COMPARISON AMONG THREE LINES OF QUAIL FOR EGG QUALITY CHARACTERS

Asia M. Hassan, Dejeen A. Mohammed, Khabat N. Hussein * and Shekhmous H. Hussen

Dept. of Animal Production, College of Agriculture – University of Duhok, Kurdistan Region – Iraq - (khabat.noori@uod.ac)

ABSTRACT:
A total of 300 eggs from 45 female quails from three different lines (Dark brown, light brown and white) aged 10 weeks old were equally divided into three experimental groups having 15 birds of each and caged separately, to estimate the external and internal egg quality traits. Half eggs were measured 24 hrs. post lay and others were measured after one week of storage at room temperature. The results showed that there were significant differences among lines for egg length, yolk height, yolk index, albumen diameter, albumen index and Haugh unit. The light brown line resulted in the best quality. All internal egg quality characters and egg length were differed significantly between fresh and storage eggs. The fresh eggs resulted in better quality than stored eggs. Phenotypic correlation appeared that there were significant correlation coefficients between some egg quality characteristics in dark brown line more than light brown and white lines.

KEYWORDS: Egg Quality, Lines, Storage, Quail.

1. INTRODUCTION

Quails are considered amongst the smallest species of poultry that has been domesticated recently. It scientific name is coturnix japonica belongs to the class aves, order galiformes (mirzutani, 2003), quails are not only attractive for its meat production, but also for egg production (hussain, 2013), the short period of egg incubation which is about 17 days and their high reproductive traits has increased its popularity for commercial egg production in poultry industry (north and bell, 1991; minvielle, 2004), comparable to commercial layers, and in ideal rearing circumstances, quail hen potentially can produce maximum number of eggs; about 350 eggs of 10-12 grams each (hrncar et al., 2014), the productivity and profitability of poultry species is commonly governed by certain properties including; egg hatchability, egg fertility, number of eggs being laid and their quality characteristics (yahaya et al., 2009; alasahan et al., 2015), though, several other factors could have an impact on the egg quality such as; body weight, breed, strain, season, raising practices and relative humidity (narushin, and romanov, 2002; khurshid, et al., 2003; roberts, 2004; nwachukwu et al., 2006; silversides et al., 2006; wolanski et al., 2007), and lacin et al., 2008). moreover, researchers have indicated that numerous traits of egg quality has genetic basis and effected by the genetic variability in dam which is mainly responsible for the hatchability of fertile egg (song et al., 2000; wolc, and olori, 2009). understanding the genetic variability could support in improving the quality traits of egg genetically (song et al., 2000).

The quality traits of eggs including; external and internal traits are considered the main factors that determine the consumer acceptability for table and hatching eggs. And also has important effect on the technology of egg products such as powder, frozen and liquid eggs (Panda, and Singh, 1990). These external characteristics could be egg weight, freshness, eggshell integrity and cleanliness. Whereas, internal properties of egg could be chemical composition, yolk index and Haugh unit and so on (Bhanja et al., 2006; Adeogun, and Amole, 2004 and Dudusola, 2010). Both external and internal characters are correlated with nutrition, management, storage condition, housing density, egg handling and stage of production cycle (Yanakopolous and Tserveni-Gousi, 1986). The size of egg and storage period can considerably affect these characters of egg (Jones and Musgrove, 2005). It’s well known that increasing storage time lead to declining the egg quality (Elmagar and Abd-Elhady, 2009). In hens, it was reported that 10 days is the appropriate storage period to maintain better quality of egg, higher number of Haugh units and to produce lower rate of unfavorable physicochemical changes that occur in egg (Yilmaz and Bozkurt, 2009). The increasing trends in quail production in Kurdistan region led the need for studying internal and external quality traits of eggs in the locally available quail lines to grade the eggs according its quality. The aim of current study was to examine and compare the external and internal quality traits of eggs obtained from three different quail’s lines.

