The Journal of Animal & Plant Sciences, 23(3): 2013, Page: 727-730
ISSN: 1018-7081

POST-PEAK EGG PRODUCTION IN LOCAL AND IMPORTED STRAINS OF JAPANESE QUAILS (*COTURNIX COTURNIX JAPONICA*) AS INFLUENCED BY CONTINUOUS AND INTERMITTENT LIGHT REGIMENS DURING EARLY GROWING PERIOD

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ABSTRACT

A study was conducted at Avian Research and Training Centre, University of Veterinary and Animal Sciences, Lahore to investigate earlier effect of continuous and intermittent lights in 3 local and one imported close-bred flocks of Japanese quails (*Coturnix coturnix japonica*) on their post-peak egg production. Day-old quails were provided continuous 24 hours light up to first 2 weeks and were maintained under 5 different light treatments, A (16L: 8D), B (8L: 6D: 2L: 8D), C (8L: 7D: 1L: 8D), D (8L :7.5D: 0.5L: 8D) and E (8L: 16D) from 3rd to 14th weeks and from 15th weeks onward provided light 16L: 8D. In this trial, 22 weeks-old 240 quails of the same treatments were kept from 23 to 34 weeks under factorial arrangements (5 lights x 4 close bred flocks x 3 replicates of 1 male: 3 females each in a 5 tier battery) under same management. The results showed significant effect of light treatments on body weight ($p<0.01$), feed intake ($p<0.01$), egg production ($p<0.05$) feed conversion ratio (feed/dozen egg) and FCR (feed/ egg) ($p<0.01$). The highest body weight was recorded under treatment B, however, A, C, D and E differed non-significantly. Higher feed intake was observed under treatment A, varying non-significantly with treatment D. The birds in group A produced significantly ($p<0.05$) more eggs than in other experimental treatments. FCR in group E was significantly ($p<0.05$) better than in all other light treatments. Light and strain interaction was significant ($p<0.01$). The quail strains differed in the above parameters.

Key words: Light regimens, body weight, egg production, egg weight, feed intake, FCR.

INTRODUCTION

The recent trend of establishing modern large size environmentally controlled poultry houses with enormous capital investment in place of small conventional open sided poultry houses has resulted in shut down of many small scale poultry farms. The situation therefore calls for finding some efficient alternate sources of poultry production requiring less capital investment to attract and reengage these small scale poultry farmers. 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. Japanese quails can be maintained for egg and meat production (Cain and Cawley 2000) due to faster growth rate, early 6-weeks sexual maturity, hardiness, ease in maintenance and handling, inexpensive and great laying ability. The modern Japanese quail is a good egg layer (Baumgartner 1994). Lewis *et al.* (2007) reported improvement in egg production and egg weight in commercial layers with increase in lighting hours during rearing period. The step-down lighting had minimal effect on 18-week body weight of layers and also delayed their sexual maturity with reduced egg production, whereas, longer constant day-length during rearing may increase feed intake and body weight gain at18 weeks (Leeson and Summers 1985; Leeson *et al.* 1988). Continuous light programs have been reported to induce sleep deprivation and severe physiological stress responses in broilers (Campo and Davila 2002; Kliger *et al.* 2000). The most recent research focus is on restricting light regimens to improve productivity of chickens due to low physical activity during darkness and considerable energy expenditure of activity (Rahimi *et al.* 2005). The beneficial effect of intermittent light on growth and feed conversion efficiency of broilers have been indicated (Mahmud *et al.* 2011).

Research work to improve productive potentials of 4 close bred flocks (three local and one imported) of Japanese quails through selective breeding is being undertaken at Avian Research and Training Centre, University of Veterinary and Animal Sciences, Lahore. Besides this, different studies are also in progress at this centre to examine effect of different continuous and intermittent lighting regimens during growing period on productive performance of quails. The research work reported in this paper is part of many research investigations carried out at this centre.

