

EFFECT OF STORAGE ON PROXIMATE COMPOSITION AND MINERAL PROFILE OF TABLE EGGS

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ABSTRACT

One hundred and twenty (120) freshly laid eggs by 36 weeks old Isa brown layers were randomly collected from the Poultry Unit of Teaching and Research Farm, Olusegun Agagu University of Science and Technology Okitipupa. The collected samples were stored at room temperature for 21 days. Thirty (30) eggs at day1, week1, week 2 and week 3 of storage, were broken for nutritional components analyses at the Analytical Laboratory of the University. Data collected were subjected to statistical analysis. Duration of storage had significant effect ($p < 0.05$) on proximate components and mineral profile. The overall means for moisture, crude protein, ash, fat and carbohydrate were 76.27 %, 12.06 %, 1.83 %, 4.62 % and 4.37 %. Most of the minerals increased in values as the eggs increased in age except Manganese and copper that were not determined. Duration of storage of egg had effect on the proximate components and mineral profile.

Keywords: Isa brown layers, mineral profile, crude protein, ash, fat

INTRODUCTION

Eggs are one of the most known and accepted foods by consumers around the world. They are widely recognized as a source of high quality proteins, several fat-soluble vitamins (for example vitamins A, D and E), and water-soluble vitamins (for example vitamin B12, riboflavin and folate) as well as a number of micronutrients (for example Iodine, Iron, Phosphorus and Selenium). The ability of eggs to be stored for several weeks evolved through their function as source of nutrients for the developing embryo. Egg production is on the increase in Nigeria and poor storage conditions may result in deterioration in egg quality and consequently, loss and waste of eggs. One of constraints to increase production in these rural and arid areas of the nation is to preserve the egg qualities by selecting the most proper storage system (storage type and duration). Several chemical-physical modifications occur inside an egg during the storage period. Easily observable physical changes include, thinning of the thick albumen, the changes related to the ageing of the albumen and the yolk, and flattening of the yolk (Stadelman and Cotterill, 1995). Moreover, the economic success of a laying flock depends on the number of quality eggs produced. Proper storage of eggs is essential to preserve quality and cooking characteristics. Poor storage conditions can reduce eggs grade within a few days. The principle degrading factors are high storage temperature and dehydration. Improper storage produces some observed changes: a change of thick albumen to watery albumen, enlargement of yolk that breaks easily when the shell is broken, enlargement of the air cell, and absorption of off odours and off-flavours if stored near pungent foods. The objective of this study is to determine the effect of duration of storage of table egg on proximate composition and mineral profile.

MATERIALS AND METHODS

One- hundred and twenty (120) Eggs were collected in a single batch on the very day they were laid from thirty-six (36) weeks old exotic chickens (Isa Brown) kept at Poultry Unit, Teaching and Research Farm, Olusegun Agagu University of Science and Technology, Okitipupa. Thirty (30) eggs were selected at random for determination of proximate composition and mineral profile of the eggs within twenty- four hours of laying at Analytical Laboratory of the University. The remaining eggs were stored at room temperature on laboratory desk and at weekly interval thirty eggs were randomly selected till the twenty first day of storage for analysis of the parameters.

Data collected was subjected to Analysis of variance (ANOVA). Duncan Multiple Range Test (SAS, 1995) was used to separate means. The experimental design used was Completely Randomized Design (CRD).

Model:

$$\gamma_{ij} = \mu + S_i + \varepsilon_{ij}$$

γ_{ij} = observation of the i^{th} Egg in j^{th} duration

μ = population mean

G_i = effect of the i^{th} treatment

ε_{ij} = experimental error committed during experiment

RESULTS

Table 1 shows the effect of duration of storage of egg on the nutrient content of the egg. Significant differences were observed in all the nutrients considered. Moisture content reduced as the egg aged (76.6 % to 75.10 %). No significant different was observed in crude protein between day1 and week 1 but had between week 2 and week 3. Crude protein and ash reduced as the egg aged. Fat indicated a significant difference between day1 and week 1, and week 3 but not with week 2. Carbohydrate increased as the egg aged. The overall means for moisture, crude protein, ash, fat and carbohydrate were 76.27 %, 12.06 %, 1.83 %, 4.62 % and 4.37 %. Table 2 shows the effect of period of storage on mineral profile of the egg. Significant difference was indicated in all the minerals considered, and all the minerals increase as egg aged. In calcium (Ca), significant difference occurred among day1, week1 and 2, however, there was no significant difference between week 2 and week 3. The same trends were also observed in phosphorus (P) and sodium (Na). Potassium (K), Iron (Fe) and zinc (Zn) had significant different from day1 to week3. The overall means for Ca, P, K, Na, Fe and Zn were 447.63, 604.64, 2903.13, 281.25, 33.5 and 42.88 respectively. Manganese (Mn) and copper (Cu) were not determined.

Table 1: Effect of duration of storage on nutrients composition of table egg

Variables	Week 0	Week 1	Week 2	Week 3	overall	SEM
Moisture	76.61 ^b	77.14 ^a	76.23 ^c	75.10 ^d	76.27	0.23
Protein	13.18 ^b	13.07 ^b	13.47 ^a	12.11 ^c	12.96	0.16
Ash	3.78 ^a	1.33 ^b	1.16 ^{bc}	1.06 ^c	1.83	0.34
Fat	4.09 ^c	5.03 ^b	4.09 ^c	5.28 ^a	4.62	0.16
CHO	2.51 ^d	3.44 ^c	5.06 ^b	6.47 ^a	4.37	0.46

Means with different superscript in a row are significantly different ($p < 0.05$) SEM: standard error of mean

Table 2: Effect of duration of storage on mineral composition of table egg

Variables	Week 0	Week 1	Week 2	Week 3	overall	SEM
Ca (ppm)	120 ^c	415.50 ^b	681.00 ^a	694.00 ^a	477.63	70.99
P (ppm)	412.06 ^c	453.21 ^b	771.34 ^a	781.96 ^a	604.64	52.31
K (ppm)	1227.5 ^d	2400.00 ^c	3700.00 ^b	4285.00 ^a	2903.13	361.25
Na (ppm)	239.00 ^c	271.50 ^b	305.50 ^a	309.00 ^a	281.25	8.72
Fe (ppm)	28.00 ^c	42.50 ^a	24.50 ^c	36.00 ^b	33.5	2.55
Zn (ppm)	7.50 ^d	66.50 ^a	42.50 ^c	55.00 ^b	42.88	6.72
Mn (ppm)	ND	ND	ND	ND		
Cu (ppm)	ND	ND	ND	ND		

Means with different superscript in a row are significantly different ($p < 0.05$)

DISCUSSION

The minerals observed in this study varied in concentrations and increased as the eggs aged in storage. This could be attributed to the fact that mineral contents in eggs show quite different concentrations, depending on the dose and form of element and other factors such as physiological reasons,

husbandry practice, geographic area (Giannenas *et al.*, 2009; Attia *et al.*, 2010; Hashish *et al.*, 2012), as well as supplemented feed additives (Bäckermann and Ternes, 2008).

Moisture content decreased as the eggs aged, this could be attributed to the evaporation of water through the shell pores (Sung and Kyung 2014). Protein and ash followed similar trend except fat and carbohydrate that increased as the eggs aged. The overall fat content (4.62) observed in this study is smaller to 5.8 reported by Song *et al* (2000). It could be concluded that moisture content, protein and ash declined as the eggs aged while carbohydrate, fat and minerals increased. Thus duration of storage had significant effect on proximate composition and mineral profile of table eggs.

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