Effect of storage period on internal and external parameters of Deshi Chicken fowl

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Abstract: The fresh eggs were collected and evaluated to effect of storage periods on internal and external characteristics in local chicken eggs. The mean value of the egg weight, egg width, shape index, albumin height, albumen weight, albumen percentage, albumin index, yolk height, yolk weight, yolk percentage, yolk index, shell thickness, shell weight, shell %, albumin pH, albumin protein and Haugh Unit are 58.60±0.84 g, 4.08±0.02 cm, 76.39±1.02, 5.40±0.16 mm, 33.67±0.37g, 58.07±0.55%, 6.76±0.49, 18.20±0.29 mm, 18.33±0.43 g, 44.27±0.91%, 44.27±0.91, 0.29±0.02, 6.06±0.22, 10.39±0.25, 7.82±0.02, 11.77±0.07 and 72.63±1.34 in local chicken eggs. The data from current study indicates that with increase in storage period, a significant (P<0.01) decline was observed in various parameters like percentage weight loss, albumen height, yolk height, egg width, albumen index, yolk index, Haugh unit, albumen %, albumen weight, shell thickness and albumen protein. Contrary to this, albumen pH (P<0.01) was found to escalate with increase in storage period. Egg length, shell %and yolk % have significantly differed at (P<0.01) level. Shape index and shell weight showed no significant differences.

Keywords: Desi fowl, Egg, Quality parameters, Storage

INTRODUCTION

The egg is one of the most nutritious as well as non-expensive food available to man and it provides a well balanced source of nutrients for the man of all ages (Matt et al., 2009). Poultry is one of the fastest growing segments of the agricultural sector in India with around eight percent growth rate per annum. India ranks 3rd in egg production and 7th in chicken meat production in the world (Watt Executive Guide, 2015). The constant efforts in upgradation, alteration and application of new technologies smooth the way for the multifold and multifaceted growth in poultry sectors. Development of high yielding layer (310-340 eggs) and broiler (2.4-2.6 kg at 6 wks) varieties together with standardized package of practices on nutrition, housing, management and disease control have contributed to spectacular growth rates in egg (4-6% per annum) and broiler production (8-10% per annum) in India. About 3.4 million tons (74 billion) of eggs are produced from 260 million layers and 3.8 million tons of poultry meat is produced from 3000 million broilers per annum in India. The Poultry Industry is contributing about Rs.70,000/- crores to the national GDP and providing employment to more than 4 million people either directly or indirectly (Chatterjee and Rajkumar, 2015). Moreover, egg quality affects the price and fertility of eggs. During storage, eggs are extremely prone to quality deterioration and microbial contamination. Moreover, egg quality affects the price and fertility of eggs. During storage, eggs are extremely prone to quality deterioration and microbial contamination. These conditions can cause serious economic losses to the poultry industry (Wong et al., 1996). One of the constraints is to preserve the egg qualities by selecting the most efficient storage system i.e. storage type and duration. As soon as egg is laid by the hen its quality starts to deteriorate (Jin et al., 2011). Egg shell quality may be affected by the strain and age of hen; induced moult; nutritional factors such as calcium, phosphorus, vitamins, water quality, non-starch polysaccharides, enzymes, contamination of feed; general stress and heat stress; disease, production system, or addition of proprietary products to the diets. Egg internal quality may be affected by storage; hen strain and age; induced moult, nutrition and disease. An understanding of the range of factors that affect egg shell quality and egg internal quality is essential for the production of eggs of high quality (Ahmadi and Rahimi, 2011) Several chemical and physical modifications occur inside an egg during the storage period As the storage temperature and time increased, egg weight, percentage of albumen, Haugh unit (HU), and yolk color decreased but egg shell weight, shell percentage, and albumen weight, yolk pH increased with increasing storage time.
RESULTS AND DISCUSSION

The fresh eggs were collected and evaluated to compare the mean value of internal and external characteristics in local chicken eggs. The mean values of external and internal parameters of the fresh eggs are shown in Table 1, 2 and 3. Our study revealed that egg weight loss was significantly increased (P<0.01) at different storage periods. Our results are not in agreement with those of Samli et al. (2005) who reported weight reductions of 2.08 and 3.11% respectively with in 5 and 10 days of storage periods. The increase in egg weight may be due to liquefaction of egg proteins.

