NIGERIAN JOURNAL OF GENETICS

VOLUME 26, 2012

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EFFECT OF EGG WEIGHT ON HATCHABILITY AND GROWTH PERFORMANCE OF THE JAPANESE QUAIL IN NIGERIA

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ABSTRACT

An experiment to determine the effect of egg weight on hatchability, hatch weight and subsequent growth performance of Japanese quail was conducted. A total of 607 eggs collected over six days from an existing quail flock at the Animal Pavilion of the University of Ilorin were used for the experiment. Eggs were individually numbered, weighed and grouped into small (<7.6g), medium (7.6-9.4g) and large (>9.4g) egg sizes. Percent hatchability, mean hatch weight and subsequent weekly feedlot performance of chicks were determined. The results showed that average egg weights were 10.23±0.84g, 8.49±0.72g and 6.94±0.93g for the large, medium and small egg sizes, respectively. Fertility and hatchability were better in large eggs than in small eggs. Hatch weight was significantly influenced (P<0.05) by egg weight with the largest grade having the highest hatch weight (7.18g) and the smallest grade having the least hatch weight of 4.78g. Chicks from the small-sized eggs had the least feed intake and weight gain (13.04 and 2.60 g/bird/day, respectively), and the poorest FCR of 5.02. The results of this study showed that eggs lesser than 7.6g should not be set for incubation in quail hatchery units.

Key words: Egg weight, hatch weight and body weight.

INTRODUCTION

The influence of egg weight on fertility and hatchability of eggs of Japanese quail is well documented in Europe and Asia (Sachdev *et al.*, 1985; Narahari,1988; Wilson, 1991; Kalita, 1994; Seker *et al.* 2004), with higher fertility and hatchability occuring in large than in small eggs. Weight of hatchling quails has also been reported to be between 62-76% (Wilson, 1991; Murad *et al.* 2001; Khurshid *et al.*, 2004) of the weight of egg set while loss in egg weight during incubation was reported to be 21.4-23.3% (Murad *et al.*, 2001; Khurshid *et al.*, 2004). Other studies by Wilson (1991), Pinchasov (1991) and Petek *et al.* (2003) showed that egg weight influenced post-hatching chick weight.

Japanese quail was introduced to Nigeria about two decades ago. Its marked advantage over other poultry birds has increased its acceptability and the bird is now well adapted to the environment. The influence of egg weight on fertility, hatchability, weight of hatched chicks and subsequent bodyweight is well documented in the country for guinea fowl (Ayorinde *et al.*, 1994), local chicken (Sola-Ojo *et al.*, 2011) and broiler chicken (Abiola *et al.*, 2008). There is however paucity of record on influence of egg weight on fertility, hatchability, weight of hatched chicks and subsequent bodyweight of Japanese quail in the country. Available literature (Ojo *et al.*, 2011; Dudusola, 2010) showed that Japanese quails raised in Nigeria produced smaller-sized eggs compared with those raised in Europe and Asia. This calls for a separate egg grading categories for quail breeder flocks in Nigeria. This study was therefore aimed at determining the influence of egg weight on hatchability and post hatch performance of the Japanese quail. This will help in determining the weight range of eggs

needed for incubation and also provide information that could assist in genetic improvement of Japanese quail in Nigeria.

MATERIALS AND METHODS

A total of 607 Japanese quail eggs were collected over a period of seven days from an existing quail flock at the Animal Pavilion of the Department of Animal Production, University of Ilorin. The eggs were placed broad end up and stored under air conditioner to keep them below the physiological zero temperature until the day of incubation. The collected eggs were numbered and weighed singly using an electronic scale with the sensitivity of 0.01g. The average weight and standard deviation (σ) of the eggs were determined and the eggs then graded into large (>9.40g), medium (7.6-9.4g) and small (<7.6g) weight groups before incubation. The largest grade consisted of eggs having weight greater than 1σ above the average weight for the 607 eggs, while all eggs with weight lesser than 1σ below the average weight were tagged as small eggs. Eggs having weight that fell between the large and the small grades were tagged as medium eggs. After incubation, the newly hatched chicks were tagged and weighed. Unhatched eggs were cracked open and subjected to fertility test. Based on the obtained results, the fertility, hatchability of incubated eggs and the hatchability of fertile eggs were calculated for each of the egg grades as follows:

