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Egg production performance of crossbred Japanese quail breeders under cage and deep litter systems of rearing

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ABSTRACT

A study was conducted to assess the comparative egg production performance of crossbred Japanese quail parent breeders under deep litter and cage systems of management. Per cent hen day egg production was significantly (P ≤ 0.01) higher in cage reared birds as compared to deep litter rearing (72.96 ± 0.53 vs 68.46 ± 0.61). Age and age x system interaction effects were also found to be significant (P d"0.01). Peak production was witnessed during 17-20 weeks of age which declined as the age advanced. Egg weight (g) was found to be 14.23 ± 0.02 and 14.15 ± 0.02 for deep litter and cage rearing and the difference was found significant (P d"0.01). Age effect on egg weight was also significant (P d"0.01). Feed efficiency per dozen eggs was not found to be significantly (P >0.05) different between the two systems of rearing. However age effect was found to be significant (P d"0.01) and the best feed efficiency figures were noticed between 13-24 weeks of age. Feed cost (Rs) for 100 eggs was marginally higher for cage rearing and the difference was not significant.

Keywords: Japanese quail breeder; egg production; egg weight; feed efficiency

INTRODUCTION

Japanese quails (*Coturnix coturnix japonica*) were recognized as a valuable animal model for research because of their short generation interval, early sexual maturity, low maintenance cost, easy handling, less space requirement and being robust to many of the avian diseases (Minvielle et al 2001). Besides Japanese quail farming is emerging as alternate small scale poultry farming in India and Japanese quail meat provides variety and value for the money to the consumers. Housing systems have a strong influence on poultry production. In many studies egg production of hens housed in conventional cages was higher than those housed in alternative systems such as aviaries, floor pens or free range. However no such uniform management practice is adopted in Japanese quail breeder management and the reports favouring one or the other system for adoption are also a few. In this

context this study was undertaken in a Japanese quail breeder farm in Palladam broiler belt in Coimbatore district, Tamil Nadu to assess the comparative egg production performance of Japanese quail breeders under cage and deep litter systems of rearing.

MATERIAL and METHODS

A total of 1848 adult commercial parent breeders of meat type Japanese quail birds (1344 females and 504 males) were selected at the age of 4 weeks and randomly divided into two treatment groups of equal number. Birds under each treatment were further allotted randomly to 4 replicate groups in equal number with a breeding ratio of 8 females to 3 males and were reared upto 32 weeks of age under both cage and deep litter systems of management. A floor space of 225 cm^2 per bird was provided under deep litter system and under cage system; 8 females and 3 males were housed in a breeder cage unit of 2025 cm^2 each offering a floor space of 184 cm^2 per bird. All the birds were fed with the same quail breeder ration (187.90 g crude protein, 10.83 MJ metabolizable energy and 28.20 g calcium per kg of feed) ad libitum and had free access to wholesome water throughout the experimental period. A total of 15 hours of light (photoperiod) was provided daily from 7 to 32 weeks of age. Data on per cent hen day egg production, egg weight, feed efficiency per dozen eggs and feed cost per 100 eggs were collected from 5 to 32 weeks of age and subjected to statistical analysis as per Snedecor and Cochran (1989).

RESULTS AND DISCUSSION

Per cent hen day egg production

Per cent hen day egg production was found to be significantly ($P \leq 0.01$) higher for cage rearing (72.96 ± 0.53) than deep litter rearing (68.46 ± 0.61) of Japanese quail breeders (Table 1). The results are in agreement with the findings of Kundu et al (2003) and Biswas et al (2005). Apart from comparatively easier access to feed and water and lesser social stress the fact that the cage reared birds remain practically away from the micro-organisms that could be present in their droppings might have also contributed to better performance by cage reared birds. Per cent hen day egg production observed in this study is in agreement with the earlier reports by Avci et al (2005) and Bandyopadhyay and Ahuja (1990). However Bhanja et al (2006) and Yesilbag (2007) reported comparatively higher egg production while Nagarajan et al (1990), Chopra and Singh (1994) and Kundu et al (2003) reported lower values. Saini et al (2005) reported that genetic differences consequent to selection could lead to variation in egg production among different lines. Age was found to have significant ($P \leq 0.01$) influence and peak production was achieved between 17-20 weeks of age irrespective of housing system and a