2. MATERIALS AND METHODS

Present study was conducted at Department of Animal Production, College of Agriculture, University of Duhok. A total of 45 female quails from three different lines (Dark brown, light brown and white) aged 10 weeks old were equally divided into three experimental groups having 15 birds of each and caged separately. To estimate the external and internal egg quality traits among the lines, average of 100 eggs were collected from each line; 50 eggs were measured 24 hrs. post lay and other 50 were measured after one week of storage at room temperature. Water and feed provided to birds ad libitum and the ration was submitted according to (NRC, 1994).

The eggs were examined for following traits; egg weight (EW), shape index (SI), shell weight with membrane (SW), Shell percentage (SP), albumen index (AI), albumen weight (AW) albumen percentage (AP), yolk index (YI), yolk weight (YW), yolk percentage (YP) and Haugh Unit (HU). Furthermore, electronic digital Vernier caliper with an accuracy of 0.01 mm was used for measuring egg long diameter or egg length (LD),

* Corresponding author
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The result from effect of stored duration on external egg quality characteristics of quail are given in Table 3. Within the studied characteristics significant differences only found in egg length between 24 hr and 7 days of storage. Simultaneously the other characteristics were not differing significantly (P>0.05).

The results of internal egg quality of three different line plumage color are presented in Table 1. In the current study significant differences in egg length between experimental lines were observed. That could be due to genetic variance among studied lines. Nonetheless, no significant differences were observed in egg weight, width shape index and shell characters. These results were disagreement with results of (Akram, et al., 2014; Ashok and Reddy, 2010), in which they found no significance difference in egg length while egg weight among different lines of quail were differed significantly.

2.1. Statistical analysis:

The collected data was analyzed using GLM procedure from SAS software (SAS, institute, 2010), according to the following model:

\[ Y_{ijk} = \mu + L_i + S_j + e_{ijk} \]

Where:
- \( Y_{ijk} \) = the observations of the studied trait.
- \( \mu \) = Overall mean;
- \( L_i \) = The effect of line;
- \( S_j \) = The effect of storage period;
- \( e_{ijk} \) = Experimental error.

Some significance traits exposed to the correlation procedure within the same software. Also, the differences among means were tested using Duncan multiple range test (Duncan, 1955).

3. RESULT AND DISCUSSION

The results of external egg quality of three different line plumage colors are presented in Table 1. In the current study significant differences in egg length between experimental lines were observed. That could be due to genetic variance among studied lines. Nonetheless, no significant differences were observed in egg weight, width shape index and shell characters. These results were disagreement with results of (Akram, et al., 2014; Ashok and Reddy, 2010), in which they found no significance difference in egg length while egg weight among different lines of quail were differed significantly.

The result from effect of stored duration on external egg quality characteristics of quail are given in Table 3. Within the studied characteristics significant differences only found in egg length between 24 hr and 7 days of storage. Simultaneously the other characteristics were not differing significantly (P>0.05).

### Table 1. External egg quality characteristics (Means ± S. E.) in quails of different plumage color lines.

| Characteristics | Dark Brown | Light Brown | White | P-Value |
|-----------------|------------|-------------|-------|---------|
| Egg weight (g)  | 11.39±0.06 | 11.54±0.09  | 11.66±0.10 | 0.0770  |
| Egg length (mm) | 32.50±0.11 | 32.17±0.24  | 32.81±0.12 | 0.0304  |
| Egg width (mm)  | 25.37±0.04 | 27.10±1.55  | 25.63±0.08 | 0.3024  |
| Shape index     | 77.69±0.56 | 88.97±0.08  | 78.17±0.25 | 0.0685  |
| Shell weight (g) | 1.89±0.31  | 1.54±0.01   | 1.59±0.02  | 0.3708  |
| Shell percentage (%) | 14.15±0.31 | 13.46±0.14  | 13.66±0.14 | 0.0739  |
| Shell thickness (mm) | 0.30±0.01  | 0.29±0.004  | 0.29±0.004 | 0.2571  |

*ab* Means in a row with no common superscript differ significantly.

