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COMPARATIVE STUDY OF PRODUCTION POTENTIAL AND EGG CHARACTERISTICS OF LYALLPUR SILVER BLACK, FAYOUMI AND RHODE ISLAND RED BREEDS OF POULTRY

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ABSTRACT

A comparison of production potential and egg characteristics of birds of Lyallpur Silver Black (LSB). Fayoumi (FAY) and Rhode Island Red (RIR) breeds was conducted. Ninety nine birds, 33 from each breed (30 females and 3 males), were used as experimental birds. The birds of each breed were divided into three experimental units (10 females + 1 male), making a total of nine units from the breeds under study (3 units/breed). All the experimental birds were placed on a layer ration. Observations on egg production, feed consumption, egg weight and egg quality characteristics viz. shell thickness, shell weight, breaking strength, albumen diameter, albumen weight and yolk weight were recorded. The data thus collected were utilized for the calculation of FCR, Haugh unit and yolk index values. Maximum egg production and egg weight were noted in the RIR birds. RIR birds also used their feed more efficiently, both on per dozen eggs and per Kg egg mass produced basis, than other breeds. Feed consumption was higher in Fayoumis than other breeds. Maximum breaking strength, shell weight, shell thickness and yolk index were observed in LSB birds. Haugh unit values were non-significantly different amongst all the breeds. Based upon these results, it may be concluded that the RIR birds exhibited better production potential, whereas LSB birds produced eggs with better egg quality characteristics than other breeds.

Key words: Feed consumption, egg production, FCR, egg characteristics, poultry breeds.

INTRODUCTION

Various strains of poultry have been developed in the past with a view to obtain maximum eggs and meat production. Due to low potential of Desi chicken and poor performance of imported breeds under rural conditions of Pakistan, Lyallpur Silver Black (LSB) breed was evolved by crossing Desi with three imported breeds namely; White Leghorn, White Cornish and New Hampshire in a two-way cross breeding programme. The objective was to develop a breed that could survive and perform well under severe climatic conditions of rural areas (Siddiqi *et al*., 1979).

Fayoumi layers are known to produce about 250 eggs per annum on low nutrition supply. Due to its non-broodiness character and strong immunity against common diseases, farmers keep this breed in their homes and farms (Rajput *et al.*, 2005). It has been introduced in Pakistan since 1980 and is well adapted to local environmental conditions but it is not a good meat producer because of its small body size. Its egg size is also small. On the other hand, Rhode Island Red is a dual-purpose breed of American class and is getting popularity in the rural areas of the country due to its good meat and egg production potential (Ashraf *et al.*, 2003). Therefore, it is being dissipated in rural areas to enhance egg and meat production for the rural masses.

Lyallpur Silver Black, Fayoumi and Rhode Island Red breeds of poultry are being reared by the people of Pakistan indiscriminately and very little information is available with respect to production potential and egg quality characteristics of these breeds. Therefore, a project was planned to compare the production potential and egg characteristics of the local breed Lyallpur Silver Black (LSB) with two exotic breeds i.e. Fayoumi and Rhode Island Red (RIR) to examine the best potential breed under local environmental conditions of Pakistan.

MATERIALS AND METHODS

A total of 99 birds, including 30 females and three males, each of Lyallpur Silver Black, Fayoumi and Rhode Island Red breeds with average age of 35 weeks, were used in this study. These birds were divided into nine replicates, each comprising of 10 hens and one cock, such that each breed had three replicates separately. All the replicates were maintained in separate pens, measuring 5×6 sq. ft. under the same managemental conditions, for a period of 10 weeks,

from October to December, 2006. The temperature was maintained at about 24-26°C, while, relative humidity inside the experimental pens varied between 50 and 60%. The birds were provided light for 16 ½ hours daily.

