Short Communication

Effect of hatch weight on performance of Japanese Quails (Coturnix coturnix japonica) during growth and egg production period

Einfluss des Schlupfgewichtes auf die Wachstums- und Legeleistung von Japanischen Wachteln (Coturnix coturnix japonica)

A. Ipek, U. Sahan and B. Yilmaz


Introduction

Numerous studies have been carried out on quails concerning improvement in live weight and egg production. Some of these studies have emphasized the importance of environment and others on the importance of genetical structure (KOÇAK et al., 1995).

The ratio of chick weight to egg weight does not result in an increase directly proportional to increased egg weight (SHANAWANY, 1987). It was concluded in a study on Japanese quails that egg weight did not affect hatch weight (ALTAN et al., 1995).

ULUOCAK et al. (1995) reported an average live weight of Japanese quails at the end of the 6th week in the groups separated according to hatch weights, as 157.3 g, 165.2 g and 173.7 g. and emphasized that the group with the highest hatch weight exhibited a significant difference in live weight compared with the other groups in all weeks. It was reported that quails reached sexual maturity earlier and their rate of lay and weight of the first ten eggs increased as the live weight on the 38th day of live increased (KOÇAK et al., 1995). ARITÜRK et al. (1980) reported a significant positive correlation between live weights in the 3rd and 6th weeks and between live weight and egg weight in quails kept under different environmental conditions.

It is important to know to which extent hatch weight is contributing to increased productivity in Japanese quails. Therefore, this research was carried out with the objective to investigating the effects of chick hatch weight on growth and egg production in Japanese quails. The results are expected to be helpful for quail breeders and to contribute to scientific knowledge on quails.

Material and Methods

A total of 700 eggs were collected from quails at the age of 15 weeks and were stored at 16–18 °C and 65–75% RH for 3 days. Eggs were incubated in a Cimuka-A1 incubator at a temperature of 37.5 °C and 65% RH for 15 days. The eggs were turned 45° every hour. Eggs were transferred to a hatcher (cimuka-A2) maintained at 37.0 °C and 70% RH until hatching (17th day of incubation). The chicks that hatched on the same day were weighed on a digital balance with 0.01 g precision and the range of their hatch weights were found between 5.5 g and 7.8 g. Therefore, according to hatch weights chicks were separated into 3 weight groups, all chicks were wing banded individually. Chick hatch weights in groups consisting of 120 chicks were determined as 5.5–6.2 g, 6.3–7.0 g and 7.1–7.8 g for the 1st, 2nd and 3rd groups, respectively.

The chicks were put into pens with a floor area of 90 × 48 cm, whose temperatures could be adjusted by a thermostat during growth period (for 5 weeks). In the growth period, chicks were placed at 33 °C for the first week and then temperature was gradually decreased at a rate of 3 °C per week until 20–21 °C were reached in the 5th week. The quails were allocated to pens at random depending on chick weight groups, 30 quails (mixing males and females) in each pen, and the experiment was carried out in 4 replicates. After hatching, the groups were subjected to continuous lighting for 24 hours a day for the first two weeks. The lighting period was gradually reduced to 12 hours a day between the weeks 2 and 4. This sheme of 12 hours lighting was kept constant between the weeks 4 and 8. After the 8th week, the lighting period was gradually increased to 17 hours. The environmental conditions were the same for all groups. During the growth period the chicks in the groups were weighed individually weekly and increases in live weight were recorded; the weightings were done with 0.01 g precision. The groups were given feed in the morning and in the evening, after weighing.

