Research Article

Comparison of Six-Week Growth Performance in Four Different Strains of Japanese Quail (*Coturnix coturnix japonica*)

Ahmed Sultan Jatoi[1*], Shahid Mehmood[2], Jibran Hussain[2], Hafiz Muhammad Ishaq[2], Yassar Abbas[3], Muhammad Akram[2]

[1]Department of Poultry Production, Faculty of Animal Production and Technology, Shaheed Benazir Bhutto University of Veterinary and Animal Sciences, Sakrand; [2]Department of Poultry Production, Faculty of Animal Production and Technology, University of Veterinary and Animal Sciences, Lahore; [3]Department of Poultry Production, College of Veterinary and Animal Sciences, Jhang, Pakistan.

Abstract | The present study was conducted to investigate the six-week growth performance in four different strains of Japanese quails maintained at Avian Research and Training Centre, University of Veterinary and Animal Sciences, Lahore. For this purpose, 2160 newly hatched quail chicks were randomly picked up from available stock and then placed into 108 experimental units (replicates comprising 20 chicks each). Growth parameters i.e. weekly body weight (g), weight gain (g), times of weight gain, feed intake (g) and Feed Conversion Ratio (FCR) were calculated during the study period. Data were analysed by ANOVA technique and means were compared by using DMR test. The results of the present study showed that the weekly mean body weight (g) of Japanese quail birds obtained from the four strains designating as M, K, S, and Z showed non-significant differences at week 0 and 1, whereas, a significant effect was found at week 2, 3, 4, 5, and 6. The average weight gain (g) was found non-significant at week 1 and week 6, however, the statistical analysis revealed significant effect from week 2 to 5, respectively. Times of gain were found significant difference at week 1 to 4; however, at week 5 and 6, it was non-significant. Feed intake (g/bird/week) differed significantly during the entire study period, whereas, feed conversion ratio (FCR) at week-4 only. Imported quail strain (M) performed better in almost all the studied parameters than that of other strains of quails.

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***Correspondence** | Ahmed Sultan Jatoi, Shaheed Benazir Bhutto University of Veterinary and Animal Sciences, Sakrand, Pakistan; **E-mail** | asultanjatoi@sbbuvas.edu.pk
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Introduction

In Pakistan, poultry industry is playing an imperative role in fulfilling the animal protein requirements of the nation by improving productive potential of poultry birds under local environmental conditions. Still we are far behind the per capita availability of chicken eggs and meat as compared to developed countries. The situation, therefore, calls for not only strengthening the existing resources of production of animal protein foods but also exploiting some suitable efficient alternate cheaper sources of production of animal protein in the country. In this respect, commercial quail production seems to be one of the possible alternate sources possessing bright prospects required to off load pressure on the already existing meager resources of production of animal protein foods. On commercial basis the quail farming has many advantages in comparison to any other small animal for home food production (Akram et al., 2008). The rear-

ing of broiler quail is attractive because of its high reproductive potential, early sex maturity i.e. fast growth rate i.e. short period of rearing (4-5 weeks for meat production) under optimal management conditions, less space requirement, more resistance to diseases, which minimizes the use of medication and vaccination and delicious meat quality (Dhaliwal et al., 2004). Moreover, it is highly prolific, very hardy, easy to raise and maintain and an efficient converter of feed into meat. Quail farming has an additional advantage as the same flock can be used as parent flock for next generations. At the event of World Poultry Congress (2004), the quail were declared as the model avian species for future research (Minvielle, 2004).

Little research work has been conducted on its growth rate, breeding, incubation, housing, nutritional requirements, feeding, management, marketing and disease control aspects in Pakistan. Due to continuous inbreeding, since that time, genetic potential of imported quail might have deteriorated for the above characteristics. Therefore, the quail farmers all over Pakistan are facing the problem of low market live weight (120g) at 4 weeks yielding only 60g meat, which is a great hurdle to commercialize quails otherwise having enormous potential. The situation, therefore, calls to take immediate concrete steps to improve genetic potential of our local quail. For this purpose four strains (three local and one imported) of Japanese quails have been being maintained with objectives of making attempts to improve their growth potentials. However, no serious attempt has yet been made to study growth performance of these strains of Japanese quails. Keeping this in view, the present research was conducted to study the growth performance in four different strains of Japanese quail.

