Researchjournali's Journal of Agriculture

Vol. 3 | No. 1 January | 2016

Estimates Of Genetic Parameters For Body Weight And Some Economic Important Traits In The Japanese Quails (*Coturnix Coturnix Japonica*)

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ABSTRACT

Research was conducted to study the effect of selection on generation, age and sex for body weight, body dimension, carcass trait and their realized heritability (h^2) in Japanese quail with foundation stock of about 784 (364 males and 672 females) quails. Data obtained were subjected to analyses of variance and realized heritability calculated as appropriate for the following: live body weight and carcass traits in generation of Japanese quail as influence by sex and age, carcass weight and some edible and Inedible traits of Japanese quail, live body dimensions of Japanese quail as Influenced by sex, generation and age, realized heritability for body weight, carcass and some Inedible traits, body length in Japanese quail. The result indicated that live body weight, carcass traits, organs and live body dimensions in generations of Japanese quail are positively influenced by sex and age and the females were consistently higher in body weight at day 35, 42, 49 and 56 of age. There was weekly body weight increased among base, first, second generations, the first generation showed lower pres-slaughtered live body weight and carcass traits values than base and second generation. Carcass weight, gizzard weight, kidney weight, testicular weight, head weight, leg weight, wing weight and abdominal weight of females showed higher figures than the males. Selection for high body weight significantly affects the carcass traits of base, first and second generation. First generation has lower values than base and second generation. That shows that selection for high body weight affects generations of quail selected positively. The body dimensions in the birds at different ages shows that their body length, keel length, pelvic circumference, shank length, thigh length, wing length, abdominal fat thickness increased with age. Body length, pelvic circumference, shank length and thigh length affects the sex of the quail but the females shows high body dimension than the males therefore selection for high body weight affects generations, sex, age of quail selected positively significantly ($P < 0.05$) and ($P < 0.01$). The realized heritability of selection base on body weight at day 35 in Japanese quail showed that live body weight and some of the Japanese quail traits parts are moderate in breast weight and high in most of the traits. Carcass and some inedible traits show higher h^2 (0.46 – 0.83). Body length, pelvic circumference, shank length h^2 are low, while wing length and abdominal fat thickness h^2 are moderate and keel length and drumstick length were high.

Key words: Japanese quails, Body traits, Selection, Generation, Heritability

Target Audience: Quail producers, Livestock researchers, Animal breeders/ scientists

1. INTRODUCTION

Japanese quails have been widely used for genetic studies because of their short generation interval and minimum requirements of space and time. Some estimates of genetic parameters for various traits of domestic Japanese quails have been reported by several workers (Kawahara and Saito, 1976; Toelle *et al.,* 1991;

Minveille *et al.*, 1999; 2000; Akpa *et al*., 2006; 2008). Experimental research indicated that Japanese quail response quickly to selection for body weight (Nestor and Bacon, 1982; Caron and Minvielle, 1990; Marks, 1993) Knowledge of the heritability of traits is essential for understanding how individual characteristics change from one generation to another in response to selection (Falconer and Mackey, 1996). Studies of heritability have mostly focused on the estimation of genetic parameters for growth, especially under different selection environment (Anthony *et al.*, 1996; Marks, 1996; Saatci *et al*., 2003). However, selection rarely operates on only one trait at a time therefore, if there is a genetic correlation between traits under selection, the overall response to selection will change according to the heritability of the traits examined, and strength and sign of the genetic covariance among them.

Kawahara and Saito, (1976); El-Fiky, (1991); Mousa, (1993); El-Full *et al.*, (2001) and Abdel-Mounsef, (2005), reported heritability estimates for carcass traits in Japanese quail to ranged from 0.06-0.78.

The awareness on quail meat production is beginning to gain the interest of quail producers in Nigeria, but most producers find it difficult to obtain superior quality parents to establish an outstanding breeding programme. This is a big set back to the quail industry and a challenge to Nigeria whose population is geometrically growing with low dietary protein intake. This research was therefore, geared towards estimating genetic parameters (h^2) based on individual selection for body weight, body length and carcass traits in generations, sex and age of Japanese quail and the scale of genetic parameters that will determine the amount of improvement necessary to predict response to selection.

The specific objectives of the study were to determine

The effect of selection on generation, age and sex for body weight, body dimension, carcass trait and heritability (h^2) based on individual selection for carcass traits and body weight in the Japanese quail.

2. MATERIALS AND METHODS

2.1 EXPERIMENTAL SITE

The study was conducted at the Poultry Unit of the Department of Animal Science, Faculty of Agriculture, Ahmadu Bello University, Samaru –Zaria. Zaria is within Northern Guinea Savannah zone of Nigeria, latitude 11' 12^{o}N and longitude 7' 33^{O}E at an altitude of 610m above sea level. The climate is relatively dry, with mean annual rainfall of 700-1400mm, occurring between the months of April and September. The dry season begins around the middle of October, with dry cold weather that ends in February. This is followed by relative hot, dry weather from March to April, when the rain begins. The mean minimum and maximum daily temperature is about 14^{o} to 24^{o}C during the cool season and from 19^{o} to 36^{o}C during the hot season. The relative humidity varies 19% in the dry season and between 63% to 80% in the wet season as stated by (Akpa *et al.*,2002).