The overall mean value of albumen height was observed to differ significantly (P<0.01) with storage period. The overall albumen % recorded at different time points were: day 1 (58.07±0.06 %), 7 days, (59.99± 0.05 %), 14 days (58.61±0.04 %) and 21 days (59.71±0.07 %) of storage period. There was significant effect (P<0.01) of storage period on albumen %.

Our results are in corroborating with the findings of Jin et al. (2011) who reported similar findings of albumen height and albumen percentage.

No particular pattern was observed in albumen weight with storage time. The mean value of albumen weight of 33.67 g, 37.12 g, 35.35 g and 35.83 g at 0, 7, 14 and 21 days of storage periods, respectively. These results are in agreements with Tabidi (2011) and Tayeb (2012).

In the present study, albumen index was found to decrease (p<0.01) significantly with increase in storage period. The present findings collaborates the reports of Tabidi (2011). Water loss from the egg or movement of water from albumin to yolk may be the possible cause of this result.

The present study indicated a significant decreases (p<0.01) in weight of yolk with increased storage time. The significant (P<0.01) decrease in yolk index was also observed with increasing storage period. The decline in aforesaid parameters may be due to gradual weakening of the vitelline membrane, reduction of the total solid and liquefaction of the yolk index.

The shell weight was found to decrease non-significantly with storage period. Akyurek and Okur (2009) also reported a significant decline in shell weight with increase in storage period. Alumnum pH was found to escalate significantly (P<0.01) with increasing storage period. The present study was carried out to investigate the possible effects of storage period on the quality changes in chicken eggs.

**TABLE 1.** Effect (Mean ± SE) of storage period on the external egg characteristics.

<table>
<thead>
<tr>
<th>DAYS</th>
<th>EWB (g)</th>
<th>EWA (g)</th>
<th>WL (%)</th>
<th>EWD (cm)</th>
<th>EL (cm)</th>
<th>SI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>58.05±0.36&lt;sup&gt;a&lt;/sup&gt;</td>
<td>58.05±0.54&lt;sup&gt;a&lt;/sup&gt;</td>
<td>0.00±0.00&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4.08±0.37&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.35±0.06&lt;sup&gt;b&lt;/sup&gt;</td>
<td>76.39±0.72</td>
</tr>
<tr>
<td>7</td>
<td>62.48±0.24&lt;sup&gt;b&lt;/sup&gt;</td>
<td>61.78±0.23&lt;sup&gt;c&lt;/sup&gt;</td>
<td>1.25±0.24&lt;sup&gt;b&lt;/sup&gt;</td>
<td>4.14±0.54&lt;sup&gt;a&lt;/sup&gt;</td>
<td>5.44±0.04&lt;sup&gt;d&lt;/sup&gt;</td>
<td>76.34±0.45</td>
</tr>
<tr>
<td>14</td>
<td>62.33±0.68&lt;sup&gt;b&lt;/sup&gt;</td>
<td>60.28±0.43&lt;sup&gt;c&lt;/sup&gt;</td>
<td>2.33±0.56&lt;sup&gt;c&lt;/sup&gt;</td>
<td>4.10±0.41&lt;sup&gt;b&lt;/sup&gt;</td>
<td>5.28±0.05&lt;sup&gt;d&lt;/sup&gt;</td>
<td>77.23±0.53</td>
</tr>
<tr>
<td>21</td>
<td>63.33±0.54&lt;sup&gt;b&lt;/sup&gt;</td>
<td>59.94±0.43&lt;sup&gt;c&lt;/sup&gt;</td>
<td>5.26±0.74&lt;sup&gt;d&lt;/sup&gt;</td>
<td>4.09±0.23&lt;sup&gt;d&lt;/sup&gt;</td>
<td>5.36±0.07&lt;sup&gt;b&lt;/sup&gt;</td>
<td>76.23±0.24</td>
</tr>
</tbody>
</table>

Values (Mean ± SE) with different superscripts in a row differ significantly *p<0.05, **p<0.01; NS= Non-significant. EW= Egg Weight, WL= Percent egg weight loss, EWD= Egg Width, EL=Egg Length, SI= Shape Index. 
findings are in agreement with results reported by (Samli et al., 2005, Akyrek and Okur, 2009). During storage, CO₂ escapes via eggshell pores resulting in increased albumen pH up to 9.6-9.7 (Kemps et al., 2007). Moreover, as the egg ages, CO₂ is gradually lost through the shell and the contents of the egg become more alkaline (Okeudo et al., 2003). Silversides et al. (1993) observed that pH is a useful means for describing changes in albumen quality over time during storage.

