APR -19

Effect of Storage and Species on the Percentage Weight Loss of Eggs from Various Poultry Species

F.C. Izukanne-Ezeoke[1], N.J. Okeudo[1] and R.O. Izukanne[2]
[1]Department of Animal Science and Technology, Federal University of Technology Owerri P.M.B 1526, Owerri, Imo State, Nigeria; [2]Department of Animal Science and Technology, Nnamdi Azikiwe University Awka P.M.B 5025,Awka Anambra State, Nigeria
Corresponding author: F.C. Izukanne-Ezeoke; E-mail:richfrank101@gmail.com**;** 08067182660

Abstract
This study was designed to compare the egg quality of three poultry species (turkey, chicken and guinea fowl) under two storage methods (refrigeration and room temperature) over 28 days storage periods. The total of 72 eggs were comprising 24 eggs from each species, eggs were assessed for exterior and interior quality at 0, 7, 14,21and 28 days of storage as well as the determination of chemical composition at 0 day of age using the 3 x 2 factorial design. Results obtained showed that the average weight of fresh turkey eggs was 69.13 g; chicken eggs, 60.13 g and guinea fowl eggs, 38.50 g .However, under refrigeration, weight loss between the species varies from 6.15 % - 7.24 % differences were not significant (p>0.05).Results also showed that guinea fowl eggs were higher in shell thickness, higher in percentage yolk content and recorded less weight loss during storage compared to turkey and chicken eggs. These are important issues in egg handling, transportation, processing and consumption.

Keywords: Storage, percentage weight loss; poultry eggs turkey, chicken, guinea fowl

Introduction

Human nutritionists have highlighted the important role of animal protein in human health, particularly during pregnancy, early life and the subsequent development of children. Maternal protein intake throughout pregnancy is related to birth size and future viability of children (Leng, 2002). Where protein under- nutrition occurs, dietary protein from any source is important in human development but increased intake of meat protein appears superior for stature development (Leng, 2002). Animal protein is a concentrated source of protein, which is not only of high biological value but also its amino acid composition, complements that of cereals and other vegetable proteins (FAO, 1992). Animal products being one of the most important constituents of human diet which aid in proper development of the body are in short or limited supply. The husbandry system coupled with the hot and humid tropical climate adversely affect product quality. Although eggs are less perishable compared with meat and milk, evidence exist nonetheless showing that chicken egg quality depreciates significantly after one week of storage under ambient condition. Presently, there is scare information on the effect of storage on the quality of poultry eggs of various species and storage temperatures. Turkey eggs and more importantly guinea fowl eggs are consumed in large numbers in Nigeria, and interestingly little are known about changes in exterior, interior and chemical quality parameters during handling and storage. Research in this area is justified because of the immense importance of poultry eggs in human diet, and losses that may be incurred during storage.

This study was designed to compare the egg quality of three poultry species (turkey, chicken and guinea fowl) under two storage methods (refrigeration and room temperature) over 28 days storage periods

Materials and methods

The total of 72 eggs comprising 24 eggs each from turkey, chicken and guinea fowl were used in this study. Fresh turkey and chicken eggs were obtained from a commercial farm at Isuofia in Aguata Local Government Area of Anambra State. Fresh guinea fowl eggs were obtained from dealers in Awka, Anambra State because of wild nature of guinea fowl. The 24 eggs from each species were divided into two groups of 12 eggs and kept in the refrigerator at 4^{o} C while the second 12 eggs were kept under the ambient temperature of 26 ^{0}C - 30 ^{0}C (room temperature) on a plastic egg crate respectively. The 12 eggs from each group were further sub divided into four of three eggs for each sub groups. Three eggs from each group were cracked for interior and exterior quality measurement at seven days intervals. Thereafter the yolk and albumen were separated and subjected to oven drying prior to proximate analysis. Three eggs (last sub-group) were analyzed after 28 days storage. The difference between the average of initial egg weights and the average final weights of the eggs after storage was expressed as percentage of the average initial egg weights.

$$\% \text{ weight loss} = \frac{Average\ initial\ \ egg\ \ weight\ \ -\ Average\ \ final\ \ egg\ \ weight}{Average\ initial\ \ egg\ \ weight} \times \frac{100}{1}$$

The experimental design was a 3 x 2 factorial designs. Factors were 3 poultry species (turkey, chicken and guinea fowl) and 2 storage methods (refrigeration and room storage). Data analysis was executed using the analysis of variance for completely randomized design. Egg quality parameters were regressed on shell thickness / percentage weight loss, and the correlation coefficients tested for significance. Means having significant differences were separated using the least significant difference (LSD) method as describe by Snedecor and Cochram (1983). Statistical analysis was performed using SAS (1999) computer application software.

