EFFECT OF OIL COATING AND STORAGE PERIODS ON THE INTERNAL QUALITY OF KALINGA BROWN CHICKEN EGGS

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Abstract: The effect of oil coating and storage periods on the internal quality indicator of Kalinga Brown chicken eggs was examined. The traits were % egg weight loss, albumen height, albumen index, yolk height, yolk index and Haugh unit. In this experiment a total of 108 fresh eggs from Kalinga brown breed were used. The storage periods were 5, 10 and 15 days while the methods were oil coating and without any treatment at room temperature (40°C). This study indicated that as the storage time increased egg weight, albumen height, yolk height, albumen index, yolk index and Haugh unit significantly ($p<0.01$) decreased. Albumen index egg quality indicator was significantly ($p<0.01$) decreased at 5 days (6.54%), 10days (4.97%) and 15 days (3.71%) of storage period. Oil coated eggs maintained better quality in terms of albumen height (4.5mm), yolk height (16.2mm), albumen index (5.6%), yolk index (36.7%)and Haugh unit (74) than untreated egg at room temperature. It evident from the study that most of egg qualities are effected by methods and periods of storage.

Keywords: Kalinga brown, Storage period, Storage methods, Oil Coating, Albumen index, Haugh unit

INTRODUCTION

Unlike external quality, the internal quality of eggs starts to decline as soon as they are laid by hens (Jin *et al*.,2011) because of loss of moisture and carbon dioxide via egg shell pores (Nongtaodum *et al.,* 2013). In rural areas, the backyard system of egg production sustains the economics of small families and generates sustainable income. One of the constraints is to preserve the egg qualities by selecting the most efficient storage system i.e. storage type and duration. Refrigeration is very effective in preserving egg quality, but it has limitation in rural areas. Surface coating is an alternative method to preserve egg quality, although it is much less effective than refrigeration. Nonetheless in some developing countries where refrigeration of eggs is seldom practised, farmers use preservatives like lime and oil in order to keep the eggs for longer periods. Some parameters like egg weight, albumen height and yolk height are important internal indicators to judge the quality of eggs. Haugh unit which is the measure of the albumen quality and measures the freshness of the egg is one of the determinants of egg quality (Keener *et al*., 2006). Many studies have linked extended storage period length with decreased egg quality (Jones and Musgroove 2005; Paditey, 2010) .The present study was undertaken to evaluate certain physic-chemical quality characteristics of chicken eggs as influenced by oil coating treatment and storage periods.

MATERIAL AND METHOD

Collection of samples: Eggs were collected from 64 weeks old Kalinga Brown breed maintained under deep litter system in Government Poultry Farm, Durg. A total of 108 fresh eggs were obtained and distributed in two groups namely A and B with 3 replicates. Control group A comprising 36 eggs were evaluated for their internal characteristics at day 0 without any preservative. Group B comprising 72 eggs were again divided into two subgroups: B1, B2, having an equal number of eggs. Subgroup B1 comprising 36 eggs was kept normal without any preservative (untreated eggs) and B2 was preserved by oil coating method and all eggs were kept at room temperature (40°C). Twelve eggs from each treatment totaling 24 eggs were taken periodically at 5 days interval for a total duration of 15 days storage period.

Egg quality analysis: The indicator of composition and qualities of eggs includes % egg weight loss, albumen height, yolk height, albumen index, yolk index and Haugh unit. The percentage (%) of weight loss of the whole egg was calculated as {[initial whole egg weight (g) at day 0 – whole egg weight (g) after storage]/initial whole egg weight (g) at day 0} × 100 (Bhale *et al*, 2003). The eggs were broken out followed by measurement of the maximum albumen height from at least 3 places with spherometer. Albumen index were calculated for individual egg using the following formula: Albumen Index (%) = Height of thick albumen (mm)/ Mean diameter of thick albumen (mm) x 100 (Heiman and Carver, 1936).The height of yolk was measured in the centre of the egg yolk. The yolk index was calculated after the measurement of height and diameter of yolk with the help of spherometer and vernier calipers, respectively (Funk, 1948). Haugh units were calculated from the recorded egg weights and albumen heights using the formula $HU= 100 \log_{10} (H-1.7 W^{0.37}+7.56)$, where HU= Haugh unit, H =

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height of the albumen (mm), and W = egg weight (g).

Statistical analysis: The data obtained from the study were statistically analyzed by two way classifications of Analysis of Variance to see the effect of storage methods and periods on internal characteristics of eggs by using statistical program SPSS (2007). The individual means was tested by Duncan's Multiple Range Test modified by Kramer (1956) for their significance.

