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 Pakistan Journal of Biotechnology
 (PJB)
 (P-ISSN: 1812-1837 and E-ISSN: 2312-7791)



INFLUENCE OF DIFFERENT HOUSING SYSTEMS ON THE QUALITY CHARACTERISTICS OF TABLE EGG PRODUCED BY PLAYMOUTH ROCK CHICKEN

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Article Received 28-11-2023, Article Revised 10-12-2023, Article Accepted 15-12-2023.

ABSTRACT

The present experiment was conducted to observe the quality of table eggs collected from three different housing systems, including conventional cage systems, floor space-free ranges, and limited floor space systems, at Mr. Janazaib Arain farm in Nasarpur, Sindh. In this experiment, the Plymouth chicken breed was kept under the housing system. It was observed that the various table egg quality characteristics-egg weight, eggshell cleanness, eggshell hardness, breaking strength, shape index, egg yolk color, and egg albumin height were significantly higher ($P < 0.05$) in the cage system as compared with free range, limited, and free floor space. The result for egg mass was also found to be significantly higher in the cage housing system as compared with other housing systems. It was concluded that a better-quality table egg with a higher egg weight, a hard eggshell, and other internal quality characteristics can be produced in the cage housing system from Plymouth Rock chickens.

Keywords: Table egg, Plymouth, Quality character, Housing system

INTRODUCTION

Eggs are considered a balanced human food. They are high in proteins and minerals, with a lot of essential amino acids of significant biological value. The eggs are very important because of their nutritional benefits and digestibility, as poor treatment may turn them toxic (Figueiredo *et al.*, 2013). The foreign egg trade is largely dependent on the manipulation of interior and shell quality. The quality of the eggs is influenced by factors such as breed (Silversides and Scott, 2001; Samli *et al.*, 2005), nutrition, aging, and storage temperature. Egg production and marketing depend on trade rules and regulations that specify the quality of eggs (Pavlovski *et al.*, 2007). It is becoming increasingly common today that people purchase the eggs made in ground chicken systems because of their statements that these eggs are produced by 'happy chickens'. On the other hand, eggs with lower cholesterol (Kaleri *et al.*, 2023;

Tumanova *et al.*, 2004) as well as higher selenium or polyunsaturated fatty acids containing eggs (omega 3 fatty acids) were also of interest (Boruta *et al.*, 2004), egg quality genetic foundation, husbandry methods, and storage circumstances, laying period and age of the hen (Kaleri *et al.*, 2023; Pavlovski *et al.*, 2007), as well as food. The ultimate goal of this project is to determine the influence of various structures (conventional systems, limited space, and free floor lines) on the egg tray. Keeping in view the importance of table eggs in food, the present study was aimed at observing the quality characteristics produced by Plymouth in Nasarpur, Sindh.

MATERIAL AND METHOD

The present experiment was conducted during the month of April 2022 at Mr. Jahanzaib Poultry Farm in Nasarpur, Tando Allahyar. In this study, Plymouth chickens were kept under three different housing and management systems with the following floor spaces:

1. Birds in a standard housing system with 5 birds in each cage have 500 cm of floor space per chicken.

2. Floor space system having 2000 cm floor space in coop with 400 cm for every bird in coop.

All the laying birds were fed L5-layer feed according to their age and nutrient requirements for Plymouth eggs at the farm. The feed was provided two times: once at 7 a.m. in the morning, and again at 7 p.m., water was provided *ad libitum*. The light was provided 14 hours a day during the egg-laying period in the house. The collection of eggs was performed at 2 p.m. daily, routine-wise, without being early or getting late in the house.

Parameters of study: The weight of the egg (g), index, eggshell hardness, breaking force of the egg (kg/cm²), egg cleanliness (one to five degrees), and height of the egg white (cm).

Whereas egg albumin height, egg mass, and Haugh unit were recorded with the following formula as suggested by Dukic et al. (2009).

$$HJ = 1001 \log H + 7.57 \sqrt{M} - 0.37$$

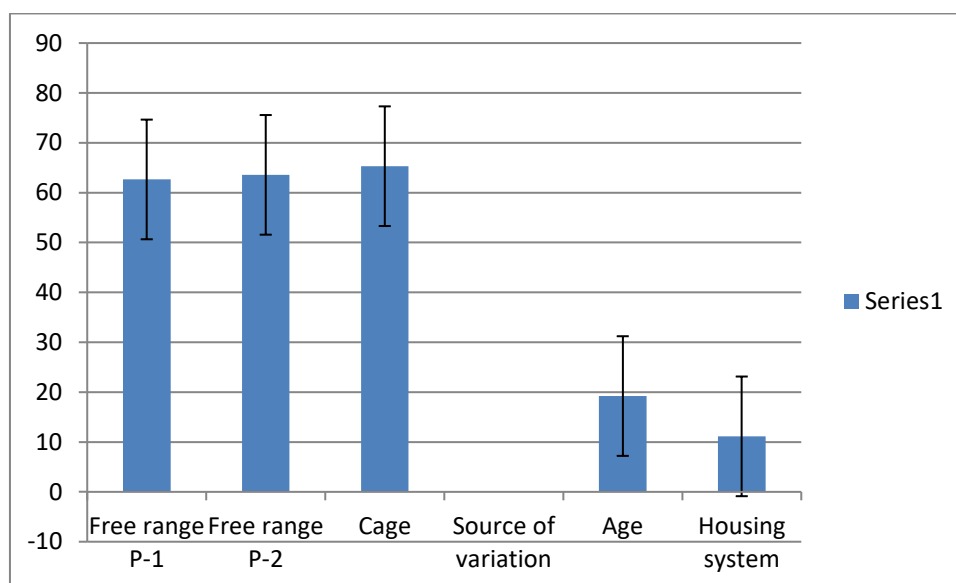
H = for height of albumin (mm)

M = for egg mass or weight

According to the collected data, it was typed on a computer and analyzed with the procedures of variance analysis and the LSD Fisher test.

