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The Effects of Live Weight of Japan Quails (*Coturnix coturnix japonica*) on the Characteristics of Interior and Exterior Quality of Eggs

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Abstract: This study was done in order to figure out between the live weight and the characteristics of interior and exterior quality of eggs. Total 75 quails are used as animal material in this study. The quails are kept in the cages throughout the study and a male + two female quails in equal weights are put to each cage compartment. Eggs are collected from the quails throughout 4 weeks. Some characteristics like the egg weight, shape index, specific gravity, shell thickness, albumen index, yolk index, yolk weight and albumen weight were measured. According to the results of this trail, the egg weight increases depending upon the body weight of the quails selected for live weight. This increase on the egg weight is due the higher albumen and yolk weight. It was observed that the differences between the live weight and egg weight, shape index, albumen and yolk weight were statistically significant ($p<0.05$).

Key words: Quail, selection, live weight, egg characteristics, yolk weight, albumen

INTRODUCTION

The way of maintaining one's life healthfully is based on its balanced and moderate nutrition. The reality that majority of the protein consumption should be animal origin in the balanced and moderate nutrition is still notable today. The egg that can be qualified as animal origin protein store has an important and valuable role in terms of healthy diet. The egg yield is one of the major criteria of economic production. Besides egg yield and some characteristics of egg are absolute factors in poultry breeding (Nazligul *et al*., 2001). Because of all these reasons both in the efficiency of incubation studies for breeding and in the field of commercial production, the necessity of study on characteristics of interior and exterior quality of eggs and the factors that are effective on these characteristics is occurred (Seker *et al*., 2005).

The necessity of study on the characteristics of interior and exterior quality of quail eggs which are significant animal protein stores and commonly produced in Turkey recently and searching the effective factors on these characteristics are in question (Sogut and Sari, 2009). Strong *et al*. (1978) and Marks (1993) indicated that there is a high genetic relationship between egg weight which is one of the exterior quality characteristics and body weight of female birds and that the eggs of the heavier layers will be heavier. Studies (Altan *et al*., 1996; Chambers, 1990; Strong *et al*., 1978; Marks, 1993; Yilmaz and Caglayan, 2008) reported that egg weight affected hatching performance, incubation period, chick weight, early chick deaths and performance at later age, on the other hand, increase in the live weight affected sperm characteristics and libido in cocks and egg efficiency in layer negatively. The selection studies made for increasing the live weight revealed itself by reduce in egg yield and increase on egg weight (Seker *et al*., 2005). Also, it is revealed that the increase on live weight increases the egg weight but the percentage of albumen, yolk and shell in other words, the egg construction is not changed (Altan *et al*., 1996; Cherry *et al*., 1978).

MATERIALS AND METHODS

This study is done in order to find the relationships between the live weight and some characteristics of interior and exterior quality of eggs. Total 75 quails are used as animal material in this study. The quails are sheltered in the cages throughout the study and a male and two female quails in equal weights were put to each cage compartment. Eggs are collected from the quails throughout 4 weeks and some characteristics like, the egg weight, shape index, specific gravity, shell thickness, albumen index, yolk index, yolk weight and albumen weight were measured. Egg weight: the eggs are weighed separately. Shell weight: the shell weight was stated after the eggs were broken; egg shells were rinsed

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and dried in the drying oven in 60°C for 8 h. Yolk weight (g): the egg yolk is weighed after the yolk is separated from the broken egg. The Albumen Weight was calculated by the equity of:

$$\text{Albumen weight (g)} = \text{Egg weight} - (\text{Shell weihgt} + \text{Yoke weight})$$

Albemen index and yoke index were calculated by the following formulas: albumen index (%): albumen height (mm)/average albumen length (mm) ×100, yolk index (g): yolk height (mm)/yolk caliber (mm) ×100. Shell thickness: the shell thickness of prickle, chump and equatorial area of each egg were measured and averaged. Shape index is calculated as the following equity:

$$\text{Shape index (\%)} = \text{Egg width} \times 100 / \text{Egg length}$$

The water and feed were supplied as *ad libitum* with nipple waterer. A 0.01 g sensitivity electronic scale was used to weight yolk and egg shell. In order to state, egg width and height, yolk caliber, albumen length, albumen width, a composing stick with 0.01 mm sensitivity was used. A table that has a glass and a tripod micrometer with 0.01 mm were used breaking the egg and calculating yolk, egg shell thickness and albumen height. Throughout the experiment, the quails were sheltered in a room with 20-25°C temperature, SAS Packaged Software (SAS, 1998) were used to analyze the data. Comparing the differences among the means Duncan's multiple range test was used.