RESULT AND DISCUSSION

Egg weight, % egg weight loss, albumen height, yolk height: So ***e***gg weight was significantly decreased (P<0.01) at different storage periods. Table (1) indicated that the mean value of % egg weight loss at 5 day (0.05%), 10 days (0.79%) and 15 days (1.99%) was observed. These results are almost in agreement with those of Samli *et al.* (2005) and Jin *et al.* (2011) who reported weight reductions of 2.08 and 3.11% respectively with in 5 and 10 days of storage periods. The reason for loss in weight was presumably attributed to loss of humidity from inside the egg due to evaporation effect. Overall effect of storage methods (Table 2) revealed that the percent weight loss was higher in case of untreated eggs (2.5%) than oil coating method. Tabidi (2011) reported the same findings. The losses could be due to loss of carbon dioxide, ammonia, nitrogen, hydrogen sulphide gas and water from the eggs (Dudusola, 2009; Alsobayel and Albadry, 2011). Albumen height was significantly (p<0.01) decreased with increased in storage periods (Table 1). Results indicated that the mean value of albumen height was 5.26mm (5 days), 4.11mm (10 days) and 3.18mm (15 days) at different storage periods. The present findings corroborate with Scott and Silversides (2000), who reported a significant decrease from 9.16 - 4.75 mm in albumen height (p<0.005) in stored eggs at 10 days. Different methods of storage were found to have a significant difference (P<0.01) on the average albumen height (Table 2). Albumen height was found higher in oil coated eggs (4.5 mm) than untreated eggs. Various storage methods and periods were found a significant difference (P<0.01) on yolk height (Table 1 & 2). The results showed that there was higher yolk height (16.2 mm) in oil coated eggs than untreated egg stored at room temperature. The decrease in albumen and yolk height with increasing temperature observed in this study corroborates the findings of Scott and Silversides (2000) and Abanikannda (2007). The difference between the various methods to maintain egg quality could be due to their varying ability to retard carbon dioxide loss and breakdown of carbonic acid to carbon dioxide. This is because these losses cause mucin fibre which gives the albumen and yolks their gel-like texture to loss their structure and so the albumen and yolk becomes watery (Raji *et al*., 2009; Gavril and Usturoi, 2012).

Table 1. Overall effect of storage period on internal quality of Vanaraja eggs

Treatment	Egg weight before storage (g)	Egg weight after storage (g)	Egg weight loss (%)	Albumen Height (mm)	Yolk height (mm)	Albumen index (%)	Yolk index (%)	Haugh unit
5 day	58.5±0.49	58.42±0.59^{a}	0.05±0.05^{c}	5.26±0.23^{a}	16.4±0.44^{a}	6.54±0.32^{a}	36.7±1.15^{a}	79.4±1.51^{a}
10 day	57±0.47	56.5±0.45^{b}	0.79±0.17^{b}	4.11±0.17^{b}	15.5±0.36^{a}	4.97±0.25^{b}	34.5±0.95^{a}	71.9±1.4^{b}
15 day	57.9±0.6	56.72±0.50^{b}	1.99±0.19^{a}	3.18±0.16^{c}	14.4±0.42^{b}	3.71±0.2^{c}	30.8±1.13^{b}	63.7±1.48^{c}
SIG	NS	*	**	**	**	**	**	**

Values (Mean±SE) with different superscripts in a row differ significantly *p<0.05, **p<0.01; NS= Non-significant

Albumen index, yolk index, Haugh unit: The effect of storage periods and methods on albumen index, yolk index and Haugh unit are shown in Table 1 and 2. The results showed that the storage period affected significantly the albumen index. The findings revealed that albumen index was significantly (p<0.01) decreased at 5 days (6.54%), 10days (4.97%) and 15 days (3.71%) of storage period (Table 1). These results are similar to the result of Tabidi (2011). Oil coated eggs showed the higher albumen index (5.6 %) than untreated eggs (2.58%) with significant difference. The significant (P<0.01) decrease in yolk index was observed with increasing storage period. The present study (Table 1) showed that yolk index significantly (p<0.01) decreased from 36.7%-30.8% at 15 days of storage period. Table 2 indicated that oil coated eggs showed the highest value of yolk index (36.7 %) than untreated egg (27.2%). The mean value of HU at 5, 10 and 15 days of storage period was 79.4, 71.9 and 63.7 respectively (Table 1). Haugh unit for the eggs stored in the oil and untreated were 74.0 and 56.9 respectively at room temperature. These results are in agreement with Tona *et al.* (2004) and Jones and Musgrove (2005), who reported storage adversely affected Haugh units (p<0.001).

Table 2. Overall effect of storage methods on internal quality in Kalinga Brown eggs

Treatments	Egg weight before storage (g)	Egg weight after storage (g)	Egg weight loss (%)	Albumen Height (mm)	Yolk height (mm)	Albumen index (%)	Yolk index (%)	Haugh unit
Untreated egg	56.5±0.67	55.0±0.65^{b}	2.5±0.33^{a}	2.4±0.16^{c}	12.7±0.4^{d}	2.58±0.4^{c}	27.2±1.0^{d}	56.9±1.6^{c}
Oil coated egg	59.1±0.68	58.8±0.67^{a}	0.51±0.13^{b}	4.5±0.22^{b}	16.2±0.49^{b}	5.6±0.27^{b}	36.7±1.16^{b}	74±1.56^{b}
SIG	NS	**	**	**	**	**	**	**

Values (Mean±SE) with different superscripts in a row differ significantly *p<0.05, **p<0.01; NS= Non-significant

From the results of the present study, it is concluded that egg weight, albumen and yolk height, albumen index, yolk index, Haugh unit, decrease with increase in storage period. Whereas % egg weight loss was increased with increase in storage period. It can also be concluded that quality of an egg is affected by the method and periods of storage. Oil coating eggs have shown better quality than untreated eggs stored at room temperature. Where refrigeration facilities are not available especially in rural areas, eggs must be stored and protected by oil coating method at room temperature because of their cheapness, effectiveness and simplicity in use. Eggs kept at high temperature without any treatment were deteriorated in quality very fast and were not fit for consumption after one week.

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