2.2 EXPERIMENTAL BIRDS AND THEIR MANAGEMENT

The research work started with a foundation stock of 784 Japanese quails at 14 days of age, sourced from National Veterinary Research Institute (NVRI), Vom, Plateau State.The management of the day old chicks included the provision of supplementary heat for 3 to 4 weeks under 24 hours lighting, and thereafter for 8 to 13 hours light and 7 to 8 hours dark cycle. Indoor air temperature for the chicks was 36 ^{o}C. Birds were allowed *ad libitum* access to food and water. They were fed with starter and grower diet containing 24% crude protein (CP) and 2904ME, Kcal/kg between 1-35 days of age and thereafter a breeder diet containing 23% CP and 2800ME, Kcal/kg. The same diets were provided to birds on the selection process across various generations. The minerals and vitamins were adequately supply to cover the requirements according to NRC, (1994).

2.3 DATA COLLECTION

Data on growth characteristics of male and female birds were collected and used to study the performance of the parents unselected (G_0), first selected generation (G_1) and second selected generations (G_2). The following observations were made:

2.4 BODY WEIGHT

Six hundred and seventy two birds were used to study the body weight (g) traits of the birds. The birds were sexed at day 21 at which point they were feathered. The birds were housed in 56 constructed cages with each family house contained 10 male and 10 female quails, that means each family housed 20 quails. Three (3) birds from each cage were picked at day 35, 42, 49 and 56 for G_0, G_1, G_2 to determine the live body weight (g) respectively. At 12 hours prior to the live body weight measurement, birds were deprived of feed. The live body weight was measured to the nearest 0.1gm to determined:

Live Body Length Measurement (cm)

The same six hundred and seventy two birds used for live body weight measurement were used to study the live body length measurement traits of the birds:

Body length (cm): obtained by using a cloth tape to measure from tail to the neck, pelvic circumference (cm): measured by using vernier caliper across the pelvic, shank length (cm): obtained by using a tailors tape from the hock joint to the base of the 3 toes, drumstick (cm): determined by using the tailors tape from the pelvis joint down through the thigh drumstick to the hock joint before shank, wing length (cm): determined by placing tailors tape across the length of the wing, abdominal fat thickness (mm): Vernier caliper was used to determine the thickness of the abdominal fat corrected to 0.01mm, Wing length (cm): determine by placing tailors tape across the length of the wing, Keel length (cm): obtained by placing tailors tape round the keel.

Carcass Trait Measurement (g):

Twelve hours prior to slaughter, birds were deprived of feed and after slaughter they were defeathered to determine the: carcass weight (g), dressing percentage (D.P %), head weight (g), leg quarter weight (g), wings weight (g), Internal contents weight (g), breast weight (g), drum + thigh weight(g), live weight (g), neck weight (g).The following carcass traits were measured to the nearest 0.1gm: Live body weight (g): The weight of the live birds were obtained before slaughter using digital weighing machine, Carcass Weight (g): Determined as the difference between the live weight and the weight after bleeding and defeathering.

Dressing percentage (D.P %)

Calculated using the following formula:

D.P = carcass and neck weights × 100 / live body weight, head weight (g): determined by detaching the head from the neck and the weight measured, wings weight (g): determined after detaching them from the body of the bird, Internal contents weight (g): determined by dissecting the birds and the weight of intestine, liver, heart, lungs, gizzard, kidney and testis measured, abdominal fat weight: obtained by removing the abdominal part of the bird and the part extracted in a soxhlet apparatus using petroleum ether as a solvent. Abdominal fat percentage was determined as:

$$\frac{\text{weight of dried sample} - \text{weight of defatted}}{\text{Original weight of the sample}} \times 100$$

Breast weight (g): determined after detaching the thigh, head and neck from the carcass using digital weighing machine, drum + thigh weight (g): determined by placing the drum stick and thigh on digital weighing machine, neck weight (g): Obtained using digital weighing machine.

2.5 MATING PLAN

Artificial selection was carried out on the birds at matured age (day 56) after weigh-taken all the birds. The remaining birds left with high body weight were chosen for breeding comparisons of 28 males and 84 females. The selected birds were mated in a constructed cage at the ratio of 1 male to 3 females (1:3). The birds were wing banded in accordance with the families and 1500 fertile eggs for generations were obtained.

Management of Fertile Egg

Eggs collected were identified by their groups in the twenty- eight (28) families, stored at room temperature lower than 20^{0}C and 65% relative humidity (RH) for a week, and then disinfected with tetra hydroxyl (TH4) mixed with 1 liter of water and spraying on egg surface. Pedigreed eggs were set in the setting trays, depending on their sire families in a forced draft incubator of 37.5^{o}C and 65% RH. Eggs were turned automatically every three hours. At the end of the 14th day of incubation eggs were set in pedigree baskets and transferred to the hatcher where the temperature was 37.5° C and RH was 70%.

Incubation and Hatching of Fertile Eggs

Pre-incubation of the fertile egg collected was made by storing them at a temperature of 15°C. Fumigation was done 12 hours before placing them in the incubator. When eggs were set in the incubator, temperature requirement was put at 37.5 ^{0}C with humidity of 60% and turning of eggs was at 45° for 4-6 times a day and the chicks were hatched at day 18 of incubation.

2.6 ESTIMATION OF GENETIC PARAMETERS

Realized heritability

Realized heritability is denotes $h^2 = \frac{R}{S}$ Where: h^2 = Realized heritability, R = Response to selection, S= selection differential. Response to selection**(R):** $R = P_1 - P_0$ Where: P_1 =Mean body weight of offspring, P_0 =Mean body weight of parents (unselected) generation. Selection differential(S)**:** $S = P_s – P_o$ Where: S= selection differential, P_s = Mean body weight of selected from population, P_o = Mean body weight of population.

