Sjournals
Scientific Journal of Agricultural (2012) 1(1) 21-26

Contents lists available at Sjournals
Scientific Journal of Agricultural
Journal homepage: www.Sjournals.com

Original article

Effects of age on organ weight and carcass characteristics of Japanese quail (*Coturnix Japonica*)

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ARTICLE INFO

Article history:
Received 20 June 2012
Accepted 29 June 2012
Available online 30 June 2012

Keywords:
Age
Organ weight
Carcass
Japanese quail

ABSTRACT

The work was carried out to study the effect of age on organ weight and carcass characteristics of Japanese quails (*Coturnix japonica*). The birds were housed in deep litter pen at the poultry unit of University of Maiduguri Teaching and Research Farm. Both sexes were reared together and raised on the same feed using broiler starter marsh from 5-8 weeks of age then, layer mash from 8-52 weeks and the experiment lasted for a period of 52 weeks. Weight of birds, weight of carcass and weight various organs were recorded on weekly basis and these were continued on the birds at 6, 8, 10, 16, 20, 24, 30 and 52 weeks of ages respectively. All data collected were subjected to Analysis of Variance using GLM sub routine of SPSS 16.0 statistical package, and the means were separated using Duncan Multiple Range Test. Effect of age on carcass characteristics were significant ($p<0.05$) live weight at weeks 6 and 52 were 97.19g, 119.93g, 132.00g, 134.44g, 129.72g, 142.11g, 154.33g and 162.67g. Carcass weight were 67.60g, 86.57g, 93.42g, 92.35g, 89.82g, 96.98g, 104.14g and 119.54g and back weight were 24.42g, 30.10g, 28.40g, 31.52g, 29.24g, 33.12g, 36.99g and 51.90g respectively. The effects of age on different organ weights was significant ($P<0.05$) except gizzard weight which showed no significant difference ($P<0.05$) at all the ages. It was generally observed with different relative significance that organs and meat/carcass of the Japanese quail were correlated with age increase; it could be of advantage to both the producer and

the consumer of the birds to slaughter the birds at appropriate ages since there are relative organ/carcass developments to corresponding ages and/or interest. This will reduce economic losses to producers and results in enhanced quality products for consumers.

1. Introduction

Poultry production is of great importance more sepecially in developing country, as a primary supplier of meat, egg, and as a source of income because cost of keeping poultry is relatively low (Demeke, 2003). Japanese quail are small bodied birds of *Galliformes* family with scientific name *Coturnix japonica.* They have high potential for production because of their short generational interval such as their ability to produce 3 to 4 generations per year, adaptability to laboratory conditions and high genetic polymorphism (Kimura *et al*., 1980; Maeda *et al*., 1997; Kayang *et al.*, 2004).

Quail was introduced to Nigeria in 1992 by National Veterinary Research Institute (NVRI, VOM) (Haruna et al., 1997). The meat of quail is lean and both eggs and meat are low in cholesterol (Garwood and Diehl, 1987; Shwartz and Allen, 1981). Therefore rapid multiplication of these birds will make their meat and eggs readily available for human consumption with less risk of public health implication. Though evidences of works exist on: Performance and Carcass Characteristics of Japanese Quails Fed Diets Containing Wolffia Meal (*Wolffia Globosa*) as a Protein Replacement for Soya Bean Meal by Chantiratikul *et al*., (2010), Determination of Body Weight and Some Carcass Traits in Japanese Quails (*Coturnix coturnix japonica*) of Different Lines by Alkan *et al*., (2010), Comparison of Egg Weight Between Two Quail Strains by Vali *et al*., (2006), Growth, Feed Consumption and Carcass Composition of *Coturnix japonica, Coturnix ypilophorus* and their Reciprocal Crosses by Vali, (2009) and Carcass Studies of Japanese Quails (*Coturnix coturnix japonica*) Reared in Hot and Humid Climate of Eastern India by Banerjee, (2010). There are no works seen by the authors on the Effects of Age on Organ Weight and Carcass Characteristics of Japanese Quail. Many factors affect carcass characteristics, including age, sex, line, brooding temperature. The study was therefore conducted to evaluate the effect of age on some organs and carcass characteristics in Japanese quails of different ages.