The result from effect of stored duration on external egg quality characteristics of quail are given in Table 3. Within the studied characteristics significant differences only found in egg length between 24 hr and 7 days of storage. Simultaneously the other characteristics were not differing significantly (P>0.05).
Table 3. Effect of stored duration on external egg quality characteristics of quail (Means ± S. E.)

| Characteristics       | After 24 h   | After 7 d   | P Value |
|-----------------------|--------------|-------------|---------|
| Egg weight (g)        | 11.50±0.06   | 11.55±0.07  | 0.7322  |
| Egg length (mm)       | 32.26±0.18   | 32.69±0.08  | 0.035   |
| Egg width (mm)        | 26.58±1.07   | 25.51±0.04  | 0.2900  |
| Shape index           | 85.34±4.93   | 78.11±4.17  | 0.1176  |
| Shell weight (g)      | 1.82±0.24    | 1.55±0.01   | 0.2899  |
| Shell percentage (%)  | 14.03±0.25   | 13.53±0.09  | 0.087   |
| Shell thickness (mm)  | 0.29±0.008   | 0.29±0.003  | 0.7493  |

Means in a row with no common superscript differ significantly.

The data from effect of stored duration on internal egg quality characteristics of quail are shown in Table 4. Significant differences noticed in all studied characteristics between 24 hr and 7 days of storage. These results are in agreement with that mentioned by Elnagar and Abd-Elhady, (2009) who reported that increasing storage time lead to declining the egg quality.

Table 4. Effect of stored duration on internal egg quality characteristics of quail (Means ± S. E.)

| Characteristics       | After 24 h   | After 7 d   | P Value |
|-----------------------|--------------|-------------|---------|
| Yolk weight (g)       | 3.68±0.04    | 3.98±0.03   | <.0001  |
| Yolk height (mm)      | 12.43±0.19   | 11.58±0.14  | 0.0004  |
| Yolk diameter (mm)    | 25.87±0.09   | 26.64±0.08  | <.0001  |
| Yolk percentage (%)   | 32.30±0.26   | 34.56±0.23  | <.0001  |
| Yolk index            | 47.95±0.77   | 43.65±0.60  | <.0001  |
| Albumen weight (g)    | 6.19±0.05    | 6.00±0.06   | 0.011   |
| Albumen percentage (%)| 53.87±0.31   | 52.07±0.30  | <.0001  |
| Albumen height (mm)   | 4.88±0.14    | 4.12±0.03   | <.0001  |
| Albumen diameter(mm)  | 41.67±0.38   | 43.82±0.28  | <.0001  |
| Yolk/albumen ratio    | 60.41±0.71   | 67.32±0.76  | <.0001  |
| Albumen index         | 11.84±0.39   | 9.51±0.11   | <.0001  |
| Haugh unit            | 90.83±0.25   | 87.36±0.21  | <.0001  |

Means in a row with no common superscript differ significantly.

Regarding to the relationships between egg quality characteristics, the phenotypic correlation coefficients in dark brown line (Table 5), illustrating that most external egg quality characters correlated significantly to internal ones. The highest positive significant correlation coefficient was recorded between shell weight and albumen high (0.98), while the lowest positive significant correlation coefficient was recorded between yolk height and egg weight (0.28). On other hand, the highest significant negative correlation coefficient was obtained between shell weight and albumen diameter (-0.79), while the lowest negative significant correlation coefficient was obtained between albumen weight and shell thickness (-0.40). These findings give a possibility to improve the quality of eggs via wide range of characters in dark brown line.

