A STUDY ON QUALITY TRAITS OF CHICKEN EGGS COLLECTED FROM DIFFERENT AREAS OF KARACHI

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ABSTRACT

Present study was conducted to evaluate the quality traits of poultry eggs collected from various sources i.e. market, commercial farm and backyard farming, in Karachi. A total of 250 eggs were analyzed for external and internal qualities. A significant difference (p <0.05) was recorded in quality parameters except percent shell, shell thickness, egg width, egg weight, shape index and Haugh unit between eggs analyzed. It was observed that eggs collected directly from farms and backyard poultry had a superior internal and external quality feature when compared with eggs from market due to a short period of storage. While the indigenous chicken eggs were rather smaller in size when compared with farm and market eggs. Whereas the farm eggs were cheaper in price as compared to market eggs but the eggs from backyard had a higher cost of purchase. It was concluded that due to inadequate storage and transportation eggs collected from market are of low quality and expensive in comparison to eggs purchased directly from farms of backyard farming.

Keywords: Market eggs, indigenous eggs, Farm eggs, Internal and external qualities

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INTRODUCTION

Poultry eggs are a cheap source of animal protein fulfilling the nutritional requirement of a growing population (Cook and Briggs, 1986). Egg quality is the characteristics of an egg that affect its acceptability to the consumer (Stadelman, 1977), as the appearance of an egg builds consumer confidence in the product and its consumption. Chicken egg contains all the essential amino acid for human and provide significant amount of several vitamins and minerals including vitamin A, riboflavin, folic acid, vitamin B6, vitamin B12, choline, iron, calcium, phosphorus and potassium along with 163 calories/100g (Ahsan and Massod, 2002) of energy. These significant features led the consumers to demand for some internal and external qualities in this nutrient (Uluocak et al., 1995). The egg industry of Pakistan comprises of egg either laid at commercial layer farms or at poultry raised in backyard. Eggs from commercial layer farms are comparatively cheaper in price, shares ease of access and high consumption rate when compared with the eggs from indigenous backyard poultry. This attribute of high consumption has no correlation with internal quality features of an egg in our population (data not shown), whereas it has been reported that external and internal characteristics of an egg mainly depend on the breed and its duration of storage (Tumova et al., 2007). The quality of egg and their stability during storage are largely determined by their physical structure and chemical composition (Seidler, 2003). Egg quality in general defines both internal and external quality of egg. External quality is focused on shell cleanliness, soundness of shell, texture, color and shape. These features are important to the processor as superior quality eggs arrive in a better condition for the consumer. The internal quality refers to egg white (albumen), relative viscosity of albumen, shape and firmness of yolk, strength of yolk, size of air cell and presence or absence of blood or meat spots. Yolk of a fresh lay egg is round and firm. As the yolk ages it loses quality by absorbing water and increasing in size and sometime rupturing occur. This absorption of water occurs from thin albumin surrounding the yolk, while the loss of carbon dioxide through egg shell causes thick albumin to be transparent and watery (Benton and Brake, 1996). The yolk integrity also depends on the strength of vitelline membrane which is inversely proportional to the duration of storage (Jones and Musgrove, 2005). Present investigation was carried out to analyze the internal and external quality chicken eggs collected directly from market, commercial poultry farms and backyard poultry.

MATERIALS AND METHOD

The study solely took place at the Poultry Research Laboratory, Department of Physiology, University of Karachi, Karachi, Pakistan. A total of 250 chicken eggs were used as criteria of research. 100 eggs from retail market, 100 directly from layer farm and 50 eggs from backyard poultry in the vicinity of Karachi were used. These were selected randomly and on average six eggs were sampled from single place (market, layer farm or backyard poultry). During egg collection; effort was made to determine the time when eggs were laid, storage condition and mode of transportation to retail market. Eggs were transported in an ice box to the laboratory for further analysis on the same day of collection.
External Qualities
External features included egg weight (g), egg length (mm), egg width (mm), shell thickness (mm) and shell weight (g).

Internal Qualities
This included albumen weight (g), albumen height (mm), albumen width (mm), yolk weight, yolk height (mm) and yolk width (mm).

Weight of an egg was determined using electronic digital balance with a range from 0.01 to 200 (Kern Model No. 440-33 N, Germany), while length and width of the egg were measured through Vernier caliper by carefully placing the internal content of an egg on smooth glass plate, not to rupture the vitelline membrane. Albumen height was measured by placing a tripod micrometer at different places of thick albumen and an average of three readings was considered as albumen height. Shell thickness was measured at broader end of the shell using a micro screw gauge.

Indexes
The shape index of an egg was measured for each egg by using the egg width and length with the help of the formula as described by Reddy et al. (1979). The albumen index which is a ratio of albumin height and width was calculated using the formula described by Singh and Panda (1987) while yolk index through yolk height and width.