Materials and Methods

The present study was conducted to investigate the growth performance of four different strains of Japanese quails (one imported and three local) already maintained at Avian Research and Training Centre, Department of Poultry Production, University of Veterinary and Animal Sciences, Lahore. The names of these strains were designated as M (Major), K (Kaleem), S (Saadat) and Z (Zahid). For this purpose, 2160 newly hatched quail chicks were randomly picked up from available stock and were placed into 108 experimental units (replicates comprising 20 chicks each). The experiment was conducted in a well-ventilated octagonal quail experimental shed measuring 32ft (L) x 13ft (W) x 9ft (H). These experimental quail were maintained in a French made multi-deck 5-tier quail battery cages. Each tier was further sub-divided into 6 decks each measuring 3.5 ft (L) x 2.5 ft (W) x 10 inch (H) per deck. The temperature during first week was maintained at 95°F and reduced by 5°F each week till 70°F (North and Bell, 1991). There was a provision of *ad-libitum* broiler-quail ration feeding prepared according to NRC standards (1994) (Table 1). Fresh and clean drinking water was provided at all the times through automatic nipple drinkers.

Table 1: *Composition of feed and nutrients*

Ingredients	%	Nutrients	Values
Maize	50.0	ME Kcal/kg	2900
Rice Polish	6.00	CP %	24.00
Canola Meal	1.98	Ca %	0.80
Soybean Meal	30.54	Available P %	0.30
Corn Gluten 60%	6.00	Phytate P %	0.34
Lime stone	1.11	Total P %	0.65
D-L Methionine	0.11	Crude Fiber %	4.38
L- Lysine	0.22	Linoleic acid %	1.42
Threonine	0.15	Methionine %	0.50
DCP	1.28	Lysine %	1.30
Vitamin Supplement	1.30		
Rock Salt	0.30		

At the end of each week following physical growth parameters data were obtained during the experimental period.

Body weight (g)

Average body weight (g) of quail birds was recorded on weekly basis replicate-wise throughout the research period including the day-old chick weight.

Weight gain (g)

Weight gain (g) was worked out by the following formula:

Weight gain = Final body weight - Initial body weight in a specified period

Times of weight gain

Times of weight gain were worked out by following formula (Akram et al., 2008):

Tomes of weight gain = Present body weight (g) / Body weight of previous week (g)

Feed intake (g)

The weighed amount of feed was given to each replicate daily and the residue was measured the next day. Feed intake was recorded for each bird to calculate weekly feed intake. The following formula was used:

Feed intake=Feed offered-Feed residue in a specified period

Feed Conversion Ratio (FCR)

Feed Conversion Ratio (FCR) was worked out for individual quails on the basis of body weight gain (g) using the following formula:

FCR = Feed intake (g) / Weight gain (g)

Statistical analysis

Analysis of variance (ANOVA) was performed on data at 5% level of significance using SAS 9.1 (2002-03). The comparisons of means were made using Duncan's Multiple Range (DMR) test (Duncan, 1955).

Results and Discussion

The results of the present study showed that the average weekly body weight (g) of day-old quail chicks obtained from four strains M, K, S and Z was found significant ($P < 0.05$) at week 2, 3, 4, 5 and 6. However, M strain performed best and Z strain showed poor response with respect to body weight (Table 2). These findings are in line with those of Vali et al. (2005), who reported significant body weight variation in two quail strains at 35, 42 and 49 days of age. The variation in body weight of different strains of Japanese quails recorded during this study could be attributed to difference in genetic makeup of these strains. The variation in body weight of close bred flocks of chickens has been attributed to difference in genetic makeup of flocks maintained in different areas and ecological regions (Marks 1971; Sefton and Siegel 1974; Darden and Marks 1988). Similarly, many other workers also described the significant effect of genetic group on body weight of chicken (Mohammed et al. 2005; Devi and Reddy 2005). In the previous studies, it has been reported that the mean body weight differed significantly among different local and imported flocks of Japanese quails. The body weight of quails in imported flock was significantly ($p<0.05$) higher than those of local quails (Rehman 2006 and Akram et al., 2008). It has also been observed that body weight from day-old to 20 weeks of age was significantly higher in selected lines than the control un-selected line (Chaudhary et al. 2009;