Results and Discussion

There were significant variations in weight loss ($p<0.05$) between turkey, chicken and guinea fowl eggs during storage (Table 1). Similarly, significant differences ($p<0.05$) in weight loss were recorded between eggs stored in refrigerators and counterparts stored under room temperature. However since species by storage period interactions were significant ($p<0.05$), individual treatment effects were determined and shown in Table 2. Results show that storage method had no significant effect ($P>0.05$) on weight loss in guinea fowl eggs stored up to 28 days. Generally, refrigeration resulted in significantly reduced weight losses ($p<0.05$) in turkey and chicken eggs, except in turkey eggs stored for 7 days where the difference between the two storage methods was not significant ($p>0.05$). Except for 7 days of storage, guinea fowl eggs recorded significantly lower weight losses ($p<0.05$) than turkey and chicken eggs under room temperature but under refrigeration, weight losses were similar across the three poultry species.

Table 1: Effect of storage and species on the percentage weight loss of variouspoultry species.

	Days			
Species	7	14	21	28
Turkey	2.115[b]	4.060[a]	7.140[a]	11.560[a]
Chicken	2.470[a]	3.635[b]	7.376[a]	12.080[c]
Guinea fowl	1.335[c]	2.525[c]	5.610[c]	7.982[b]
SEM	0.017	0.074	0.150	0.529
Storage				
RM	2.427[a]	4.350[a]	8.533[a]	14.573[a]
RG	1.520[b]	2.463[b]	4.883[b]	6.508[b]
SEM	0.014	0.016	0.122	0.432
Interaction (Species x Storage)	**	**	**	**

[a, b, c,] Means in the same column bearing different superscript(s) are significantly different ($p< 0.05$)
RM = Eggs stored under room temperature; RG = Refrigerated eggs; SEM= Standard error of the mean

The decline in egg weight in the two storage methods could be due to water, carbon dioxide, ammonia, nitrogen and hydrogen sulphide lost from the eggs as storage proceeds (Ihekoronye and Ngoddy, 1985). Results presented here whichshowed that cold storage may not be necessary as a means of preventing weight loss of guinea fowl eggs during storage should be of significant commercial value. Ordinarily, it will be expected that since guinea fowl eggs are small in size compared with turkey or chicken egg, they should have relatively larger surface area. Therefore weight loss during storage in guinea fowl eggs should be comparatively greater compare with losses from turkey or chicken eggs. This was not the case. For analysis of trend, weight loss was plotted against storage period (Figure I). The line graphs reveal that the lower weight loss recorded by guinea fowl eggs in comparison to turkey and chicken eggs was profound and consistent in eggs stored under room temperature, which was not the case in eggs stored in refrigerator. Secondly, in both conditions, there is a clear change in the slope of the curve at 14th day of storage, suggesting that the rate of weight loss accelerated after the 14th day. This may be due to liquefaction of albumen or increased breakdown of barriers limiting gaseous loss after the 14th day.

Table 2: Interaction means on the percentage weight loss between turkey, chicken and guinea fowl egg stored in room temperature verses refrigeration temperature.

Species	RM	RG
7 days storage		
Turkey	2.43[a]	1.80[ab]
Chicken	3.27[a]	1.67[bc]
Guinea fowl	1.58[bc]	1.09[c]
SEM		0.294
14 days storage		
Turkey	5.47[a]	2.65[b]
Chicken	4.91[a]	2.36[b]
Guinea fowl	2.67[a]	2.38[b]
SEM		0.539
21 days storage		
Turkey	10.14[a]	4.14[b]
Chicken	9.83[a]	4.92[b]
Guinea fowl	5.63[a]	5.59[b]
SEM		1.004
28 days storage		
Turkey	15.88[a]	7.24[b]
Chicken	18.03[a]	6.13[b]
Guinea fowl	9.81[a]	6.15[b]
SEM		2.041

RM = Eggs stored under room temperature; RG = Refrigerated eggs; SEM= Standard error of the mean

