AGE RELATED CHANGES IN EGG WEIGHT AND QUALITY TRAITS IN FOUR DIFFERENT CLOSE BRED STOCKS OF JAPANESE QUAIL

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Abstract: The present experiment was conducted to investigate the effect of age on egg quality. A total of 72 eggs from 4 different close-bred stocks (18 eggs from each) were subjected to egg quality analysis at the age of 8, 16 and 24 weeks respectively. Statistical analysis of data using ANOVA with RCBD factorial arrangement for further interpretation using General Linear Model procedures and comparison of means using Duncan’s Multiple Range Test depicted significant differences in egg weight, shape index, yolk index and Haugh unit value while non-significant differences were observed in case of shell thickness. Egg weight and yolk index increased significantly with the increase in age, while shape index and Haugh unit score decreased as the age progressed from 8 to 24 weeks. Different close bred stocks (CBS) showed significant differences among egg shape index and shell thickness while non-significant differences were observed among egg weight, egg shape index and Haugh unit score.

Key words: Japanese quail, egg weight, shape index, yolk index, Haugh unit value, shell thickness

INTRODUCTION

Over all egg production, egg weight, feed consumption and egg quality characteristics are strongly influenced by age in Japanese quail. With the advancement in age, egg production increases, gets a peak and then declines but there happen different trends with the advancement of age in different egg quality traits. As the quail age increases, egg weight (Oloyo, 2003; Brand et al., 2004; Rizzi and...
Chiericato, 2005; Johnston and Gous, 2007), yolk and albumen weight and shell weight increases, while Haugh unit and shell thickness decreases. Contrarily Zemková et al. (2007) reported that the egg weight was not significantly influenced by age.

Earlier studies conducted by Yannakopoulos and Tserveni-Gousi (1986) also suggest that egg weight, yolk index increases, whereas the egg shape index and shell thickness decreases with the advancement in age. Nagarajan (1991) further added that egg weight gradually increase with age but shell thickness is influenced neither by age of the hen nor by stocking density and the albumen index, internal quality unit, yolk index and yolk color values increase with age. Different scientists (Gunlu et al., 2003; Monira et al., 2003; Brand et al., 2004) reported negative correlation between the age and egg shape index, it might be due to the fact that as age increases eggs become longer than wider and egg shape index is directly proportional to the egg breadth. While Nedeljka and Dragoslav (2005) reported positive correlation between the age and egg shape index. Some studies (Yilmaz and Bozkurt, 2009) reported that yolk index is negatively correlated with the age. Whereas it was concluded by Silversides and Scott (2001) that Egg size increased with increasing age of the hen, and the yolk increased more in size than did the shell and albumen.

Breed, strain and age of hens, egg storage, nutrition and diseases directly influence size and composition of eggs (Cook and Briggs, 1997). Baishya et al. (2008) reported different Haugh unit values in different strains of chickens. Significant difference in yolk index of different cross-bred and other breeds of chickens have also been reported (Gupta et al., 2007; Baishya et al., 2008; Haunshi et al., 2011).

Generally it is concentrated more on chicken in such studies but very less data is available regarding Japanese quail, especially in typical Pakistani environmental conditions. Also there is a need to explore the behavior of different close-bred stocks (CBS) of Japanese quail regarding all above parameters. So, keeping in view the above, present study was planned to investigate the effect of age on egg weight and some egg quality characteristics in different CBS of Japanese quail.
MATERIALS AND METHODS

The study was conducted at Avian Research and Training (ART) Center, UVAS, Lahore. Total seventy two eggs, 18 each from 4 different close-bred stocks, namely, M (Major), K (Kaleem) S (Saadat) and Z (Zaahid) were subjected to egg quality analysis at the age of 8, 16 and 24 weeks respectively.

Egg weight, shape index (egg width/length), yolk index (yolk height/diameter) and Haugh-unit score (albumen height/egg weight). The shell thickness was determined by using digital screw gauge.

Statistical analysis

Statistical analysis was carried out using ANOVA with RCBD factorial arrangement for further interpretation using GLM (General Linear Model) procedures (SAS, 9.1) and comparison of means was done with the help of Duncan’s Multiple Range (DMR) Test.