Table 1. Average per cent hen day egg production of crossbred Japanese quail breeders under deep litter and cage systems

Age (weeks)	System (observations= 112)		Overall mean (age)
	Deep litter	Cage	
13-16	$68.94^{Bb} \pm 0.76$	$76.86^{Aab} \pm 1.20$	$72.90^{b} \pm 0.76$
17-20	$78.15^{a} \pm 0.71$	$78.83^{a} \pm 0.75$	$78.49^{a} \pm 0.52$
21-24	$69.56^{b} \pm 1.10$	$72.55^{b} \pm 0.91$	$71.06^{b} \pm 0.72$
25-28	$66.12^{Bbc} \pm 0.70$	$69.38^{Ac} \pm 0.44$	$67.75^{c} \pm 0.43$
29-32	$59.57^{Bc} \pm 0.72$	$67.18^{Ac} \pm 0.45$	$63.37^{d} \pm 0.49$
Overall mean (system)	$68.46^{B} \pm 0.61$	$72.96^{A} \pm 0.53$	

Means bearing different superscripts in upper case alphabet differ significantly ($P \leq 0.01$) among columns within each row
Means bearing different superscripts in lower case alphabet differ significantly ($P \leq 0.01$) among rows within each column

gradual decline was noticed uniformly thereafter. Bhanja et al (2006) also observed that 14-20 week production was much higher than 7-13 week production at all cage intensity levels.

Egg weight

Egg weight (g) of Japanese quail breeders at different ages under the two systems of housing management ranged between 13.89-14.55 (Table 2) and the values were much higher than those reported by Yildiz et al (2004), Yesilbag (2007) and many other authors indicating the genetic superiority of the stock employed. As egg weight is positively influenced by the body weight of females selection for high 4-week body weight might have led to higher adult body weight of female breeders and consequently resulted in higher egg weights too. Deep litter rearing resulted in significantly ($P \leq 0.01$) heavier (14.23 ± 0.02 g) eggs compared to cage rearing (14.15 ± 0.02 g) of Japanese quail breeders. Age x system interaction effect was also evident and at 32 weeks cage reared birds laid heavier eggs compared to deep litter rearing.

Feed efficiency per dozen eggs

Feed efficiency (kg of feed per dozen eggs) did not differ significantly ($P > 0.05$) between deep litter (0.96 ± 0.02) and cage (0.97 ± 0.02) systems of rearing (Table 3). Even though comparatively higher values for per cent hen day egg production were obtained for cage rearing over deep litter system, feed consumption

Table 2. Average egg weight (g) of crossbred Japanese quail breeders under deep litter and cage systems

Age (weeks)	Deep litter	Cage	Overall mean (age)
12	$14.13^{bc} \pm 0.04$ (96)	$14.18^{c} \pm 0.04$ (126)	$14.16^{b} \pm 0.03$ (222)
16	$14.54^{Aa} \pm 0.04$ (110)	$14.33^{Bb} \pm 0.04$ (121)	$14.43^{a} \pm 0.03$ (231)
20	$14.24^{Ab} \pm 0.03$ (147)	$13.99^{Bd} \pm 0.04$ (134)	$14.12^{b} \pm 0.02$ (281)
24	$14.09^{Ac} \pm 0.05$ (95)	$13.89^{Bd} \pm 0.05$ (96)	$13.99^{c} \pm 0.03$ (191)
28	$13.90^{d} \pm 0.04$ (62)	$13.90^{d} \pm 0.05$ (64)	$13.90^{c} \pm 0.03$ (126)
32	$14.30^{Bb} \pm 0.05$ (88)	$14.55^{Aa} \pm 0.05$ (89)	$14.43^{a} \pm 0.04$ (187)
Overall mean (system)	$14.23^{A} \pm 0.02$ (598)	$14.15^{B} \pm 0.02$ (640)	