Percentage (%) Shell
To measure the percentage of shell the eggs were broken down and after removal of egg albumen, the egg shell was dried and cleaned with the help of cotton and weighed with the help of an electronic digital balance (Kern Model No. 440-33 N, Germany).

Haugh Unit (HU)
The Haugh unit (Haugh, 1937) is a measure of egg protein quality based on the height of egg white and is calculated by using the formula given below:

\[ HU = 100 \log (h+7.6-1.7w^{0.37}) \]

Where, \( h \) = observed albumen height in mm  
\( w \) = observed weight of the egg in gms

Statistical analysis was performed using One Way ANOVA to determine the differences between the quality traits of egg collected from market, layer farm and backyard poultry.

RESULTS AND DISCUSSION
Quality of any food product determines its acceptability to potential consumer. Per capita protein consumption in Pakistan is far lower than recommended international level. In order to achieve this standard cheap source of protein should be managed for the population and quality chicken eggs can play a very important role. Present study was carried out with the perspective that what is the quality (internal & external) of chicken eggs available for consumption in the market. It was observed that all the eggs collected had clean egg shell surface whether they were from backyard poultry (brown shell egg) or commercial layer (white shell egg) farms and it has no influence on the internal and external egg quality (Scott and Silversides, 2000). The mean value of physical (external and internal) characteristics of eggs collected from different sources is summarized in Table 1 - 2. A significant difference (p<0.05) was observed when eggs from all three sources were compared for egg weight, albumen weight and yolk weight. While a non-significant (p>0.05) difference was observed between egg shell weight although the percent shell of eggs from backyard poultry was higher as compared to egg from other two sources. The result shows that a positive relationship exists between egg weight and the weight of albumen and yolk but this increase did not considerably influence the egg shell weight. Moreover the egg weight, albumen weight, yolk weight and shell weight of eggs from farms was significantly (p<0.05) higher as compared to market and indigenous eggs.

The egg quality characteristics such as egg weight, albumen and yolk weight shown a significant (p<0.05) correlation which is accordance with the earlier work done by Şekeroğlu and Altuntas (2009). The mean egg, egg albumen and yolk weight recorded in current study is in agreement with those reported by Fayeye et al. (2005) and Yakubu et al. (2008). The mean weight of backyard (indigenous) eggs in present study was higher as compared to those reported for Sudanese indigenous ecotype (Muhammad et al., 2005), but it is comparable to previous study in Tanzania (Msoffe et al., 2002). The indigenous eggs are mostly small in size with less weight when compared with other types of chicken eggs. Egg
weight is largely affected by factors such as environment, feed, chicken ecotype, age, genetic makeup and number of egg laid (Msoffe et al., 2002; Yakubu et al., 2008).

The analysis of egg weight and length showed a positive correlation (p<0.05) which is in accordance to previous findings by Khurshid et al. (2003) and Farooq et al., (2001) but a non-significant difference (p<0.05) between egg weight and egg width was observed. It was observed that an increase in albumen and yolk weight increases their height respectively. But this difference in albumin and yolk weight may be a result of age, management aspects and feed (Monira et al., 2003). Moreover, a significant difference (p<0.05) between albumen height and yolk height was seen among eggs from all three sources.

The mean value of shell thickness was comparatively higher in indigenous eggs but this difference was non-significance (p>0.05). The mean shell weight values in this study are comparable with reports by Fayeye (2005) and Sekeroglu (2009). The egg shell weight and shell thickness showed a positive correlation which is in accordance with the previous finding by Farooq (2003). Higher shell thickness may be due to poor egg production as there is negative correlation between shell thickness and egg production (Kumar et al., 1971).

<table>
<thead>
<tr>
<th>Physical Characteristics</th>
<th>Market n = 100 Mean ± S.E.</th>
<th>Farm n = 100 Mean ± S.E.</th>
<th>Indigenous n = 50 Mean ± S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Egg weight (g)</td>
<td>53.95 ± 0.53</td>
<td>58.13 ± 0.60</td>
<td>41.05 ± 0.63</td>
</tr>
<tr>
<td>Albumen weight (g)</td>
<td>31.26 ± 0.38</td>
<td>34.26 ± 0.79</td>
<td>21.56 ± 0.56</td>
</tr>
<tr>
<td>Yolk weight (g)</td>
<td>15.50 ± 0.15</td>
<td>16.15 ± 0.51</td>
<td>13.75 ± 0.32</td>
</tr>
<tr>
<td>Shell weight (g)</td>
<td>05.08 ± 0.08</td>
<td>05.10 ± 0.14</td>
<td>04.89 ± 0.06</td>
</tr>
<tr>
<td>Egg length (mm)</td>
<td>59.30 ± 0.05</td>
<td>06.07 ± 0.14</td>
<td>55.00 ± 0.07</td>
</tr>
<tr>
<td>Egg width (mm)</td>
<td>47.40 ± 0.04</td>
<td>04.08 ± 0.07</td>
<td>44.10 ± 0.05</td>
</tr>
<tr>
<td>Albumen height (mm)</td>
<td>05.20 ± 0.18</td>
<td>05.90 ± 0.73</td>
<td>04.40 ± 0.18</td>
</tr>
<tr>
<td>Yolk height (mm)</td>
<td>15.40 ± 0.22</td>
<td>16.27 ± 0.35</td>
<td>13.60 ± 0.24</td>
</tr>
<tr>
<td>Albumen width (mm)</td>
<td>75.55 ± 1.16</td>
<td>76.90 ± 0.09</td>
<td>73.77 ± 1.68</td>
</tr>
<tr>
<td>Yolk width (mm)</td>
<td>46.43 ± 0.40</td>
<td>46.64 ± 0.11</td>
<td>44.44 ± 0.76</td>
</tr>
<tr>
<td>Shell thickness (mm)</td>
<td>0.24 ± 0.001</td>
<td>0.26 ± 0.001</td>
<td>0.53 ± 0.003</td>
</tr>
</tbody>
</table>

