The Journal of Animal & Plant Sciences, 26(2): 2016, Page: 315-319
ISSN: 1018-7081

EFFECT OF DIFFERENT DIETARY LYSINE REGIMENS ON THE GROWTH PERFORMANCE AND ECONOMIC EFFICIENCY OF JAPANESE QUAILS

Y. Abbas[1], A. W. Sahota[1], M. Akram[1], K. Javed[2], M. Younus[3], S. Mehmood[1], S. Ahmad[1], Ikerma[3] and A. S. Jatoi[4]

[1]Department of Poultry Production, [2]Department of Livestock Production, [3]CVAS Jhang, University of Veterinary and Animal Sciences, Lahore-Pakistan, [4]Shaheed Benazir Bhutto University of Veterinary and Animal Sciences, Sakrand-Pakistan
Corresponding Author e-mail: yassar.abbas@uvas.edu.pk

ABSTRACT

The present study aimed to examine the growth performance and economic efficiency involving 1440 day-old Japanese quail (*Coturnix japonica*) chicks at Avian Research and Training (ART) Centre, University of Veterinary and Animal Sciences, Lahore, Pakistan. Three dietary lysine levels (1.3, 1.4-1.2 & 1.5-1.3-1.1 %) in 3 different phases were allocated to four different close-bred stocks (Imported, Local-1, Local-2 and Local-3) of Japanese quails to assess their comparative growth performance by replicating each treatment for three times. The experimental day-old quail chicks were randomly divided into 36 experimental units of 40 chicks each. Quails under 1st treatment were fed a diet with 1.3 percent lysine throughout the grow-out period of 28 days, while, those under 2nd treatment were allotted diet with 1.4 percent lysine up to14 days of age and then subsequently reduced to 1.2 percent lysine up to 28 days. The 3rd treatment was split into 03 different phases. The first phase was up to 9th, 2nd up to 19th and 3rd up to 28th day by allotting diet containing 1.5, 1.3 and 1.1 % lysine, respectively. Weekly data on growth performance were recorded and analyzed through ANOVA technique in CRD under factorial arrangement. The comparison of means was carried out using DMR test by the help of SAS 9.1. Maximum ($P<0.05$) feed intake, body weight gain and improved FCR were observed in three phase dietary lysine regimen leading to maximum profit margin. However, close bred stocks could not show any significant difference in growth parameters.

Key words: lysine regimens, growth performance, economics, close bred stock, Japanese quails.

INTRODUCTION

Quail (*Coturnix japonica*) production has gained much importance in the commercial sector due to its excellent meat quality and higher global demand. Early sexual maturity, small body size, low maintenance cost, easy handling, high resistance against diseases and less space requirements have made their farming more attractive (Minvielli., 2004). The efficient and economical quail production requires provision of proper housing, feeding, strict biosecurity measures and marketing, however, availability of balanced feed is much important as it involves about 70 to 75 percent cost of production (Mahmood *et al.*, 2005). The feed prices in the world and especially in Pakistan are rising due to high prices of electricity and global shortage of grains. Therefore, any improvement in the performance of birds (broilers, layers and quails) through proper feeding strategies has a profound effect on profitability.

Poultry farmers around developing countries and especially in Pakistan follow a single diet plan with constant energy and protein content throughout the life span of meat producing birds. Use of single diet seems to be inappropriate as it is not compatible to the growth pattern of the birds which decrease every week, hence needs to reduce the protein or essential amino acid like lysine consequently cutting down the feed cost. The optimum time for changing the dietary specification, therefore, is of economic importance (Walkins *et al.*, 1993).

Protein and amino acids being the major nutrients represent a high percentage of total cost of the poultry ration. Increasing prices of corn and soybean meal and the greater commercial availability of lysine being the most important limiting amino acid for birds have drawn interest to diet formulation based on reduced protein levels with adequate amino acid supplementation.

Gheisari *et al.* (2011) in his study proved that changing protein levels in Japanese quail diet during the starter, grower and finisher periods can be recommendable to achieve a better body weight gain and improved FCR. Contrarily, one or two phase feeding system resulted in significant improvement in FCR by consuming less feed and attaining better growth rate when compared to three or four-phase feeding system in Japanese quail (Abdel Mageed., 2012). Whereas, Soares *et al.*(2003) observed no effect of different protein levels on feed intake and feed conversion ratio in Japanese quail.