RESULTS AND DISCUSSION

The means related to egg characteristics in the selected quail lines are shown in the Table 1. The test results indicated that in the quails chosen on live weight the egg weight increases in relation to the increasing bird weight. The differences among the averages on egg weight were significant ($p<0.001$). The lightest and heaviest eggs were obtained from the first group by 11.14 g and the fifth group by 12.84 g, respectively. The differences among the means of groups were not significant in terms of specific weight, albumen index and yolk index. The average and standard deviations of the groups examined in terms of shape index for Groups 1-5 were found as 77.34±0.58, 81.12±0.56, 76.41±0.58, 77.35±0.85 and 78.50±0.58%, respectively, the averages among the groups were significant ($p<0.001$). In terms of albumen weight, the averages and standard deviations of the group for Groups 1-5 were determined to be 6.35±0.17, 6.65±0.16, 7.13±0.17, 7.43±0.173 and 7.44±0.170 g, respectively. It is observed that the more live weight increases, the more albumen weight increases. The differences among the means of the groups averages in terms of albumen weight were significant ($p<0.001$). When the means of the groups were examined in terms of yolk weight, it could be seen that the difference among the means were significant ($p<0.001$) and the means for Groups 1-5 were as 3.86±0.09, 4.416±0.089, 4.13±0.09, 4.54±0.09 and 4.53±0.09 g, respectively. The means of shell thickness for Groups 1-5 were observed as the following 235.26±1.27, 241.90±1.24, 240.00±1.27, 238.05±1.31 and 237.23±1.27 μm. The difference among the groups in terms of shell thickness and shell weight were found significant ($p<0.05$).

This study was done in order to figure out between the live weight and the characteristis of interior and exterior quality of eggs. In this study, the average egg weights were found lower than that of Orhan obtained and higher than that of Ipek, Turkmut and Ozcelik reported in their study. It is indicated that the reason why the egg weight is different among groups is that the amount of albumen and yolk in the the eggs of the heavy breeders are heavier.

The albumen index in this study revealed to be superior than that of Sogut and Sari (2009) and Seker *et al.* (2005) and yolk index calculated as higher than that of Seker *et al.* (2005) but lower than that of Sogut and Sari (2009) stated in their studies. In terms of shape index of the group averages, in this study was similar as Altan *et al.* (1996) and he was higher than results of Seker *et al.* (2005) and lower than Turkmut. The results of this study in terms of shell thickness were agree to finding of Seker *et al.* (2005).

Table 1: The averages related egg characteristics in the quail lines selected on live weight

	Groups $(\bar{X} + S_{\bar{X}})$					
Characteristics	1	2	3	4	5	p-value
Egg weight (g)	11.140±0.140^{c}	11.870±0.140^{b}	12.100±0.140^{b}	12.540±0.150^{a}	12.840±0.140^{a}	***
Specific weight (g)	1.072±0.110^{a}	1.074±0.110^{a}	1.072±0.110^{a}	1.072±0.110^{a}	1.074±0.110^{a}	-
Albumen weight (g)	6.350±0.170^{b}	6.650±0.160^{b}	7.130±0.170^{a}	7.430±0.173^{a}	7.440±0.170^{a}	***
Yolk weight (g)	3.860±0.090^{c}	4.416±0.089^{b}	4.130±0.090^{cb}	4.540±0.090^{a}	4.530±0.090^{a}	***
Shell weight (g)	762.890±12.36^{c}	805.000±12.04^{b}	831.050±2.360^{b}	900.270±12.70^{a}	873.150±12.36^{a}	*
Shell thickness (μm)	235.260±1.270^{c}	241.900±1.240^{a}	240.000±1.270^{ab}	238.050±1.310^{bc}	237.230±1.270^{bc}	*
Shape index (%)	77.340±0.580^{bc}	81.120±0.560^{a}	76.410±0.580^{c}	77.350±0.850^{bc}	78.500±0.580^{b}	***
Albumen index (%)	9.200±0.240^{a}	9.320±0.230^{a}	9.250±0.240^{a}	9.150±0.250^{a}	9.310±0.240^{a}	-
Yolk index (%)	45.310±0.670^{b}	47.440±0.660^{a}	47.400±0.670^{a}	47.750±0.690^{a}	47.760±0.670^{a}	***

There are differences among the averages indicated in the same line by different letters; *: $p<0.05$; ***: $p<0.001$

The averages of the groups in terms of shell weight were are respectively determined as the following: 762.89±12.36, 805.00±12.04, 831.05±2.36, 900.27±12.70and 873.15±12.36 g for Groups 1-5, respectively.

CONCLUSION

This study shows that when the effect of live weight on the interior and exterior quality characteristics of egg in the Japan quails selected, the egg weight, yolk weight, albumen weight and shape index increased by increasing breeder weight. However, albumen index, yolk index, specific weight and shell quality were not affected by increasing live weight. It is concluded in this research that when the effect of live weight on the interior and exterior quality characteristics of egg in the Japan quails selected, the egg weight, yolk weight, albumen weight and shape index increased by increasing live weight. However, albumen index, yolk index, specific weight and shell quality were not affected by increasing live weight.

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