Means bearing different superscripts in upper case alphabet differ significantly ($P \leq 0.01$) among columns within each row
Means bearing different superscripts in lower case alphabet differ significantly ($P \leq 0.01$) among rows within each column
Figures in parentheses indicate number of observations

was also higher under cage rearing compared to deep litter rearing the relative advantage got nullified and net feed efficiency did not ultimately differ among the two different systems. Bandyopadhyay and Ahuja (1990) and Nagarajan et al (1990) reported comparatively better feed efficiency figures under cage rearing. The difference in genetic potential of the breeders employed and meat type heavy breeders could only be expected to perform poorly in this count. Age effect on feed efficiency was however found significant ($P \leq 0.01$) and the poorest feed efficiency was observed between 29-32 weeks while the birds were the most efficient between 17-20 weeks of age when they reached their peak egg production level.

Feed cost for 100 hatching eggs

Feed cost (Rs) required to produce 100 hatching eggs was not found to differ significantly ($P > 0.05$) between the two rearing systems of deep litter and cage rearing (Table 3). Even though per cent hen day egg production was higher for cage rearing higher feed consumption had offset the advantage of high production leading to comparable feed cost to produce hatching eggs. However age was found to have significant ($P \leq 0.01$) bearing with the feed cost for 100 hatching eggs found to be the highest at the oldest age of 32 weeks. The feed cost remained the least during 17-20 weeks of age. Feed cost for 100 hatching eggs for the deep litter and cage rearing systems averaged between Rs 81.92 and

Table 3. Feed efficiency and feed cost for 100 hatching eggs of crossbred Japanese quail breeders under deep litter and cage systems

Age (weeks)	Feed efficiency (feed kg/dozen eggs)			Feed cost for 100 hatching eggs (Rs)		
	Deep litter	Cage	Overall mean (age)	Deep litter	Cage	Overall mean (age)
13-16	0.94 ± 0.03 (16)	0.88 ± 0.03 (16)	0.91^{b} ± 0.02 (32)	79.95 ± 2.10 (16)	75.32 ± 2.83 (16)	77.64^{b} ± 1.78 (32)
17-20	0.82 ± 0.02 (16)	0.86 ± 0.02 (16)	0.84^{a} ± 0.01 (32)	69.85 ± 1.28 (16)	73.31 ± 1.32 (16)	71.58^{a} ± 0.96 (32)
21-24	1.00 ± 0.05 (16)	1.02 ± 0.03 (16)	1.01^{c} ± 0.03 (32)	85.04 ± 3.83 (16)	87.10 ± 2.88 (16)	86.07^{c} ± 2.37 (32)
25-28	0.99 ± 0.02 (16)	1.05 ± 0.01 (16)	1.02^{c} ± 0.01 (32)	84.84 ± 1.34 (16)	89.93 ± 1.15 (16)	87.38^{c} ± 0.98 (32)
29-32	1.05 ± 0.02 (16)	1.06 ± 0.02 (16)	1.06^{c} ± 0.01 (32)	89.91 ± 1.52 (16)	90.38 ± 1.91 (16)	90.15^{c} ± 1.20 (32)
Overall mean (system)	0.96 ± 0.02 (80)	0.97 ± 0.02 (80)	- -	81.92 ± 1.24 (80)	83.21 ± 1.25 (80)	- -

Means bearing different superscripts in lower case alphabet differ significantly ($P \leq 0.01$) among rows within the column
Figures in parentheses indicate respective number of observations

Rs 83.21 and was almost double the cost reported by Sathishkumar (2003) involving cage rearing of Japanese quail breeders. The difference in genetic merit of the breeders used and consequent variation in egg production and ever rising cost of feed ingredients might have been responsible for the relatively higher costs in this study.

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