

Araştırma Makalesi

EFFECTS OF HATCHING EGG WEIGHT ON HATCHING CHICK  
WEIGHT, POSTHATCHING GROWTH PERFORMANCE AND LIVEABILITY  
IN JAPANESE QUAILS (*Coturnix coturnix japonica*)

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Geliş Tarihi : 04.08.2004

Kabul Tarihi : 13.01.2005

Japon Bildiricilerinde (*Coturnix Coturnix Japonica*) Kuluçkalık Yumurta Ağırlığının Çıkış  
Ağırlığı, Büyüme Performansı ve Yaşama Gücüne Etkisi

**Özet:** Bu çalışma, Japon bildiricilerinde kuluçkalık yumurta ağırlığının civciv çıkış ağırlığı, kuluçka sonrası büyüme performansı ve yaşama gücüne olan etkisini ortaya koymak için yapılmıştır. Araştırmada üç farklı yumurta ağırlık grubundan (hafif: <10 g, orta ağır: 10-12 g, ağır: >12 g) elde edilen 228 adet bildiricinin civcivi kullanılmıştır. Araştırma 6 hafta sürdürülmüştür. Civciv çıkış ağırlığı, canlı ağırlık, yem tüketimi ve yaşama gücü gibi parametreler incelenmiştir. Civciv çıkış ağırlığı gruplarında sırası ile  $7.3 \pm 0.08$  g,  $8.3 \pm 0.03$  g ve  $9.3 \pm 0.06$  g olarak, üçüncü ve altıncı haftalarda ortalama canlı ağırlık gruplarında sırası ile  $93.3 \pm 1.22$  g,  $88.4 \pm 0.88$  g,  $97.9 \pm 1.05$  g ve  $183.2 \pm 3.34$  g,  $178.2 \pm 1.99$  g,  $181.6 \pm 3.23$  g olarak saptanmıştır. Kuluçkalık yumurta ağırlığının büyümeye olan etkisi 6. hafta dışında istatistiksel olarak önemli bulunmuştur. Hayvan başına toplam yem tüketimi (0-42 gün) gruplarında sırası ile 701.36 g, 641.37 g ve 685.56 g olarak belirlenmiştir.

**Anahtar Kelimeler:** Japon bildiricisi, yumurta ağırlığı, çıkış ağırlığı, büyüme

**Summary:** The purpose of this study was to investigate the effect of hatching egg weight on the hatching chick weight, posthatching growth performance and liveability in Japanese quails (*Coturnix coturnix japonica*). A total of 228 quail chicks that hatched from three different egg weight groups (light: <10 g; medium: 10-12 g; heavy: >12 g) were used in the experiment. The study was carried out for six weeks. Parameters such as hatching and body weight, feed consumption and liveability of the chicks were investigated. The average hatching chick weights were  $7.3 \pm 0.08$  g,  $8.3 \pm 0.03$  g and  $9.3 \pm 0.06$  g in the light, medium and heavy egg weight groups, respectively. The average live weights in the light, medium and heavy egg weight groups at the 3<sup>rd</sup> and 6<sup>th</sup> weeks were  $93.3 \pm 1.22$  g,  $88.4 \pm 0.88$  g,  $97.9 \pm 1.05$  g and  $183.2 \pm 3.34$  g,  $178.2 \pm 1.99$  g,  $181.6 \pm 3.23$  g, respectively. The posthatching growth performance was significantly affected by the hatching egg weight except the 6<sup>th</sup> week. Averages of total (0-6 weeks) feed consumption per quail

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were 701.36 g, 641.37 g and 685.56 g in the light, medium and heavy hatching egg weight groups, respectively.

**Key Words:** Japanese quail, egg and hatching weight, growth performance

## Introduction

Quail is an animal both used as a laboratory animal in experimental studies and a farm animal for egg and meat production. Success in hatchery is necessary for the duration in production and some reproductive requirements in poultry. There are lots of factors affecting on hatching process and posthatching growth performance in quails and one of them is weight of hatching egg (2). The rate of hatching weight to the hatching egg weight was 62-72 % in chickens, 60-70 % in turkeys and 66 % in quails (8, 13). Many authors reported that there was a positive correlation between hatching weight and hatching egg weight (4, 15, 17, 18, 20). Average egg weight commonly ranged between 7-15 g in Japanese quails (16). In another study, it was reported that average egg weight in Japanese quails was 10.3 g (12). Additionally, the egg weight was varied at different periods in quails. The average egg weight in quails reported as follows, 9.39-11.19 g (10.41 g) at the age of 8-24<sup>th</sup> weeks, by Nazlıgöl et al. (9); 10.9-12.19 g (11.49 g) at the age of 7-20<sup>th</sup> weeks, by Altınel et al. (3) and 11.25-12.95 g at the age of 7-22<sup>nd</sup> weeks by Yannokopoulos and Tserveni-Gousi (19). Vatansever (16) reported that the average daily feed consumption during 1-6 weeks period was 3.29, 8.43, 12.43, 14.86, 18.43 and 19.0 g, respectively. It was reported that to get the best hatching performance, the hatching eggs should be in the optimum weight limits (2, 11, 16). Because, posthatching performance and liveability were directly bound to the hatching egg weights. Tserveni-Gousi (15) and Shanawany (13) reported that the hatching weight had a great effect on the posthatching liveability. On the other hand, Yıldırım and Yetişir (20) mentioned that hatching weight had no effect on liveability in the long term. As related to hatching weight, it was reported that heavy chicks had more liveability than the lighter ones because of more feeding storage in the egg (14). The light and heavy chicks could reach to the optimum weights and show compensative growth if they were fed by enriched feeding material (1, 5).

