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The Effects of Parent Age, Egg Weight, Storage Length and Temperature on Fertility and Hatchability of Japanese Quail (*Coturnix coturnix japonica*) Eggs

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Abstract: This study was carried out to investigate the effects of egg weight, storage temperature of hatching eggs, parent age and storage length during preincubation period on fertility and hatchability traits in Japanese quail. Totally 5015 eggs data obtained from Japanese quail, in factorial design trial (2×2×4×10), was analysed by General Linear Method (GLM) by using 4 way analysis of variance (10-11 and 14-15°C egg storage temperature, 3 and 6 months of parent age; <10, 10-11, 11-12, >12 g egg weights and 0-9 days egg storage length factors). Inspecting GLM results, differences among fertility averages was statistically significant for egg weight ($p = 0.0001$), egg storage temperature ($p = 0.007$) and storage length ($p = 0.018$) factors and was not statistically significant for parent age factor. Differences among hatchability averages was statistically significant for egg weight ($p = 0.005$), egg storage temperature ($p = 0.0001$) and was not statistically significant for storage length and parent age factors.

Key words: Parent age, egg weight, storage length, hatchability, quail, fertility

INTRODUCTION

Japanese quail are one of the poultry species, which are recently reared for egg and meat production in many countries.

In some investigations, hatchability percentages were 73.97-76.18% (Insko *et al*., 1971), 71.30-78.10% (Vilchez *et al*., 1991), 51.1-67.6% (Kumar *et al*., 1990), 70-90% and 45-70% (Woodard and Abplanalp, 1971) in quails with eggs weighing above 9 g. Insko *et al*. (1971) reported that hatchability percentages were 3.70, 29.28 and 40% in eggs obtained from quails with 8 months old in production and weighing 6.01-6.5, 8.1-8.5 and 10.6-11 g, respectively.

Wilson *et al*. (1961), Woodard and Abplanalp (1971), Kumar *et al*. (1990), Vilchez *et al*. (1991), Altan *et al*. (1995), Ozdemir and Poyraz (2000), Kirmizibayrak and Altinel (2001) and Esen and Ozcelik (2002) studied on fertility in Japanese quail.

This study was carried out to investigate the effects of egg weight, storage temperature of hatching eggs, parent age and storage length during preincubation period on fertility and hatchability traits in Japanese quail.

MATERIALS AND METHODS

Totally 5015 eggs data obtained from 2 Japanese quail stock having 90 male and 180 female quail of 3 and 6 months of age were used. Breeder quails, 2 female and 1 male, used in the present experiment were randomly assigned to laying cage compartments in size of 20×30×35 cm. Quails were fed diet consisting 20% crude protein and 2800 kcal kg^{-1} metabolisable energy. Quails were provided 15 h day^{-1} light during experiment.

Eggs obtained from breeder dams during 10 days were weighed and divided into 4 weight group such as <10, 10-11, 11-12 and >12 g. Placing into treatment groups, eggs marked according to treatment were set into incubator and following hatching process, eggs from which chick does not hatch were broken for determining fertility means of the groups. In computing hatchability averages, only chicks hatching alive were used.

Data, in factorial design trial (2×2×4×10), was analysed by General Linear Method (GLM) by using four way analysis of variance (10-11 and 14-15°C egg storage temperature, 3 and 6 months of parent age; <10, 10-11, 11-12 and >12 g egg weights and 0-9 days egg storage

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length factors). Data were subjected to arcsin transformation prior to statistical analysis. Following statistical model was used in the experiment:

$$Y_{ijklm} = \mu + a_i + b_j + c_k + d_l + e_{ijklm}$$

μ = General mean of population
a_i = Effect of egg weight treatment
b_j = Effect of parent age
c_k = Effect of egg storage temperature
d_l = Effect of egg storage length
e_{ijklm} = Error

Significance level of groups was determined using Tukey's Honestly significant difference test. Minitab 12.1 (1998) Programme was used in statistical analysis.

RESULTS AND DISCUSSION

Influence of egg storage temperature, egg weight, parent age and egg storage length on percentages of hatchability are shown in Table 1. Fertility (%) and hatchability (%) means and standart errors of treatments were presented in Table 2.

Although, any statistically significant effect of age treatment on fertility was observed; influence of the egg weight ($p = 0.0001$), egg storage temperature ($p = 0.007$) and egg storage length ($p = 0.018$) treatment on fertility was statistically significant.

Fertility was highest in eggs of >12 g and lowest in eggs of <10 g ($p<0.05$). This result is contrast to the findings of Esen and Ozcelik (2002), who reported that there was not significant effect of egg weight on fertility. In the present study, fertility results of eggs of <10 g and >11 g agrees with those reported by Altan *et al.* (1995).

