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The Variation of Egg Traits Components within and between Three Genetic Groups of Japanese Quail by Using Coefficient of Variation

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Annotation: Egg quality and quantity traits of the birds are one of the determinants of the breed selection; in addition to that, the homogeneity of the flock is the second determinant, which is help the farmers to predict productivity. The current study was carried out at the poultry farm at animal production department, College of agriculture, Kirkuk University from 1/8/2021 until 1/10/2021. The eggs were collected from three hundred hen of Japanese quail (White=100, Brown=100, and Grey=100) at age of 55 days to study egg traits variation within and between the lines. Electronic balance with (0.001) g sensitivity was used to measure the egg weight, and the internal traits. Moreover, electronic caliper vernier with (0.01) sensitivity was used to measure the egg external traits. Both the external and internal traits were not significantly differing among the lines. There were significant differences between the three lines of

Japanese quail in egg shape index it was high in brown line, intermediate in grey line, and low in white line (78.59, 77.81, 77.78) respectively. Our egg internal and external traits of the three Japanese quail, which is collected in the same age, did not differ significantly, except the egg shape index. We conclude that egg internal and external traits of the three Japanese quail, which is collected in the same age, did not differ significantly, except the egg shape index.

Keywords: coefficient of variation, quail, egg traits.

Introduction:

The Japanese quail (*Coturnix coturnix japonica*) has long been recognized as an economically important avian species, not only for its utility in meat and egg production but also as a valuable model organism in scientific research [1]. Since its domestication and use in commercial egg production in the 19th century, the Japanese quail has gained popularity among researchers and farmers alike due to its small size, short generation interval, high reproductive rate, and adaptability to different environmental conditions [2]. These attributes have positioned the species as an ideal subject for genetic, immunological, nutritional, and physiological studies [3-5]. Among the many traits evaluated in poultry production, egg quality and quantity remain critical parameters for determining the suitability of a breed or strain [6]. These traits influence both consumer preference and commercial value, making them essential selection criteria in breeding programs. Moreover, the uniformity of egg traits within a flock plays a significant role in improving predictability in production, which is of enormous benefit to poultry farmers [7].

Homogeneity in egg characteristics ensures consistency in packaging, processing, and marketing; thus, it enhances overall productivity and profitability. Extensive research has been conducted on the internal and external egg traits of various bird species, including chickens [8,9], quails, waterfowl such as ducks and geese [10, 11], and even wild birds [12]. These studies typically assess parameters such as egg weight, shell thickness, albumen height, yolk index, and shape index, all of which contribute to both quality evaluation and breed characterization [13]. Furthermore, investigations into the variability of egg protein content and composition have been conducted to understand nutritional profiles and their genetic determinants [14, 15]. Such analyses provide insight into the biochemical uniformity or diversity among different breeds or strains, which is crucial for targeted nutritional interventions and genetic improvement. In the context of Japanese quail, studies have explored both general production traits and more specific egg quality attributes. For instance, research on white Japanese quail has revealed significant correlations among external egg traits such as shell weight, shape index, and egg length [16]. These findings have implications for selective breeding aimed at enhancing desired characteristics. Additionally. The aim of the study is to study the variation of egg traits components within and between three genetic groups of Japanese quail by using coefficient of variation

Materials and Methods

The current study was carried out at the poultry farm at animal production department, College of agriculture, Kirkuk University from 1/8/2021 until 1/10/2021. The eggs were collected from three hundred hen of Japanese quail (White=100, Brown=100, and Grey=100) at age of 55 days to study egg traits variation within and between the lines. After collecting the eggs, the egg weight was measured by using electronic balance with (0.001) g sensitivity. The egg length and

breadth was measured by using electronic caliper Vernier with (0.01) sensitivity. After getting the external traits, the eggs were broken and egg yolk was measured by using electronic balance, and the eggshell was washed and drayed under the room temperature for 24 hours to getting the eggshell weight and thickness. The albumin weight was measured by the equation below:

Albumin weight (g) = Egg weight – (Yolk weight + eggshell weight)

The egg shape index, egg volume, and the egg surface area was collected by using the equations below:

$ESI = (B/L) \times 100$

$EV = (0.6057 - 0.0018 \times B) \times LB^2$

$ESA = (3.155 - 0.0136 \times L + 0.0115 \times B) \times LB$

Where:

ESI= egg shape index

B= breadth

L= Length

EV= egg volume

ESA= egg surface area

Means, standard errors, standard deviation, and coefficients of variation of egg external and internal traits were calculated using the descriptive statistic of SPSS /PASW statistics for Windows version 19 [17]. One-way analysis of variance was used to test the effect of genetic line on the traits. The differences between the means of genetic lines for each trait were tested by using multiple range test (18).

