition of eggs. There were four treatment groups comprised Isa brown (T_1), Noiler (T_2),Lohmann (T_3) Leghorn (T_4), and five replicates.

2.4 Equipment and Reagents Used

The equipment used include test tube, 250ml and 500ml beaker, magnetic shaker, starrier, burette, pipettes, water bath, hot plate, sieve, Whatman No: 1 filter paper, Buchner funnel, spatula digital timer watch, 100ml column separating funnel, 50ml boil tube,50ml measuring cylinder and AAS (atomic absorption spectrometer) machine. The reagents used includes Teteraoxosulphate (vi) acid, Hydrogen peroxide, Nitric acid (HNO_3) and distil water.

2.5 Sample Preparation for Analysis

The four strain egg samples gotten from organically reared hen were picked after three days interval, crack opened into a 250ml beaker and homogenized with a stirrer.

2.6 Experimental procedure

The method of AOAC Project number 984.27/ 2011.14 of 2013 was used. The mineral content analysis of the sample were divided into macro nutrient (Calcium, phosphorous, sodium and potassium) and micronutrient (iron).

2.6.1 Acid Digestion of sample (method of AOAC Project number 984.27/ 2011.14 of 2013)

Four grams (4g) each of the four strains of egg white and yolk were weighed into 50ml boiling tube. 10ml of teteraoxosulphate (vi) acid was added. The sample was heated on a hotplate for 30minutes. 2ml of hydrogen peroxide (H_20_2) was added using a pipette. Digested samples were allowed to cool, then filtered through Whatman No.1 filter paper. The filtrates were collected in 50ml sample bottle and ready for clean-up before being injected into AAs (Atomic absorption spectrometer) machine.

2.6.2 Digested Sample Clean-up

In order to remove impurities, the digested samples were passed through silica gel packed in column separating funnel. The pure digested filtrates were collected in 50ml sterile sample bottle ready for injection into AAs machine.

2.6.3 Flame Test Using AAs Machine

One millilitre (1ml) of each of the samples were injected into AAs machine. The Macronutrient Minerals (Calcium, phosphorous, sodium and potassium) and micronutrient minerals (Iron) concentration of samples were ressad off the detector sand recorded accordingly for each of the samples tested.

III. STATISTICAL ANALYSIS

The data collected were subjected to one way Analysis of variance (ANOVA) using GenStat 20th edition. The differences between treatment means were separated using Duncan's New Multiple Range Test at 5% level of significance.

IV. RESULTS AND DISCUSSION

The effect of strain (Isabrown, Noiler, Lohmann, and Leghorn) on the mineral composition of egg is shown in Table 1.

TABLE 1
THE EFFECT OF STRAIN (ISA BROWN, NOILER, LOHMANN, LEGHORN) ON THE MINERAL COMPOSITION OF EGGS

PARAMETERS	ISA BROWN	NOILER	LOHMANN	LEGHORN	SEM
CALCIUM	0.00140^{b}	0.00192^{ab}	0.00100^{b}	0.00390^{a}	0.00069
IRON	0.05342	0.04726	0.03704	0.03168	0.01483
PHOSPHORUS	6.79580^{a}	7.31580^{a}	5.87760^{b}	5.96380^{b}	0.25835
POTASSIUM	0.00458^{a}	0.00028^{a}	0.00092^{b}	0.00330^{b}	0.00060
SODIUM	1.19078^{b}	0.77600^{b}	4.58860^{a}	0.92768^{b}	0.14464

[#]MEANS bearing different superscripts along the same row are significantly different (p<0.05)
SEM=STANDARD ERROR OF MEAN

Calcium in Noiler is similar (p>0.05) to leghorn, lohmann and isa brown. Iron in the four strains were uniform across the board (p>0.05). While isa brown and Noiler were higher in phosphorous (p<0.05) compared to lohmann and leghorn . Potassium in isa brown and Noiler were similar and higher (p<0.05) compared to lohmann and leghorn. Lohmann had the highest sodium (p<0.05), while isa brown, noiler and leghorn were similar in sodium (p>0.05).

The calcium levels in the four strains did not show any significant difference and this could be as a result of their Age, or time of oviposition. These results is in accordance with the report of Clunies *et al.* (1993) who reported constant plasma-Ca concentrations 1–6, 6–12, 12–18 or 18–24 h post oviposition. Similarly, Gunaratne and Boorman (1996) reported no significant trends in plasma Ca during the day. The serum Ca content was the same at both ages used in the course of study which is in contrast with Brackpool *et al.* (1996), Suchy *et al*. (2004), Gyenis *et al*. (2006), and Pavlik *et al*. (2009) who demonstrated a gradual decrease in plasma Ca with age.

Iron contents of the four strains of eggs were uniform across the board. This therefore, implies that there is no significant different seen in the iron mineral contents of the eggs from the four strains and this can be attributed to the type of feed they were fed. Schiavone & Barroeta (2011) reported that the content of some trace minerals in eggs such as selenium, iodine, and, at lower magnitudes, iron, zinc, fluoride, or magnesium are function their dietary supply for hens .

Phosphorous mineral as well was seen to be high in Isa brown egg and Noiler egg as compared with the Leghorn and Lawman. This difference could be as a result of time of lay or genetic makeup of the birds. Higher plasma P levels have been reported by Suchy *et al.* (2004) in laying hens at the end of the laying cycle but these results are in contrast to those of Eren *et al*. (2004) and Pavlik *et al.* (2009) where plasma P content was higher at the beginning of the laying cycle. Higher Phosphorous content in egg has been reported by Hester (1986) who also determined a higher P content in the eggs laid in the afternoon.

Concentration of potassium as well was noted to be the same in both Isa brown and Noiler egg followed by Leghorn and Lohmann brown. This finding agrees with the finding of Grobas *et al*. (2001) who reported that egg weight and egg mass from ISA-Brown were more than that from Dekalb Delta, and feed efficiency was also better for the ISA-Brown hens.

The finding also showed that sodium mineral is higher in Lohmann brown as compared to Isa brown, Leghorn and Noiler.

V. SUMMARY

A total of 20 eggs from the four breeds were used to determine the mineral composition in them using atomic absorption spectrometery and from the findings gotten from the result above showed that there is significant difference in the concentration of potassium, phosphorus and sodium while iron and calcium were not significant.

VI. CONCLUSION

Evidence from the study has proven that the mineral concentration of egg from different strain might be due to its diet composition and genetic makeup as well as management practices of the bird. It is also evident that for a particular mineral nutrient like sodium, more of Lohmann egg should be taken. For phosphorus and potassium, Isa brown and Noiler is better when compared to Lohmann and leghorn, while calcium and iron shows no significant difference amongst the four breeds used for the research. Based on the findings of the study, I would advice that egg consumers should consume more of Isa brown egg and Noiler as this contain better mineral constituents in terms of potassium and phosphorus. But more of

Lohmann brown egg if they need more of sodium. Further Research should be carried out on the meat different strain of birds to ascertain the mineral concentrate and constituents of different strains.

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