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Body weight, FCR and laying behaviour of commercial brown layer under cage-free EC house in tropics

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ABSTRACT

Cage-free systems for laying hens offers better animal welfare, higher-quality eggs, and premium market opportunities, it also poses economic, disease management, and consumer affordability challenges. In the present study, the performance of birds in terms of feed intake and laying behaviour under cage free system (EC house) from start of first lay till 70 weeks of age is analysed and compared with standard production as per commercial standard. The average body weight and feed intake by 25 weeks was 1502g and 97g which gradually rose along with daily feed intake. The body weight and feed intake near end of laying period was 1910g and 115g per bird. The FCR per dozen eggs is best between 26-45 weeks during the peak production period. The percentage of floor eggs during the study period ranged from 11.01 to 16.08.

Keywords: Cage free system, Body weight, Feed intake, FCR/Dozen eggs, Laying behaviour

Introduction

The production performance of a layer is influenced by the housing systems being kept, particularly in tropical climates where environmental conditions can worsen the challenges associated with management (Oloyo, 2018) [1]. Tropical region is characterized by high temperature and humidity which invariably deter the production performance especially feed intake of the birds. The most common housing systems for laying hens in common practice are the battery cage and cage-free systems, both having distinct differences in terms of welfare, productivity, and egg quality (Manzoor *et al.*, 2024; Volkmann *et al.*, 2024) [2, 3]. The battery-type caging system where a massive number of chickens are piled up draws the consumers' reaction; therefore, facilities with furnished cages, deep litter, free-ranging areas, or cage-free rearing systems have become widespread in layer poultry farming.

Currently there has been a shift in the poultry industry from the use of battery cage production systems to the use of cage-free egg production systems globally. Cage-free systems for laying hens can be floor housing systems or aviary systems with multiple tiers. These systems offers better animal welfare, higher-quality eggs, and premium market opportunities, it also poses economic, disease management, and consumer affordability challenges. Consumers tend to believe that eggs produced in cage-free systems are of better quality (Vits *et al.*, 2005) [4].

Behaviour traits related to nest preference and laying duration may be associated with floor eggs along with the choice of nest site (Cronin *et al.*, 2012) [5]. Floor eggs, which are defined as eggs that hens lay off-nest, are a major issue in cage-free systems for several reasons as collecting floor eggs by hand is laborious and time-consuming. Floor eggs cause economic losses as they are often soiled, broken, or eaten by the hens and also have high bacteria count on eggshell (De Reu *et al.*, 2006) [6]. Hens that lay floor eggs display more nest-seeking behavior, less nest-building behavior, and less sitting before oviposition than hens that lay in the nests, which may indicate frustration and reduced welfare (Cooper *et al.*, 1996) [7]. In the present study, the performance of birds in terms of feed intake and laying behaviour under cage free system (EC house) from start of first lay till 70 weeks of age is analysed and compared with standard production as per commercial standard.

Materials and methods

The present data was recorded from a flock of 10000 commercial brown shelled egg layers. Day old chicks were procured from commercial supplier and were reared under standard managerial conditions. Standard feeding, lighting and vaccination protocols were adopted stringently without any deviation. Birds were shifted to cage free house (EC House) at 17th week. Commercial layer feed was offered to the birds as per available standards. The egg production was recorded from start of lay on daily basis up to 70 weeks. Mortality numbers was recorded daily to arrive at overall mortality over the laying period. Body weight,

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body weight gain, Feed intake, egg production and Nest eggs (%) and floor egg (%) were recorded every week. Feed conversion ratio per dozen eggs were calculated using the formula

$$\text{FCR (per dozen eggs)} = \frac{\text{Kg of feed consumed} \times 12}{\text{Total eggs produced}}$$

Results and discussions

Average body weight (g) and feed intake (g) of commercial brown layer during production is presented in table 1. The average body weight and feed intake by 25 weeks was 1502g and 97g which gradually rose along with daily feed intake. The body weight and feed intake near end of laying period was 1910g and 115g per bird. Coloured layer fetches more sale cost after the end of lay owing to high preference towards meat from coloured birds by the public. The higher body weight therefore fetches high returns to the producer. Sekeroglu *et al.* (2010) [8] showed that laying hens housed in cage-free or litter-based systems tend to have higher feed consumption compared to those in conventional battery cages.

Dikmen *et al.* (2016) [9] found that chickens reared in a free-range system had higher feed intake than in battery cages. In our study, the

feed intake is on par with the standard which maybe attributed towards the environment controlled housing system. The study also showed that cage-free laying hens have a higher body weight compared to battery hens. Several studies have found that laying hens housed in cage-free hens tend to have higher body weight compared to those in conventional battery cages (Kang *et al.*, 2013; Kesler *et al.*, 2021) [10, 11].

Feed conversion ratio being the most important economic trait is calculated for every 5 week interval per dozen egg produced. The FCR per dozen eggs is best between 26-45 weeks during the peak production period. FCR of 1.5 and below is considered to be the best in white layers. In the present study FCR is less than 1.5 during peak production is achieved in coloured brown layer under cage free system which indicates best management during rearing period. FCR after 70 weeks reached a value of 1.75 indicating higher cost of production as age advances. The increased activity levels in cage-free hens may result in higher feed intake without a corresponding increase in egg production, leading to a higher FCR compared to battery cage system (Englmaierova *et al.*, 2014) [12].

Table 1. Production performance of commercial brown layer under cage free system upto 70 weeks ($n = 10000$)

Age	Body weight (g)	Feed intake(g)/day	Egg Nos.	FCR/dozen eggs	Nest eggs (%)	Floor eggs (%)
21-25 weeks	1502 ± 15.24	97 ± 1.21	267230	1.51	85.86	14.14
26-30 weeks	1651 ± 21.25	99 ± 2.01	308702	1.34	87.27	12.73
31-35 weeks	1699 ± 15.86	105 ± 1.82	303640	1.44	88.99	11.01
36-40 weeks	1740 ± 28.20	109 ± 3.13	303690	1.49	88.67	11.33
41-45 weeks	1750 ± 31.25	108 ± 2.71	300057	1.49	84.11	15.89
46-50 weeks	1760 ± 41.12	111 ± 3.11	292552	1.57	83.92	16.08
51-55 weeks	1778 ± 45.31	115 ± 4.01	290017	1.63	85.06	14.94
56-60 weeks	1835 ± 41.20	115 ± 2.13	292166	1.62	85.76	14.24
61-65 weeks	1875 ± 23.87	115 ± 1.86	283976	1.67	83.72	16.28
66-70 weeks	1910 ± 45.60	115 ± 1.91	266389	1.75	86.97	13.03

Floor eggs, which are defined as eggs that hens lay off-nest, are a major issue in cage-free layer poultry systems. They create additional work for farmers because they must be collected by hand. The percentage of floor eggs during the study period ranged from 11.01 to 16.08. Since the nesting behaviour indicates the welfare of the birds indirectly and the trait is low heritable one further selection among the parents will be of immense value for future breeding though no affordable or accurate methods are available to identify the birds which prefer to lay floor eggs.

Conclusions

No significant variations were noted between the standard productions in cages to that of Cage free systems in terms of FCR per dozen eggs when compared to the standard production performance. Also the laying behaviour inside nest indicates better welfare for the birds inside EC house under cage free system. Considering the positive impact of cage free system on welfare of the birds and increasing awareness of consumers on products from caged birds, this system offer considerable economic advantages for the farmers.

Competing interests

Authors have declared that no competing interests exist.

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