Statistical analysis

Statistical analysis was done by the aid of SAS software (SAS, 2004) according to the following Statistical models: $Y_{jkm} = M + A_i + \beta_j + D_k + e_{ijkm}$

Where: Y_{jkm} is an individual record, M is the population means, A_i is the effect of ith age group, β_j is the effect of jth sex, D_k is the effect of *k*th generation and e_{ijkm} is the residual effects. Significant differences between means were ranked by using Duncan's Multiple Range Test (Duncan, 1955).

3. RESULTS

Live Body Weight and Carcass Traits in Generation of Japanese quail as influence by Sex and Age

The least square means for carcass traits in generations of Japanese quail as influenced by sex and age are shown in Table 1. The result indicated that live body weight and carcass traits differed significantly ($P < 0.01$) in sex, generation and age of the Japanese quail except drumstick + thigh weight, % carcass weight, neck weight and lung weight which differed significantly ($P < 0.05$) in sex of birds. Live body weight, breast weight, % carcass weight, % breast weight differed significantly ($P < 0.05$) in generation. Live body weight, breast weight, drumstick + thigh weight, % breast weight, neck weight, intestinal weight, liver weight, heart weight and lung weight differed significantly ($P < 0.01$) in age.

The female shows higher weight in carcass traits than the males except % breast weight. The generation selected (Gs) traits has higher values than G_1 and G_2 but G_2 values are higher than G_1.Advance in age shows improvement in carcass traits parts, except liver weight, heart weight and lung weight which shows increased at day 35, 42, 49 then decreases at day 56.

Carcass weight and some edible and Inedible Traits of Japanese Quail

The carcass weight and some organs of Japanese quails as influence by sex, generation and age are shown in Table 2. The result indicated that the carcass and some organ traits differed significantly ($P< 0.05$) in sex, generations and age, except kidney weight, testicular weight which are not significant in sex of the Japanese quail while kidney weight differed significantly ($P< 0.01$) in generations.

The females weight traits are higher than the males while for the generations the selected generation (Gs) was higher than G_1 and G_2 while G_2 was higher than G_1($Gs < G_2 < G_1$). There was important in traits as bird's advances in age.

Live Body Dimensions of Japanese Quail as Influenced by Sex, Generation and Age

Least square means for carcass and live body dimensions of Japanese quail as influenced by sex, generation and age are shown in Table 3. The result indicated that live body dimensions differed significantly ($P< 0.05$) for sex, generation and age, except pelvic circumference, wing length which are not significant. Body length, keel bone circumference, pelvic width, thigh length differed significantly ($P< 0.01$) in generations. While keel bone circumference, keel bone width also differed significantly ($P< 0.01$) in age of Japanese quail. The females Japanese quail live body length dimensions are higher than males. While advances in age shows increased in the live body length of the Japanese quail, except day 42 and 49 for body length which decreases and increases at day 56.

Table. 1: Least square means for live body weight, carcass traits in generations of Japanese quail as influenced by sex and age

Characteristics	N	Sex		LoS	Generations			LoS	Age(d)				LoS
		Males	Females		G_s	G_1	G_2		D_{35}	D_{42}	D_{49}	D_{56}	
Live body weight(g)	56	174.6±3.12^{b}	188.5±2.45^{a}	**	195.5±2.40^{b}	180.0±2.95^{c}	190.0±3.84^{a}	*	146.4±3.72^{d}	171.7±3.42^{c}	191.3±2.48^{a}	181.5±4.12^{b}	*
Breast weight(g)	56	58.2±0.74^{b}	62.2±0.82^{a}	**	93.5±1.43^{b}	48.8±1.24^{c}	50.4±1.28^{a}	*	44.1±1.21^{d}	56.7±1.02^{c}	66.1±2.36^{b}	74.0±1.38^{a}	*
Drumstick +Thighweight(g)	56	37.9±0.28^{b}	45.1±0.24^{a}	*	43.5±1.32^{b}	29.4±1.41^{c}	41.7±1.12^{a}	**	29.5±0.24^{d}	39.8±1.41^{c}	45.8±1.02^{b}	50.9±1.38^{a}	*
%Carcass weight	56	105.4±0.23^{b}	108.8±0.03^{a}	*	106.1±1.36^{b}	94.7±1.24^{c}	100.5±1.23^{a}	*	91.5±0.06^{d}	99.5±1.42^{c}	108.8±1.23^{b}	128.7±1.22^{a}	**
% Breast weight	56	36.9±1.32^{b}	36.5±1.42^{a}	Ns	47.37±1.02^{b}	31.54±0.12^{c}	40.9±0.24^{a}	*	32.6±0.12^{d}	35.5±1.02^{c}	38.4±0.24^{b}	40.4±1.02^{a}	*
Neck weight(g)	56	6.4±1.42^{b}	6.6±1.23^{a}	**	9.0±0.08^{b}	4.4±0.09^{c}	8.1±0.32^{a}	**	6.0±0.10^{d}	6.3±0.15^{c}	7.0±0.13^{b}	6.7±0.42^{a}	*
Back weight(g)	56	44.8±1.12^{b}	53.4±1.24^{a}	**	59.7±1.49^{b}	39.4±1.28^{c}	58.2±1.27^{a}	**	36.7±1.04^{d}	45.3±1.34^{c}	52.6±1.26^{b}	61.8±1.27^{a}	**

