

Research Article

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# The effect of parental age and egg weight on fertility, hatchability and day-old chick weight of Japanese quail (*Cortunix cortunix japonica*)

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## Abstract

The study was carried out to determine the effects of the parental age and egg weight of Japanese quail on the weight of one day old chick, fertility and hatchability of incubated eggs. Three hundred and sixty Japanese quail eggs were obtained from 22 and 36 weeks old quails. The eggs were weighed and grouped into 2 categories: Light (7.5-9.5g) and Heavy (9.6 – 12g). The weight of the chicks were recorded, percent fertility and hatchability were also calculated. The data was analyzed with SAS (2003) and means were separated with Duncan's Multiple Range Test. The parental age was found to have a significant effect on hatchability and fertility of incubated eggs ( $P<0.001$ ) and the effect of egg weight groups on the weight of day - old chick was found to be significant ( $P<0.05$ ). Results obtained from this study reveal that the parental age of quail had a significant effect on the egg weight, fertility and hatchability of incubated eggs. It was also observed that with increasing egg weight, chick weight increased.

**Keywords:** Japanese quail, Egg weight, Chick weight, Fertility, Hatchability

## INTRODUCTION

The Economic Commission for Africa reported in their online reports stated that there is a high demand for animal protein in Africa but animal production falls short of this demand. Presently, an average Nigerian consumes less than 10g of the required 35g of animal protein per day compared to 50g of animal protein consumed by an average individual in the United State of America (Dione, 2007). Therefore, there is need to develop new strategies aimed at increasing animal production and consequently animal protein supply.

One way of increasing protein supply will however be to diversify poultry production to include species with short generation intervals such as quails (NVRI, 1994; Reddish *et al*, 2003; Kayang *et al*, 2004). *Cortunix cortunix japonica* is farmed worldwide for its meat and egg and its economic importance has grown greatly (Baumgartner, 1994). Compared to all other poultry species however, quail meat and egg is a very good source of animal protein that is very low in fat and cholesterol which makes it the choice of people suffering from high blood pressure (Rogerio, 2009).

As for other poultry production, one of the main prerequisites for efficient and profitable quail breeding is to produce fertile eggs and to obtain the highest hatchability in these eggs. In quails, the production of fertile eggs is affected by many factors related to both parents and the environment.

The influence of the age of male quails on fertility rates has been demonstrated in previous researches by Sexton *et al* (1989) and Erensayin (2002). Studies have shown that age and body weight of the hen has considerable influence on both productive traits and reproductive of birds (Novo *et al*, 1997; Sahan and Ipek 2000; Elibol *et al*, 2002; Erensayin, 2002; Gallo *et al*, 2005). Senapati *et al*. (1996) reported positive correlation between egg weight and hatchability. A close correlation between egg weight and hatching weight in domestic birds has also been documented (Abiola, 1999). Given the high correlation between egg weight and final chick weight, the economic importance of egg weight is worthy of note (Wilson, 1991).

Furthermore, the age of a hen during reproduction can significantly influence embryo development and hatching growth (Yildirim and Yetisir, 1998; Seker *et al*, 2004). Williams (1994) studied the relationship between egg size and offspring quality in birds and he reported that egg weight typically affects chick weight more strongly than it affects hatching size in birds because the main effect of egg size lies in the mass of the residual yolk sac that the chick retains at hatching. Hatchability of incubated eggs has also been discovered to reduce as the age of birds increased (Elibol *et al*, 2002). Researchers have also reported increased embryo mortality in eggs of older laying hens compared to younger ones (Novo *et al*, 1997; Sahan and Ipek, 2000).

This research was carried out to determine the effects of parental age and egg weight of Japanese quails on one-day old chick weight, fertility and hatchability of incubated eggs.

## MATERIALS AND METHODS

The data used for this project were obtained from an experiment conducted at National Veterinary Research Institute (NVRI), Ikire, Osun state, Nigeria.

A total of 360 fertile eggs were collected from 2 groups of Japanese quails (*Cortunix japonica*) which were 22 weeks and 36 weeks old respectively. The first group (22 weeks old) comprised of 14 males and 45 females while the second group (36 weeks old) comprised of 12 males and 35 females. The quails were raised in deep litter and were fed with layer rations. Eggs were collected daily for 3 days and stored on a tray at room temperature. The eggs were weighed on the day of lay. These eggs were later grouped into 2 distinct categories based on their weight: Light (7.5-9.5g) and Heavy (9.6-12g).

The eggs were incubated in a commercial hatchery located in Ibadan, Oyo State, Nigeria. At the hatchery, the eggs were arranged according to their weight categories in the incubator crates. The eggs were placed in the incubator set at temperature of 37.7<sup>o</sup>C for the first 15 days and are turned around automatically every 6 hours of the day. The air conditioning, temperature and relative humidity were also adjusted automatically. On the 15<sup>th</sup> day, the fertile eggs were turned into the Hatcher set at temperature of 37.5<sup>o</sup>C and relative humidity of 77% for the next 3 days for hatching to take place (Salisbury, 1992). At the end of the incubation period, the eggs that were not hatched were cracked open to reveal their content and the chicks were weighed using an electronic scale with accuracy of 0.01g (Vali *et al.*, 2006).

% fertility, hatchability and % hatch were also calculated as follows.

(%) Fertility = (number of fertile eggs / total numbers eggs placed into incubator) x 100.

(%) Hatchability of fertile eggs = (number of fertile eggs hatched / number of fertilized eggs placed into incubator) x 100.