RESULTS AND DISCUSSION

Age of the birds significantly affected the egg weight with positive correlation (Figure 1). Similar findings were reported by Nazligul et al. (2001) that as age increases egg weight also increases. Similarly various scientists reported that egg weight is directly proportional to the age of the birds; as age increases the egg weight also increases (Weatherup and Foster, 1980; Summers and Leeson, 1983; Ledur et al., 2002; Machal and Simeonovova, 2002; Oloyo, 2003; Brand et al., 2004; Rizzi and Chiericato, 2005; Johnston and Gous, 2007). This may be attributed to the mature/larger ovule size (Joyner et al., 1987) which also increases with the age. Contrarily Zemková et al. (2007) reported that the egg weight was not significantly influenced by age. While non-significant differences in the egg weight were observed among different varieties of the quail (Figure 2). The results regarding different CBS are not in line with the findings of some other scientists who observed variation in egg weight to be associated
with breed, strain, size of the bird, rate of egg production (Baishya et al., 2008; Zita et al., 2009). Singh et al. (2009) also observed significant variation in egg weight among different genetic groups. Little or no variation in the egg weight of different stocks in the present study might be attributed to very little genetic variation among them. Age of the birds showed significant effect on the egg shape index of the birds and there is negative correlation between age groups and egg shape index (Table I). The age of the birds increased the egg shape index decreased, it might be due the fact that egg shape index is directly proportional to the egg breadth and inversely proportional to the egg length which implies that with the increasing age, the rate at which eggs become longer is faster than rate of being wider (Gunlu et al., 2003; Monira et al., 2003; Brand et al., 2004).

**Table I:** Shape index, yolk index, Haugh unit score and shell thickness at different age groups of different close bred stocks of Japanese quail.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Levels</th>
<th>n.</th>
<th>Shape Index</th>
<th>Yolk Index</th>
<th>Haugh Unit Score</th>
<th>Shell Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age Groups</strong></td>
<td>8 weeks</td>
<td>72</td>
<td>81.36 ±0.59&lt;sup&gt;a&lt;/sup&gt;</td>
<td>45.29±0.61</td>
<td>73.54±0.21</td>
<td>0.182±0.002</td>
</tr>
<tr>
<td></td>
<td>16 weeks</td>
<td>72</td>
<td>81.47 ±0.58&lt;sup&gt;a&lt;/sup&gt;</td>
<td>46.43±0.44</td>
<td>73.18±0.16</td>
<td>0.186±0.002</td>
</tr>
<tr>
<td></td>
<td>24 weeks</td>
<td>72</td>
<td>79.50 ±0.61&lt;sup&gt;b&lt;/sup&gt;</td>
<td>46.9±0.67</td>
<td>72.86±0.16</td>
<td>0.187±0.002</td>
</tr>
<tr>
<td><strong>Different CBS</strong></td>
<td>M</td>
<td>54</td>
<td>82.86±0.71&lt;sup&gt;a&lt;/sup&gt;</td>
<td>47.83±0.53</td>
<td>73.22±0.14</td>
<td>0.19±0.002&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>54</td>
<td>80.69±0.63&lt;sup&gt;b&lt;/sup&gt;</td>
<td>46.13±0.72</td>
<td>73.15±0.22</td>
<td>0.17±0.003&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>S</td>
<td>54</td>
<td>81.08±0.71&lt;sup&gt;b&lt;/sup&gt;</td>
<td>46.75±0.76</td>
<td>72.72±0.27</td>
<td>0.19±0.001&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Z</td>
<td>54</td>
<td>78.49±0.36&lt;sup&gt;c&lt;/sup&gt;</td>
<td>44.11±0.39</td>
<td>73.69±0.13</td>
<td>0.18±0.002&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td><strong>Age groups × Different CBS</strong></td>
<td>M</td>
<td>18</td>
<td>84.35 ± 0.23&lt;sup&gt;a&lt;/sup&gt;</td>
<td>46.92 ± 1.09&lt;sup&gt;a&lt;/sup&gt;</td>
<td>73.67 ± 0.23</td>
<td>0.19 ± 0.01&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>18</td>
<td>81.69 ± 0.80&lt;sup&gt;b&lt;/sup&gt;</td>
<td>45.20 ± 1.21&lt;sup&gt;b&lt;/sup&gt;</td>
<td>73.57 ± 0.48</td>
<td>0.17 ± 0.01&lt;sup&gt;b&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>S</td>
<td>18</td>
<td>81 ± 1.32&lt;sup&gt;c&lt;/sup&gt;</td>
<td>45.90 ± 1.51&lt;sup&gt;c&lt;/sup&gt;</td>
<td>72.93 ± 0.50</td>
<td>0.19 ± 0.003&lt;sup&gt;c&lt;/sup&gt;</td>
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<td></td>
<td>Z</td>
<td>18</td>
<td>78.45 ± 0.23&lt;sup&gt;d&lt;/sup&gt;</td>
<td>47.76 ± 0.60&lt;sup&gt;d&lt;/sup&gt;</td>
<td>73.28 ± 0.16</td>
<td>0.19 ± 0.004&lt;sup&gt;d&lt;/sup&gt;</td>
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<tr>
<td></td>
<td>M</td>
<td>18</td>
<td>81.80 ± 0.79&lt;sup&gt;e&lt;/sup&gt;</td>
<td>46.23 ± 0.99&lt;sup&gt;e&lt;/sup&gt;</td>
<td>73.09 ± 0.34</td>
<td>0.18 ± 0.01&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>K</td>
<td>18</td>
<td>81.12 ± 1.31&lt;sup&gt;f&lt;/sup&gt;</td>
<td>47.52 ± 0.80&lt;sup&gt;f&lt;/sup&gt;</td>
<td>72.74 ± 0.50</td>
<td>0.19 ± 0.003&lt;sup&gt;f&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>Z</td>
<td>18</td>
<td>78.53 ± 0.66&lt;sup&gt;g&lt;/sup&gt;</td>
<td>44.23 ± 0.26&lt;sup&gt;g&lt;/sup&gt;</td>
<td>73.64 ± 0.17</td>
<td>0.19 ± 0.003&lt;sup&gt;g&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>M</td>
<td>18</td>
<td>79.79 ± 1.53</td>
<td>48.83 ± 1.01</td>
<td>72.72 ± 0.25</td>
<td>0.19 ± 0.01&lt;sup&gt;i&lt;/sup&gt;</td>
</tr>
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<tr>
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<td>0.18 ± 0.004&lt;sup&gt;a&lt;/sup&gt;</td>
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The data is given as Mean±SEM; mean values with different letter differ significantly. Abbreviations used; CBS (close-bred stocks), M (major), K (Kaleem), S (Saadat) and Z (Zaahid).
Contrarily some scientists reported significant effect of age on the egg shape index, as age increases the egg shape index also increases (Nedeljka and Dragoslav, 2005). While significant effect in the egg shape index was observed among different CBS (Table I) significantly higher egg shape index was observed in M followed by K, S and Z.

