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Performance of Japanese Quails (*Coturnix coturnix japonica*) on Floor and Cage Rearing System in Sylhet, Bangladesh: Comparative Study

Research Article

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ABSTRACT

A total number of 66 day old Japanese quail chicks divided into 2 treatment groups (33 in each treatment) with 3 replications in each having 11 birds (male, 5 and female, 6) were reared on floor and in cage system for a period of 5 weeks to know the effect of rearing system on growth performance and carcass characteristics. At the age of 35 days, average body weight and feed intake were 102.15 and 320.7 g/quail for cage and 78.41 and 146.02 g/quail for floor system, respectively. Feed conversion ratio (FCR) was 3.89 and 4.10 for cage and floor system, respectively ($P<0.01$), at the end of study period. Body weight, feed intake and FCR were significantly ($P<0.01$) different between cage and floor rearing system. At the age of 21 and 35 days survivability were 72.72 and 72.72% for cage and 63.63 and 60.60% for floor, respectively. There was higher survivability in cage system. In case of meat yield characteristics, average weight of breast, thigh, wing, drum stick were 20.92, 7.37, 5.42 and 5.72 g for cage and 20.84, 7.35, 5.39 and 5.63 g for floor, respectively. There were no significant difference among average weight of breast, thigh and drum stick between two rearing system. In case of sex average, wing weight differed among sexes. It was concluded that cage reared quails showed better performance compared to littered floor rearing system.

KEY WORDS comparative study, floor and cage system, performance, quail.

INTRODUCTION

Quail farming is very easy and entertaining because it is one of the smallest species of poultry birds and is very profitable similar to chicken and duck farming. Almost all types of weather condition are suitable for quail farming. Quail eggs are more nutritious than other poultry egg because it contains comparatively much more protein, lipid and carbohydrates (Anca *et al*. 2012). Quail farming, needs small capital and labor can play a vital role to meet up the demand of nutrition. Japanese quail growth experienced great development in recent decades due to biological characteristics, which determines the high level of production and economic efficiency as well as the market requirement for quail eggs and meat, with recognized quality (highly nutritional and biological value, particular taste) (Ayasan, 2013). Among the main productive characteristics of the quail is fast growth rate (reach adult weight to 5-6 weeks after hatching), early sexual maturity, short interval between generations, high laying rate and low feed and low spaces accommodation. Quail is recently getting popular as a profitable enterprise. People are now becoming interested in commercial quail production in a densely populated country such as Bangladesh due to its short generation interval,

quick business return, low investment and small living space. The immense potentiality of quail for meat and egg production is a new dimension in poultry farming providing gainful employment, supplementary income and a valuable source of animal protein for human diet. However enough scientific information about the management practices of quail under Bangladesh conditions yet to be disseminated among the people who are showing interest to rear quails as a commercial venture. Management practices specially housing are most important for optimum production of quail. In addition, proper housing of quails makes it possible to control flying and to manage them more carefully and efficiently. However rearing methods and housing during the growth periods are vitally related to the cost of producing quails. Karousa *et al*. (2015) demonstrated that the entire farmer in Bangladesh rear quails in cages. This is probably due to comparative availability of information on cage rearing rather than on other methods of rearing. Research comparing the growth performances of quails in different rearing systems is rather limited. Some investigators, Padmakumar *et al*. (2000a), Ayorinde (1994), Sharma and Panda (1978) and Huque *et al*. (1992) reported a non-significant effect on housing system (Cage *vs*. littered floor) on body weight gain and survivability, but reported variable results on feed consumption and feed conversion. On the other hand some researcher observed significantly high growth rate in floor system than cage system (Ojedapo and Amao, 2014; Dogan and Tulin, 2012).

Some experimental works have been done comparing cage and littered floor. However, effects on the production performances of quails on these two systems under Bangladesh condition are not known. Therefore, it is necessary to compare these two systems of rearing of growing quails at the present time when more emphasis is given on cage systems. The construction of floor for rearing quails is easier and involves less cost in Bangladesh in comparison to cages due to locally available cheaper materials like bamboos, wood frame packing box, wooden saw dust, rice husk and etc. which may be comfortable housing system for quails for economic productivity. Considering the above fact and circumstances, the present study was conducted to investigate the effect of two different management systems (cage and floor) on the performance and survivability of quails and also to recommend which one is the suitable management system out of these two systems in Sylhet.

MATERIALS AND METHODS

Statement of the experiment

The present experiment was conducted with growing Japanese quails (*Coturnix coturnix japonica*) at Abul Kashum quail farm, Khadimnagor, Sylhet to study the effect of two different management systems (cage and floor) on their growth, feed intake, feed conversion efficiency, survivability and interaction of sex and two rearing system on meat yield characteristics of Japanese quail. Before starting experiment, we have conducted academic committee, Department of Poultry Science, Sylhet Agricultural University for approval of the experimental protocol according to the animal ethics guidelines and received protocol approval.