(%) Hatchability of incubated eggs = (number of eggs hatched / total number of egg placed into incubator) x 100.

Data were analyzed with SAS statistical package (SAS, 2003). Duncan Multiple Range Test was used to compare the means.

## RESULTS

As shown on Table 1, mean egg weights for 22 weeks old Japanese quails are 8.07g±0.06 and 10.20g ±0.05 for light and heavy egg weight category respectively and mean egg weights for 36 weeks old quails are 8.66g ±0.07 and 10.81g± 0.05 for light and heavy egg weight category respectively. There was a progressive increase in the weight of the egg weight as the age of the parent quails increases.

The means of day-old chicks are shown on Table 2. For 22 weeks old quail, the chicks weighed 6.91g ±0.05 and 7.20g± 0.07 from light and heavy egg weight categories respectively; and chicks from 36 weeks old quails weighed 7.14g ± 0.04 and 7.65g± 0.05 respectively for light and heavy eggs respectively.

The percentage fertility, hatchability and hatch are presented on Table 3. From 22 weeks old quail, the percent fertility were 95% and 94%, percent hatchability were 96.05% and 95.75% and percent hatch were 91.25% and 90% for light

**Table 1.** Egg Weight according to Parental ages

Parental ages	Egg weight group	Number of eggs	Egg weight (g) $\pm$ SE
22 weeks	1	80	8.07 $\pm$ 0.06***
	2	100	10.20 $\pm$ 0.05***
36 weeks	1	99	8.66 $\pm$ 0.07***
	2	81	10.81 $\pm$ 0.05***

Keys: \* = P<0.05, \*\* = P<0.01, \*\*\* = P<0.001, SE = Standard Error of Mean

**Table 2 .** Day – old Chick weight according to Parental ages and Egg Weight

Parental ages	Egg weight group	Number of eggs	Egg weight (g) $\pm$ SE
22 weeks	1	70	6.91 $\pm$ 0.05**
	2	90	7.20 $\pm$ 0.07**
36 weeks	1	70	7.14 $\pm$ 0.04**
	2	50	7.65 $\pm$ 0.05**

Keys: \* = P<0.05, \*\* = P<0.01, \*\*\* = P<0.001, SE = Standard Error of Mean

**Table 3.** Effects of parental age and egg weight on hatchability and fertility

Parental ages	Egg group	% Fertility	% Hatchability	% Hatch
22 weeks	1	95.00**	96.05*	91.25
	2	94.00**	95.74*	90.00
36 weeks	1	89.90**	78.65*	70.71
	2	92.59**	66.67*	61.73

Keys: \* = P<0.05, \*\* = P<0.01, \*\*\* = P<0.001

and heavy egg weight categories respectively. From 36 weeks old quails, the percent fertility were 89.90% and 92.59%, percent hatchability were 73.65% and 66.67% and percent hatch were 70.71% and 61.73%, respectively for light and heavy egg weight categories. The percent fertility and hatchability decreased as the parental age increases (from 22 weeks to 36 weeks).

## DISCUSSION

The study revealed that parental age and egg weight had a very significant effect on the chick weight ( $P < 0.001$ ). Very significant differences ( $P < 0.001$ ) were obtained in the chick weight among the egg weight groups involved in each parental age group indicating that the weight of the day-old chick increases significantly as a result of the increasing egg weight. This increase in chick size due to increasing egg weight is attributable to the fact that egg weight, yolk weight and albumen weight increase as the age increases in chickens while egg shell quality deteriorates as reported by (Hurnik *et al.*, 1997). This result is similar to the findings of Yildirim and Yetisir (1998); and Farooq *et al.* (2001) who researched the effects of the egg weight of Japanese quails on the chick weight and determined that egg weight groups of 11.0-11.9g, 12.0-12.9g and 13.0-13.9g gave chick weights of 6.98g, 7.56g and 8.39g respectively.

The reduction in hatchability due to increasing parental ages as revealed in the study may be due to certain internal and external characteristics of the egg such as egg weight and egg shell quality changed significantly by age which have been reported to have significant effect on the hatchability of fertile eggs (Roland, 1979; Altan *et al.*, 1995). This result obtained is consistent with the findings of researchers who observed that the hatchability of incubated eggs and hatchability of fertile eggs is higher in younger group compared with the older group (Sahan and Ipek, 2000; Erensayin, 2002).

Higher fertility and hatchability of fertile eggs was obtained in light weight group of 22 weeks old quail (95.05%) compared to those in the heavy weight group (94.00%) although these values were higher than the value obtained by Seeker *et al.* (2004). This report disagrees with the report of Sachdev *et al.* (1987) which found the fertility and the hatchability of fertile eggs of Japanese quails higher in heavy egg group (10.1-11.00) than the light egg group (7.01- 8.90g). These differences may be due to differences in the age group and egg weight of the quails used by researchers. Nonetheless, higher fertility was observed in the heavy weight category of 36 weeks old quail (92.59%) compared to that of the light weight category (89.90%).

## CONCLUSION

From the study, it was revealed that hatchability and chick weight have a close relationship with the weight of the egg. Parental age of Japanese quails had a significant effect on the weight of a day-old chick, the fertility and hatchability of fertile eggs. With respect to fertility and hatchability, 22 weeks old quails gave the best result when compared with 36 weeks old quails. Increasing weight of eggs due to increasing parental age resulted in increased weight of day old chick of Japanese quail.

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