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SEXUAL DIMORPHISM ON BODY WEIGHT AND CARCASS CHARACTERISTICS OF JAPANESE QUAIL (*Coturnix coturnix japonica)*

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ABSTRACT

The effect of sex on carcass characteristics of Japanese quails was evaluated in this study. A total of 500 day-old chicks of 250 chicks per sex in 5 replicates were reared in a completely randomized design; and forth-nightly body weight was measured for nine weeks. One hundred chicks per sex were slaughtered for the evaluation of carcass characteristics. The carcass characteristics were live weight (LW), dressed weight (DW), eviscerated weight (EW), drumstick (DRS), breast (BRS) and thigh, back cut (BKC) and internal organs (Filled gizzard-FG, empty gizzard-EG, Liver, heart and Lungs) weights. All data collected were analysed using General Linear Model of SAS statistical software package version 9.2. The result showed that sex significantly ($p < 0.05$) affected body weight of Japanese quails at 3, 5, 7 and 9 weeks measured in this study. Females of Japanese quail had higher body weight than the male counterparts at all ages. The results showed that sex significantly ($p < 0.05$) influenced all carcass traits and internal organs except for wings measured. Female quails had significantly ($p < 0.05$) higher mean values for LW, DW, EW, DRS, BRS, thigh, FG, EG, liver and lungs while males were significantly ($p < 0.05$) higher in BKC and heart weights. Females of Japanese quails performed better in both body weight and carcass characteristics measured. Hence, female Japanese quails should be bred more by farmers for meat purpose and utilization by the populace to ameliorate the problem of animal protein shortage in developing countries.

Keywords: Japanese quail, Carcass characteristics, Sexual dimorphism, Internal organs

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INTRODUCTION

Quail farming in Nigeria can play a very important role in food security, health, wealth benefits and employment creation. Quails are like other poultry birds, but they are highly productive, strong and disease resistant than other birds (Kul and Seker, 2004). Usually, quails are reared for their eggs and meat. Since quail production is gaining attention and more patronage in Nigeria, due to the advantages associated with it as its meat is lean, and its eggs and meat are low in cholesterol (Gardward *et al*., 1987), more efforts are now geared towards its production as well as finding for it non-conventional alternative cheaper feed resources. It is no doubt one booming business that is gradually taking over chicken poultry business in most part of Northern Nigeria.

Quails have been raised all over the world for meat and egg production especially in countries of Europe for meat, and in Japan and America for egg production (Minvielle, 2004). In Brazil, the number of birds and egg production in the last few years has almost

doubled (IBGE*,* 2010). Thereby, it is necessary to meet the production needs and consequently to ensure the future of this activity.

The last few decades had seen a transition in poultry genetics from dual-purpose birds to those specialized in meat or eggs (Siegel *et al.,* 2006). However, studies on quails specialized for meat production are limited; most of studies reported are only concerned with body weight measured from hatch to the sixth week at slaughter, as reviewed by Vali (2008). Although several studies performed multi-trait analyses, these are restricted to two-trait analysis with an anchor trait (Varkoohi *et al.,*2011; El-Fiky *et et al*., 2006) or when using more than two traits simultaneously, performance and carcass traits were only used (Resende *et al.,* 2005; Vali *et al.,* 2005), but seldom with reproductive traits. However, the context of this study dwelt on the effect of sexual dimorphism on the body weight and carcass characteristics of Japanese quail.

MATERIALS AND METHODS

Experimental site: The experiment was conducted at the Quail Breeding Unit of the Teaching and Research Farm of the University of Uyo, Uyo of Akwa Ibom state, Nigeria. The farm is located in the coastal southern part of the country, lying between latitude 4^0 32'N and 5^0 33'N, and longitudes $7^0$25'E and $8^0$25E. The rainfall ranges from 800 – 3200 mm per annum which begins in March and continues till October. The topography is gentle slope with a sandy loam soil and a soil pH of 4.5 - 6.5 (Afangideh, 2006).

Management procedures: The experimental site was cleaned by washing with detergent, disinfected and fumigated two weeks before the arrival of the birds to avoid spread of diseases or incidence of pest attack on the experimental birds. A rearing unit containing hutch with 20 cells was constructed for the research. Beddings (wood shavings) were laid on the floor of each cell of the hutch. This served as a source of heat to the birds. Adequate sanitary measures were kept; wood shavings were changed twice a week. Feeding troughs, drinkers and other needed equipment for successful rearing of the quail birds were kept clean and also heat source was provided. The birds were kept under intensive system of management.