Results and Discussion

The mean, standard error, and coefficient of variation for the external egg traits of the three lines of the Japanese quail are shown in table 1. The external egg traits (egg weight, and egg length, egg breadth) for the three lines of the Japanese quail were not significantly differing ($P \leq 0.05$). The coefficient of variation of the egg weight was intermediate in the white, brown, and grey lines, which were (10.31, 8.92, 9.29) respectively. The coefficients of variation of egg length for the three lines were low (5.80, 6.40, 6.48) respectively. The coefficients of variation of egg breadth for the three lines were also low (5.16, 5.30, 5.75) respectively. Although non-significant differencese was observed among the quail lines for egg weight in the same age in the sudy of [3]. Also it was obsurved for the egg length and breadth.

Table 1: Mean, standard error, and the coefficient of variation of the external egg traits for the Japanese quail lines

Line	White		Brown		Grey		Sig.
Traits	Mean ± S.E	C.V.	Mean ± S.E	C.V.	Mean ± S.E	C.V.	
Egg weight	8.59±0.08	10.31	8.78±0.08	8.92	8.74±0.08	9.29	0.193
Egg length	31.78±0.17	5.80	31.67±0.20	6.40	31.62±0.19	6.48	0.833
Egg breadth	24.69±0.12	5.16	24.86±0.13	5.30	24.58±0.13	5.75	0.319

S.E.=Standard error, C.V.=Coefficient of variation, means with different superscripts in each row differ significantly ($P \leq 0.05$).

The mean, standard error, and coefficient of variation for the internal egg traits of the three lines of the Japanese quail are shown in table 2. The internal egg traits (yolk weight, albumin weight, shell weight, and eggshell thickness) for the three lines of the Japanese quail were not

significantly differing (P≤0.05). The coefficients of variation of all traits for the three lines were intermediate, and it's ranged from (8.57) to (10.68). The white Japanese quail was characterized by [1], the means of yolk, albumin, and shell weight were (3.73, 5.62, 1.45) g respectively. The means were differ to our study due to the genetic and non-genetic effects.

Table 2: Mean, standard error, and the coefficient of variation of the internal egg traits for the Japanese quail lines

Line	White		Brown		Grey		Sig.
Traits	Mean ± S.E	C.V.	Mean ± S.E	C.V.	Mean ± S.E	C.V.	
Yolk weight	2.62±0.03	10.22	2.69±0.02	8.62	2.66±0.02	9.31	0.220
Albumin weight	5.12±0.05	10.47	5.24±0.05	9.21	5.23±0.05	9.61	0.166
Shell weight	0.84±0.01	10.24	0.86±0.01	8.80	0.86±0.01	9.23	0.280
Egg shell thickness	0.25±0.00	10.68	0.26±0.00	8.57	0.26±0.00	8.57	0.267

S.E.=Standard error, C.V.=Coefficient of variation, means with different superscripts in each row differ significantly (P ≤0.05).

The mean, standard error, and coefficient of variation for the egg shape index, egg volume, and egg surface are of the three lines of the Japanese quail are shown in table 3. There were significant differences between the three lines of Japanese quail in egg shape index it was high in brown line, intermediate in grey line, and low in white line were (78.59, 77.81, 77.78) respectively. The egg volume and egg surface area were not differing significantly among the three lines (P>0.05). Their no significant differencese was observed among the quail lines for egg volume, and egg surface area in the same age in the study of [3]. The significant differenncese was obsurved among the lines in egg shape index. Significant differences was observed between four genetic group of the Kurdish local chicken in the egg shape index [16]. Moreover the shape index was vary significantly acording to the age of the chicken, and [11] Observed in his study their was correlation and significant differences between the chicken color and the egg shape index.

Table 3: Mean, standard error, and the coefficient of variation of the egg shape index, egg volume, and egg surface area for the Japanese quail lines

Line	White		Brown		Grey		Sig.
Traits	Mean ± S.E	C.V.	Mean ± S.E	C.V.	Mean ± S.E	C.V.	
Egg shape index	77.78±0.27 **c**	3.63	78.59±0.28 **a**	3.52	77.81±0.22 **b**	3.06	0.046
Egg volume	4809.52±85.35 **a**	18.86	4885.58±87.39 **a**	17.89	4848.86±86.85 **a**	19.37	0.830
Egg surface area	933.49±13.08 **a**	14.90	950.33±13.02 **a**	13.70	943.97±12.76 **a**	14.62	0.658

S.E.=Standard error, C.V.=Coefficient of variation, means with different superscripts in each row differ significantly (P ≤0.05).

Conclusion:

The egg internal and external traits of the three Japanese quail, which is collected in the same age and feed with same diet, did not differ significantly in all traits, except the egg shape index, which was significantly differ.

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