Intestine weight(g)	56	7.4±1.13^{b}	9.3±1.12^{a}	**	9.9±0.14^{a}	5.5±0.23^{c}	9.8±0.36b	**	6.2±1.12^{d}	7.0±0.81^{c}	8.1±1.22^{b}	8.4±1.32^{a}	*
Liver weight(g)	56	3.7±0.08^{b}	5.5±0.02^{a}	**	4.9±0.26^{a}	3.6±0.23^{b}	4.3±0.24a	*	3.7±0.14^{d}	3.8±0.24^{c}	4.9±0.16^{a}	4.6±1.34^{b}	*
Heart weight(g)	56	3.5±0.11^{b}	4.3±0.01^{a}	**	1.2±0.32^{a}	0.6±0.02^{c}	0.9±0.06b	**	4.0±0.12^{c}	4.4±0.32^{a}	4.2±0.05^{b}	3.9±0.02^{d}	*
Lung weight(g)	56	2.4±0.04^{b}	2.5±0.02^{a}	*	5.5±0.02^{b}	1.1±0.10^{c}	0.1±0.18a	**	2.0±0.05^{c}	1.6±0.18^{d}	2.6±0.03^{a}	2.5±1.23^{b}	*
Means within each generations columns with different superscripts differ*= (P< 0.05),**=(P< 0.01);,LoS= Level of significance,G_0=Generation of unselected parents,G_1=Generation one., G_2=Generation two,													

Table 2: Least square means for carcass weight and some internal organs and inedible traits of Japanese quail as influenced by sex, generation and age

Characteristics	N	Sex		LoS	Generations			LoS	Age(d)				LoS
		Males	Females		G_s	G_1	G_2		D_{35}	D_{42}	D_{49}	D_{56}	
Carcass weight(g)	56	155.7±2.83^{b}	169.1±3.42^{a}	*	174.9±3.24^{b}	152.7±3.86^{c}	169.6±2.13^{a}	*	134.3±3.24^{d}	156.2±2.89^{c}	171.7±1.24^{b}	187.4±3.24^{a}	*
Gizzard weight(g)	56	3.2±1.23^{a}	3.4±3.03^{b}	*	3.9±0.81^{b}	3.2±1.20^{c}	3.6±0.73^{a}	*	3.3±1.02^{d}	3.5±0.89^{c}	3.6±0.81^{b}	3.8±0.52^{a}	*
Kidney weight(g)	56	0.8±0.02^{a}	0.8±0.16^{a}	Ns	1.1±0.42^{a}	0.5±1.02^{c}	0.8±0.89^{b}	**	0.7±0.21^{b}	0.6±0.27^{c}	0.7±0.67^{b}	1.2±0.92^{a}	*
Testicular weight (g)	56	2.4±0.02	Nil	Ns	2.6±0.42^{b}	1.8±0.82^{c}	2.1±0.29^{a}	*	1.6±0.12^{d}	2.0±0.45^{c}	2.2±0.18^{a}	2.1±0.16^{b}	*
Head weight(g)	56	6.3±2.88^{b}	6.6±3.26^{a}	*	5.8±2.42^{b}	4.6±3.24^{c}	5.5±2.83^{a}	*	5.9±1.20^{d}	6.2±0.72^{c}	6.5±0.02^{b}	7.2±1.34^{a}	*
Leg weight(g)	56	3.4±4.21^{b}	4.6±2.07^{a}	*	3.5±0.82^{b}	3.2±0.06^{c}	3.3±0.05^{a}	*	3.3±0.02^{d}	3.6±0.01^{c}	3.9±0.73^{b}	5.3±1.20^{a}	*
Wing weight(g)	56	8.1±2.87^{b}	8.8±3.14^{a}	*	7.9±0.50^{b}	6.7±2.45^{c}	7.7±1.28^{a}	*	8.6±0.14^{c}	8.7±0.34^{a}	7.8±0.79^{b}	8.8±0.73^{a}	*
Abdominal fat weight(g)	56	5.4±2.46^{b}	5.6±2.24^{a}	*	5.2±0.02^{b}	3.0±2.84^{b}	4.4±2.01^{a}	*	3.7±0.08^{d}	5.0±0.04^{c}	6.3±0.53^{b}	7.0±1.09^{a}	*
Means within sex generations and age with different superscripts differ*= (P< 0.05),**=(P< 0.01); LoS= Level of significance, G_0=Base population; G_1=Generation one; G_2=Generation two.													

Table 3: Least square means for carcass and live body dimensions of Japanese quail as influenced by sex, generation and age