Age showed non-significant effect on the yolk index of the birds and was positively correlated with the yolk index, as age increased the yolk index also increased (Table I). It might be due the fact that yolk index is the ratio of yolk height and yolk width and is directly proportional to the yolk height which increases with the age. Nagarajan et al. (1991) reported similar findings that as the age increased the yolk index also increased.

Contrarily some scientists reported that age is negatively correlated with the yolk index (Yilmaz and Bozkurt, 2009). While Yasmineen et al. (2008) reported no effect of age on yolk index. While among CBS significant differences in the yolk index were also observed (Table I). Contrarily reported by Rehman (2006) that yolk index were non-significant among different local and imported flocks of Japanese quail, it might be due to the difference in the genotype of different birds as Tumova et al. (2007) reported that genotype significantly (p<0.001) influenced yolk index. Age showed non-significant effect on the Haugh Unit score of the birds, but numerically it negatively correlated with the age, as age increased the Haugh Unit score decreased (Table I). As Haugh Unit score is the indicator of albumen quality, generally it decreases with the age because with the increase in age albumen height decreases. Various scientists reported similar findings that as age increased, Haugh Unit score decreased (Liljedahl et al., 1984; Doyon et al., 1986; Coutts and Wilson, 1990; Jones, 2006). Contrarily some scientists reported that age is positively correlated with the Haugh Unit score (Nazligul et al., 2001; Silversides and Scott, 2001). Significant differences were observed in the Haugh Unit score among different CBS (Table I). Contrary to earlier findings of Rehman (2006) who reported non-significant differences in the Haugh unit score among local and imported flocks of Japanese quail. Nwachukwu et al. (2006) also reported that Haugh unit value was significantly higher for the mutual crossbreds.

Age showed non-significant effect on the shell thickness of the birds but numerically age is directly related with the shell thickness as age
increased shell thickness also increased (Table I). Similar findings have been reported by various scientists that egg shell thickness is positively correlated with the age (Luqueti et al., 2004). Contrarily various researchers (Garlich et al., 1984) reported negative correlation of age with the egg shell thickness. The increase in shell thickness with the advancement in age from 8 to 24 weeks might have been due to the fact that as age advances, over all egg production decreases, so the birds body has more reserves for over all egg weight and shell thickness in comparison to earlier or peak egg production. While significant differences in the shell thickness were observed among different CBS (Table 1). Similar findings have been reported by Rehman (2006) that significant differences were observed in egg shell thickness among local and imported flocks of Japanese quails.
Figure 1: Effect of age on egg weight of different close-bred stocks of quail.

Figure 2: Egg weight among different close bred stocks of quail.

Based on the above discussion it can be concluded that age affected the egg weight and shape index. Different CBS also affected the egg shape index and shell thickness. As age increases the egg weight, yolk index and shell thickness increases but egg shape index and Haugh unit score decreases.

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