The birds were offered a commercial layer ration (Table 1) throughout the experimental period of 10 weeks. Collection of residual feed was done weekly and then it was re-weighed. Feed consumption per bird was calculated by subtracting the feed residue from the feed offered. Eggs were collected from the pens daily at 12:00 noon to record daily egg production per replicate. At the end of each experimental week, egg production/bird/week was calculated. Eggs laid per replicate were weighed daily and then at the end of each experimental week average egg weight was calculated. Feed conversion ratio (FCR) on the basis of one dozen of eggs and one Kg mass of eggs was calculated.

Table 1: Ingredients and chemical composition of the experimental layers ration

Ingredients	Ratio
Corn yellow	40.5
Rice	20.0
Rice polishing	7.50
Soybean meal	6.70
Cotton seed meal	1.50
Corn gluten 60%	6.10
Fish meal	5.30
Di-calcium phosphate	2.70
Limestone	7.00
Molasses	2.20
Vitamin/mineral premix	0.50
Total	100.0
Chemical composition	
Crude protein (%)	16.04
Metabolizeable energy (Kcal/Kg)	2802
Vitamin A (IU/Kg)	3000
Calcium (%)	3.50
Phosphorus (%)	0.74
Crude fiber (%)	3.73
Lysine (%)	0.76
Methionin (%)	0.37

The egg quality parameters were determined on fortnight basis. For this purpose, three eggs per replicate were taken randomly to determine various egg quality parameters viz., breaking strength, shell weight, shell thickness, yolk height, yolk diameter, and albumin weight and albumin height. Breaking strength was measured by egg testing equipment. Egg shell thickness was recorded using a micrometer screw gauge. Yolk index was calculated by dividing the yolk height with the yolk diameter. Haugh unit was calculated as the ratio between egg weight and albumin height. The data thus collected were subjected to analysis of variance technique using Completely Randomized Design. Differences between means were compared using Duncan's Multiple Range test (Steel *et al.*, 1997).

RESULTS AND DISCUSSION

Production performance

Mean values of feed consumption, egg production, egg weight and FCR/dozen of eggs and FCR/Kg egg mass for birds of the three breeds are shown in Table 2. Feed consumption per bird per week in Fayoumi was significantly ($P<0.05$) higher compared to that of LSB and RIR. The lowest feed consumption per bird per week was recorded in RIR birds. Feed consumption due to weeks and interaction between breed × weeks was also significant ($P<0.05$). Mahmood *et al*. (1984) also observed lesser feed consumption in LSBs than those of Fayoumi birds. Similar findings were observed by Leeson *et al.* (1997) and Jaroni *et al*. (1999) where strain showed a significant ($P<0.05$) effect on feed intake rather than that of rearing diet. Normally, feed consumption is considered a heritable characteristic, however, a probable explanation for more feed consumption in Fayoumi birds might be their activeness, where a large portion of feed might have been consumed in their physical activities.

RIR birds laid more eggs compared to LSB and Fayoumi birds ($P<0.05$). The lowest egg production was recorded in LSB birds. However, the difference in egg production between LSB and Fayoumi birds was non-significant. Similarly, the effect of weeks on egg production of LSB, Fayoumi and RIR was non-significant. Sazzad (1992) also observed higher egg production in RIR than indigenous breeds. Egg production of RIR birds has also been reported higher than LSB birds (Ashraf *et al*., 2003). The reason for higher egg production in RIR might be their better genetic potential. Contrary to the findings of the present study, Mahmood *et al.* (1984) observed that Fayoumi exhibited higher egg production than LSB birds. According to Leeson *et al.* (1997) and Hocking *et al.* (2003), there were no detectable differences between breeds within category (traditional and commercial lines) in egg production ($P>0.05$). The reason for contrary findings might be the difference in the genetic potential of the breeds used in these studies.