This inconsistency in results and scarcity of information regarding the effect of phase feeding trials in Japanese quail arise the dire need to plan the present study to evaluate the growth performance and economic

efficiency of four close bred stocks of Japanese quail reared under different dietary lysine regimens.

MATERIALS AND METHODS

The present study of 4 weeks duration was executed at Avian Research and Training (ART) Centre, University of Veterinary and Animal Sciences, Lahore, Pakistan. In this experiment, 1440 day-old Japanese quail chicks were obtained from the hatchery of ART Centre. Three different dietary lysine levels (1.3, 1.4-1.2 & 1.5-1.3-1.1 %) were allocated to four different close bred stocks {(Imported), (Local-1), (Local -2) and (Local-3)} of Japanese quails to assess their comparative performance by replicating each treatment for three times. The experimental day-old quail chicks were randomly distributed into 36 experimental units of 40 chicks each. The quails under 1st treatment were fed a diet with 1.3 percent lysine throughout the grow-out period of 28 days, while, those under 2nd treatment were allotted diet with 1.4 percent lysine up to14 days of age and then subsequently reduced to 1.2 percent lysine up to 28 days. The 3rd treatment was split into 03 different phases. The first phase was up to 9th, 2nd upto 19th and 3rd upto 28thday by allotting diet containing 1.5, 1.3 and 1.1 % lysine, respectively. Feed and clean drinking water were made available *ad-libitum* throughout the experimental period. The data were recorded regarding the growth performance of quails including feed intake (g), body weight gain (g) and mortality (%). Feed conversion ratio, feed efficiency and economic efficiency were also calculated. The body weight of individual quail bird was recorded on weekly basis. FCR (performance of feed) was calculated by dividing feed intake by weight gain while the Feed efficiency (Efficiency of birds in converting feed), opposite to that of FCR formula (Poultry Production Manual, University of Kentucky, U.K.).The data thus collected were analyzed according to Completely Randomized Design (CRD) under factorial arrangements using analysis of variance (ANOVA) technique (Steel *et al., 1997*). The means were compared by Duncan's Multiple Range test (DMR) (Duncan, 1955) through SAS (Statistical Analysis System) 9.1 for windows.

The composition of the experimental diets is shown in Table 1.

Table 1. Composition of experimental diets for quails

Ingredients	**Dietary lysine levels (percent)**				
	1.1	**1.2**	**1.3**	**1.4**	**1.5**
Maize	59.08	56.84	54.56	52.31	50.04
Sunflower Meal (25%)	18.90	16.42	16.44	21.13	25.84
Soybean Meal (45.5%)	7.04	11.73	13.93	11.45	8.95
Rapeseed Meal	3.00	3.00	3.00	3.00	3.00
Fish Meal (52%)	3.00	3.00	3.00	3.00	3.00
Poultry byproduct meal	3.00	3.00	3.00	3.00	3.00
Molasses	3.00	3.00	3.00	3.00	3.00
Limestone	1.14	1.12	1.11	1.10	1.08
Lysine sulphate	0.70	0.70	0.69	0.68	0.67
Supplement	0.20	0.22	0.27	0.33	0.39
Nutrients	**Dietary lysine levels (percent)**				
	1.1	**1.2**	**1.3**	**1.4**	**1.5**
Metabolize energy (k calories/kg)	2735	2735	2735	2735	2735
Crude protein (%)	17.56	18.91	20.30	21.64	23.02
Calcium (%)	0.95	0.95	0.95	0.95	0.95
Available Phosphorus	0.40	0.40	0.40	0.40	0.40
Lysine	1.10	1.20	1.30	1.40	1.50
Methionine	0.52	0.57	0.62	0.69	0.75
Methionine+Cystine	0.83	0.90	0.97	1.05	1.12
Arginine digestible	1.10	1.20	1.30	1.40	1.50
D-lysine	0.96	1.05	1.14	1.23	1.31

RESULTS AND DISCUSSION

Feed Intake (g): Feed intake showed significant ($P<0.05$) difference due to phase-feeding of different dietary lysine regimens (Table 3).Three-phase feeding dietary lysine regimens showed maximum feed intake followed by two and then one-phase feeding dietary lysine regimens. Maximum feed intake in three- phase

feeding dietary lysine regimens could be attributed to optimum dietary lysine levels compatible to different stages of growth by meeting the exact lysine requirements varying with rate of growth as the age advances the requirement for lysine decreased. Protein requirements of Japanese quails have been reported to decrease with age (Abdel-Mageed, 2012). Similarly Attia *et al.* (2012) observed higher feed intake in Japanese quails fed high protein level during growing age (1-6 weeks), and during second rearing period (15-28 days) (Gheisari *et al.*, 2011).