This study was conducted to reveal the effect of hatching egg weight on some production traits such as average live weight, feed consumption and liveability in the first six weeks in quails.

## Materials and Methods

The material of this study was obtained from the quail parent stock in the Poultry Unit of Faculty of Veterinary Medicine, University of Adnan Menderes. Eggs from quails at the age of 13 weeks were stored for one week in optimum conditions (n= 316). After numbering, all eggs were weighed with a balance sensitive to 0.01 g. Eggs were divided into three groups according to their weights (light group: < 10 g, medium group: 10-12 g, heavy group: > 12 g). Grouped eggs were then taken to the incubator (light

group n= 50, medium group n= 207, heavy group n= 59). To determine the hatching weight, quail chicks were weighed individually and placed in the brooder by groups for two weeks. Then quails were transferred to the group cage system. Dimensions of each section of the cage battery were 40X20X20 cm and 7-8 quails were placed in each section. In order to calculate the average live weight, all quails were weighed individually at the beginning of each week. Broiler starter feed containing 23 % crude protein and 3060 kcal/kg metabolic energy and broiler finisher feed containing 22 % crude protein and 3060 kcal/kg metabolic energy were fed in the first two weeks and in the latter period, respectively. Feeding was applied to group basis and the remaining feed at the end of each week were weighed for calculation of total feed consumption. Fifteen quails died in the medium egg weight group at the third week of the study from a crush in two of the cage sections due to collapse of the cage floor. For that reason, statistical analysis had performed with this consideration. One way ANOVA test was used in comparison the live weight inside the egg weight groups. Significant differences between groups were determined by Duncan test. Chi-Square test was also used to compare the liveability in egg weight groups (6, 10).

## Results

The average hatching egg and chick weights by groups were given in Table 1.

**Table 1.** Average hatching egg and chick weights in groups

**Tablo 1.** Gruplarda ortalama kuluçkalık yumurta ve civciv çıkış ağırlıkları

Age (week)	Hatching egg weight groups						F
	n	Light $\bar{X} \pm S_x$	n	Medium $\bar{X} \pm S_x$	n	Heavy $\bar{X} \pm S_x$	
Hatching egg weight (g)	50	9.6 ± 0.05 <sup>c</sup>	207	11.2 ± 0.03 <sup>b</sup>	59	12.5 ± 0.04 <sup>a</sup>	986.5***
Hatching chick weight (g)	39	7.3 ± 0.08 <sup>c</sup>	148	8.3 ± 0.03 <sup>b</sup>	41	9.3 ± 0.06 <sup>a</sup>	303.6***

\*\*\*: P<0.001

a,b,c: Mean values within a row with no common superscript differ significantly (P<0.001).

The average hatching egg weights in the light, medium and heavy groups were found 9.6 g, 11.2 g and 12.5 g, respectively. The differences between these groups were found statistically significant (P<0.001). In accordance to the egg weights, the heaviest chicks were hatched from the heaviest egg weight group and the differences between groups were found statistically significant (P<0.001).

The average live weights in different weeks in groups were given in Table 2. The average live weight was found higher in the heavy group during the first 5 weeks than the light and medium groups. The lowest live weight was recorded in the medium group during 6 weeks. While the average live weights of the beginning, first, 3<sup>rd</sup> and 4<sup>th</sup> weeks ( $P<0.001$ ); 2<sup>nd</sup> week ( $P<0.01$ ) and 5<sup>th</sup> week ( $P<0.05$ ) were found statistically significant, no significance were recorded in the 6<sup>th</sup> week.

**Table 2.** Average live weights in egg weight groups (g)

**Tablo 2.** Yumurta ağırlık gruplarında ortalama canlı ağırlık değerleri (g)

Age (week)	Egg weight groups						F
	n	Light $\bar{X} \pm S_x$	N	Medium $\bar{X} \pm S_x$	n	Heavy $\bar{X} \pm S_x$	
Hatching chick weight	39	7.3 ± 0.08 <sup>c</sup>	148	8.3 ± 0.03 <sup>b</sup>	41	9.3 ± 0.06 <sup>a</sup>	303.6 ***
1	39	23.4 ± 0.54 <sup>h</sup>	148	23.2 ± 0.29 <sup>b</sup>	41	26.7 ± 0.43 <sup>a</sup>	18.69 ***
2	39	53.6 ± 0.96 <sup>h</sup>	144	52.6 ± 0.64 <sup>b</sup>	41	56.8 ± 0.82 <sup>a</sup>	5.79 **
3	39	93.3 ± 1.22 <sup>h</sup>	143	88.4 ± 0.88 <sup>c</sup>	41	97.9 ± 1.05 <sup>a</sup>	18.28 ***
4	39	126.5 ± 1.42 <sup>h</sup>	128	124.9 ± 0.99 <sup>b</sup>	41	135.9 ± 2.41 <sup>a</sup>	39.97 ***
5	39	155.3 ± 1.79 <sup>ab</sup>	126	152.2 ± 1.14 <sup>b</sup>	41	157.7 ± 1.53 <sup>a</sup>	3.51 *
6	39	183.2 ± 3.34	123	178.2 ± 1.99	41	181.6 ± 3.23	0.95 -