Although, Kirmizibayrak and Altinel (2001) reported 88% fertility average in quails of 70-170 days old, it was found as 81.88% at the present study. Fertility values were found as 79.21 and 84.55% in 10-11 and 14-15°C egg storage temperature, respectively. The lowest, 70.81 and highest, 86.31%, fertilities were found in the groups of 0 and 2 days egg storage length, respectively. Fertility means obtained from present study were higher than that of reported by Insko *et al.* (1971) and Flunker *et al.* (1991), but lower than results reported by Blohowiak *et al.* (1984). On the contrary of present study, Kirmizibayrak and Altinel (2001) stated that there was significant difference among fertility averages in groups of quail of various age. It can be suggested that main reason for the contradiction may be due to use of quails of lower numbered age interval. In the present study, fertility average of eggs obtained from quails of 6 months of age corroborate research findings by Kumar *et al.* (1990), but found to be lower than fertility values ranging from 95.7-96.7% reported by Vilchez *et al.* (1991).

The highest and lowest hatchability values were determined in groups of >12 and <10 g egg weight. Hatchability values were determined as 65.96 and 78.04% in 10-11 and 14-15°C egg storage temperature, respectively. Hatchability value, 72%, obtained from present study was similar to research by Woodard and Abplanalp (1967) and Esen and Ozcelik (2002), was lower than those reported by Insko *et al.* (1971), Kirmizibayrak and Altinel (2001) and was higher than those reported by Altan *et al.* (1995) and Ozdemir and Poyraz (2000). Differences among hatchability results may have been resulted from variations in parent age and feeding conditions, egg storage conditions and related environmental conditions.

In the present study, nonsignificant difference between 71.11 and 72.89% hatchability values in eggs obtained from breeders of 3 and 6 months age is in contrast to result reported by Woodard and Abplanalp (1967) and Esen and Ozcelik (2002). On the contrary of the result suggesting that deviation from average egg weight

Table 1: Influence of egg storage temperature, egg weight, parent age and egg storage length on percentages of hatchability

	Parent age (month)															
	3				6				3				6			
Egg storage length (day)	n = 106 <10	n = 382 10-11	n = 361 11-12	n = 240 >12	n = 78 <10	n = 208 10-11	n = 529 11-12	n = 503 >12	n = 276 <10	n = 466 10-11	n = 374 11-12	n = 111 >12	n = 149 <10	n = 480 10-11	n = 497 11-12	n = 255 >12
0	58	73	63	87	87	50	75	81	58	65	57	57	0	82	80	65
1	42	72	64	72	33	74	82	80	73	84	68	64	67	54	80	78
2	100	70	62	63	60	59	86	74	79	84	77	83	100	88	88	71
3	60	59	55	57	73	71	75	71	78	84	71	87	63	79	76	77
4	40	51	65	84	43	76	70	82	97	80	89	73	60	91	88	79
5	44	56	50	84	80	68	57	79	87	92	87	100	71	75	83	68
6	42	44	71	90	63	64	65	73	78	81	96	89	76	71	87	83
7	27	58	74	76	71	76	73	76	86	88	76	88	81	81	80	65
8	50	54	60	83	78	65	64	61	86	92	82	67	91	77	81	86
9	44	54	64	53	63	84	67	73	83	89	80	79	55	84	79	89
Total	54	59	63	75	68	69	71	75	82	84	80	80	75	79	82	76

Table 2: Fertility (%) and hatchability (%) means and standart errors of treatments (x±Sx)

	Traits (x±Sx)	
Treatment	Hatchability	Fertility
Egg weight (g)		
<10	65.67±0.17b	73.28±0.15b
10-11	72.48±0.17ab	84.07±0.15a
11-12	73.68±0.17a	83.15±0.15a
>12	76.18±0.17a	87.02±0.15a
Parent age (month)		
3	71.11±0.12	82.01±0.10
6	72.89±0.12	81.75±0.10
Egg storage temperature (°C)		
10-11	65.96±0.12b	79.21±0.10b
14-15	78.04±0.12a	84.55±0.10a
Egg storage length (day)		
0	64.88±0.27	70.81±0.24b
1	67.94±0.27	76.62±0.24ab
2	77.75±0.27	86.31±0.24a
3	71.00±0.27	84.31±0.24ab
4	73.00±0.27	82.62±0.24ab
5	73.81±0.27	83.19±0.24ab
6	73.31±0.27	82.62±0.24ab
7	73.50±0.27	84.44±0.24a
8	73.56±0.27	85.50±0.24a
9	71.25±0.27	82.37±0.24ab

a,b: means within a column with different superscript are different ($p<0.05$)

resulted in a decrease in hatchability (Kirmizibayrak and Altinel, 2001), in the present study a positive correlation between egg weight and hatchability value was determined. The lowest, 64.88 and highest, 77.75%, hatchabilies were found in the groups of 0 and 2 days egg storage length, respectively.

CONCLUSION

Taking into consideration 4 factors together, it was determined that overall 72% hatchability mean was mostly influenced negatively by 0 day egg storage length, -7.13% and positively by 10-11°C egg storage temperature, 6.04%.

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