Significant (P<0.05) difference in feed intake was observeddue to different close-bred stocks (CBS) (Table 3). Significantly (P<0.05) lower feed intake was observed in local-2 CBS as compared to others. This might be due to genetic diversity in different close-bred stocks with different body requirements. Similar findings about variation in feed intake in different strains of broilers have been reported by Mehmood *et al.* (2012). Santos *et al.* (2009) also reported significant effects of genotype by lysine interaction on all the performance traits in two genetic groups of meat type Japanese quail during growing period.

In terms of interaction significantly (P<0.05) higher feed intake was observed in local-one CBS in three-phase feeding program (Table 3) showing variation in performance of different close- bred stocks.

Body Weight Gain (g): Body weight gain indicated significant (P<0.05) difference due to phase-feeding of different dietary lysine regimens (Table 3). Three-phase feeding dietary lysine regimens exhibited maximum body weight gain followed by two and then one-phase feeding dietary lysine regimens which might be due to optimum dietary lysine regimens at various stages with different nutrient profile which ultimately resulted in meeting the birds' requirements for lysine. Mehmood *et al.* (2012) reported higher body weight in broilers fed four-phase feeding program. Furthermore, the compensation in body weight gain was more pronounced for treatments getting diets with high crude protein or ideal protein levels in the consecutive phase (Eits *et al.*, 2003).

Non-significant difference (P<0.05) in body weight gain due to different close-bred stocks (CBS) was observed (Table 3).In terms of interaction of phase feeding with different close bred stocks, significantly (P<0.05) the highest body weight gain was observed in local-3, fed three-phase feeding program that could be due to treatment effect (Table 3).

Feed Conversion Ratio: Feed conversion ratio showed significant (P<0.05)difference due to phase-feeding of different dietary lysine regimens (Table 3).The best feed conversion ratio was obtained by three phase lysine feeding followed by two and then one phase feeding dietary lysine regimen that could be attributed to different dietary lysine regimens with different nutrient profiles at different age periods.FCR improved linearly with reducing dietary lysine level at terminal phase and the best FCR emerged from very low lysine levels compared to diets with high lysine levels. Kaur *et al.* (2008) reported similar findings in growing Japanese quail during 0-3 weeks of age where manipulation of dietary CP level resulted in improved feed conversion ratio.

Non-significant difference in feed conversion ratio due to different close-bred stocks was observed in the present study (Table 3).In terms of interaction of phase feeding with different close bred stocks significantly (P<0.05) higher feed conversion ratio was observed in local-3 CBS fed three-phase feeding program (Table 3).

Feed Efficiency: In term of efficiency of different dietary lysine programs significant differences (P<0.05) were observed (Table 3). Three phase lysine feeding diet resulted in significantly (P<0.05) best feed efficiency followed by two and then one phase feeding dietary lysine regimen that could be attributed to the gradual declining in dietary lysine level may helpful in satisfying the needs of the quails more efficiently. Similarly, Mehmood *et al.* (2012) observed improvement in feed efficiency in broilers fed at 4 phase feeding program. Non-significant difference in feed efficiency due to different close-bred stocks was observed in the current study (Table 3). In terms of interaction of phase feeding with different close bred stocks significantly (P<0.05) better feed efficiency was observed in all close-bred stocks fed three-phase feeding program (Table 3) that might be due to the effect of treatment.

Mortality (%): Non- significant (P<0.05) difference in mortality (%) due to phase-feeding of different dietary lysine regimens and close-bred stocks (CBS) was observed (Table 3). It seems that birds reared under different phase feeding might have fulfilled their nutritional requirements at particular age.

In terms of interaction, significantly (P<0.05) higher mortality was observed in imported CBS fed with single phase, while, lowest in local-3 CBS in three dietary lysine regimens (Table 3) showing variation in performance of different close bred stocks.