2. Materials and methods

This research was conducted at the University of Maiduguri Livestock Teaching and Research Farm, Borno State, Nigeria. A total number of 200 birds (Japanese Quails comprising both male and females) were purchased at four weeks old from the National Veterinary Institute (NVRI) VOM in Jos, Plateau State, Nigeria. They were temporarily housed inside well ventilated cages and transported by road to the Livestock Teaching and Research Farm at the University of Maiduguri, where they were housed in deep litter pens equipped with feeding and watering troughs. The floor was covered with wood shaving. The birds were first fed on commercial broiler starter ration containing 24% CP and 32ME kcal/Kg which was later changed to layers marsh. Other management practices like sanitation and weekly weighing was conducted to obtain various weights at different ages.

Starting at week 6 of age and alternatively weeks 8, 10, 16, 20, 26, 30, and 52 respectively, a number of 12 birds (male and female) were selected and slaughtered from each of the alternating age groups where a total number of 96 birds were used. The birds were starved over night but water given *ad libitum.* Their weights were taken before slaughter to obtain the live weight, then later slaughtered by cutting the jugular vein and defeathered manually. They were eviscerated and the empty carcasses weighed using a sensitive balance to obtain the carcass weights. Wings were removed by cutting through the shoulder joint at the proximal end of the humerus. The whole breast portion was obtained by cutting through the ribs, thereby separating the breast portion from the back. The carcasses were divided into major parts such as the breast, thigh, back and their weights taken. Fat tissues were excavated from different parts of the body and their weights also measured. Similarly, various organs (liver, gizzards, testes, proventriculus and heart) were appropriately identified and dissected out and their weights measured using a weighing scale.

3. Statistical analysis

The data collected was subjected to analysis of variance using the statistical package SPSS 16.0 with age as fixed factor and significant means separated using Duncan Multiple Range Test.

4. Results and discussion

4.1. Effect of age on carcass characteristics

The effect of age on carcass traits were significant (P<0.005). Back weight at 6, 8, 10, 16, 20, 24, 30 and 52 weeks of age were significantly different (P<0.005) from each other with values of 24.42g, 30.10g, 28.40g, 31.52g, 29.24g, 33.12g, 36.99g and 51.90g respectively. Birds aged 52 weeks had the highest back weight value (51.90g) while those aged 6 weeks had the least value (24.42g), this shows that back weight increased with age. According to Moran (1977), many factors affect carcass characteristics, including age, sex, line, brooding temperature, however in this research the age was the factor considered.

The effect of age on bled weight was significant (P<0.005) though week 52 and 30, week 10 and 20 did not differ from each other. Birds aged 52 and 30 weeks had the highest values (149.72g and 154.88g) respectively, while the least values were for weeks 6 and 8 (81.08g and 112.44g) respectively. This agrees with the works of Ayansan *et al*., (2000), where they observed high slaughter weight in older birds between the ages of 14 and 42 days as (24.37g and 181.4g).

A significant difference (P<0.05) was observed for breast weight at different ages except for weeks 8 and 20 (26.95g and 26.60g) and weeks 10 and 16 (31.16g and 29.79g) which showed no significant difference (P<0.05) in the breast weight. This does not support Minvielle *et al*., (2000) who observed increase in weight of carcass trait at different ages (day 7, 16, 23, 25, 27 and 36) without increase in breast weight. Breast meat yield is most commonly defined as the proportion of breast meat relative to the weight of the processed carcass or the weight of the breast relative to slaughter weight. Breast is one of the primal cut of high economic value (Omojola *et al*., 2004) and in small sized bird like quail it constitutes a greater percent of the bird. There was significant difference (P<0.05) in carcass weight at all the ages except weeks 16 and 20 (92.35g and 89.82g). Similarly, Selim *et al*., (2006) observed differences among carcass weights at different (ages 14, 35 and 42) days of age. In the works conducted by Khaldari *et al*., (2011), they found out that carcass weight is highly correlated to breast weights which are also both related to the age of the bird, as seen in this study.