Preparation of experiment house

The experimental house was cleaned, washed and disinfected and kept empty for two weeks. The cages were also washed and disinfected.

Experimental birds and diets

A total of 66 growing Japanese quail were used for conducting the experiment. Sixty six (66) quails were divided into 2 treatment groups (33 in each treatment) with 3 replications having 11 birds (male, 5 and female, 6) in each. Initial body weight was 6.90 ± 0.50 g and birds were randomly assigned to either in cage or floor. Diet was formulated using locally available feed ingredients on dry mater basis. The nutrient requirements (meta bolizable energy (ME): 2758.6 kcal/kg; crude protein (CP): 27.04%; Ca: 1.56%; P: 1.12%; lysine: 1.29% and methionine: 0.75%) were satisfied according to the recommendations of Singh and Panda (1988). The diet was prepared weekly and proper mixing of ingredients was ensured (Table 1).

Table 1 Composition of the diets fed to the experiment quails

Feed ingredients	Amount in 100 kg mixed feed
Crushed wheat	45.50
Rice polish	08.00
Til oil cake	16.00
Soybean meal	16.00
Meat and bone meal	14.00
Common salt	0.25
Rhodivit G.S (vita. mineral premix)	0.25
Total	100

Management practices

Before commencement of the study, the birds were brooded on floor for first week in a previously cleaned and disinfected brooder house under necessary care and management. Then the chicks were brooded under 23 hour lighting and one hour darkness period per day and this lighting schedule was maintained until the end of the experiment. After successful brooding on floor at one week of age, the birds were divided into 2 treatment groups: first group in cage and second group on floor. Floor space in cage and on floor provided according to the recommendation of Panda *et al*. (1987). Clean dry and fine sawdust at a depth of 5 cm used as litter material on floor.

The feeders and drinkers were set in such way that the experimental bird could eat and drink easily. All mash dry feed was supplied *ad libitum* to the birds throughout the experimental period. Fresh drinking water was made available at all times. Feeders were cleaned every week end and the drinkers were cleaned every morning. Strict hygienic and sanitation procedure were also followed. The trial was conducted with identical care and management for all the treatments.

Recording of temperature and relative humidity

Room temperature was recorded three times daily in the morning, at noon and in the evening. Relative humidity was calculated from dry and wet bulb thermostat reading.

Processing of quails

At the end of the experiment, 2 quails from each replication group were randomly selected and slaughtered for processing. To facilitate slaughtering, all birds had their feed and water removed 12 hours period to killing. The selected birds were slaughtered using halal method. After slaughter, the birds were immersed in hot water (51 ˚C) for 2 minutes in order to loosen the feather. Final processing was performed by removing of head, shanks, viscera, oil gland, kidney, lungs and heart of the carcass. Heart and liver were cut loose from the viscera. The gizzard was removed by cutting it loose in front of the proventriculus and then cutting both in coming and going tracts. Then the carcass was opened with knife, emptied, washed and the lining was removed by hand.

Data collection and record keeping

During 5 weeks rearing period following records were kept:

a) Body weight: initially and weekly for each replication.

b) Feed intake: weekly for each replication.

c) Mortality: recorded when death occurred for each replication.

d) Dressed weight: blood weight, feather weight, heart weight, liver weight, gizzard, shank weight, head weight, abdominal fat and skin weight and shank length.

Based on above records, feed intake, feed conversion ratio, survivability and dressing percentage were calculated. All dressing yield related parameters were converted into the percentage of live weight of respective quail slaughtered.

Statistical analysis

All recorded and calculated data were analyzed using completely randomized design (CRD). An analysis of variance compared the all the parameters among treatments. The significant differences were identified by Duncan's new multiple range test (DMRT). Data on body weight, feed intake and feed conversion were analyzed by paired t-test with the help of MINITAB (USA). All recorded data and calculated data were analyzed using M-Stat C method and the design was CRD ANOVA.

RESULTS AND DISCUSSION

Performance of quails

Body weight

The result on weekly body weight of quail chicks are shown in Table 2. The data indicate that the body weight of quails reared in cage and littered floor were 102.15 and 78.41 g at 35 days of age, respectively. Significantly ($P<0.01$) higher body weight gain were found in cage birds compared to the littered floor birds. It is also evident that females were always heavier than males. However, during the experiment, cage birds gained weight faster and reached higher body weight than birds on littered floor. This result are in agreement with the previous findings of Jatoi *et al.* (2013), Roshdy *et al.* (2010), Padankumar *et al.* (2000a) and Ahuja *et al.* (1998). They all found significantly higher body weight in cage housed quails both male and female birds than in littered floor on different density floor housed quail birds.