Economic Impact/Benefit: The highest profit 30.16 (%) was recorded in three phase dietary lysine regimens followed by 19.79(%) in two and then 14.28(%) in single phase dietary lysine regimen (Table 2). Regarding feed cost, it was almost the same for different phases of dietary lysine regimens but three phase feeding regimen produced the highest body weight among all the treatments that resulted in to more quantity of meat sold leading to higher income and profit. Single phase feeding program may result in undesirable expenditure of nutrients, deficiency during starter phase, while, excess during the finisher phase causing in poor economics or

rise in feed cost. It has been further elaborated by Lomeli *et al*. (2009) that feeding 24% CP diet during 14 days and changed to 21% CP diet saved protein expense in Japanese quail.

Table 2. Economics ofraising quail under different levels of dietary lysine.

Parameters	% Lysine Phases		
	1	2	3
Feed consumed (g)	384.35	388.99	398.93
Cost of day- old chick (Rs).	8	8	8
Total feed cost (Rs)	14.56	14.61	14.92
Miscellaneous cost (Rs)	10	10	10
Total cost/quail (Rs)	32.56	32.61	32.92
Total live weight/quail (g)	148.84	156.25	171.4
Sale price/ Kg live wt. (Rs)	250	250	250
Total sale price / quail (Rs)	37.21	39.06	42.85
Net Profit/ quail (Rs)	4.65	6.45	9.93
Profit (%)	14.28	19.79	30.16

Table 3.Feed intake (g), Body weight gain (g), FCR, Feed Efficiency and Mortality (%) in 4 close-bred stocks (CBS) of Japanese quails reared for 4 weeks under 3 dietary lysine regimens.

Parameters Treatments		Feed Intake (g)	Body weight gain (g)	FCR	Feed Efficiency	Mortality %
Lysine levels (%)						
1.3		384.39±1.47^{c}	141.34±1.85^{c}	2.72±0.01^{a}	0.36±0.00 ^{c}	12.70±0.35
1.4-1.2		389.00±0.93^{b}	148.84±0.64^{b}	2.61±0.01^{b}	0.38±0.00 ^{b}	12.22±0.11
1.5-1.3-1.1		398.94±0.93^{a}	163.95±0.86^{a}	2.43±0.01^{c}	0.41±0.00 ^{a}	12.05±0.15
Close-Bred Stocks						
Imported		391.88±2.04^{a}	151.57±3.07	2.59±0.03	0.38±0.05	12.62±0.48
Local-1		392.93±2.41^{a}	152.69±3.11	2.57±0.03	0.38±0.06	12.27±0.22
Local -2		386.94±2.85^{b}	149.97±3.97	2.59±0.05	0.38±0.07	12.18±0.10
Local-3		391.32±2.20^{a}	151.27±3.67	2.59±0.04	0.38±0.07	12.22±0.15
Lysine levels (%) × Close-Bred Stocks						
1.3	**Imported**	385.51±2.71^{e}	142.77±2.84^{cd}	2.70±0.03^{abc}	0.37±0.05^{de}	13.63±1.36^{a}
	Local-1	388.64±1.44^{cd}	144.22±2.84^{bcd}	2.69±0.01^{abc}	0.37±0.01^{cde}	12.27±0.37 ^{ab}
	Local -2	377.92±2.66^{f}	136.81±0.97^{e}	2.76±0.00^{a}	0.36±0.00^{e}	12.43±0.23 ^{ab}
	Local-3	385.93±0.35 ^{e}	141.56±2.62^{ed}	2.72±0.04^{ab}	0.36±0.05 ^{de}	12.47±0.15 ^{ab}
1.4-1.2	**Imported**	388.02±1.86^{cd}	149.26±1.59 ^{b}	2.59±0.01^{d}	0.38±0.0.2^{bc}	12.30±0.21 ^{ab}
	Local-1	392.19±0.89^{cd}	149.21±0.82 ^{b}	2.62±0.01^{cd}	0.38±0.01 ^{bcd}	11.97±0.20 ^{b}
	Local -2	386.51±1.56^{cd}	136.81±0.97^{b}	2.58±0.03^{d}	0.38±0.05^{b}	12.17±0.09 ^{ab}
	Local-3	389.32±1.92^{de}	147.45±1.06^{bc}	2.64±0.01^{bcd}	0.37±0.02 ^{bcd}	12.43±0.33 ^{ab}
1.5-1.3-1.1	**Imported**	397.93±1.89^{ab}	162.73±0.88 ^{a}	2.44±0.01^{e}	0.40±0.01 ^{a}	12.27±0.18 ^{ab}
	Local-1	402.14±0.89 ^{a}	164.60±0.57 ^{a}	2.44±0.01^{e}	0.40±0.02 ^{a}	12.23±0.62 ^{ab}
	Local -2	396.46±1.56^{bc}	163.66±2.17 ^{a}	2.42±0.04^{e}	0.41±0.07 ^{a}	11.93±0.03^{b}
	Local-3	399.24±1.93^{ab}	164.81±3.06 ^{a}	2.42±0.04^{e}	0.41±0.08 ^{a}	11.77±0.07 ^{b}