Characteristics	N	Sex		LoS	Generations			LoS	Age(g)				LoS
		Males	Females		G_s	G_1	G_2		D_{35}	D_{42}	D_{49}	D_{56}	
Body length(cm)	56	14.6±0.25^{a}	14.9±0.34^{a}	*	17.8±0.83^{b}	14.3±0.15^{c}	15.2±0.21^{a}	**	14.1±0.71^{c}	14.9±0.32^{b}	14.7±1.34^{b}	15.4±1.72^{a}	*
Keel length(cm)	56	6.8±0.22^{a}	6.8±0.23^{a}	Ns	7.8±0.71^{b}	6.5±0.67^{b}	7.1±0.12^{a}	*	5.9±1.62^{c}	6.5±0.34^{b}	7.1±1.72^{b}	7.8±0.89^{a}	*
Pelvic circumference (cm)	56	2.4±0.08^{b}	2.6±0.06^{a}	*	4.5±0.32^{a}	2.4±0.12^{b}	2.6±0.26^{a}	**	0.3±2.34^{b}	3.2±1.78^{a}	3.2±0.24^{a}	3.3±2.17^{a}	**
Shank length (cm)	56	3.0±0.31^{a}	3.3±0.15^{a}	*	4.0±0.14^{a}	2.8±0.12^{b}	3.1±0.22^{a}	*	2.3±0.24^{b}	3.2±0.32^{a}	3.6±0.63^{a}	4.0±0.81^{a}	*
Drumstick length (cm)	56	5.5±0.32^{a}	5.6±0.25^{a}	*	5.9±0.42^{a}	5.2±0.52^{b}	5.6±0.28^{a}	*	3.5±0.67^{c}	3.6±1.24^{b}	4.6±1.08^{b}	5.7±0.79^{a}	**
Wing length (cm)	56	10.4±0.89^{b}	10.5±1.45^{a}	Ns	11.8±0.89^{a}	10.2±0.27^{b}	10.6±0.73^{a}	*	9.6±0.62^{c}	10.5±2.12^{b}	10.5±1.73	11.4±1.34^{a}	*
Abdominal fat thickness (cm)	56	0.4±0.01^{a}	0.4±0.02^{a}	Ns	1.4±0.11^{b}	0.2±0.08^{c}	0.6±0.09^{a}	**	0.2±0.71^{c}	0.4±0.81^{b}	0.4±0.24^{b}	0.6±0.41^{a}	**
Means within sex generations and age with different superscripts differ*= (P< 0.05),**=(P< 0.01); NS = Not significant,LoS= Level of significance, G_0=Base population; G_1=Generation one; G_2=Generation two.													

Table 4 shows the realized heritability for body weight and some parts of Japanese quail. The result indicated that realized heritability were high. The selection differential mean values are higher than the mean values for response to selection while the lung weight percentage was higher for response to selection than selection differential.

Table 4: Realized heritability for body weight and some parts of Japanese quail

Characteristics	Response to Selection	Selection Differential	Realized h^2
	%	%	
Live body weight(g)	7.69	8.14	0.97
Breast weight(g)	3.17	8.76	0.34
Drumstick+Thighweight(g)	29.50	32.26	0.89
%Carcass weight	5.77	10.74	0.51
% Breast weight	22.98	33.96	0.58
Neck weight(g)	45.68	51.11	0.80
Back weight(g)	32.17	34.19	0.93
Intestine weight(g)	43.88	44.44	0.98
Liver weight(g)	53.57	62.31	0.69
Heart weight(g)	75.51	79.93	0.80
Lung weight(g)	73.17	56.00	0.68

Table 5 shows the realized heritability carcass and some inedible traits parts of Japanese quail. The result indicated that realized h^2 values were high. The response to selection mean and percentage values are lower than selection differential.

Table 5: Realized heritability carcass and some inedible traits parts of Japanese quail

Traits	Response to Selection	Selection Differential	Realized h^2
	%	%	
Carcass weight(g)	9.96	12.19	0.46
Gizzard weight(g)	11.11	17.95	0.57
Kidney weight(g)	37.55	54.55	0.50
Testicular weight (g)	0.33	57.69	0.47
Head weight(g)	0.16	20.69	0.75
Leg weight(g)	3.03	8.57	0.33
Wing weight(g)	12.99	15.19	0.83
Abdominal weight(g)	31.82	43.31	0.76

The realized heritability of body dimension of Japanese quail is shown in table 6. The result indicated that the realized h^2 for some of the traits such body length, pelvic circumference, shank length were low while wing length, abdominal fat thickness were moderate and keel length drumstick length traits were high. The mean and percentage values for response to selection are lower than selection differential except thigh length.

Table 6: Realized heritability of body length of Japanese quail

Traits	Response to Selection	Selection Differential	Realized h^2
	%	%	
Body length(cm)	5.92	19.66	0.26
Keel length (cm)	8.45	16.67	0.46==

Pelvic circumference(cm)	7.69	46.67	0.10
Shank length (cm)	9.68	30.00	0.01
Drumstick length (cm)	7.14	11.86	0.57
Wing length (cm)	3.77	13.56	0.25
Abdominal fat thickness (cm)	66.67	85.71	0.33

4. DISCUSSION

Live Body Weight and Carcass Traits in Generation of Japanese quail as influence by Sex and Age

The least square means for live body weight and carcass traits in generations of Japanese quail as influenced by sex and age are shown in Table 1. The result indicated that live body weight and carcass traits significantly affects the sex, generation and age of the Japanese quail. The results agrees with the studies that of Yalcin *et al*. (1995) and Sharaf (1996) who reported significant effects on carcass traits of Japanese quail sex and that female quails had heavier live body weight and carcass traits weight than the males. This is the same with findings of Daikwo (2013) and Joseph *et al*. (1992), but disagrees with El – Full (2000) who have reported that female quails have significantly higher dressing percentage than male quails. The mean values for body weight in this study were higher than that of Marks (1993); Vali *et al*. (2005) both in selected group of Japanese quail. This is possible because of some considerable normal physiological response of birds that are more in females than males and possibly because of more appetite development in female for more feed intake than males as the females attain sexual maturity.

The females were consistently higher in body weight at day 35, 42, 49 and 56 of age. This is possible because of selection base on high body weight for the ages that shows positive response to selection. This collaborates with findings of Minvielle *et al*. (2000) and Vali (2009) who reported that the body weight of female's Japanese quails was higher at day 49, 56 and 63 of age than the males. The observed sexual dimorphism may be due to testosterone hormone that is released at sexual maturity and is reported to cause decrease in growth rate of the males (Hyankova *et al*., 2001). Selection for body weight significantly affects generations of Japanese quail. The first generations were lower than base and second generations. Magda *et al*. (2010) reported that body weight of males and females within the same generation were not significantly differed. Also with the advancement in age the increased in heart weight might be attributed to increased blood circulation while lung weight increase in-order to fulfill elevated oxygen needs of growing body while increased liver weight and intestinal weight provide more surface area for nutrient digestion and absorption in-order to care for the metabolic requirements of growing birds. The findings of the present study are in consonance with results of Akram *et al*. (2013) who found significant differences in relative to liver, gizzard and heart, giblets and intestinal weight to that of liver weight with advancement in age.