4.2. Effect of age on organ weight

Effect of age on live weight was significant (P<0.05), however, weeks 52 and 30 (162.67g and 154.33g) did not differ from each other but were significantly different from other ages. Weeks 52 and 30 had the highest mean values followed by weeks 24, 16, 10, 20 8, and 6 with these values of 162.67g, 154.33g, 142.11g, 134.44g, 132.00g, 129.72g, 119.93g and 97.19g respectively. Thus, as age increased, live weight also increased this is in agreement with the findings of Ibrahim *et al*., (2009) where they observed increased in weight at 14, 21, 28, 35 and 42 days as 61.62g, 102.39g, 136.60g, 160.10g and 183.93g respectively. According to a study conducted by Knizetova (1996), he concluded that live weight of quail at 4 weeks of age affected the relative growth rate and feed efficiency. However, generally there is a favorable correlation between growth and feed conversion ration because of enhanced pulsative growth hormone release (Buyes *et al.* 1999, Leclercq *et al.* 1989) and ultimately the live weight gain.

Thigh weight was significantly affected (P<0.05) by age of birds. Week 52 and 24 (21.87g and 21.77g) and weeks 10 and 16 (20.96g and 20.84g) did not differ from themselves but were significantly different from other ages. This is in agreement with th findings of Vali *et al*., (2005), where they observed differences in thigh weights at 35, 42, 49 and 63 days of age as 20.70g, 10.80g 27.83g and 34.80g respectively. Thus, this implied a general increase in the thigh weight with relative age increase.

The effect of age on organ weight was significant (P<0.05) except gizzard weight which showed no significant difference (P<0.05) at all the ages. Fat weight at 52 weeks was 11.09g while fat weight at 6 weeks was 0.21g, this shows that fat deposition increased with age increase.

Table 1

Least Square Means, Standard Error for the Effect of Age on Carcass Characteristics of Japanese quail (n=96).

Age (week)	Back Weight (g)	Bled Weight (g)	Breast Weight (g)	Carcass Weight (g)	Live weight (g)	Thigh Weight (g)
6	24.42 ± 1.58^{d}	81.08 ± 2.78^{e}	15.10±0.69^{d}	67.60±2.77^{e}	97.19±2.99^{e}	12.72±0.45^{e}
8	30.10±1.82^{e}	112.44±3.21^{d}	26.95±0.71^{c}	86.57±3.19^{d}	119.93±3.50^{d}	17.54±0.51^{d}
10	28.40±2.17^{ed}	126.53±3.83^{c}	31.16±0.94^{ab}	93.42±3.81^{bed}	132.00±4.12^{c}	20.96±0.61b^{c}
16	31.52±2.23^{bc}	127.33±3.93^{bc}	29.76±0.98^{ab}	92.35±3.92^{ed}	134.44±4.23^{bc}	20.84±0.63^{bc}
20	29.24±2.23^{cd}	124.94±3.93^{c}	26.60±0.98^{c}	89.82±3.92^{cd}	129.72±4.23^{cd}	19.72±0.63^{c}
26	33.12±2.23^{bc}	137.56±3.93^{b}	29.53±0.98^{b}	96.98±3.92^{bc}	142.11±4.23^{b}	21.77±0.63^{b}
30	36.99±2.23^{b}	149.72±3.93^{a}	32.47±0.99^{b}	104.14±3.92^{b}	154.33±4.23^{a}	23.80±0.63^{a}
52	51.90±1.93^{a}	154.88±3.40^{a}	28.79±0.86^{bc}	119.54±3.39^{a}	162.67±3.67^{a}	21.87±0.55^{b}

$^{a, b, c}$Means within columns with different superscript are significantly (P<0.05) different from other.

Table 2

Least Square Means± Standard Error for the Effect of Age on Organ Weight (n=96).