Table 2: *Growth performance of four strains of Japanese quails at different ages*

Parameters		Strains			
	Weeks	M	K	S	Z
Body weight (g)	Wk-0	7.18±0.128^{a}	7.22±0.128^{a}	7.22±0.051^{a}	7.34±0.077^{a}
	Wk-1	23.43±0.626^{a}	22.04±0.379^{a}	22.07±0.538^{a}	22.07±0.402^{a}
	Wk-2	58.19±1.142^{a}	52.67±0.685^{b}	51.00±1.279^{b}	49.81±1.679^{b}
	Wk-3	104.22±1.788^{a}	100.56±1.254^{ab}	99.19±1.611^{b}	91.26±1.172^{c}
	Wk-4	143.22±2.608^{a}	140.04±1.581^{a}	134.00±2.273^{b}	130.63±1.373^{b}
	Wk-5	173.44±2.903^{a}	170.52±2.443^{ab}	165.04±3.299^{b}	155.33±1.609^{c}
	Wk-6	193.74±3.796^{a}	190.89±4.144^{a}	176.56±4.246^{b}	170.78±2.998^{b}
Weight gain (g)	Wk-1	16.15 ±0.583^{a}	14.78 ±0.367^{a}	14.74 ±0.563^{a}	14.67 ±0.409^{a}
	Wk-2	34.74 ±0.789^{a}	30.78 ±0.665^{b}	28.93 ±1.265^{b}	27.70 ±1.640^{b}
	Wk-3	46.04 ±1.141^{a}	47.89 ±1.021^{a}	48.19 ±1.119^{a}	41.44 ±1.702^{b}
	Wk-4	39.00 ±1.408^{a}	39.48 ±1.352^{a}	34.81 ±1.536^{b}	39.37 ±1.482^{a}
	Wk-5	30.22±1.704^{ab}	30.48 ±1.929^{ab}	30.37 ±2.511^{a}	24.70 ±1.670^{b}
	Wk-6	20.30 ±2.142^{a}	20.37 ±3.708^{a}	11.52 ±2.678^{a}	15.44 ±2.838^{a}
Times of weight gain	Wk-1	3.27 ±0.080^{a}	3.08 ±0.087^{ab}	3.06 ±0.079^{ab}	3.01 ±0.058^{b}
	Wk-2	2.51 ±0.046^{a}	2.404 ±0.043^{ab}	2.34 ±0.068^{ab}	2.27 ±0.077^{b}
	Wk-3	1.80 ±0.022^{b}	1.91 ±0.023^{a}	1.96 ±0.036^{a}	1.87 ±0.048^{ab}
	Wk-4	1.38 ±0.013^{b}	1.40 ±0.016^{ab}	1.35 ±0.017^{b}	1.44 ±0.021^{a}
	Wk-5	1.21 ±0.012^{a}	1.22 ±0.013^{a}	1.23 ±0.019^{a}	1.19 ±0.013^{a}
	Wk-6	1.12 ±0.012^{a}	1.12 ±0.023^{a}	1.07 ±0.017^{a}	1.10 ±0.019^{a}

Different alphabets on means in a row show significant difference at p<0.05; Wk-0 = Day-old quail chick weight (g); M = Major, K = Kaleem, S = Saadat, Z = Zahid

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Table 3: *Feed intake (g) and feed conversion ratio (FCR) in four different strains of Japanese quails at different ages*