$$\% \text{ fertility} = \frac{\text{Number of fertilized eggs}}{\text{Total No. of eggs set}} \times 100,$$

$$\% \text{ hatchability of incubated eggs} = \frac{\text{No. hatched chicks} \times 100}{\text{Total number of eggs set}}$$

$$\% \text{ hatchability of fertile eggs} = \frac{\text{No. of hatched chicks}}{\text{Total No.of fertile eggs}} \times 100,$$

$$\% \text{ chick weight} = \frac{\text{Mean chick weight}}{\text{Mean weight of eggs set}} \times 100$$

Hatched chicks were reared in three separate electrically heated pens. Birds were fed diet containing 24% crude protein and 2700 Kcal Metabolizable energy (Table 1). Feed and water were provided *ad libitum* throughout the six-week experimental period. Weekly body weight, feed intake and weight gain were measured and recorded. The effect of egg weight on hatchability, hatch weight and weekly body weight of chicks were determined by one way ANOVA using the completely randomized design. Significant differences between means were separated using the Duncan Multiple Range Test. Statistical analysis was performed using the SPSS (SPSS, 1999).

RESULTS AND DISCUSSION

Table 1 shows the results of fertility, hatchability of incubated eggs and hatchability of fertile eggs. Percent fertility was 79.4, 73.5 and 65.9 for the large, medium and small egg weight group, respectively. Fertility was highest in the largest egg group (>9.4) and lowest in the smallest egg grade group (< 7.6). Seker *et al.* (2004) obtained fertility rates of 61.7, 58.8 and 78.8% in egg weights groups 9.5-10.5, 10.51-11.50 and 11.51-12.5 g, respectively. Alkan *et al.* (2008) reported low fertility rates of 46±0.02, 50±0.02, 46±0.02, 36 ±0.03 and 39±0.03% in egg weight groups <10.0, 10.1-11.0, 11.1-12.0, 12.1-13.0 and >13.1g, respectively. Higher fertility in this study can be attributed to the floor mating of

the breeding quails which ensured effective mating than cage rearing used in other studies. Hatchability of incubated eggs was 52.7, 48.7 and 19.4% in the large, medium and small egg weight group, respectively. Hatchability of incubated eggs increased as egg weight increased to 11.9g. The present study suggested that eggs ranging between 7.6 and 11.9g were best suited for incubation. Alkan *et al.* (2008) reported highest hatchability of incubated eggs in the egg weight group 10.1-11.0g, and the lowest in the egg weight group 12.1-13.0g and suggested that egg weights of 10.0-12.0g were best suited for incubation.

Seker *et al.* (2004) reported a lower hatchability for the different egg weight groups observed and concluded that egg quality and storage condition might have caused this difference. The hatchability percentages of fertile egg were 66.4, 66.3 and 29.4% for the large, medium and small egg weight groups, respectively. This result differs from those reported by Sachdev *et al.* (1985), Seker *et al.* (2004) and Alkan *et al.* (2008) who noted that the hatchability of fertile eggs was lower in heavy than in lighter quail eggs. Seker *et al.* (2004) recorded the hatchability of fertile eggs to be 75.2, 99.2 and 86.2% in egg weight groups of 9.5-10.5, 10.51-11.50 and 11.51-12.5g, respectively.

The highest hatchability of fertile eggs was found in the middle egg weight group, 10.51-11.50g. The differences in mean egg weight most suitable for hatchery operation between this study and the earlier reports of Sachdev *et al.* (1985), Seker *et al.* (2004) and Alkan *et al.* (2008) could be as a result of smaller egg sizes produced by Japanese quails raised in the tropics compared with their counterparts in the temperate regions. Thus the large egg group in this study can be categorized as a medium size when compared with weight of eggs in earlier studies carried out in Asian countries.