There was weekly body weight among different generations and selection methods. First generation showed lower pres-slaughtered live body weight and carcass traits values than base and second generation. This might be due to selection for higher body weight which showed positive response to section. However, similar studies to improved body weight in Japanese quail was also observed in birds selected for higher body weight and carcass traits also (Hussain *et al.*, 2013; Baylan *et al.*, 2009; Syed Hussein *et al.*, 1995; Tozluca, 1993; Nestor *et al*., 1982). Canon and Minvielle (1990) reported increased in live body weight at 45 days of age in generations of Japanese quail.

Carcass weight and some edible and Inedible Traits of Japanese Quail

The carcass weight and some organs of Japanese quails as influence by sex, generation and age are shown in Table 2. The result indicated that the carcass and some organ traits significantly affect the sex, generations and age. The result indicated that carcass weight, gizzard weight, kidney weight, testicular weight, head weight, leg weight, wing weight and abdominal weight of females showed higher figures than the males. This may possibly because of some among of testosterone released more in females when attain age at sexual maturity than. Other reports of females having heavier weight than males are reported by (Caron and Minvielle, 1990; Yalcin *et al*., 1995). There was increase in carcass weight, gizzard weight, kidney weight, testicular weight, head weight, leg weight, wing weight, abdominal weight as bird's advances in age. It might be because of selection base on higher body weight in Japanese quail.

Selection for high body weight significantly affects the carcass traits of base, first and second generation. First generation has lower values than base and second generation. That shows that selection for high body weight affects generations of quail selected positively. This is similar to study of Schmidt *et al.* (2000); Henderson *et al*. (2009) who reported higher carcass traits weight in generations selected. Mignon – Grasteau *et al.* (2000) reported improvement in gizzard, heart weight and legs in generations selected in birds. Marks (1993) investigated the carcass composition changes following 51 generations of selection for high 4 week body weight in Japanese quail significantly affects carcass composition.

In general, the observed changes in the internal organs were associated with the body weight of base generation selected. Selection for increased body weight induced changes in the sizes of various organs.

Live Body Dimensions of Japanese quail as Influenced by Sex, Generation and Age

Least square means for carcass and live body dimensions of Japanese quail as influenced by sex, generation and age are shown in Table 3. The result indicated that live body dimensions significantly affects the sex, generation and age. The analysis of body dimensions in poultry birds at different ages shows that their body length, keel length, pelvic circumference, shank length, thigh length, wing length, abdominal fat thickness increased with age. This is possible because as bird's increases in body weight the body dimension, increases this is in accordance with finding Kozaczyrisk *et al*. (1999); Bochno *et al*. (1999); Nsoso *et al*. (2008) and Akram *et al*. (2012). The increased in dimension of traits might be as a result of considerable normal physiological response of birds to aging and possibly effect of selection for high body weight.

Selection of bird's base on high body weight also affects the sex of bird's body dimension significantly. Body length, pelvic circumference, shank length and thigh length affects the sex of the quail but the females shows high body dimension than the males. This might has been a more developed appetite towards feeding than the male's quail that led to more extension in size and length of the body length.

Realized Heritability for Body weight in Japanese quail

The realized heritability of selection base on body weight at day 35 in Japanese quail showed in Table 4 indicated that live body weight and some of the Japanese quail traits parts are moderate in breast weight and high in all the other traits. The high h^2 values may be as a result of environmental factors feed and management of the birds. Result of earlier selection studies also suggested that h^2 of body weight was high; Abplanalp *et al*. (1963) found that realized h2 of 8- and 24- week body weight was 0.43 and 0.62, respectively. Mc Cartney *et al*. (1968) observed that the realized h^2 of 8 and 21- week body weight was 0.44 and 0.39, respectively. Based on four generations of selection Mukherjee and Frairs, (1970) reported that the realized h^2 of 12- week body weight ranged from 0.37 to 0.57 in different base populations.

Realized Heritability for Carcass and some Inedible Traits in Japanese Quail

The realized h^2 of carcass and some inedible traits of Japanese quail are shown in table 5. It was observed that h^2 of all the traits are higher and ranges 0.46 – 0.83. The findings are similar to Vali *et al*. (2005) who have reported moderate h^2 (0.27) for carcass weight in Japanese quail. Toelle *et al*. 1991) reported gizzard weight in Japanese quail to be 0.38 and Kawahara and Saito (1976) reported testis weight to be high (0.74) in Japanese quail. The high h^2 might be as a result of some environmental factors. Therefore conditions selection for this trait may lead to improvement for the traits.

Realized Heritability of Body Length of Japanese Quail

The Realized h^2 of body length of Japanese quail in table 6 indicated that body length, pelvic circumference, shank length h^2 are low. This is an indication that traits are genetically affected while wing length and abdominal fat thickness h^2 are moderate and keel length and drumstick length were h^2, this might be as a result of some non additive genetic effects and environmental effects. These are dearth information on h^2 of body dimension on poultry birds.