-: Non significant \* :  $P<0.05$  \*\* :  $P<0.01$  \*\*\* :  $P<0.001$

a, b, c: Mean values within a row with no common superscript differ significantly

The daily feed consumption per quail by weeks in groups was given in Table 3. The daily feed consumption was calculated slightly higher in the heavy and light groups than the medium group during the study except the second week.

**Table 3.** Feed consumption in egg weight groups (g/quail/day)**Tablo 3.** Yumurta ağırlık gruplarında yem tüketim miktarları (g/bıldırcın/gün)

Age (week)	Egg weight groups					
	n	Light	N	Medium	n	Heavy
1	39	4.86	148	3.93	41	5.31
2	39	9.29	144	9.63	41	10.48
3	39	17.30	143	13.02	41	16.73
4	39	19.90	128	18.21	41	18.93
5	39	23.33	126	21.68	41	22.29
6	39	25.51	123	25.14	41	24.19
0-6 weeks	39	701.36	148	641.37	41	685.56

The liveability values in different weeks in groups were given in Table 4. While there was no dead reckoning in the light group, one quail had died in the heavy group in the 4<sup>th</sup> week. Liveability of egg weight groups on the week basis have shown no statistically significance, while liveability was significantly ( $P<0.05$ ) affected by the hatching egg weight in 0-6 weeks period.

Table 4. Liveability values in egg weight groups (%)

Tablo 4. Yumurta ağırlık gruplarında yaşama gücü değerleri (%)

Age (week)	Egg weight groups									X <sup>2</sup>
	Light			Medium			Heavy			
	n	Dead (birds)	%	N	Dead (birds)	%	n	Dead (birds)	%	
1	39	-	100.0	148	4	97.3	41	-	100.0	2.20 -
2	39	-	100.0	144	1	99.3	41	-	100.0	0.56 -
3	39	-	100.0	143	-	100.0	41	-	100.0	--
4	39	-	100.0	128	2	98.4	41	-	100.0	1.26 -
5	39	-	100.0	126	3	97.6	41	-	100.0	1.93 -
6	39	-	100.0	123	6	95.1	41	1	97.6	2.27 -
0-6 weeks	39	-	100.0 <sup>a</sup>	148	16	89.2 <sup>b</sup>	41	1	97.6 <sup>a</sup>	7.05*

-: Non significant

\*: P&lt;0.05

a, b: Mean values within a row with no common superscript differ significantly

## Discussion

The weights of the eggs collected for hatching showed similarity to the results of other studies (3, 9, 16, 19). The differences between group means for hatching weight were found statistically significant ( $P<0.001$ ). The results of the heaviest chicks that had been hatched from the heaviest eggs were found parallel to the other studies. Some researchers reported that hatching weight was affected by hatching egg weight (4, 13, 15, 17, 18, 20). The average live weight was found heavier in the heavy group than the other groups at the beginning and during the first five weeks (13, 15, 20). The highest live weight was recorded in the light group at the end of the study. In other words, the light group had reached to the heavy group in six weeks. In general, the differences between groups showed statistical significance except 6<sup>th</sup> week (Table 2). The light group showed the best growing performance especially in the latter weeks of the study. This could be explained by compensative growth and this was also parallel to the results of other studies (8). Deeming (5) notified that chicks could be reached to the normal levels from smaller and bigger eggs with intensive care. Many researchers reported that weak but healthy chicks could reach to normal levels with compensative growth (1).

Daily feed consumption had shown similar results to the study that reported by Vatansever (16). It was found high in the 1<sup>st</sup> and 2<sup>nd</sup> weeks both in the heavy and light groups. High feed consumption in the heavy group in the first two weeks could be

explained with higher live weight and higher daily live weight gain. In the other weeks, a little increase was determined in the light group because of high growth rate.

In general (0-6 weeks), the liveability was found statistically significant ( $P<0.05$ ). High liveability in the light group was not similar to the other studies (7, 14, 20). Skewes et al. (14) reported that high liveability could probably be possible due to more egg storage. In another study, it was claimed that small eggs caused weak and small chicks (7).

Consequently, it was determined that hatching chick weight was affected by hatching egg weight. For that reason, posthatching growing performance was indirectly affected by hatching egg weight. On the other hand, it was determined that quails with light hatching weight could compensate this situation with high growing rate. The liveability was affected by hatching egg weight. Finally, it was thought that small eggs could be used for hatching.

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40 Ahmet NAZLIGÜL Mehmet Kenan TÜRKYILMAZ Hüsnü Erbay BARDAKÇIOĞLU

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