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GENETIC STUDY ON PRODUCTION TRAITS OF JAPANESE QUAILS

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ABSTRACT

This research was carried out to determine the genetic parameters for some production traits. The overall least-squares means for body weights at day-old, 2nd and 4th week of age were 7.94, 59.20 and 141.64 g, respectively and average daily gains (ADGs) during 0-2, 2-4, 4-6, 6-8, 8-10 and 10-14 weeks of age were 3.66, 5.89, 3.69, 2.72, 1.51 and 0.46 g, respectively. Hatches, sexes and strains had significant effect on body weight and ADGs. The females were significantly heavier than the males. The heritability estimates for the body weights varied from low to high in Black, medium to high in Brown and low to medium magnitude in Black random bred, while these estimates for ADGs were low or moderate to high in magnitude.

Key words: Average daily gain, Body weight, Heritability.

INTRODUCTION

Japanese quails, besides being a premium meat producing birds, have also been recognized as a good pilot animal in genetic studies for elucidating the growth and egg production mechanism of chickens (Wilson *et al.* 1961). The features like shorter generation interval and excellent reproductive characteristic of this game bird makes them analogous to the *White rat* in its utility for laboratory experiments (Ellen and Reese 1962). Growth and production are major interest in the commercial Quail industry. The present study was taken up to estimate the genetic parameters of body weights and average daily gains (ADGs) of Japanese quails at different ages.

MATERIALS AND METHODS

A total of 57 Black and 50 Brown sire families which underwent 10 generations of selection for high 4-week body weight and 122 sire families of Black random bred population were used to produce 526 Black, 296 Brown and 1395 Black random bred chicks of Japanese quails and which were maintained at Poultry Experimental Station (PES), College of Veterinary Science, Hyderabad, India under uniform management conditions during April to September, 2008. Individual bird's own body weight (g) at 4 weeks age along with theirs dam's age at first egg (AFE) and egg production up to 16 weeks age (EP16) were taken as selection criteria for G_{11} Black and Brown birds. In the Black random bred population, birds were randomly mated. The body weight and ADGs were recorded at biweekly interval from day old to 10 week of age and finally at 14 weeks and then subjected to least squares analysis (Harvey 1979) using the fixed effects linear model to study the influence of hatches, strains and sexes. The hatch corrected data were utilized for the estimation of heritabilities and correlations within strain and within sex by half sib method as per Becker (1985).

RESULTS AND DISCUSSION

Least-squares means of body weights and ADGs of Japanese quails presented in Table 1, have revealed that hatch had significant influence on the body weights up to 10 weeks of age, which was in agreement with the findings of Sreenivasaiah *et al.* (1997) and Vali *et al* (2005), attributable to the variation in the environmental conditions over different hatches.

Body weight: The overall least-squares means for the body weight of day-old, 2, and 4-weeks of age were 7.94, 59.20 and 141.64 g, respectively, which were found to be similar to those reported by

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Table 1: Least squares means (g) of body weight and Average Daily Gain (ADG) at various age.

	Body Weight							
	BW0		BW2		BW4		BW4£	
	n	Mean ± SE	N	Mean ± SE	N	Mean ± SE	n	Mean ± SE
Overall	2217	7.94 ± 0.03	2217	59.20 ± 0.45	2217	141.64 ± 0.74	672	154.74 ± 0.96
Strains:								
Black	526	8.12 ± 0.04[b]	526	65.45 ± 0.65[c]	526	153.62 ± 1.07[c]	226	163.46 ± 1.33[c]
Brown	296	8.28 ± 0.05[c]	296	59.87 ± 0.87[b]	296	140.46 ± 1.42[b]	148	143.18 ± 1.71[a]
Black random bred	1395	7.41 ± 0.04[a]	1395	52.29 ± 0.66[a]	1395	130.83 ± 1.07[a]	298	157.57 ± 1.56[b]
Sexes:								
Males	1072	7.94 ± 0.03	1072	58.38 ± 0.56[a]	1072	139.38 ± 0.91[a]	236	154.78 ± 1.36
Females	1145	7.93 ± 0.03	1145	60.03 ± 0.53[b]	1145	143.90 ± 0.87[b]	436	154.69 ± 1.08
	BW6		BW8		BW10		BW14	
	n	Mean ± SE	N	Mean ± SE	N	Mean ± SE	n	Mean ± SE
Overall	672	206.37 ± 1.39	654	243.46 ± 1.46	634	264.64 ± 1.27	510	275.31 ± 2.63
Strains:								
Black	226	215.95 ± 1.82[c]	224	260.92 ± 1.64[c]	212	288.38 ± 1.84[c]	116	289.48 ± 4.60[b]
Brown	148	195.28 ± 2.47[a]	138	229.40 ± 2.11[a]	134	251.61 ± 2.41[a]	118	268.45 ± 4.39[a]
Black random bred	298	207.75 ± 2.18[b]	292	242.06 ± 1.93[b]	288	258.92 ± 2.66[b]	276	268.02 ± 3.62[a]
Sexes:								
Males	236	200.07 ± 1.92[a]	229	230.69 ± 1.68[a]	223	243.78 ± 1.84[a]	169	259.02 ± 3.85[a]
Females	436	212.59 ± 1.56[b]	425	257.57 ± 1.34[b]	411	280.48 ± 1.46|	341	291.63 ± 2.90[b]