Fayoumi hens laid lighter/smaller eggs than those of LSBs and RIRs, whereas, Lyallpur Silver Black hens laid heavier eggs than birds of other two breeds

Table 2: Mean values of feed consumption, egg production, egg weight, FCR/dozen of eggs and FCR/Kg egg mass basis for Lyallpur Silver Black, Fayoumi and Rhode Island Red birds

Parameters	Treatment groups		
	LSB	FAYOUMI	RIR
Feed consumption per bird/week (kg)	$0.776^{b} \pm 0.053$	$0.808^{a} \pm 0.078$	$0.738^{c} \pm 0.063$
Egg production (Nos.)	$3.60^{b} \pm 0.313$	$3.72^{b} \pm 0.342$	$4.49^{a} \pm 0.350$
Egg weight (g)	$51.84^{a} \pm 3.318$	$45.91^{c} \pm 3.443$	$49.86^{b} \pm 3.341$
FCR/dozen of eggs	$2.584^{a} \pm 0.211$	$2.636^{a} \pm 0.227$	$2.094^{b} \pm 0.155$
FCR/kg egg mass	$4.190^{b} \pm 0.365$	$4.789^{a} \pm 0.321$	$3.384^{c} \pm 0.247$

The values in the same row with different superscripts are significantly different (P<0.05).

(P<0.05). The effect of weeks and interaction between breed × weeks on egg weight of LSB, Fayoumi and RIR was non-significant. Mahmood *et al.* (1984) found that eggs produced by LSBs were heavier than those of Fayoumis. Egg weight is largely affected by the environmental factors, food restriction (Shaler and Pasternak, 1993) and genetic make up of birds.

The birds of RIR breed utilized their feed more efficiently on the basis of per dozen of eggs and per Kg egg mass produced than LSBs and Fayoumis (P<0.05). The difference in FCR per Kg of egg mass of the birds of LSB and Fayoumi was also significant (P<0.05). However, the difference in FCR per dozen of eggs of Fayoumi and LSB was non-significant. Ashraf *et al.* (2003) recorded better FCR per dozen of eggs and per Kg egg mass produced in RIRs than those of LSBs. Jaroni *et al.* (1999) observed that DeKalb hens showed better feed efficiency than Hisex hens, which means that difference in strain strongly affected the feed efficiency. The reasons for better FCR in RIR may be either their better egg production with large egg size and/or lesser feed intake than birds of other breeds.

Egg quality characteristics

The mean values of breaking strength, shell weight, shell thickness, Haugh unit, yolk index, albumen weight and yolk weight are shown in Table 3. Statistical analysis of the data revealed that breaking strength of eggs produced by LSB hens was significantly (P< 0.05) higher than that of Fayoumis and RIRs. The data depicted that the maximum breaking strength was observed during first week of study. The interaction between breeds × weeks in respect of breaking strength of eggs was non significant. Monira *et al.* (2003) also observed that the breaking strength of the eggs produced by RIR was lower than those of White Leghorns.

The shell weight of eggs produced by LSB birds was significantly (P<0.05) higher than that of Fayoumis and RIRs. The difference between the latter two breeds was non significant. Variation in shell weight of various breeds in respect of weeks was non-significant. Similarly, the effect of breeds × weeks was also non-significant. Khalid (2001) reported that shell weight of different breeds was significantly different. The reason for heavier shells might be the production of heavier eggs by LSB birds than other two breeds. However, Tharrington *et al.* (1999) observed no difference in the shell weight of different strains.

