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Effects of Housing and Sex on Growth Performance of Coturnix Quails in the Derived Savannah Zone of Nigeria

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Abstract

This study focused on the effect of housing and sex on the growth traits of coturnix quails. A total number of 200 day-old mixed sexes quail chicks were procured for the study. The birds were separated into deep litter and cage from 3rd week of age. Sex separation was also carried out at the same time. The experiment lasted for 8 weeks and the growth traits measured on weekly basis were body weight, wing length, thigh length and breast girth. Analyzed data showed that female quails had significantly ($P<0.01$) superior growth rates than males across the two housing systems, that is, the former recorded higher mean values in body weight and other linear body parameters than the latter. The former also had broader breast, longer thigh and wing. These attributes could be employed in distinguishing between sexes during any breeding and selection programmes. In addition, the findings of this work reveal the superiority of cage system over that of deep litter in all the production traits evaluated. There were higher mean values in body weight of cage birds when compared with those on deep litter. It was observed that all the birds irrespective of their sexes grew in size with advancing age, although the rate of growth decreased from 7th week onwards. For increased quail meat production and regular supply of animal proteins for human consumption, female quails should be reared in large quantities and cage system of rearing should be adopted.

Keywords

Coturnix Quail, Sex, Cage, Deep Litter, Chick

1. Introduction

Japanese quails are reared for egg and meat production (Cain and Cawley, 2000). They are robust, disease resistant, easy to maintain with less space and equipment requirements (Tikk and Tikk, 1993). Live body weight is a qualitative trait, controlled by few pairs of genes, highly heritable and influenced also by the environment. Previous investigators had posited that differences in growth pattern are under genetic control, and that variations exist within species (Lilja et al., 1985; Carborg et al., 2003). Determination of conformation traits in chickens such as shank length, thigh length, breast girth and body length are important for any breeding programme to be meaningful and successful. According to Ibe (1989), some of these conformation traits are good indicators of body weight and market value in chickens, and by extension all domestic animals.

Quail farming though is in its infancy in this country is fast gaining acceptability among skilled and unskilled workers. The improvement in this sub-sector will no doubt lead to increase in animal proteins supply and consumption and enhances the wellbeing of the people in addition to promoting national growth and development. There is a strong evidence that there are genetic differences in growth rate between strains or breed of chickens (Deep and Lamont, 2002; Rondelli et al., 2003) and differences between sexes on some performance traits such as body weight, growth rate, feed intake and feed conversion ratio (Balogun et al., 1997; Ajayi and Ejiofor, 2009). Body weight according to Chambers (1990) is the most frequently used indicator of growth. Previous studies also indicated significant differences in body weight and weight gain at different ages of chickens (Leeson et al., 1997; Taha et al., 2010). Effect of sex on body weight of quails was studied by some workers and they both found that females of Japanese quails were heavier than males (Saatci et al., 2006; Alkan et al., 2010). Altinel and Cerit (1998) similarly observed higher live

weight in females than males of Japanese quails at 6 weeks of age.

In broiler chickens, previous studies (Shahin and Elazim, 2005) also observed significant sex effect on live weight and carcass traits (Wiseman and Lewise, 1998; Shahin and Elazim, 2005; Ojedapo et al., 2008). In the same vein, Amin (2009) observed significant differences between sexes in body weight at different ages of turkeys. The purpose of the present investigation was to evaluate the growth traits of coturnix quails as affected by sex and housing system in the Derived Savannah zone of Nigeria. The objectives of this study include:

a. determination of housing environment most conducive for rearing

b. evaluation of sex effect on growth parameters.

2. Materials and Methods

The study was carried out at the Animal Breeding Unit, Teaching and Research Farm, Ekiti State University, Ado-Ekiti, between August, 2013 and November, 2013. Ado-Ekiti is situated along latitude 7°31' and 7°49' North of the Equator and longitude 5°71' and 5°27' East of the Greenwich Meridian.The city falls under Derived Savannah zone. The city enjoys two separate seasonal periods namely, Rainy (May-October) and Dry (November-April) seasons.

2.1. Management and Experimental Birds

A total number of 200 day-old quails of mixed sexes were sourced from local hatcheries and used for this study. The chicks were brooded using coal pot to supply heat for the first three weeks of life. Antibiotics and vitamins were administered as and when due. Their beddings are made up of dry wood shavings to prevent coccidiosis outbreak and high level of hygiene was maintained throughout the experimental period to ensure unhindered conducive environment for growth and to lower death rate.