5. CONCLUSION AND RECOMMENDATIONS

The live body weight carcass traits, some organs and live body dimensions in generations of Japanese quail are positively influenced by sex and age. The females were consistently higher in body weight at day 35, 42, 49 and 56 of age and live body weight, carcass weight, internal organs traits than the males. Selection for high body weight significantly affects the traits in base, first and second generation positively but the first generation traits are lower than base and second generations. The body dimensions in the birds at different age's shows increased with age and sex of the birds. There was moderate to high realized h^2 (0.34-0.98) for body weight and some parts of Japanese quail. The carcass and some inedible traits parts that shows h2 ranges from 0.33-0.83. The body length traits h^2 are high in drum stick length, keel length has high h^2, while wing length, body length, abdominal fat thickness has moderate heritability (0.25-0.33) and lower h^2 are observed in shank length (0.01) and pelvic circumference (0.10). The moderate to high realized h^2 observation indicates that response to selection for high body weight affects the traits could be rapid while low h^2 implies that response to selection could be slow. It is therefore recommended that selection for high body weight affects the traits in generations, sex and age of Japanese quail; therefore selection can be done at first generation, early age and on any of the sex of the Japanese quail.

ACKNOWLEDGEMENTS

Thanks most be made to Prof. G.N. Akpa of Department of Animal Science, Prof. I.A. Adeyinka ., Head of Department, Data Processing Unit of Animal Production Research Institute, Shika, and Prof. B.I. Nwagu of Animal Production Research Institute, Shika. The authors appreciate Staff of the Poultry research unit and laboratory attendance of the Department of Animal Science, Zaria.

6. REFERENCE

Abdel-Mounsef, N.A. (2005). Non-genetic Factors Affecting some Productive Traits in Japanese Quail. MSc. Thesis Fac. of Agric. Al-Azhar Univ. Cairo Egypt. 66pp.

Abplanalp, H., F.X. Ogasawara, and V.S. Asmundson, (1963). Influence of selection for body weight at different ages on growth of turkeys. Br. Poult. Sei. 4:71-82.

Akpa, G.N, Kaye, J, Adeyinka, I.A and Kabir, M. (2006). Repeatability of body weight and egg traits in Japanese quail (Coturnix coturnix japonica). Savannah Journal of Agriculture. Volume 1 Number 2.

Akpa, G.N., Kaye, J,.,Adeyinka, I.A. and Kabir, M. (2008). The relationships between laying age and repeatability of egg quality traits in Japanese quails (Coturnix coturnix japonica), Int. J. of Poult. Sci., 7(6): 555-559.

Akpa, G.N., Asiribo, O.E., Oni., O.O., Alawa, J.P., Dim. N.I., Osinowo, O.A. and Abubakar, B.Y. (2002). Milik production agrospastoral red sokoto goats in Nigeria. Tropical Animal Health and production., 34(6): 523-533.

Akram, M., J. Hussain, S. Ahmad, S. Mehood, A. Rehman, A. Iqbal, M. Usman (2013). Study on body measurements and slaughter characteristics in Japanese quail as influenced by age. Journ of Zoology 2(3)23-26.

Akram, M., J. Hussain, S. Ahmad, S. Mehood, A. Rehman, A. Iqbal, M. Usman (2013). Study on body measurements and slaughter characteristics in Japanese quail as influenced by age. Journ of Zoology 2(3)23-26.

Anthony, N. B., Nestor, K. E. and Bacon, W. L. (1986). Growth curves of Japanese quail as modified by divergent selection for 4 - week body weight. Poult. Sci. 65: 1825 - 1833.

Baylan, M., S. Canogullari, A. Sahin, G. Copur, and M. Baylan. (2009). Effects of different selection methods for body weight on some genetic parameters. J. Anim. Vet. Adv. 8:1385–1391

Bochno, R., Rymkiewicz, J., Janiszewska, M., (1999). Regression equations for the estimation of the meat and fat content in broiler carcasses. J. Anim. Feed Sci., 8, 73-80.

Caron, N., F. Minvielle, M. Desmarais and L. M. Poste (1990). Mass selection for 45- day body weight in Japanese quail. Selection response, Carcass composition, cooking loss properties and sensory characteristics, Poult. Sci, 69:1037- 1045.

Akram, M., J. Hussain, S. Ahmad, S. Mehood, A. Rehman, A. Iqbal, M. Usman (2013). Study on body measurements and slaughter characteristics in Japanese quail as influenced by age. Journ of Zoology 2(3)23-26.

Duncan, D.B., 1955. Multiple range and multiple F tests. Biometrics, 11: 1-42.

El- Deen, M.B.M.K Shebl, G. A. Abd Allah and A. D. Debes (2005). Using selection index to improve some performance traits in Japanese quail females. Egypt, Poult. Sci, 25: 449b – 460.

El-Fiky, F.A. (1991). Genetic Studies of some Economic Traits in Japanese Quail. Ph.D. Thesis, Fac. Agric. Al-Azhar Univ. Cairo, Egypt. 156PP.

El-Full, E.A. (200**0)**. Genetic analysis of hatched egg weight, body weight at different ages and reproductive performance with their relationships in Japanese quail. Egypt. Poult. Sci. J., 21(11):291-304.

Falconer,D.S. and Mackay, T.F.C.(1996). Introduction to quantitative genetics -4th E d. (London , Longman) .

Henderson, S.N., J.T. Barton, A.D. Wolfenden, S.E. Higgins, J.P. Higgins, W.J. Kuenzel, C.A. Lester, G. Tellez, and B.M. Hargis (2009). Comparison of beak-trimming methods on early broiler breeder performance. Poultry Sci., 88:57–60.