On the other hand the present results contradict the observation of Ojedapo and Amao (2014) and Dogan and Tulin (2012) who reported that floor housed quail birds had significantly heavier weight gain that cage housed quails.

Feed intake

It is revealed from Table 2 that quails on floor had lower feed intake than cage housed quails at all stage. The feed intake of both cage and floor housed quails increased gradually with age. Feed intake (g/bird) was affected ($P>0.01$) by rearing system in all stage except 14 days of age.

However, feed intake of quails were significantly ($P>0.01$) higher at 21, 28, 35 days of age on cage rearing that floor rearing. The feed intake results are supported by Fouzder *et al.* (1999), who found higher feed intake in cage quails than floor quails. On the other hand, this study contradicts the finding of Ayorinde (1994) and Huque *et al.* (1992) who found higher feed intake by floor reared quails compared to those reared in cages.

However, Padmakumar *et al.* (2000a) and Ahuja *et al.* (1998) showed that feed intake were not influenced by two rearing system (cage and floor).

Feed conversion

It is evident from Table 2 that feed conversion ratio (FCR) was higher in floor quails than cage reared quails at all ages.

Table 2 Effect of rearing system on body weight, feed intake and feed conversion ratio (FCR)

Variable	Age	Rearing		LSD and level of significant*
		Cage	Floor	
Body weight (g/quail)	Day old	6.90	6.90	NS
	7	19.75[a]	19.42[b]	(0.337)*
	14	27.21[a]	24.06[b]	(3.288)*
	21	42.36[a]	31.45[b]	(2.738)**
	28	76.48[a]	62.32[b]	(3.659)**
	35	102.15[a]	78.41[b]	(1.737)**
Feed intake (g/quail)	Up to 14	33.72	33.43	(0.766)[ns]
	Up to 21	103.5[b]	76.12[a]	(2.549)**
	Up to 28	190.46[b]	146.02[a]	(2.829)**
	Up to 35	320.71[b]	241.89[a]	(1.592)**
FCR	Up to 14	4.5[b]	7.20[a]	(2.360)**
	Up to 21	4.6[b]	6.30[a]	(1.453)**
	Up to 28	3.36	3.40	(0.337)[ns]
	Up to 35	3.89[b]	4.10[a]	(0.101)**

The means within the same row with at least one common letter, do not have significant difference (P>0.05) and (P>0.01).
* (P<0.05) and ** (P<0.01).
NS: non significant.
LSD: least significant difference.

FCR value of quails in two rearing system (cage and floor) were statistically (P<0.01) higher in floor rearing system at 14, 21 and 35 days. Cage housed quails showed superior FCR compared to litter or floor house quails. It may be due to that quails housed on cage utilized feed more efficiently than floor housed quails.

The result of present study demonstrated that quails reared on cage housed showed superior efficiently of feed than quails reared on floor similarly to the observation of Alam *et al.* (2008) and Narahari *et al*. (1986). In contrast, Padmakumar *et al.* (2000b) found non-significant variation in FCR in cage and littered reared birds.

Survivability

The survivability of quails is shown in Table 3. The results indicate that survivability percent at 7 and 14 days were higher on littered floor than cage. At 21, 28 and 35 days of age survivability percent was tended to be lower on floor housed than cage rearing. Significant effects of rearing system on survivability were found during the experimental periods. The effect of two rearing systems (cage and littered floor) on survivability percent was significantly higher on floor at 7th and 14th days. But in 3rd, 4th, 5th week, the higher survivability rate was observed in cage than floor. The recent study showed higher survivability percentage in quails reared in cage than those reared on littered floor (69.70% *vs.* 65.91%) which was consistence with the findings of Roshdy *et al.* (2010), Padmakumar *et al*. (2000b) and Akram *et al.* (2000).

Meat yield characteristics

The results on meat yield characteristics are presented in the Table 4.

The differences in live weight, heart weight and gizzard weight were statistically significant (P<0.01). Live weight was highest in cage housed birds. Significantly (P<0.01) higher heart weight was found in cage housed birds compared to littered floor housed quails. Interaction of sex and rearing system on meat yield characteristics of Japanese quail at 35 days are shown in Table 4. There was no difference in the weight of head, liver, breast weight, thigh, wing drum stick between cages housed and littered floor house quails.

Gizzard weight was higher in cage housed birds. There was no significant interaction of rearing system and sex in case of breast weight, thigh weight, wing weight, heart weight, liver weight, gizzard weight and head weight. In case of sex, the female birds live weight and head weight were higher in cage housed quails birds but not heart weight, liver weight, gizzard weight, wing weight, drum stick, breast weight, thigh weight, wing weight and drum sticks weight.