Table 1. Composition and nutritive value of diets

<table>
<thead>
<tr>
<th>Diet composition (%)</th>
<th>Broiler Starter diet 0–5 wks</th>
<th>Layer diet 6–24 wks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dry matter</td>
<td>100.00</td>
<td>100.00</td>
</tr>
<tr>
<td>Organic matters</td>
<td>93.47</td>
<td>91.20</td>
</tr>
<tr>
<td>Crude protein</td>
<td>23.08</td>
<td>18.05</td>
</tr>
<tr>
<td>Ether extract</td>
<td>7.15</td>
<td>5.13</td>
</tr>
<tr>
<td>Crude fibre</td>
<td>8.87</td>
<td>12.40</td>
</tr>
<tr>
<td>Crude ash</td>
<td>6.51</td>
<td>8.75</td>
</tr>
<tr>
<td>Free Nitrogen extract</td>
<td>54.47</td>
<td>46.97</td>
</tr>
<tr>
<td>M.E. (kcal/kg)</td>
<td>3050</td>
<td>2700</td>
</tr>
</tbody>
</table>
The recorded live weight values of the chick hatch weight groups are given in Table 2, the mean increases in live weight are presented in Table 3. The effects of hatch weight on live weight and weight gain were determined to be lowest in the 1st group and the highest live weight was observed in the 3rd group.

Table 2. Mean live weights (g) during rearing (mean ± SEM) Lebendgewichte (g) während der Aufzucht (Mittelwert ± SEM)

<table>
<thead>
<tr>
<th>Live weights groups</th>
<th>1st Day</th>
<th>7th Day</th>
<th>14th Day</th>
<th>21st Day</th>
<th>28th Day</th>
<th>35th Day</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.8c ± 0.21</td>
<td>20.7a ± 0.78</td>
<td>60.8bc ± 1.81</td>
<td>86.8c ± 2.13</td>
<td>127.5c ± 2.01</td>
<td>151.2c ± 4.18</td>
</tr>
<tr>
<td>2</td>
<td>6.8b ± 0.33</td>
<td>24.7b ± 0.93</td>
<td>63.5b ± 1.90</td>
<td>94.0b ± 2.98</td>
<td>134.6b ± 3.13</td>
<td>165.1b ± 4.63</td>
</tr>
<tr>
<td>3</td>
<td>7.4a ± 0.51</td>
<td>27.9a ± 0.93</td>
<td>68.8a ± 1.95</td>
<td>99.8a ± 3.75</td>
<td>140.3a ± 3.38</td>
<td>172.8a ± 5.82</td>
</tr>
</tbody>
</table>

a,b,c: Values within columns with no common letter differ significantly P < 0.05

Results

The age at 5% lay and sexual maturity weight values of the experimental groups are given in Table 5. The differences determined between the experimental groups with respect to the age at 5% lay and sexual maturity weight were found to be significant (P < 0.01).

The rate of lay and egg weight values of the experimental groups are given in Table 6. The differences determined between the experimental groups with regard to these parameters, beginning from the 8th week to the 24th week, were found to be significant (P < 0.05). The highest rate of lay and mean egg weight values were determined in the quails with higher hatch weight (3rd group) in all weeks.

Discussion

At the end of the experiment, it was determined that live weight and weight gain increased and feed conversion was
improved with increasing hatch weight in Japanese quails. MARKS (1975) reported significant correlations between hatch weight and live weights on the 14th and 28th day of live in Japanese quails. LASKEY and EDENS (1985) investigated the growth rates after hatching by classifying the Japanese quails depending on hatch weights and reported that the chick hatch weight had a significant effect on live weight on day 68. DEATON et al. (1979) determined in their study that hatch weight had critical effect on live weights of commercial chicken layers at the 12th and 18th weeks. The results of these researchers support the findings obtained from the present research. The effect of chick hatch weight on mortality ratio was found to be insignificant.

The age at 5% lay which is a determinant of egg production in quails was evaluated as the age when the first egg was laid. Age at first egg is of importance since it indicates the sexual maturity age. It was observed that the age at 5% lay preceded and sexual maturity weight increased with increasing hatch weight. NAZLIGÜL et al. (2001) determined the age when the first egg was laid in dual purpose type quails amounted as 43rd day. This result is higher than those obtained from the 2nd and the 3rd groups in the present research, but lower than in the 1st group. TESTIK et al. (1993) determined the sexual maturity age as the 48th and the 49th days in German bred quails and as 60.05 days in quails from France. KOÇAK et al. (1995) determined this age as 58 days. The age at 5% lay obtained from the research was earlier compared with the results of these researchers.