At exactly three weeks old, the chicks were separated into sexes (male/female) and into two housing systems, that is, cage and deep litter. The sex was determined correctly by plumage colouration at 21 days of age. Males were identified by those having rusty brown throat and breast feathers, and cloaca gland, a bulbous structure on the upper edge of the vent that secretes a white, foamy material. Females on the other hand were identified by those having light tan feathers with black speckling on the throat and upper breast. The birds were raised under same nutritional status, uniform management and environmental conditions. They were of the same age and were given chicks mash from 1st day-6th week containing 21% CP and 3000 Kcal/kg ME. Thereafter, they were switched over to layers mash containing 16% CP and 2600 Kcal/kg ME to the end of the 10th week when the study was terminated.

2.2. Data Collection

The birds were weighed at week three (3) at the time they were separated into sexes and housing systems and subsequently at one week interval up to 10 weeks of age. Thirty (30) birds per sex and per housing were taken at random for weighing with a top loading scale in grammes after being starved overnight from the pens each time the exercise was carried out. Other linear measurements taken using tape rules in centimeters were wing length, thigh length and breast girth.

2.3. Statistical Analysis

Data collected were subjected to analysis of variance and the differences between means for sex and housing were separated using Duncan New Multiple Range Test as per SAS [2001].

The appropriate statistical model used is:

$$Y_{ijk} = \mu + S_j + H_i + \mathcal{E}_{ijk}$$

Y_{ijk}= observation of the kth population, of the jth sex and ith house

μ= common mean

S_j= fixed effect of jth sex (j=2)

H_i = fixed effect of ith house (i=2)

ε_{ijk}= random error

3. Results and Discussion

In general, the growth curve of experimental quails was sigmoid. The rate of increase in body weight was faster during early ages, that is, 3rd-7th week of age, but declined towards the end of the experimental period. This finding agrees with the observation of Osei-Amponsah and Kayang (2012) who worked with domestic chickens.

3.1. Effect of Housing

3.1.1. Body Weight (g)

In the present study (Table 1), body weight of quail birds differed (P<0.01) significantly between the two housing systems. Birds in the cage system had a higher mean values in body weight than those on deep litter from week 3 to 8 regardless of quails' sex. However, the weight difference was non-significant between the two housing systems from 9th week of age. The possible reason for this difference was due to the fact that birds in the cage were not as free like their mates on the floor; they were able to utilize feeds given optimally and converted same into more meat than the floor birds. This was why the cage birds produced better and higher mean values in body weight during the experimental period.

3.1.2. Wing Length (cm)

Wing length in this study (Table 1) also differed (P<0.01) significantly between the two housing systems. Birds in the cage had superior mean values in terms of wing length than those on deep litter. This could also be due to restriction of movement applied to the former resulting to increased muscle growth and development of the wing region. It

appears cage system positively influenced body size and length of the wing and this can be taken into consideration when researchers and farmers are seeking for means of improving the quality and quantity of quail meat production.

3.1.3. Thigh Length (cm)

In the present study (Table 1), significant (P<0.01) differences were observed between the two housing systems in thigh length. In this case, deep litter birds had superior mean values than cage birds, that is, the former had longer thigh than the latter. This could be as a result of larger space provided for deep litter birds to walk around, roost and fly a short distance within the small pen provided.

Table 1. *Least square means showing the effect of house on growth traits at various ages of Coturnix quails.*

Traits	House	Ages							
		3	4	5	6	7	8	9	10
BW	Cage	70.20[a]	96.02[a]	116.85[a]	132.55[a]	140.28[a]	143.20[a]	138.15	143.98
	Floor	55.23[b]	78.33[b]	90.52[b]	106.40[b]	124.60[b]	141.73[b]	141.73	144.68
	SE	1.49	1.61	1.39	1.94	1.67	1.53	1.48	1.42
WL	Cage	7.91[a]	8.63	9.37	9.92[a]	9.50	9.71	9.89	10.00
	Floor	7.48[b]	8.88	9.22	9.28[b]	9.54	9.68	9.94	10.08
	SE	0.09	0.09	0.07	0.09	0.06	0.06	0.07	0.06
TL	Cage	3.76[b]	4.58[b]	5.05[b]	6.60	5.70	6.03[a]	5.82[a]	5.93[a]
	Floor	4.13[a]	4.74[a]	5.29[a]	5.58	5.76	5.75[b]	5.70[b]	5.54[b]
	SE	0.04	0.05	0.05	0.04	0.04	0.05	0.04	0.04
BG	Cage	5.55[b]	6.20[b]	7.03[b]	7.98[b]	9.06[b]	10.18[a]	10.14[a]	10.24
	Floor	6.16[a]	7.73[a]	8.52[a]	9.06[a]	9.64[a]	9.63[b]	9.98[b]	10.22
	SE	0.08	0.08	0.10	0.07	0.07	0.13	0.05	0.06

ab: means with different superscripts along columns are significantly different (P<0.01)
BW=body weight (g) WL=wing length (cm) TL=thigh length (cm) BG=breast girth (cm)

3.1.4. Breast Girth (cm)

There was significant (P<0.01) difference between cage and deep litter in this production trait (Table 1). Similar to what was obtained for thigh length, deep litter birds had higher mean values than their mates in the cage. This implies that the former had broader breast probably due to increased activity of the muscles of that region as a result of constant movement within the pen and frequent flight to explore their surroundings. In the event that developing a broad-breasted quail is the breeding goal, deep litter system should be considered for such a research study.