From the result, non-significant effect on sex of cage and floor housed quails birds for male and female quails were found on breast weight, thigh weight and drum stick of quails. The current study showed significant effect of interaction of sex and two rearing systems (cage and floor) on meat yield characteristics of Japanese quails at 35 day on live weight, heart weight and gizzard weight and non-significant effect on head, breast, thigh, wing and drumsticks weight.

Live weight, head weight have significant result in cage housed quails birds than floor housed birds for main effect of sex and interaction effect of rearing system and sex. Head weight, liver weight, wing weight have non significant effect on two rearing system.

Table 3 Effects of rearing system on survivability

Age (d)	Rearing system				X^2 value (chi square)	Level of significance
	Cage		Floor			
	Dead (%)	Alive (%)	Dead (%)	Alive (%)		
07	4^{b} (12.12)	29^{a} (87.87)	2^{b} (6.06)	31^{a} (93.93)	23.26	**
14	9^{c} (27.27)	24^{b} (72.72)	5^{d} (15.15)	28^{a} (84.84)	1.48	**
21	9^{d} (27.27)	24^{a} (72.72)	12^{c} (36.36)	21^{b} (63.63)	0.952	**
28	9^{c} (27.27)	24^{a} (72.72)	13^{bc} (39.39)	20^{ab} (60.60)	3.60	*
35	9^{c} (27.27)	24^{a} (72.72	13^{bc} (39.39)	20^{ab} (60.60)	3.60	*

The means within the same row with at least one common letter, do not have significant difference (P>0.05) and (P>0.01).
* (P<0.05) and ** (P<0.01).

Table 4 Interaction of sex and rearing system on meat yield characteristics of Japanese quail at 35 days

Variables	Rearing system				LSD (SED) and level of significant*		
	Sex	Cage	Floor	Mean	RS	S	RS × S
Live weight (g)	male	95.80^{a}	74.62^{b}	85.21	(0.465)**	(0.919)**	(0.431)**
	female	108.50^{a}	82.20^{b}	95.35			
	mean	102.15^{a}	78.41^{b}	90.28			
Heart (g)	male	1.87^{a}	0.77^{b}	1.32	(0.144)**	(0.101)**	(0.101)**
	female	1.39^{a}	0.65^{b}	1.02			
	mean	1.63^{a}	0.71^{b}	1.17			
Liver weight (g)	male	3.03^{a}	2.94^{b}	2.99	$(0.176)^{ns}$	(0.337)**	(0.227)**
	female	2.87^{a}	2.17^{b}	2.52			
	mean	2.95^{a}	2.56^{b}	2.76			
Gizzard weight (g)	male	3.42^{a}	2.87^{b}	3.15	(0.144)**	(0.101)**	(0.176)**
	female	2.95^{a}	2.76^{b}	2.86			
	mean	3.18^{a}	2.82^{b}	3.00			
Head weight (g)	male	5.22	5.27	5.25	$(0.144)^{ns}$	(0.144)**	(0.287)**
	female	5.32^{a}	4.40^{b}	4.86			
	mean	5.28^{a}	4.83	5.06			
Breast weight (g)	male	22.23	22.11	22.17	$(0.203)^{ns}$	$(0.919)^{ns}$	$(0.465)^{ns}$
	female	19.61	19.57	19.59			
	mean	20.92	20.84	20.88			
Thigh weight (g)	male	8.23	8.22	8.23	$(0.144)^{ns}$	$(0.101)^{ns}$	$(0.101)^{ns}$
	female	6.51	6.48	6.50			
	mean	7.37	7.35	7.36			
Wing weight (g)	male	5.78	5.76	5.77	$(0.176)^{ns}$	(0.032)**	$(0.101)^{ns}$
	female	5.06^{a}	5.02^{b}	5.04			
	mean	5.42	5.39	5.41			
Drum stick (g)	male	6.12	6.05	6.09	$(0.203)^{ns}$	$(0.287)^{ns}$	$(0.175)^{ns}$
	female	5.31	5.22	5.27			
	mean	5.72	5.63	5.67			

The means within the same row with at least one common letter, do not have significant difference (P>0.05) and (P>0.01).
* (P<0.05) and ** (P<0.01).
NS: non significant.
LSD: least significant difference.

Wing weights of male and female quail have non-significant result in the study but in case of sex and two rearing system showed significant effect of Japanese quail birds.

CONCLUSION

It is concluded from the results of this study that:

1) Rearing system had significant influence on the performances (body weight, feed intake and feed conversion ratio) of growing Japanese quails. So, there was a consistent tendency of quails to perform better in cage than floor in Sylhet region.

2) Higher survivability was found in cage housed birds during the 35 days of experiment.

3) There were no significant difference among average weight of breast, thigh and drum stick between two rearing system.

Further study is needed in Sylhet, which would be help to justify the result of this study.

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