Procurement and management of experimental birds: One thousand *Coturnix coturnix japonica* eggs were purchased from National Veterinary Research Institute, Vom, Plateau State, Nigeria. The fertile eggs were sorted out and eight hundred and fifty (850) fertile eggs were incubated of which six hundred and forty (640) hatched. Five hundred (500), day-old chicks were selected, weighed and kept in the brooder for three weeks. Commercial feed (starter mash) and fresh water was given *ad libitum*. Body weights of these birds were measured forth-nightly till the 9^{th} week. At the 3^{rd} week post hatching, 500 sexed chicks were randomly selected and placed in five replicates, 250 birds per sex and were transferred to the grower pen made of wooden battery cage system (hutch) which comprises of four tiers of 20 cells of 62 x 80 x 56 cm^3 each, water and grower mash were fed to the birds from 4^{th} to 5^{th} week. Then layer mash was given to the birds from the $6^{th}$to 9^{th} week when the research was terminated. Feed and water were supplied *ad libitum.*

Medication and Vaccination: Glucose and vitamins were added to their drinking water on the first day to cushion the effect of stress due to long transportation. Medications were administered too to prevent diseases. They were also vaccinated against Newcastle disease and Infectious Bursal disease (Gumboro).

Table 1: Nutrient composition (%) of the diets given to Japanese quails

Composition	Starter Mash	Grower Mash	Layers Mash
Crude Protein	22.00	15.00	16.00
Fat	5.10	3.60	3.60
Crude Fibre	4.30	8.60	4.20
Calcium	1.20	1.10	4.20
Available Phosphorus	0.45	0.40	0.50
Methionine	0.56	0.37	0.45
Lysine	1.20	0.70	0.850
ME (Kcal/kg)	3000	2500	2650

Source: Vital feed (2019).

Data collection: Throughout the experimental period of nine weeks, body weight for the birds was taken forth-nightly using sensitive weighing balance. The birds were fasted for 24 hr and weighed to measure their live weights (for both sexes) before being slaughtered for carcass characteristics' determination. Two hundred mature quails of 100 males and 100 females were randomly selected from the experimental unit and slaughtered at the 9th week. Parameters measured were live weight, eviscerated weight, dressed weight, drumstick, breast, wings, back and shank weight and internal organs weight like the filled and empty gizzard weights, heart, lungs, liver which were all measured with the help of a sensitive weighing scale. Carcass weight was expressed as percentage of dressed weight while organs weight was expressed as percentage of the eviscerated weight.

Statistical analysis: Data for body weight and carcass measurements collected were analysed using General Linear Model (GLM) analysis of variance of SAS statistical software package (2010, v. 9. 2) and separation of means were done using Duncan Multiple Range test at 5% probability (Duncan, 1995).

Model: $\mathbf{Y_{ijk} = \mu + G_i + \Sigma_{ijk}}$

Where; Y_{ijk} = Observation of the i^{th} strain on the birds; μ = Overall mean; S_j= Effect of the i^{th}sex; Σ_{ijk}= Error due to individual observation

RESULTS AND DISCUSSION

The effects of sex on body weight of Japanese quails (*Coturnixcoturnix japonica*) are as shown in Table 2 below. The mean body weight for female Japanese quails at weeks 3, 5, 7 and 9 recorded were 48.20 ± 0.60, 102.81±0.75 g, 142.92±1.38 g, and 164.07±0.74g, respectively, while the males weighed 40.04 ± 0.61 g, 93.46 ± 0.69 g, 125.92 ± 1.31 g, 148.12 ± 0.90g respectively. Mean body weights for female Japanese quails were significantly ($p < 0.05$) heavier than what obtained for the male counterparts. This indicated that sex had a significant ($p < 0.05$) effect on the body weight at all ages, and which implies that more of female Japanese quails should be kept in production for meat purposes. This result was in support of the previous study by Bonos *et al*. (2010) and Minvielle *et al*. (2000) who reported higher body weight in females than in males. Similarly, this result is in agreement with the findings of some researchers (Seizai *et al.*, 2010; Caron *et al*., 1990; Yannakopoulos and Tserveni-Gousi, 1986) who observed genetic differences in body weight of quails and reported that the females are usually heavier than their male counterparts.

Table 2: Effects of sex on body weight of Japanese quails (*Coturnix coturnix japonica*) LSM±SE

Sex	N	Body weights per week			
		3rd Week	5th week	7th Week	9th Week
M	250	40.04±0.61[b]	93.46±0.69[b]	125.14±1.31[b]	148.12±0.90[b]
F	250	48.20±0.60[a]	102.81±0.75[a]	142.92±1.38[a]	164.07±0.74[a]

[a-b]Means in the same column with different superscript are significantly ($p < 0.05$) different.
M = Male; F = Female; N = Number of observations; BW = Body weight; LSM = Least Square Mean; SE = Standard error.

The Effects of sex on Carcass characteristics of Japanese quails (*Coturnix coturnix japonica*) is as shown in Table 3 below.