Table 2 shows the effect of egg weight on hatch weight of quail chicks. Hatch weight was significantly ($P< 0.05$) affected by the egg weight. The large egg grade had the highest hatch weight (7.18g) while the smallest egg grade had the least hatch weight (4.78g). Percent loss in egg weight was highest in the small grade (31.1%) and lowest in the large egg grade (29.8%). The ratios of chick weight to egg weight were 70.2, 69.6 and 68.9% for the large, medium and the small egg grades, respectively. The present work agrees with earlier submissions on the effect of egg size or weight on the hatch weight of quail chicks (Seker *et al.* 2004; Petek *et al.*, 2003). The weight of chick as a percentage of egg weight has been reported to be fairly constant across species, for instance, Ayorinde *et al.* (1994) reported a percentage of 72.42 in guinea fowl, while Murad *et al.* (2001) and Khurshid *et al.* (2004) found this proportion to be 67.3 and 68.2% in Fayoumi chicken and Japanese quails, respectively.

Table 3 shows the effect of egg weight on weekly body weight of Japanese quails. Small eggs produced smaller chicks (4.78g) which also had smaller body weight at 42 days of age (127.0g) compared with medium (141.08g) and large sized eggs (146.03g). Birds from large-sized eggs were about 19g bigger than birds from the small-sized eggs at six weeks of age. The present result supports the findings of Farooq *et al.* (2001) and Petek *et al.* (2003) that egg weight, hatch weight and subsequent chick growth are interrelated. The superiority of chicks from the large-sized eggs over those from the small and medium-sized eggs however decreased from 33.50% at hatching to 13.03%, and from 17.69% at hatching to 3.39% at six weeks of age due to compensatory growth of chicks from low and medium grade eggs. Body weight gain and feed conversion ratio were not significantly affected by egg grade, though the large and the medium sized grades had better feed conversion ratio. This corroborates the

findings of Tufft and Jenson (1991) and Petek *et al.* (2003) that feed conversion ratio was not significantly affected by egg weight. Alabi *et al.* (2012) however reported better feed conversion ratio in Potchefstroom koekoek chicks hatched from large sized eggs.

CONCLUSION

Egg weight significantly affected hatchability traits in the present study. Large and medium-sized eggs had better fertility, hatchability of fertile eggs, hatchability of incubated eggs and growth performance of hatched quail chicks compared with small-sized eggs. Thus for optimum hatchability and growth performance of quail chicks, small egg (<7.6g) should not be selected for incubation.

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Table 1: Hatchability characteristics in egg weight groups

Group of egg weight	Total no. of eggs incubated	No. of fertile eggs	No. of released chicks	Fertility (%)	Hatchability of incubated eggs (%)	Hatchability of fertile eggs (%)
Large	131	104	69	79.4	52.7	66.4
Medium	347	255	169	73.5	48.7	66.3
Small	129	85	25	65.9	19.4	29.4

Table 2: Effect of egg weight on chick weight

Group of egg weight	Egg weight (g) (means± S.E.)	Chick weight (g) (means±S.E)	Loss in egg weight %	Chick to egg weight ratio (%)
Large	10.23 ± 0.84^{a}	7.18 ± 0.70^{a}	29.8	70.2
Medium	8.49 ± 0.72^{b}	5.91 ± 0.56^{b}	30.4	69.6
Small	6.94 ± 0.43^{c}	4.78 ± 0.30^{c}	31.1	68.9

$^{a-c}$ means having different superscripts differ significant ($P<0.01$)

Table 3: Effect of egg weight group on weekly body weight of Japanese quails

Age (week)	Small (g)	Medium (g)	Large (g)	SEM
Hatch	4.78^{a}	5.91^{b}	7.18^{c}	0.17
1	15.48	16.62	18.09	0.80
2	37.03	38.58	45.20	9.53
3	66.19	68.65	68.87	2.17
4	90.60	97.36	100.25	2.17
5	114.58	127.14	127.48	2.79
6	127.0	141.08	146.03	3.53
F. I. (g/bird/day)	13.04	13.37	13.6	2.51
W. G. (g/bird/day)	2.60	2.87	2.91	0.52
F.C.R	5.02	4.66	4.70	3.41

F.I – Feed intake; W.G. – Weight gain; F.C.R. – Feed conversion ratio
a-c: means in the same column having different superscripts differ significantly ($P<0.05$).