Different alphabets on means show significant differences (P<0.05)

Conclusion: The inference thus could be drawn from the present study that the quails in three phase dietary lysine regimen had the maximum feed intake, gained the highest body weight and resulted into best FCR and feed efficiency leading to maximum profit margin followed by 2 and 1 phase program. However, CBS could not show any significant difference on growth and economics efficiency in Japanese quail.

REFERENCES

Abdel-Mageed, M. A. A. (2012). Effect of using enzymes on performance of Japanese quail fed optimal and sub-optimal energy levels. Egypt. Poult. Sci., 32(4):865-881.

Attia, A. I., K. M. Mahrose, I.E. Ismail, and D.E. Abou-Kasem (2012). Response of growing Japanese

quail raised under two stocking densities to dietary protein and energy levels. Egypt. J. Anim. Prod., 47:159-166.

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

Eits, R. M., R. P. Kwakkel, M.W. A. Verstegen, and G.C. Emmans (2003). Responses of broiler chickens to dietary protein: Effects of early life protein nutrition on later responses. Brit. Poult. Sci., 44: 398-409.

Gheisari A., A. H. Habib, M. Ghasem, T. Majid, A. Amir, and E. S. Shahin (2011). Effect of different dietary levels of energy and protein on performance of Japanese quails (*Coturnix Coturnix Japonica*).2nd International Conference on Agricultural and Animal Science, IPCBEE. IACSIT Press, Singapore.

Kaur, S., A. B. Mandal, K. B. Singh, and M. M. Kadam (2008). The response of Japanese quails (heavy body weight line) to dietary energy levels and graded essential amino acid levels on growth performance and immuno-competence. Livestock Sci., 117:255-262.

Lomeli, J.J., L.R. Flores, and R. Barajas (2009). Influence of descending dietary-protein levels on performance of fattening Japanese quail: II. Response during the cool season. Proceedings, Western Section, American Society of Animal Science.

Mahmood, S., S. Hassan, F. Ahmed, M. Ashraf, M. Alam, and A. Muzaffar (2005). Influence of feed withdrawal for different durations on performance of broilers in summer. Int. J. Agri. Biol., 7:975-978.

Mehmood, S., A.W. Sahota, M. Akram, A.S. Jatoi, and K. Javed (2012). Growth performance, breast yield and economics in sexed broiler chickens influenced by different phase feeding program. Abst.National Sci. Conf. on "Agriculture and food security issues in global environmental perspectives" The University of Poonch, Rawalakot, Azad Jammu and Kashmir.Pp: 281p

Minvielle F. (2004). The future of Japanese quail for research and production World`s Poult. Sci. J., 60: 500-507.

Poultry Production, Manual, http://www2.ca.uky.edu/ poultry profitability/ Production_manual/ Cha pter6_Factors_affecting_feed_conversion/ Chapter6_Introduction.html.Acessed on 26 February, 2014.

Santos, B. M., C. G. Pereira, S. M. Marin, and T. G. Morato (2009). Genotype by lysine level interaction on performance traits of meat type quail (*Coturnix coturnix Japonica*) during the growing period. J. ArquivoBrasileiro de MedicinaVeterinária e Zootecnia. 61: (6): 1382-1390.

Soares, R., J.B. Fonseca, A.S. Santos, and M.B. Mercandante (2003). Protein requirement of Japanese quail (*Coturnix Coturnix Japonica*) during rearing and laying periods. Brazilian J. Poult. Sci., 5:153-156.

Steel, R. G. D., J. H. Torrie and D. A. Dickey (1997). Principles and procedures of Statistics-A biometric approach.3rd Edit.McGraw-Hill Book publishing company, Toronto, Canada.

Sultan, S. I. (2012). Use of Habek Mint (*Menthalongifolia*) in broiler chicken. Int. J. Poultry Sci., 3(10):629-634.

Walkins, S.E., K.L. Waldroup, and P.W. Waldroup (1993).Effect of dietary amino acid level on time of change from starter to grower diets for broiler chickens. J. Appl. Poult. Res., 15: 312-325.