MATERIALS AND METHODS

Experimental plan: The present experiment was conducted with four close-bred strains of quails, namely Major (M), Zahid (Z), Sadaat (S) and Kaleem (K) under 5 different light regimens (A, B, C, D, and E) at Avian Research and Training Center, University of Veterinary and Animal Sciences, Lahore. The light regimens E (8L: 16D) and A (16L: 8D) served as negative and positive controls, respectively, while B, C and D were, three different intermittent lighting regimens (treatments). Day-old quails were provided continuous 24 hours light up to first 2 weeks of age and then they were kept under 5 different light regimens from 3rd to 14th weeks of age as per experimental plan given in Table 1. The light control was made by an electric panel fitted with manual timers. From 15th to 34th weeks, experimental quails were maintained on a lighting schedule of 16 hours light and 8 hours darkness. This experiment was conducted for 12 weeks from 22nd to 34th weeks to study lighting effect of earlier growth period on post-peak production (results from 15 to 21 weeks have been reported in another study).

Table 1. Lighting regimes (3 to 14 weeks of age)

Treatments	Light hours	Dark hours	Light hours	Dark hours
A	8	16	---	---
B	8	6	2	8
C	8	7	1	8
D	8	7.5	0.5	8
E	16	8	---	---

The experimental quails were maintained in a 5-tiered quail battery cages. In each tier there were 6 decks, each measuring 3.5 ft (L) x 2.5 ft (W) x 10 inch (H). Fresh and clean drinking water was provided at all the times through automatic nipple drinkers. The birds were fed *ad libitum* a balanced quail breeder ration according to NRC standards (1994), containing Metabolizable energy 2900 kcal/kg, crude protein 20%, calcium 3% and available phosphorus 0.4%.

The experiment was conducted according to factorial arrangements of 5 lighting regimens (treatments) x 4 close-bred flocks x 3 replicates x 4 quails (1 male, 3 female). The weekly data on body weight (g), feed intake/bird (g) and egg production were recorded. Feed conversion ratio (FCR) for egg production (dozen) and Kg egg mass was calculated. As both the male and female quails were kept together and male body weight was about 10 percent lesser than the female body weight, therefore male feed intake was recorded as 90 percent of the feed intake of female quails as per procedure followed by Akram *et al.* (2008).

Statistical analysis: The data thus collected were analyzed using ANOVA techniques (Steel *et al.* 1997). The comparison of means was made using Duncan's Multiple Range (DMR) Test (Duncan 1955).

RESULTS AND DISCUSSION

The results of the present study showed that the mean body weight (g) in quails was 268.81±5.09, 280.70±12.3, 267.96±2.99, 274.10±12.3, 271.20±10.3g under light treatments A, B, C, D and E, respectively, indicating significant ($p<0.05$) effect of light treatments on body weight. The highest mean body weight was recorded under treatment B (intermittent light 2 hours plus) followed by treatments D, E, A and C. The body weights of quails under lighting treatments D and E were significantly ($p<0.05$) better than those under lighting treatments A and C, however a non-significant difference in body weight under lighting treatments, D and E and A and C were recorded. The mean body weight of flock M was comparatively higher than all other closed bred flocks. The treatment into close bred flock interaction was also found to be significant ($p<0.01$). This higher ($p<0.05$) body weight gain in quails under the intermittent light treatment B than positive and negative control groups could be attributed to higher feed intake in this group than in other groups resulting in higher weight gain (Table 2). The effect of photoperiod on weight gain of quails has been mainly attributed to availability of feed (Boon *et al.* 2000) who further indicated that photoperiod below which detrimental effects on weight gain occurred was 9L:15D for broiler and layer quail strains. Restriction of light regimens has reported to improve performance of chickens due to their low physical activity during darkness and saving considerable energy expenditure of activity (Rahimi *et al.* 2005). The beneficial effect of intermittent light on growth and feed conversion efficiency of broilers has also been indicated (Mahmud *et al.* 2011). These findings are also in line with those of Boon *et al.* (2000) who stated that changes in feeding behavior and energy expenditure shown under short photoperiods allowed chicks to gain more weight continuously. The results of this study are also substantiated by those of Prakbaran *et al.* (1991) who indicated that a light period of 08 hours in Japanese quails gave the best body weight.