LSB hens produced eggs with thicker shells than Fayoumis and RIRs (P<0.05), while shell thickness of eggs of RIR and Fayoumi birds showed non-significant difference. The interaction of breeds × weeks was significant (P<0.05). Ashraf *et al.* (2003) recorded that LSB birds produced thicker shelled eggs than those of RIR birds. Mohammed *et al.* (2005) observed significant differences in the average egg shell thickness among local Sudanese breeds. The difference in egg shell thickness between these breeds might be due to genetic peculiarities of these breeds, because the

Table 3: Mean values of egg quality characteristics of Lyallpur Silver Black, Fayoumi and Rhode Island Red birds

Parameters	Treatment groups		
	LSB	FAYOUMI	RIR
Breaking strength (Kg/cm^2)	$2.80^{a} \pm 0.165$	$2.13^{b} \pm 0.166$	$1.03^{c} \pm 0.070$
Shell weight (g)	$7.29^{a} \pm 0.620$	$6.29^{b} \pm 0.478$	$6.50^{b} \pm 0.540$
Shell thickness (mm)	$0.40^{a} \pm 0.021$	$0.37^{b} \pm 0.023$	$0.35^{b} \pm 0.028$
Haugh unit	75.8 ± 7.353	75.1 ± 6.533	72.2 ± 5.993
Yolk index	$0.476^{a} \pm 0.034$	$0.446^{b} \pm 0.034$	$0.454^{b} \pm 0.030$
Albumen weight (g)	25.50 ± 2.423	23.99 ± 2.926	25.14 ± 1.911
Yolk weight (g)	$15.55^{c} \pm 1.057$	$16.29^{b} \pm 1.205$	$16.83^{a} \pm 1.380$

The values in the same row with different superscripts are significantly different (P<0.05).

ability to produce eggs with varying shell thickness is an inherited (25% heritable) character. Contrary to findings of the present study, Khalid (2001) found no difference in egg shell thickness amongst LSB, RIR and White Leghorn breeds. Hocking *et al.* (2003) also reported no difference in egg shell thickness of commercial and traditional breeds.

The results of the present study revealed that there was no difference in the Haugh unit values of eggs produced by LSB, Fayoumi and RIR birds. Khalid (2001) and Ashraf *et al.* (2003) also found that Haugh unit of all the experimental breeds was the same. Haugh unit determines the albumen quality; higher Haugh unit means better albumen quality. These results show that the quality of albumen contents present in eggs of three breeds is the same.

The yolk index of eggs produced by LSB birds was significantly ($P<0.05$) higher than those of Fayoumi and RIR. However, yolk index of eggs of RIR and Fayoumi showed non-significant difference. Difference in yolk index of various breeds regarding the effect of weeks was also significant ($P<0.05$). However, the difference due to breeds × weeks interaction was non significant. Haq (1995) also observed that different breeds had different yolk index. However, Khalid (2001) observed that yolk index of different experimental breeds did not show any difference amongst them.

The RIR birds produced heavier yolk than that of the Fayoumis and LSBs. Yolk weight of eggs of Fayoumi was also higher than that of LSBs ($P<0.05$). The effect of weeks on yolk weight was also significant ($P< 0.05$), whereas, interaction between weeks × breeds was found to be non significant. These results are in line with the findings of Silversides and Scott (2001) and Silversides *et al.* (2006), who observed that yolk weight of different strains differed significantly. However, the difference in albumen weight among hens of the three breeds was non significant.

Cost of feed consumed by LSB, Fayoumi and RIR birds was Rs. 3759, 3914 and 3575, respectively, during the experimental period. The miscellaneous cost including the cost of labour, electricity, litter, disinfections, medications and vaccination summed up Rs. 500. Thus, the total calculated cost of production was Rs. 4259, 4414 and 4075 in the respective breeds. The layers of LSB, Fayoumi and RIR produced 1080, 1116 and 1347 eggs, respectively during the experimental period. These eggs were sold at the rate of Rs. 54 per dozen. The income from the sale of eggs was calculated to be RS. 4860, 5082 and 6061 in the respective breeds. This shows that RIR layers fetched more profit (Rs. 1985) than that of Fayoumi (Rs. 668) and LSB (Rs. 601).

Based upon the results of this study, RIR birds produced more eggs and utilized their feed more efficiently along with more profit margin than its counterparts. Keeping this in view, maintenance of RIR birds can be recommended in rural areas to enhance egg production in rural poultry population.

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