3.2. Effect of Sex

3.2.1. Body Weight (g)

The effect of sex on body weight is presented in Table 2. During the eight weeks of the experimentation, there were significant (P<0.01) differences in body weight between the sexes regardless of the housing system adopted. Females had higher mean values than their male counterparts. Similar results were observed in previous studies by Bonos et al. (2010) who reported higher body weight in females than male quails. The findings of this study were also in agreement with those of earlier researchers (Yannakopoulos and Tserveni-Gousi, 1986) who found genetic differences in body weight and that females are usually heavier than the males. Sezer et al. (2006) posited that unlike other poultry species, coturnix quail is a sexually dimorphic bird with females having a larger body size than males. Growth trends in both sexes depicted linear increase in body weights; however, the rate of increase in body weights was higher in females as compared to males, thereby indicating clear sexual dimorphism. Sexual dimorphism was said to have been evolved under the pressure of natural and sexual selection, and this implies that genes controlling sexually dimorphic characteristics differ between males and females (Midnon-Grasteau et al., 2004).

3.2.2. Wing Length (cm)

In the present study (Table 2), wing length between sexes was not significantly (P>0.05) different between weeks 3-8. However, from 9th week to the end of the experiment, females appeared to have longer wing than the males. This might probably be as a result of genetic differences that exist between the two sexes.

3.2.3. Thigh Length (cm)

There were also significant (P<0.01) sex differences in the length of thigh of coturnix quails (Table 2). Females consistently recorded higher mean values than the males in this study. This implies that females have longer thigh region and this can serve as a means of identifying and separating them during any breeding and selection for improved performance in addition to other criteria already being used by researchers and farmers.

3.2.4. Breast Girth (cm)

Breast girth in the present study (Table 2) differed (P<0.01) significantly between the sexes. Females from the 9th week recorded higher mean values in this trait than the males. This means that the former have broader breast than the latter. This unique attribute of the females can be employed to separate them into sexes even from younger age. In agreement with the results in this study, Tarhyel et al. (2012) observed sex differences in breast weight of quails with females having superior mean values than the males.

Table 2. *Least square means showing the effect of sex on growth traits at various ages of Coturnix Quails.*

Traits	House	Ages							
		3	4	5	6	7	8	9	10
BW	Male	63.95	84.70	104.30	116.12[b]	124.27[b]	125.50[b]	124.03[b]	129.83[b]
	Female	61.48	86.65	103.07	122.83[a]	140.62[a]	155.22[a]	155.85[a]	158.83[a]
	SE	1.49	1.61	1.39	1.94	1.67	1.53	1.48	1.42
WL	Male	7.68	8.73	9.29	9.49	9.56	9.70	9.74[b]	9.68_b
	Female	7.72	8.78	9.29	9.70	9.48	9.69	10.09[a]	10.40[a]
	SE	0.09	0.09	0.07	0.09	0.06	0.06	0.07	0.06
TL	Male	3.94	4.61	5.24	5.53[b]	5.74	5.85	5.69[b]	5.67[b]
	Female	3.98	4.71	5.10	5.65[a]	5.72	5.92	5.82[a]	5.80[a]
	SE	0.04	0.05	0.05	0.04	0.04	0.05	0.04	0.04
BG	Male	5.87	6.99	7.80	8.41	9.26	9.93	9.88[b]	9.94_b
	Female	5.84	6.94	7.75	8.63	9.44	9.88	10.25[a]	10.52[a]
	SE	0.08	0.08	0.10	0.07	0.07	0.13	0.05	0.06

ab: means with different superscripts along columns are significantly different (P<0.01)
BW=body weight (g) WL=wing length (cm) TL=thigh length (cm)
BG=breast girth (cm)

4. Conclusions

The study revealed the genetic differences in growth traits between male and female quails. Females in the present study recorded higher and superior body weights than males. In addition, the former also showed superiority in other linear measurements. With regard to housing system, cage birds recorded significant heavier body weight than those on deep litter.

For possible and sustained increase in quail meat production and regular supply of animal proteins to enhance the total wellbeing of the citizenry, more females should be produced and reared on commercial basis. And the suggested conducive housing environment for rearing quails for better and profitable production is cage system.

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