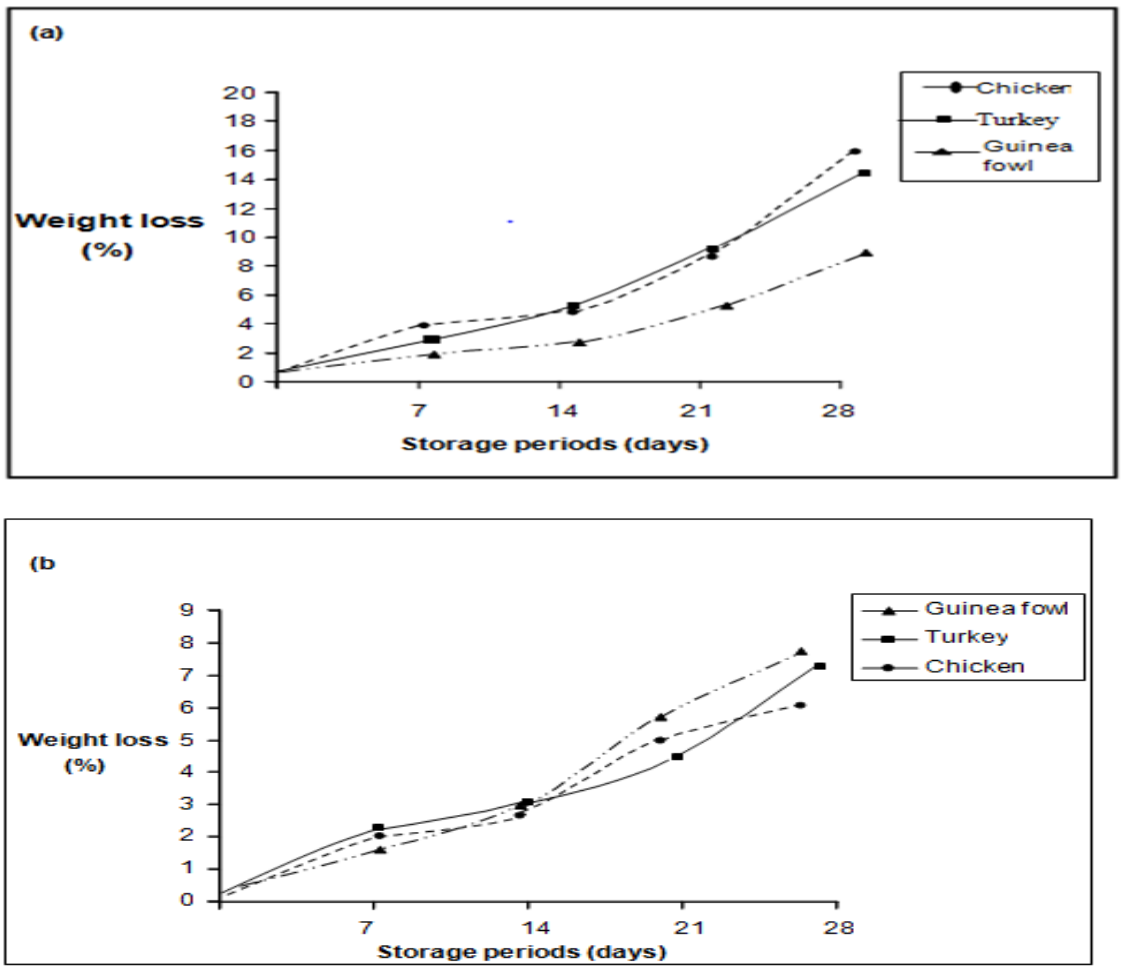

Fig.I: Egg weight loss versus length of storage (a= eggs stored under room temperature; b= refrigerated eggs)

Conclusion and Recommendation

After 28 days storage under room temperature, guinea fowl eggs lost significantly less weight (9.81 %) than turkey eggs (15.88 %) and chicken eggs (18.03 %). Under refrigeration, weight loss across the three poultry species varied from 6.13 % - 7.24 % and differences were not significant. The lower weight loss recorded by guinea fowl eggs under room temperature and thick shell cover are positive attributes to be considered in egg handling and transportation especially in developing countries with poor cold preservation facilities. Further studies are required to establish the most appropriate indices for interior quality of poultry species like guinea fowls because of its lower weight loss during storage compared to the chicken.

References

Ihekoronye, A.I. and Ngoddy, P.O. (1985). *Integrated food science for the tropics*.Macmillan Publisher, London.

FAO (1992). Food and nutrition paper. Food and Agricultural Organization, Rome, Italy.

Leng, R.A. (2002). Future direction of animal protein production in a fossil fuel hungry world. *Livestock Research for Rural Development,* 14 (5). 27-31.

Mbap, S.T., Butswat, I.S. and Afegbua, A.M. (1996). Some quality parameters of local and exotic chicken eggs under different storage conditions.*Nigerian Journal of Animal Production,* 23: 173 – 177.

SAS (1999). SAS Institute INC. CARY, NC, USA.

Snedecor, G.W. and Cochran, W.C. (1980). *Statistical methods*, 7th ed. Iowa State University Press, Ames, Iowa.