A comparative study was conducted at Arain Farm in Nasarpur, Sindh during January 2024 to March 2024.

**Objective:** To assess the production performance and egg quality of Plymouth Rock and Rhode Island Red chickens.

**Methods:** A total of 105 birds (50 females and 5 males per breed) were selected for the study. The birds were divided into 10 groups, with 5 groups per breed. The chickens were fed layer feed L5, and various parameters including feed conversion ratio, egg weight, egg production, and egg quality characteristics were measured.

**Results:** The results revealed that Rhode Island Red chickens showed higher egg weight and production, as well as more efficient feed utilization per kilogram of egg weight and per dozen eggs compared to Plymouth Rock chickens. Rhode Island Red chickens also exhibited higher values for yolk weight, shell weight, albumin weight, breaking strength, yolk index, and shell thickness. Haugh unit values did not differ significantly between the two breeds.

**Conclusions:** Rhode Island Red chickens demonstrated superior production performance and egg quality characteristics in the Nasarpur region of Sindh.

**Keywords:** Chicken, Feed Consumption, Egg Quality, Poultry Breeds


*Corresponding Author:
Rameez Raja Kaleri
Department of Livestock and Fisheries, Government of Sindh, Karachi, Pakistan
rameezkaleri@gmail.com

**Received Date:** 5th April, 2024
**Acceptance Date:** 23rd May, 2024
**Published Date:** 30th June, 2024

**INTRODUCTION**

Many poultry strains have been developed in order to achieve the highest egg and meat production from poultry birds. In Pakistan, due to the lower production potential of desi chicken in terms of egg farming, it has been replaced with various imported layer breeds in rural areas such as Plymouth Rock and Rhode Island Red. The purpose of developing these breeds is to provide better performance and enable them to survive under harsh climatic conditions in both urban and rural areas. The Plymouth Rock was developed from Dominique, Java, Cochin, and Brahma in America, while the Rhode Island Red was developed from Cochin, Java, Malay, and Shanghai breeds with Brown Leghorn birds in Italy [1]. Both the Plymouth Rock and Rhode Island Red chicken breeds are dual-purpose breeds from the American class and are becoming increasingly popular in rural and urban areas of Pakistan due to their...
superior taste of meat and egg production [2-4]. These breeds are being kept on a large scale in rural areas of Sindh to increase egg and meat production. There is a lack of information regarding the Plymouth Rock and Rhode Island Red breeds in Pakistan, and they are being kept indiscriminately due to insufficient information about their body characteristics, production potential, and survivability in severe climatic conditions of Sindh, Pakistan [5, 6].

Recognizing the importance of these exotic breeds, the present study aimed to compare the production performance of Plymouth Rock and Rhode Island Red chicken breeds in Nasarpur, Sindh.

**METHODS**

In this experiment, a total of one hundred ten birds, with 5 males and 50 females from each Plymouth Rock and Rhode Island Red breed at 32 weeks of age, were placed under study. The birds were distributed into 10 replicates, each composed of 1 cock and 10 hens, with 5 replicates each. All the groups were reared in separate portions with 5.8 square feet of floor space and kept under similar management conditions for an 8-week period from January to March 2024. The relative humidity and temperature inside the shed were maintained and observed to vary from 26°C to 28°C and 55% to 65%. The birds were provided with 16 hours of light daily. The experimental birds were fed commercial L5 layer feed throughout the experiment. Weekly residual feed was removed and weighed on a digital weighing balance machine. Egg collection was done routinely at 12:00 pm daily without delay. The feed consumption ratio was recorded after deducting the residue feed. Eggs were weighed daily, and the average weight of eggs at the end of each week was recorded. The feed consumption ratio was recorded based on the kilogram mass of eggs and one dozen eggs (Table 1).

The chemical composition of the layer ration feed provided to the experimental birds is summarized in table 2. The egg quality characteristics were recorded over a two-week period. To observe various egg quality traits, 3 eggs from each group were randomly selected for analysis, including albumin height, yolk height, egg breaking strength, shell thickness, and yolk diameter, as suggested by [1]. The data for egg Haugh unit was calculated as a percentage of albumin height and egg weight. The recorded parameters were then analyzed using the RCBD model. Variation among the average values was compared using Duncan’s Multiple Range Test [7].

**RESULTS**

**Production Potential**

The average results for FCR eggs per dozen, egg weight, egg production, FCR per bird per week in kilograms, and FCR per egg mass per kilogram of both chicken breeds are presented in table 3. The feed consumption ratio per bird per week in Plymouth Rock chickens was significantly higher (P<0.05) compared to Rhode Island Red birds. The minimum feed consumption was observed in Rhode Island Red birds per week per bird. In this study, Rhode Island Red birds produced a greater number of eggs compared to Plymouth Rock chickens. It was also noted that Rhode Island Red birds produced heavier eggs with better FCR per dozen compared to Plymouth Rock chickens (Table 3).