*Indicate significant difference between columns

A non-significant (p>0.05) difference was seen between the shape index of farm and indigenous eggs but farm eggs had highest shape index. Shape index of directly farm collected eggs had higher than market and indigenous eggs, but the difference is non-significance and these result shows that shape index is non-significant egg quality trait. Premavalli and Viswanathan (2004) have reported lower shape indices for indigenous and White leghorn chicken eggs as reported in this study. Variation in shape index may be due to age of layers and system of management and genetic makeup of the breed.

Higher mean value of albumen index and yolk index were found in Farm eggs followed by market eggs and indigenous eggs. A significant difference (p<0.05) were found when comparison was made between albumen and yolk index. The albumin index was significantly (P<0.05) among all three groups of eggs. Farm eggs had higher albumin index followed by market and indigenous eggs. This might be due to longer storage period time of indigenous eggs. As indigenous birds mostly farmed in far areas of Karachi so eggs collection from indigenous farm, transportation of eggs and selling of eggs required terrific amount of time and gradual decline in albumin index as compare to market eggs and eggs collected directly from farm. Hermiz et al. (2012) reported negative relation between storage time and albumin index. Similarly yolk index was found significantly higher in farm eggs than followed by market and indigenous eggs. Contradictory to present finding, lower yolk index value of farm eggs and white leghorn chicken eggs was reported by Premavalli and

<table>
<thead>
<tr>
<th>Egg quality traits</th>
<th>Market n = 100 Mean ± S.E.</th>
<th>Farm n = 100 Mean ± S.E.</th>
<th>Indigenous n = 50 Mean ± S.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shape index (SI)</td>
<td>81.20 ± 0.85</td>
<td>80.21 ± 0.98</td>
<td>80.40 ± 1.19</td>
</tr>
<tr>
<td>Albumen index (AI)</td>
<td>07.54 ± 0.35</td>
<td>09.90 ± 0.27</td>
<td>06.11 ± 0.32</td>
</tr>
<tr>
<td>Yolk index (YI)</td>
<td>33.42 ± 0.63</td>
<td>31.35 ± 0.20</td>
<td>30.90 ± 0.91</td>
</tr>
<tr>
<td>Percent shell (PS)</td>
<td>09.99 ± 0.18</td>
<td>09.29 ± 0.33</td>
<td>10.80 ± 0.24</td>
</tr>
<tr>
<td>Haugh unit (HU)</td>
<td>73.23 ± 1.50</td>
<td>74.42 ± 1.68</td>
<td>71.40 ± 1.48</td>
</tr>
</tbody>
</table>

*Indicate significant difference between columns
Viswanathan (2004). The mean value of the percent shell was higher for indigenous eggs than market and Farm eggs, but the difference was non-significant among different sources of eggs.

A non-significant difference (p>0.05) in the values of Haugh unit was seen among different group of eggs. A relatively higher mean value of Haugh unit was found for farm eggs than market collected and indigenous eggs, results shows that an increase in egg weight increases the Haugh unit. The mean Haugh unit values was found non-significantly higher in farm collected eggs compare to market and indigenous eggs as reported in albumin and yolk indices but Sakunthaladevi and Reddy (2005) found a positive and significant difference between Haugh unit (HU) of different sources of eggs. The Haugh unit value is mainly depends on strain and storage condition of eggs.

CONCLUSIONS AND RECOMMENDATIONS

The present study provides a preliminary baseline data on physical eggs quality characteristics of eggs collected from market, directly from farm and from indigenous eggs selling in different areas of Karachi. However it is recommended that a mass scale study should be carried out to recommended the transportation and storage environment as per our weather, so that it will assure that superior quality eggs are being supplied in market for consumption.

REFERENCE