Hussein, J., M. Akram,A.W. Sahota, k., Javed., H.A. Ahmad., S. Mehmood., S. Ahmad., R. Sulaman, I. Rabbani and A.S. Jatoi. (2013). Selection for higher three week body weight in Japanese quail: 1. Effect on growth performance: Journ. Anim & Plant Sci., 23 (6): 1496-1500.

Hyankova, L., H. Knizetova, L. Dedkova and J. Hort (2001). Divergent selection for shape of growth curve in Japanese quail. 1. Responses in growth parameters and food conversion . Br. Poult. Sci., 42:583-589.

Joseph, J.K., Balogun, O. O. & Famuyiwa, M. A. (1992). Carcass evaluation and organoleptic assessment of quality attributes of some selected Nigerian birds. Bulletin of Anim. Health Prod. Africa. 40:97-102.

Kawahara, T. & Saito, K. (1976). Genetic parameters of organ and body weight in the Japanese quail. Poult. Sci. J. 55: 1247-1252.

Kozaczyoski, K.A. (1999). Characteristics of selected species of guinea fowl. Pol. Drob., 3, 3–4 (in Polish).

Mc Cartney, R.D., S. Barbut and M. Ointon (1996). Seasonal effect on pale soft exudative (PSE) occurrence in young, turkey breast meat. Food RS. Int. 29: 363-366.

Marks, H.L. (1993). Carcass composition, feed intake and feed efficiency following long- term selection for four-week body weight in Japanese quail. Poult. Sci. 72: 1005-1011.

Marks, H. (1996)Long-term selection for body weight in Japanese quail under different environments. Poult. Sci., 75, 1198–1203.

Mousa, K. R. M. (1993). The influence of different nutritional conditions on some genetic parameters in Japanese quail. M.Sc. Thesis, Fac. Agric. Al-Azhar, Univ. Cairo, Egypt.

Magda I, Abo Samaha, Sharaf MM, Hemeda ShA (2010). Phenotypic And Genetic Estimates Of Some Productive And Reproductive Traits In Japanese Quails. Egypt. Poult. Sci. Vol 30 (3): 875-892.

Mignon-Grasteau, S., C. Beaumont, H. de Rochambeau, J. P. Poivey, A. Blasco and C. Beaumont (2000). Bayesian analysis of Gompertz curve of chickens selected on the shape of the growth curve. J. Anim. Sci. 78: 2515-2524.

Minvielle, F., G. Gandemer, Y. Maeda, G. Leborgoyen and M. Boulay (2000). Carcass characteristics of a heavy Japanese quail line under introgressions with the roux gene. Bri. Poult. Sci., 41: 41-45.

Mukherjee, T. K. and Friars, G. W. (1970). Heritability estimates and selection responses of some growth and reproductive traits in control and early growth selected strains of turkeys. Poult. Sci. 49: 1215-1222.

N R C (1994). National Research Council, Nutrient Requirements of Poultry. 9th Ed. National Academy of Sciences, Washington, D.C. USA.

Nestor, K. E., W. L. Bacon, and A. L. Lambio (1982). Divergent selection for body weight and yolk precursor in *Coturnix coturnix japonica*. 1. Selection response. Poult. Sci. 61:12–17.

Nestor, K. E. and Bacon, W. L. (1982). Divergent selection for body weight and yolk precursor in Coturnix coturnix japonica. 3.Correlated responses in mortality and reproduction traits and adult body weight. Poult. Sci. 61:2137-2142.

Nsoso, S.J., Mareko, M.H.D., Manyanda, S., Legodimo, P.P. (2008). The effect of housing type on body parameters, feed intake and feed conversion ratio of guinea fowl (Numida meleagris) chemical composition of their meat during growth and development in Botswana. Anim., Sci., 2 (2), 36-40.

Saatci, M., I.A. Dewi and A. R. Aksoy (2003) Application of REML procedure to estimate the genetic parameters of weekly live weight in one – to- one sire dam pedigree recorded Japanese quail. J. Anim. Breed. Genet., 120- 23-28.

SAS (2004). Statistical Analysis system, user's guide: statistics 8. 6ed. SAS's Institute Inc. carry, North Carolina USA.

Schmidt, G.S., E.A.P. Figueiredo, and M.C. Ledur (2000). Genetic gain for body weight, feed conversion and carcass traits in selected broiler lines. Braz. J. Poultry Sci., 8:29-32.

Sharaf, M. M. (199**6**). Genetic and nongenetic estimates of some reproductive and productive traits in Japanese quail. Egypt. Poult. Sci. 12: 211-231.

Syed Hussein, S.A., Y.S. Chee and M. Jamilah, (1995). Selection of quail for meat production. Proccding of the 17th Malaysian society of animal production,Malaysia, Penang, pp:124-125.

Toelle, V., G. Havenstein, K. Nestor and W. Harvey (1991). Genetic and phynotypic relationships in Japanse quail. 1. Body weight, carcass and organ measurements. Poult. Sci., 70: 1679 – 1688.

Tozluca, A. (1993). Productivity of selection according to body weight in different nutrition condition and the effects on the others production parameters in Japanese quail. PhD Diss. Univ. Selçuk, Turkey.

Vali, N., M.A. Edriss and H.R. Rahmani (2005). Genetic parameters of body and some carcass traits in two quail strains. Int. J. Poult. Sci., 4:296-300.

Yalcin, S., Oguz, I. & Otles, S. (1995). Carcass characteristic of quail (Coturnix Japonica) Slaughtered at different ages. Brt. Poult. Sci. J. 36:393-399.