Parameters	Strains				
	Weeks	M	K	S	Z
Feed intake (g)	wk-1	47.73±1.828[a]	43.71±1.982[ab]	41.04±1.712[bc]	38.21±1.135[c]
	wk-2	108.76±3.896[a]	95.93 ±2.791[b]	95.41 ±3.468[b]	80.11 ±2.313[c]
	wk-3	154.65±5.123[a]	137.15±3.109[b]	143.11±5.495[ab]	124.70±3.405[c]
	wk-4	194.96±7.861[a]	186.93±5.242[a]	190.30±8.881[a]	164.63±4.217[b]
	wk-5	252.26±7.123[a]	243.96±7.600a	251.74±11.237a	213.11±5.275b
	wk-6	302.81±6.906[a]	294.00±8.092[ab]	298.15±10.785[a]	272.22±4.818[b]
Feed conversion ratio (FCR)	wk-1	3.01±0.114[a]	2.98±0.128[a]	2.95±0.243[a]	2.64±0.086[a]
	wk-2	3.16±0.130[a]	3.14±0.103[a]	3.51±0.244[a]	3.05±0.153[a]
	wk-3	4.48±0.141[a]	4.52±0.161[a]	5.31±0.417[a]	4.83±0.317[a]
	wk-4	5.06±0.184[ab]	4.85±0.188[b]	5.61±0.315[a]	4.43±0.290[b]
	wk-5	9.87±1.285[a]	9.84±1.441[a]	10.66±1.701[a]	12.83±3.740[a]
	wk-6	19.95±3.04[a]	26.37±4.170[a]	30.36±4.360[a]	36.86±9.641[a]

Different alphabets on means in a row show significant difference at p<0.05; M = Major, K = Kaleem, S = Saadat, Z = Zahid

Choi et al. 2013). The significant (p<0.01) effects of strains and generations on body weight of Japanese quails at different ages have been reported by Mohammed et al. (2006), Rehman (2006) and Jatoi et al. (2013) indicating that selection could increase body weight in Japanese quails (Varkoohi et al., 2010). Moreover, these results are similar with the earlier findings of Marks (1975 and 1993), Oguz et al. (1996), Abdel-Fattah (2006), Abdel-Tawab (2006), El-Fiky (1991), Aboul-Hassan (2001), Kadry et al. (1986), Hussain et al. (2013) and Akram et al. (2014).

The average weekly weight gain (g) showed significant (P<0.05) differences at week 2, 3, 4 and 5, respectively. Times of gain were found significant difference at week 1, 2, 3 and 4 (Table 2). The results showed variation in body weight gain (g) among different strains of quails and are in agreement with those of Yakubu et al., (2006) who reported strain variation in body weight gain in broilers at the age of 4-week. The similar strain variation in body weight gain in Aseel chicken and Japanese quails at different ages has also been indicated by Shoukat (1989), Iqbal (2011), Jatoi (2012), Akram et al. (2014).

The average feed intake (g) was found to be significantly different during the entire study period in different strains of quails (Table 3). Similarly, significant strain variation in feed intake has been reported (Joya et al., 1979; Proudfoot and Hulan 1987; Leeson et al., 1997; Akram et al., 2014).

A significant (P<0.05) differences were observed at week-4 in respect of FCR during the study period (Akram et al. (2014)). These results are in agreement with those of Rehman (2006) and Akram et al. (2014), who indicated significant difference in FCR at different ages between different local and imported flocks of Japanese quails. The variation in feed conversion ratio due to strain has also been observed (Balogun et al., 1997; Ajayi and Ejiofor 2009). Similarly, Iqbal (2011)) reported that the FCR in four varieties of Aseel was significantly different at 1st, 5th, 6th, 7th, 8th, 9th, 10th, 11th, 12th, 13th, 14th and 15th weeks of age.

Conclusion

Considerable variations in almost all the studied parameters in different strains of quail were recorded during the course of this study indicate possibility of further improvement in their growth performance. Imported quail strain (M) performed better in almost all the studied parameters than that of other strains of quails.

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