Contrary to the previous results, the phenotypic correlation coefficients between most characteristics of egg quality in light brown line are not differed significantly (Table 5). The highest positive significant correlation coefficient was recorded between egg weight and yolk diameter (0.73) and also the same value between yolk weight and yolk diameter (0.74), while the lowest positive significant correlation coefficient was recorded between yolk diameter and albumen diameter (0.26). However, there were not negative significant correlation coefficients between egg quality characteristics in light brown line. These results determining the improvement of egg quality traits in a narrow range, and give an idea that the best quality resulted from the heaviest eggs.

In respect to white line of quail, the phenotypic correlation coefficients between egg quality characters differed than previous both brown lines, in order to show the highest positive significant correlation coefficient between egg weight and yolk diameter (0.73) and also the same value between yolk weight and yolk diameter (0.74), while the lowest positive significant correlation coefficient was recorded between albumen weight and albumen diameter (0.56). Also, there were not negative significant correlation coefficients between quality characteristic in white line eggs.

Anywhere, the presence of positive significant correlation coefficient between egg weight and external egg quality traits such as shape index give an idea about egg size (Sezer, 2007).
Table 5. Phenotypic correlation coefficients between different egg quality characters in quails of different plumage color line

| Plume Color | Characteristic | Egg Weight | Yolk Height | Yolk Diameter | Albumen Height | Albumen Diameter | Shell Weight | Shell Thickness | Yolk Weight | Albumen Weight |
|-------------|----------------|------------|-------------|--------------|---------------|-----------------|--------------|----------------|-------------|----------------|
| Light brown | Egg Weight     | 1.00       | 0.28 *      | 0.39 **      | 0.15          | 0.04            | 0.17         | 0.18           | 0.20        | 0.62 **        |
| Light brown | Yolk Height    | 1.00       | 0.05        | 0.30 *       | 0.22          | -0.05           | -0.05        | -0.05          | 0.05        | 0.05 **        |
| White       | Yolk Diameter  | 1.00       | 0.33        | 0.73 **      | 0.11          | 0.65 **         | 0.67 **      | 0.23           | 0.62 **      | 0.66 **        |
| Light brown | Albumen Height | 1.00       | 0.22        | -0.004       | 0.01          | 0.02            | 0.07         | 0.33 **        | -0.01       |                |
| Light brown | Albumen Diameter | 1.00       | 0.08        | 0.17         | 0.02          | 0.08            | 0.008        | -0.04          | 0.07        |                |
| Light brown | Shell Weight   | 1.00       | 0.32        | 0.07         | 0.14          | 0.07            | -0.07        | 0.26           | 0.23        |                |
| Light brown | Shell Thickness | 1.00       | 0.11        | 0.01         | 0.01          | 0.01            | 0.01         | 0.14           |            |                |
| White       | Albumen Diameter | 1.00       | 0.16        | 0.26 *       | 0.16          | -0.18           | 0.22         | 0.17           |            |                |
| White       | Egg Weight     | 1.00       | 0.06        | 0.27 *       | 0.16          | -0.18           | 0.22         | 0.17           |            |                |
| White       | Yolk Height    | 1.00       | 0.07        | 0.02         | 0.15          | 0.01            | 0.14         |                |            |                |
| White       | Albumen Height | 1.00       | 0.79 **     | -0.71 **     | 0.55 **       | 0.53 **         |              |                |            |                |
| White       | Albumen Diameter | 1.00       | -0.05       | -0.16        | -0.13         | 0.04            |              |                |            |                |
| White       | Shell Weight   | 1.00       | 0.28        | 0.11         | 0.30          | 0.56 **         |              |                |            |                |
| White       | Yolk Height    | 1.00       | 0.93 **     | -0.71 **     | -0.44 **      |                |              |                |            |                |

* = significant (p<0.05); ** = highly significant (p<0.01)

4. CONCLUSION

It could conclude from this study that the light brown line laid the best quality eggs compared to dark brown and white lines, because having the highest Haugh unit, lowest albumen diameter and intermediate yolk height. The fresh eggs resulted in a better quality than stored ones as expected.

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