	Average Daily Gain (ADG)					
	ADG 0-2		ADG 2-4		ADG 4-6	
	n	Mean ± SE	n	Mean ± SE	n	Mean ± SE
Overall	2217	3.66 ± 0.03	2217	5.89 ± 0.04	672	3.69 ± 0.07
Strains:						
Black	526	4.10 ± 0.05[c]	526	6.30 ± 0.05[b]	226	3.78 ± 0.10
Brown	296	3.68 ± 0.06[b]	296	5.75 ± 0.07[a]	148	3.73 ± 0.13
Black random bred	1395	3.21 ± 0.05[a]	1395	5.61 ± 0.05[a]	298	3.57 ± 0.12
Sexes:						
Males	1072	3.60 ± 0.04[a]	1072	5.79 ± 0.05[a]	236	3.24 ± 0.11[a]
Females	1145	3.72 ± 0.04[b]	1145	5.99 ± 0.04[b]	436	4.14 ± 0.08[b]
	ADG 6-8		ADG 8-10		ADG 10-14	
	n	Mean ± SE	n	Mean ± SE	N	Mean ± SE
overall	654	2.72 ± 0.08	634	1.51 ± 0.06	510	0.46 ± 0.03
Strains:						
Black	224	3.18 ± 0.10[b]	212	1.65 ± 0.09[b]	116	0.41 ±0.06
Brown	138	2.56 ± 0.14[a]	134	1.62 ±0.12[b]	118	0.56 ± 0.06
Black random bred	292	2.43 ± 0.12[a]	288	1.25 ± 0.10[a]	276	0.40 ±0.05
Sexes:						
Males	229	2.22 ±0.11[a]	223	1.33 ± 0.09[a]	169	0.41 ± 0.05
Females	425	3.23 ± 0.09[b]	411	1.69 ± 0.07[b]	341	0.51 ± 0.04

Means with same superscript do not differ significantly (P<0.05).

Chaudhary *et al* (1999). The overall least-squares mean body weights from 6 to 10 weeks of age, in the present investigation were quite higher to those of Feroz Mohammed *et al* (2006) and Saini *et al* (2007), which might be due to the effect of selective breeding practiced over several generations. The birds of selected strain weighed heavier (P<0.01) than Black random bred line at all the stages in their life coinciding with earlier the findings Dhaliwal *et al* (2004) and Saini *et al* (2007).

The sex of the chicks influenced the body weights (P<0.01) from 2 to 14 weeks of age. Unlike

in other species, females weighted heavier than males. In the present study, agreeing well with the previous studies Brah (1997) and Vali *et al* (2005). The magnitude of sexual dimorphism, measured as percentage superiority of females over the males was 2.83, 3.24, 6.26, 11.65, 15.05 and 12.59 percent, respectively for 2, 4, 6, 8, 10 and 14 weeks of body weight, which implied that quails of two sexes had differential growth pattern.

Average daily gain: The overall least-squares means for the ADGs at 0-2, 2-4, 4-6, 6-8, 8-10 and 10-14 weeks of age were 3.66, 5.89, 3.69, 2.72, 1.51 and 0.46 g, respectively, which is found to be similar to those of Feroz Mohammed *et al* (2006). The differences in ADGs among the hatches were found to be significant ($P<0.01$) throughout the period in the present study.

In similarity with the body weights, the Average Daily Gains were affected ($P<0.01$) by strains, except ADG 4-6 and ADGs 10-14 which corroborated with the report of (Feroz Mohammed *et al.* (2006). Sexual dimorphism was also ($P<0.01$) noticed in ADGs at all the ages studied, except during 10 to 14 weeks of age. While Metodiev *et al* (1997) observed that the males and females had equal growth rates up to 3 weeks age and later on, the females grew faster than the males until 5 weeks age.

Heritability: The estimates of heritability for body weights in the three strains ranged from 0.17 to 0.91, 0.01 to 0.91 and 0.01 to 0.68, respectively, where coinciding with the ranges reported by Drbohlav and Medodiev (1998) and Dhaliwal *et al* (2003). Heritability of for ADGs varied from as low as 0.002 to as high as 0.95, across the strains, which lied within the range of estimates reported by Praharaj *et al* (1990) and Aggrey and Cheng (1994). The low to high h^2 estimates indicated the availability of adequate genetic variation among the sires, offering the scope for their improvement through selection coupled with good management.

Correlations: The genetic correlations among the body weights of different ages varied from low to high (0.27 to 0.99) in Black, (-0.15 to 0.93) Brown and (0.19 to 0.98) Black random bred Japanese quails, agreeing well with those found by Resende *et al* (2005) and Metin Sezer (2007). The genetic correlations revealed that body weight in Japanese quails is influenced by the same set of genes (pleiotropic) and suggested that selection for early body weight would improve body weight at later ages. Genetic correlations among ADGs in Black, Brown and Black random bred Japanese quails in the present study varied from -0.57 to 0.92, -0.86 to 0.9 and -0.89 to 0.78, respectively. Estimates were low to high and in both directions.

CONCLUSION

The present study indicated a significant influence of genetic group (strains), sex and also hatches on growth. The heritability estimates and genetic correlation for the body weights and ADGs varied from low to high in magnitude, revealing the pleiotropic action of genes and possibility of altering one or more traits by indirect selection.

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