The results reveal that the mean weekly feed intake under 16 hours continuous day light was 214.91±2.97g, which was significantly ($p<0.05$) higher than that of the quails under other light regimens except that of light treatment D (Table 2). This could be attributed to longer photoperiod resulting in higher feed intake in quails. These findings are in quite agreement with those of Leeson and Summers (1985) who observed that providing longer constant day-length increased feed intake. Significant difference in feed intake among different close bred flocks was also observed. Feed intake in M and Z flocks was found to be significantly ($p<0.05$) higher than S and K strains, It could be attributed to higher body weight in M and Z flocks leading to higher feed requirement. The quails under 8L:16D exhibited significantly best feed conversion ratio (FCR/kg egg) perhaps due to short photoperiods resulting in reduced activity in quails (Table 2).

The results further indicated that mean egg production percent in experimental quails subjected to lighting regimens A, B, C, D and E during rearing period was 79.49, 74.65, 75.99, 76.33, 75.64 percent, respectively. The significantly ($p<0.05$) higher mean egg production was recorded under treatment A (16L:8D) which could be due to better stimulation of birds under continuous lighting as compared to intermittent lighting. The close-bred flocks differed non-significantly in egg production. The lighting regimen x close-bred flock was found to be non-significant (Table 2). These results are in agreement with the findings of Lewis *et al.* (2007) who reported that egg production in commercial layers increased with increase in lighting hours during rearing period. The results of this study are also in line with the findings of Abplanalp *et al.* (1962) and Wilber (1962). Leeson *et al.* (2005) reported that step down light during rearing had non-significant effect on egg production in chickens.

The mean egg weight (g) in quails under different light regimens implied under the present study differed significantly ($p<0.05$) from each other. Close-bred flock differed non-significantly (Table 2). The results of this study are substantiated with the findings of Padhi *et al.* (1998) who reported variable egg size in different inbred strains of chickens.

The results of the present study indicate that different intermittent versus continuous light regimens significantly influenced performance of Japanese quails in terms of body weight, egg production, feed intake and FCR/ Kg eggs (Table 2).

Table 2. Production performance of experimental quails influenced by differ Lighting regimens

Particulars	A	B	C	D	E	Results
Body weight (g)	268.81 ±5.09 ^{c}	280.70 ±12.30 ^{a}	267.96 ±2.99 ^{c}	274.10 ±12.30 ^{b}	271.20 ±10.30 ^{b}	**
Egg production (%)	79.49 ± 1.78 ^{a}	74.65 ± 1.78 ^{b}	75.99 ± 1.78 ^{b}	76.33 ± 1.78 ^{b}	75.64 ±1.78 ^{b}	*
Feed intake(g)	214.91 ±2.97 ^{a}	213.21 ±1.49 ^{b}	213.32 ±2.17 ^{b}	214.39 ±2.46 ^{a}	212.68 ±2.10 ^{c}	**
FCR /dozen eggs	0.461 ±0.02 ^{b}	0.543 ±0.04 ^{a}	0.498 ±0.03	0.475 ±0.02	0.452 ±0.06	NS
FCR/Kg eggs	3.207 ±0.19 ^{b}	3.731 ±0.33 ^{a}	3.328^{b} ±0.23	3.217^{b} ±0.05	3.0883 ±0.05 ^{c}	**
Egg weight (g)	11.342 ±0.44	11.675 ±0.32	11.13 ±1.06	10.766 ±0.66	11.833 ±0.46	NS

** = Significant ($p<0.01$) *= Significant ($p<0.05$) NS= Non-significant

Table 3. Analysis of variance of data

S.O.V	Body weight (g)	Egg Production (%)	Feed intake (g)	FCR/ dozen eggs	FCR/egg mass	Egg weight (g)
			------------------------ Mean square ---------------------------			
CBF†	29209.808**	9.828 ^{NS}	1758.059**	188.630^{NS}	6.377**	6.739*
Light Treatment	3785.900**	42.034*	141.174**	188.772^{NS}	8.899**	2.520 ^{NS}
CBFX Light	8686.346**	10.295 ^{NS}	534.244**	113.638^{NS}	6.548**	4.275*
Error	337.851	9.539	33.690	19.256	0.873	2.277

** = Significant ($p<0.01$) *= Significant ($p<0.05$) NS= Non-significant †= Close-bred flocks

Acknowledgements: The authors thankfully acknowledge provision of excellent research facilities during course of this study by Avian Research and Training Centre, Department of Poultry Production, Faculty of Animal Production and Technology,

University of Veterinary and Animal Sciences, Lahore, Pakistan.

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