The highest rate of lay and average egg weight values were obtained from the quails with higher hatch weight in the 3rd group in all weeks. The rate of lay values determined in Japanese quails for different ages and periods based on hen-day were 71.8–77.2% for a 90 day egg production period (ARITORK et al., 1980), 90.2% for 5–28 weeks of age (GERKEN et al. 1988) and 87.5–96.0% for 8–24 weeks of age (VILCHEZ et al., 1991). DARDEN and MARKS (1988) reported the average rate of lay between generations 1 and 11 as 71.1% and 75.5% for the light and heavy lines, respectively. NESTOR and BACON (1982) stated that both light and heavy lines had rate of lay values inferior to the control line, while PRAHARAJ et al. (1990) reported that the heavy line at 16 weeks of age gave 3.8 less eggs than the control line. MARKS (1991) reported that the heavy line had a rate of lay of 74.4% and the light line of 71.3% between generations 12 and 20. KOÇAK et al. (1995) determined the rate of lay in quails as 84.0% in 25 week-period, whereas JONDA (1977) determined this value as 245 eggs annually. The rate of lay value found as a result of the research is similar to the values given in the references with the exception of minute differences in positive and negative directions, considering the annual period. It was reported that there was a high level of genetic correlation between live weight and egg weight in female avians, the eggs of heavy individuals being heavier (LEESON et al., 1991; ALTAN and OĞUZ, 1996; ALTAN et al., 1998; TÜRKMUT et al., 1999). The results obtained in the study related to egg weight are similar to these reports.

As a result, hatch weight was found to be a significant factor on performance of Japanese quails during growth and egg laying period. Therefore, more detailed breeding studies aimed at improving hatch weight will increase productivity in Japanese quails.

Summary

Japanese Quails were separated into 3 weight groups depending on hatching weight (1st group 5.5–6.2 g, 2nd group 6.3–7.0 g and 3rd group 7.1–7.8 g). The effect of hatching weight on mean live weight, weight gain, feed consumption and feed conversion during the rearing period was found significant (P < 0.05). The effect of hatching weight on mortality was not significant. Females in each group were placed in cages at the end of the rearing period (5th week). The effect of hatching weight on age and weight at sexual maturity was found to be significant (P < 0.01).

Mean age of females at sexual maturity was found as 43.6, 42.0 and 41.6 days in the 1st, 2nd and 3rd groups, respectively. Sexual maturity weight of females was found as 181.4 ± 5.12, 194.7 ± 5.68 and 203.4 ± 6.94 g, respectively. The highest rate of lay and mean egg weights were obtained with the highest hatch weight group.

Keywords

Japanese quail, hatch weight, body weight, rate of lay
Zusammenfassung

Einfluss des Schlupfgewichtes auf die Wachstums- und Legeleistung von Japanischen Wachteln (Coturnix coturnix japonica)

Japanische Wachteln wurden anhand ihres Schlupfgewichtes in drei Gewichtsgruppen eingeteilt (Gruppe 1 5,5–6,2 g, Gruppe 2 6,3–7,0 g, Gruppe 3 7,1–7,8 g). Während der Aufzuchttage zeigte sich, dass das Schlupfgewicht einen signifikanten Einfluss auf das Lebendgewicht, den Zuwachs und den Futterverbrauch hatte. Die weiblichen Tiere wurden im Anschluss an die Aufzuchttage (5 Wochen) in Legekäfige umgesetzt. Es wurde festgestellt, dass das Schlupfgewicht die Legeleistung von Japanischen Wachteln setzte. Es wurde festgestellt, dass das Schlupfgewicht das Alter beeinflusste, während die Mortalität nicht beeinflusst wurde. Die weiblichen Tiere wurden im Anschluss an die Aufzuchttage (5 Wochen) in Legekäfige umgesetzt. Es wurde festgestellt, dass das Schlupfgewicht das Alter und das Gewicht bei Erreichen der Geschlechtsreife signifikant beeinflusste ($P < 0,01$). Das durchschnittliche Alter bei Erreichen der Geschlechtsreife betrug 43,6, 44,1 und 44,7 Tage in den Gruppen 1, 2 und 3, das Lebendgewicht 181,4, 194,7 und 203,4 g, die höchste Legeleistung in der Gruppe mit den höchsten Schlupfgewichten ermittelt.

Stichworte

Japanische Wachtel, Schlupfgewicht, Lebendgewicht, Legeleistung

References