There were significant decrease (P<0.01) in HU with storage period. Samli et al. (2005) also documented that the storage period and temperature adversely affects HU. Tabidi (2011) and Khan et al. (2014) found that HU values decreased significantly with increasing storage period. Moisture loss by evaporation through the shell pores and the escape of CO₂ from albumen is important factor for the changes occur in of HU, albumen height, albumen pH, yolk index, specific gravity, and air cell size in egg quality (Robinson, 1987).

**Conclusion**

In conclusion, our study showed that storage period negatively affects the myriad quality parameters of eggs. Among various methods used, refrigeration (5°C) may be effectively used to avert the deterioration of egg quality with passage of time. However, in future more in depth studies may be done to explore innovative methods that can prevent the loss of quality of eggs.

**REFERENCES**


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**Table 2. Effect (Mean ± SE) of storage period on the internal egg characteristics.**

<table>
<thead>
<tr>
<th>DAYS</th>
<th>AH (mm)</th>
<th>AW (g)</th>
<th>AWP (%)</th>
<th>AI (%)</th>
<th>YH (mm)</th>
<th>YW (g)</th>
<th>YWP (%)</th>
<th>YI (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>5.40±0.02</td>
<td>33.67±0.04</td>
<td>58.07±0.06</td>
<td>6.76±0.05</td>
<td>18.19±0.02</td>
<td>18.33±0.04</td>
<td>31.53±0.03</td>
<td>44.27±0.06</td>
</tr>
<tr>
<td>7</td>
<td>4.50±0.04</td>
<td>37.12±0.07</td>
<td>59.99±0.05</td>
<td>5.41±0.04</td>
<td>15.38±0.06</td>
<td>18.76±0.03</td>
<td>30.37±0.04</td>
<td>34.57±0.15</td>
</tr>
<tr>
<td>14</td>
<td>3.53±0.03</td>
<td>35.35±0.09</td>
<td>58.61±0.04</td>
<td>3.96±0.04</td>
<td>12.89±0.07</td>
<td>19.08±0.04</td>
<td>31.67±0.05</td>
<td>26.85±0.21</td>
</tr>
<tr>
<td>21</td>
<td>2.93±0.03</td>
<td>35.83±0.11</td>
<td>59.71±0.07</td>
<td>3.28±0.04</td>
<td>10.85±0.07</td>
<td>18.23±0.04</td>
<td>30.46±0.06</td>
<td>22.32±0.22</td>
</tr>
</tbody>
</table>

**Level of sign.** **NS** **NS** **NS** **NS** **NS** **NS** **NS** **NS**

**Table 3. Effect (± SE) of storage period on the internal egg characteristics.**

<table>
<thead>
<tr>
<th>DAYS</th>
<th>ST (mm)</th>
<th>SW (g)</th>
<th>SWP (%)</th>
<th>APH</th>
<th>AP (%)</th>
<th>HU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Day 1</td>
<td>0.29±0.003</td>
<td>6.06±0.02</td>
<td>10.39±0.02</td>
<td>7.81±0.01</td>
<td>11.77±0.03</td>
<td>72.64±0.15</td>
</tr>
<tr>
<td>7</td>
<td>0.32±0.008b</td>
<td>5.92±0.02</td>
<td>9.57±0.02b</td>
<td>8.25±0.04b</td>
<td>11.88±0.02b</td>
<td>62.52±0.22b</td>
</tr>
<tr>
<td>14</td>
<td>0.34±0.004c</td>
<td>5.89±0.01</td>
<td>9.78±0.02c</td>
<td>8.42±0.05c</td>
<td>11.62±0.02c</td>
<td>51.55±0.30c</td>
</tr>
<tr>
<td>21</td>
<td>0.33±0.010d</td>
<td>5.86±0.02</td>
<td>9.78±0.03d</td>
<td>8.63±0.07d</td>
<td>11.44±0.03d</td>
<td>41.73±0.38d</td>
</tr>
</tbody>
</table>

**Level of sign.** **NS** **NS** **NS** **NS** **NS**

**Values (Mean±SE) with different superscripts in a row differ significantly *p<0.05, **p<0.01; NS= Non-significant. AH= Albumen Height, AW=Albumen Weight, AWP=Albumen %, AI= Albumen Index, YH=Yolk Height, YW=Yolk Weight, YWP= Yolk %, YI=Yolk Index.**