**Egg Quality Traits**

The average results for yolk weight, shell weight, albumin weight, breaking strength, Haugh unit, yolk index, and shell thickness are displayed in table 4. The findings of the present study revealed that egg yolk weight and albumin weight were significantly higher (P< 0.05) in Rhode Island Red chickens compared to Plymouth Rock chickens, and the influence of the week on the egg yolk weight was also
significantly higher. The results for the egg yolk index were non-significant among both breeds. The results for the Haugh unit were non-significant and at the desired level in both breeds. The results for shell strength were significantly higher (P<0.05) in Rhode Island Red chickens compared to Plymouth Rock chickens, and the highest breaking strength was observed during the 1st week of the experiment, while the interaction of breed on the week was recorded non-significantly (Table 4).

**Table 4:** Average Values for Different Egg Quality Characteristics of Plymouth Rock and Rhode Island Red Layer

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Yolk Weight (grams)</th>
<th>Shell Weight (grams)</th>
<th>Albumin Weight (grams)</th>
<th>Breaking Strength</th>
<th>Haugh Unit</th>
<th>Yolk Index</th>
<th>Shell Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>RIR (Mean ± S.D)</td>
<td>Plymouth Rock (Mean ± S.D)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yolk Weight (grams)</td>
<td>16.87 ± 1.055</td>
<td>16.25 ± 1.91</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shell Weight (grams)</td>
<td>7.57 ± 0.845</td>
<td>6.55 ± 0.611</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Albumin Weight (grams)</td>
<td>26.45 ± 5.317</td>
<td>26.27 ± 0.195</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breaking Strength</td>
<td>2.90 ± 0.141</td>
<td>1.95 ± 0.075</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Haugh Unit</td>
<td>76.5 ± 8.243</td>
<td>74.3 ± 6.876</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yolk Index</td>
<td>0.467 ± 0.031</td>
<td>0.437 ± 0.021</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Shell Thickness</td>
<td>0.39 ± 0.013</td>
<td>0.34 ± 0.011</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**DISCUSSION**

The results for feed consumption ratio per bird per week in Plymouth Rock chickens were observed to be significantly higher (P<0.05) compared to Rhode Island Red birds. The minimum feed consumption was observed in Rhode Island Red birds per week per bird. Previous studies have reported that feed consumption ratio during the 8th week of study was significantly higher (P<0.05) in Rhode Island Red compared to Plymouth Rock chickens [8]. It was observed that Rhode Island Red birds showed minimum feed consumption ratio results compared to Fayoumi. Our findings are concordant to previously reported studies that certain layer strains had a significant influence on feed intake compared to other diets [3-8]. It is widely considered that Feed Conversion Ratio (FCR) is a heritable feature, and the maximum feed intake in Fayoumi and Plymouth Rock birds might be due to their different physical activities on the farm, where the maximum amount of consumed feed can be effectively utilized by their bodies for multiple functions. In our study, significantly higher (P<0.05) and heavier egg production was recorded in Rhode Island Red birds compared to Plymouth Rock birds. The results of various literature reports are relative to our findings, as they reported maximum egg weight and egg production in Rhode Island Red compared to Lyallpur Silver Black birds [10-13]. Another study reported lower egg weight and production in Lyallpur Silver Black birds compared to Rhode Island Red chickens [6]. The variation in egg weight and production might be due to genetic potential and better management conditions with proper feeding, vaccination, and medication during the laying process. The results of some previous studies are contrary to our findings, as they reported that Lyallpur Silver Black birds produced heavier and higher egg production compared to Fayoumi and Rhode Island Red chickens [8, 15, 16]. According to some other studies, the significant difference in egg production between breeds might be due to feed composition, body weight, and genetic makeup of individual breeds [17-19]. The results for egg yolk weight and egg index were observed to be significantly higher (P<0.05) in Rhode Island Red compared to Plymouth Rock. Similarly, higher egg yolk index in Rhode Island Red hens compared to White Leghorn hens have been reported previously [18-22]. The egg yolk index was recorded as non-significant between Lyallpur Silver Black and Fayoumi breeds. On the contrary, some studies have revealed no significant difference among breeds at any stage for egg yolk index [23-26]. In our study, Rhode Island Red produced heavier egg yolk weight. It has been suggested that the maximum egg yolk and albumin weight was non-significant among three different poultry breeds during the 8th week experiment [22]. The highest results for eggshell breaking strength were recorded during the initial week of the experiment. The results of higher eggshell strength were observed in White Leghorns compared to Rhode Island Red, which had less shell breaking strength [28].

**CONCLUSIONS**

It is concluded that Rhode Island Red chickens produced higher egg production with better feed utilization in Nasurpur compared to Plymouth Rock chickens. It is suggested that Rhode Island chickens can be reared in rural areas of Sindh to improve egg production and the economy of rural people.

**Authors Contribution**

Conceptualization: RRK
Methodology: MAK
Formal analysis: MAH, NU, IA, HA, RH
Writing, review and editing: AZ, AGG

All authors have read and agreed to the published version of the manuscript.

**Conflicts of Interest**

The authors declare no conflict of interest.

**Source of Funding**

This research has been partially funded by ORIC KMU as Master Thesis approved by ASRB.
REFERENCES