Female Japanese quails in this study were observed to weigh 164.17±4.02g, 138.59±3.10g, 107.51±3.82g, 5.66±0.18g, 8.43±0.31g, 26.52±1.09g and 4.87±0.18 g for live weight, dressed weight, eviscerated weight, drumsticks, thigh, breast cut and wing weights, respectively while the males had the mean values of 148.98±4.85g, 127.81±4.77g, 103.24±1.22g, 5.07±0.10g, 7.40±0.28g, 22.35±0.80g and 4.65±0.22g for the same parameters, respectively.

The Effects of sex on internal organs of Japanese quails (*Coturnix coturnix japonica*) is as shown in Table 4 below. The female Japanese quails had the mean values of 3.36±0.13g, 2.67±0.10g, 3.68±0.10 g, 0.52±0.23g and 0.87±0.04g for filled gizzard, empty gizzard, liver, lungs and heart, while males had the mean values of 2.87±0.05g, 2.43±0.05g, 2.14±0.06g, 0.41±0.03g and 0.96±0.05g for the same parameters, respectively. Female Japanese quails had higher mean values for all the carcass characteristics and internal organs weights which were significantly ($p < 0.05$) higher than what obtained for their male counterpart except for back cuts and heart weights at week 9th of the study. This indicated that sex significantly ($p < 0.05$) influenced all carcass characteristics and internal organs weights except for the wing weights. The result also revealed that gizzard for female quails were higher than those of male counterparts which agrees with the observation of Ozcelik *et al*. (1998) which found that female quails had heavier internal organs than the males. The male Japanese quails were also observed to show higher significant ($p < 0.05$) different in heart with the mean values of 0.96±0.05g compared to their female counterparts with the mean values of 0.87±0.04g for the same parameters. The results in live weight are in support of the study of Vali *et al*. (2005) which observed that the average weight of males before slaughtered were less in weight than those of the females. In considering dressed weight, the result is in agreement with the findings of Khaldari *et al*. (2010) which reported that female quail birds had higher values for dressed weight than those of the Males counterparts. The result for breast cut in this study agree with the report of Vali *et al*. (2005) and Alkan*et al*. (2010) who had similar observations that females were heavier in dressed weight than males. However, the result for breast disagrees with Aksit *et al*. (2003) and Genchev *et al*. (2008) which reported of the difference between both sexes in respect to breast cut not significant. However, the result of this study confirms the study of Caron *et al*. (1990) which indicated that females grow faster and yield larger muscles and more abdominal fat than the males of the same age. Meanwhile, the carcass of female quails produced higher meat percentage than those produced from males in this study, which is in line with the observation of Bonos *et al*. (2010) and Mousa

(1993) which reported that female carcasses were higher in meat percentage than the male carcasses.

Table 3: Effect of sex on carcass characteristics of Japanese quails (LSM±SE)

Sex	N	LW (g)	DW (g)	EW (g)	DRS (g)	Thigh (g)	WINGS (g)	BRC (g)	BKC (g)
F	100	164.17 ±4.02[a]	138.59 ±3.10[a]	107.51± 3.82[a]	5.66± 0.18[a]	8.43± 0.31[a]	4.87± 0.18[a]	26.52± 1.09[a]	17.89± 0.53[b]
M	100	148.98 ±4.85[b]	127.81 ±4.77[b]	103.24± 1.22[b]	5.07± 0.10[b]	7.40± 0.28[b]	4.65± 0.22[a]	22.35± 0.8[b]	20.54± 0.91[a]

[ab]Means with different superscripts within the same column are significantly ($p < 0.05$) different.
N = Number of observations; LW = Live weight; DW = Dressed weight; EW = Eviscerated weight; DRS = Drumstick; TH = Thigh; BRC = Breast cut; BKC = Back cut.

Table 4: Effect of sex on internal organs of Japanese quails (LSM±SE)

SEX	N	FG	EG	LUNGS	LIVER	Heart
Female	100	3.36±0.13[a]	2.67±0.10[a]	0.52±0.23[a]	3.68±0.10[a]	0.87±0.04[b]
Male	100	2.87±0.05[b]	2.43±0.05[b]	0.41±0.03[b]	2.14±0.06[b]	0.96±0.05[a]

[ab]Means with different superscripts within the same column are significantly ($p < 0.05$) different,
N = Number of observations; FG = Filled gizzard; EG = Empty gizzard.

CONCLUSIONS

- Sex significantly influenced body weight of Japanese quails at all ages measured. Female Japanese quail were heavier than the male quails.
- Sex significantly influenced all the carcass traits and the internal organs of Japanese quail except for the wing and heart weights. Female quails had significantly higher values for live, dressed, eviscerated, drumstick, breast cut and thigh weights; and internal organs weights like filled and empty gizzards, liver and lungs than male counterparts.

RECOMMENDATION

- Farmers should be encouraged to rear female Japanese quails for meat production as this could assist in ameliorating the problem of inadequate animal proteins intake by the populace.

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