Age (week)	Fat weight (g)	Gizzard weight (g)	Heart weight (g)	Liver weight (g)	Proventriculus weight (g)	Testes weight (g)
6	0.21±0.63^{d}	3.95±0.11^{a}	0.56±0.003^{f}	3.44±0.13^{a}	0.56±0.02^{ed}	0.13±0.12^{d}
8	0.66±0.74^{d}	4.30±0.14^{a}	0.96±0.04^{cd}	2.56±0.15^{d}	0.49±0.03^{d}	0.33±0.12^{d}
10	1.99±0.96c^{d}	4.50±0.18^{a}	0.76±0.05^{e}	3.44±0.19^{a}	0.59±0.03^{bc}	1.40±0.15^{c}
16	1.90±0.99c^{d}	4.46±0.19^{a}	1.05±0.05^{bc}	2.93±0.20b^{ed}	0.59±0.04^{bc}	2.81±0.23^{b}
20	1.90±0.99c^{d}	4.76±0.19^{a}	0.89±0.05^{d}	2.77±0.20^{bc}	0.56±0.04^{cd}	2.72±0.19^{b}
26	3.24±0.99b^{c}	4.30±0.19^{a}	1.04±0.05^{bc}	3.05±0.20^{abc}	0.60±0.04^{abc}	2.92±0.19^{b}
30	4.60±0.99^{b}	3.82±0.19^{a}	1.19±0.05^{a}	3.27±0.20^{ab}	0.65±0.04^{ab}	3.11±0.19^{b}
52	11.09±0.81	4.37±0.15^{a}	1.10±0.04^{ab}	3.02±0.16^{abc}	0.68±0.02^{a}	3.64±0.14^{a}

$^{a, b, c}$ Means within columns with different superscript are significantly (P<0.05) different from other.

However, according to Pym (1990), improved feed conversion ratio to a certain body weight could be partially due to lower fat deposition of birds with higher growth rate.

Heart weight at different ages are significantly different (P<0.05), weeks 30 had the highest heart weight with the value of 1.19g while week 6 had the least heart weight with the value of 0.56g. This could be attributed to fact that as the birds are advancing in age, the body organs are also developing to conform to the general body growth pattern and the demands to be met by them in terms of anatomic and physiologic predisposition.

In this research, the highest liver weight was found at week 6 and 10 with the value 3.44g while the least liver weight was found at week 8 which indicated that liver weight differed significantly (P<0.05) from each other. Koong *et al.* (1985) and Bond, *et al.* (1989), reported that heavier values of organs probably indicate hypertrophy, though this assertion has not been proved in this work.

A significance (P<0.05) was discovered for proventriculus weight. Birds aged 52 weeks had a provetriculus weight of 0.68g while those aged 6 weeks had a value 0.56g. The effect of age on testes was not significantly different at all the ages except weeks 6 and 10; week 52 had the highest value of 3.64g, while week 6 had the least value. This agrees with the work of Selim *et al*., (2006), where they observed significant difference (P<0.05) of organ weights at different ages. They observed higher heart weight, liver weight, giblet weight and fat weight between 21-42 days of age and found 42 days to have higher organ weights than 21 days. This shows that the weight of organs correlates with age increment in the birds. The increases of organs weight of birds may be due to the increase of body weights of this group which in turn is directly related to the age increase of the birds.

5. Conclusion

Conclusively, Japanese quail, despite their small body size, have an important place in commercial production because of their high egg and meat production capacity. Many producers want to obtain heavier quails since small quails are not preferred by most consumers, which extend the rearing period. However, it has been confirmed that most of the weight increases are due to abdominal fat deposition when the optimal slaughtering age of the Japanese quail is exceeded (Toelle *et al*., 1991). Since it has been generally shown that organs and meat/carcass of the Japanese quail are correlated with age increase, it could be of advantage to both the producer and the consumer of the birds to slaughter the birds at appropriate ages since there are relative organ/carcass development relative to the intended age and interest. This will reduce economic losses to producers and results in enhanced quality products for consumers.

Acknowledgement

Thanks are due to Dr A. O. Raji of the Department of Animal Science, Faculty of Agriculture, University of Maiduguri, Maiduguri, Nigeria for the guidance in the course of this research work.

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