RESULT

The results of the present study showed that there was no significant difference observed among table egg weights produced by plymouth hens under different housing systems. There were a little bit higher values observed for egg weight in the cage housing system as compared with the free-range, limited-range, and free-range systems. Details are displayed in (Figure. 1)



Tabel-1 Showed the average results for table egg weight produced by Plymouth chicken under different types of housing system

The results for various external table quality characteristics of table eggs showed higher average values in the birds kept under the standard cages housing system as compared with those kept on the free range floor housing system. There was a statistically significant difference ($P < 0.05$) recorded among egg mass values in different housing systems.

In a similar way, a statistical difference ($P < 0.05$) was recorded for eggshell cleanliness among cages and floor housing systems. It was recorded that hens producing eggs in cage systems were more neat and clean as compared with floor housing systems in (Table. 1)

Table. 1 Shows the average data of external quality traits of table egg produced by Plymouth chicken under different types of housing system

Housing system	Eggshell color	Eggshell cleanness	Shape index %
Free range P-1	2.99	4.01	71.89
Free range P-2	2.98	3.97	72.82
Cage	2.91	4.33	73.01
Source of variation			
Age	3.91	13.76	9.03
Housing system	0.11	68.78	1.21

Whereas the results for eggshell color and shape index% were not significantly different between the

recorded parameters. The results for age of birds showed a significant difference ($P < 0.05$) among

external table egg quality characteristics in various housing systems under the study. The results for eggshell hardness showing great variation in shell thickness in the table were laid in the floor housing system with free range as compared with the cage housing system. Still, there was no significant 2).

difference among various housing systems for this parameter in Table 2. It was also observed that the eggshells produced in the cage housing system were somewhat thicker as compared with other housing systems, but there was no statistically significant difference among them in (Table

Tabel-2 Showed the average data of external quality traits of table egg

Housing system	Hardness strength	Eggshell thickness	Eggshell weight
Free range P-1	2.34	31.67	7.95
Free range P-2	2.23	32.75	7.99
Cage	2.47	35.13	8.27
Source of variation			
Age	3.37	241.01	29.03
Housing system	1.97	2.13	0.29

The result for layer age was recorded as highly influenced by various quality characteristics of table eggs. The birds were kept under a floor housing system with free range and recorded more egg albumin height as well as egg Haugh unit values as compared with housing systems. The variation among

systems was observed due to limited floor space, with conventional cage systems at a significant level. The result for egg yolk color was observed somewhat more in the cage housing system as compared, but there was no significant difference among the different housing systems under the study in Table 3

Tabel. 3 Showed the average data of external quality traits of table egg

Housing system	Egg albumin height	Egg yolk color	Haugh unit
Free range P-1	8.00	13.01	86.95
Free range P-2	7.97	12.01	90.27
Cage	9.03	12.07	90.93
Source of variation			
Age	17.57	11.21	8.07
Housing system	6.11	2.21	3.01

DISCUSSION

The results of Pavlovski *et al.* (2007), Jin *et al.* (2011), and Figueiredo *et al.* (2013) are controversial in the comparison of egg weight produced by birds kept under free range and battery systems as compared with the findings of our study. The variation might be the breed of egg and size, age, and management conditions of the farm. The results of Samali *et al.* (2005) and Roberts (2004) support our study. The hens that lay eggs under the cage system were observed to be more neat and clean as compared with the free-range housing system. It was suggested that the cleanliness of eggs directly depends on the condition of the environment, management system, and nests of birds on the farm. It was also reported that the method and frequency of egg collection and cleaning of nests have an effect on the quality of table eggs laid by hens in various housing systems. The results of Samli *et al.* (2005) and Santos *et al.* (2009) are also in agreement with the results of the current study for eggshell thickness, which reported that eggshell was observed to be harder in eggs collected from cage systems as compared with other housing systems. A similar result for egg yolk was also supported by the fact that hens produce eggs in cage systems with a higher amount of albumin and height as well as egg yolk color. In our study, the color of

egg yolk was observed to be brighter in the cage system as compared with other housing systems, which might be due to management and environmental conditions with routine practices on the farm. Barbosa *et al.* (2011) reported that the color of egg yolk may be brighter and darker due to some feed ingredients included in poultry feeds with different colors. The findings of our study were supported by the research conducted by Yakubu *et al.* (2008) for the average egg weight recorded under the cage housing system. The results of Msoffe *et al.* (2002) are controversial as compared with the results of the present study, which reported the low egg weight of indigenous chickens kept in cage housing systems. It is suggested that egg weight was highly affected by various factors, including genetic makeup, chicken ecotype, number of eggs laid, feed, age, and environment in which chickens were raised. A similar study was performed by Fayeye *et al.* (2005); the same average values for eggs were related to the results of the present study.

CONCLUSION

It is concluded that the cage housing system was observed to be better as compared with other housing systems, and egg quality characteristics are greatly affected by the breed, feed, and housing system in which chickens are kept

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