INTERNATIONAL JOURNAL OF AGRICULTURE & BIOLOGY
1560–8530/2003/05–4–449–451
http://www.ijab.org

Comparative Reproductive Efficiency and Egg Quality Characteristics of Lyallpur Silver Black and Rhode Island Red Breeds of Poultry

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ABSTRACT

A study was conducted to compare the reproductive efficiency and egg quality characteristics of a locally evolved Lyallpur Silver Black (LSB) breed with Rhode Island Red (RIR) breeds of poultry. For this study, 42 birds (24 weeks of age) comprising 36 females and males of each breed were divided into six experimental units/replicates (six females and one male/ replicate). Each replicate was placed in a separate breeding pen provided with a trap nest to obtain pedigreed offsprings. The birds were fed *ad libitum*. The data on egg weight, shell thickness, albumen height, yolk height and yolk diameter was recorded fortnightly. The eggs obtained from the birds were incubated for fertility, hatchability and weight of day old chicks. RIR exhibited significantly more weight (36.66 g) of day old chicks than those of LSB (31.62 g). LSB layers produced significantly thicker shelled eggs (0.383 mm) than their counter parts (0.367 mm). However, the difference in haugh unit, yolk index, fertility percentage and hatchability percentage was found to be non significant.

Key Words: Lyallpur Silver Black; Rhode Island Red; Poultry; Eggs; Reproductive efficiency

INTRODUCTION

A number of breeds of poultry have been developed in the world to obtain maximum eggs and meat production. Some of these breeds such as Leghorn, Plymouth Rock, Fayoumi, Minarca, Sussex, New Hampshire and Rhode Island Red (RIR) have been imported in Pakistan. However, low livability of imported poultry breeds in local climatic conditions is one of the important deterrent factors in the way of developing and popularizing profitable poultry keeping particularly in rural areas. Although such breeds are being maintained in the country but their production potential has not been achieved up to their maximum genetic potential.

RIR has gained more appreciation than the other breeds imported in Pakistan, due to its good egg production ability (Moreng & Avens, 1985). Basically, it is a dual purpose breed of American class and is getting more popularity in the rural areas because of its long stay in Pakistan which has made it well adapted to the local environmental conditions.

Lyallpur Silver Black (LSB) a local breed was evolved by crossing the Desi chickens with three imported breeds namely, White Leghorn, White Cornish and New Hampshire. The main objective was to develop a breed that could survive under hard environmental conditions of rural areas as well as be capable of producing more eggs per year. LSB birds have the ability to produce 150 eggs per year, which is triple than that of the production of Desi birds (Siddiqi *et al*., 1979).

A little information is available on the comparative reproductive efficiency and egg quality characteristics of LSB and RIR birds. As these characters are genetically controlled (Merat, 1990, Froman *et al*., 1992), therefore, needs to be compared under local environmental conditions. Therefore, a project was planned to compare the genetic potential of LSB with RIR breeds regarding various aspects of reproductive efficiency and egg quality characteristics under local environmental conditions which could be of use for the poultry farmers to select the best suited breed for farming business.

MATERIALS AND METHODS

A total of 42 mature birds (24 weeks of age) comprising 36 females and six males of each breed reared at the Poultry Research Centre, University of Agriculture, Faisalabad–Pakistan, were used for the study. These birds were divided into six experimental units/replicates, each having six females and one male. Each replicate was placed in a separate breeding pen provided with a trap nest for identification of egg to get pedigreed offspring for further studies. All birds were leg-banded for identification. The birds were maintained under the same conditions of temperature, humidity, ventilation, floor space and light for a period of 20 weeks. A commercial layer mash (Table I) was fed *ad libitum* to the birds and fresh water was made available to them throughout the experimental period.

The data regarding egg quality characteristics (shell thickness, haugh unit and yolk index), fertility, hatchability and weight of day old chicks were recorded. Random samples of two eggs from each replicate were taken fortnightly. The eggs were broken to check their egg quality characteristics.

Table I. Ingredients and chemical composition of the experimental rations

Ingredients	Inclusion level (%)
Corn	40.0
Rice broken	17.0
Rice polishing	6.0
Wheat bran	2.0
Cotton seed meal (untreated)	4.0
Sunflower meal	3.0
Corn gluten meal (30%)	2.0
Corn gluten meal (60%)	5.3
Fish meal	6.0
Blood meal	1.0
Dicalcium phosphote	0.7
Limestone (ground)	4.5
Molasses (cane)	2.0
Soybean oil	1.0
Vitamin/mineral premix	0.5
Chemical composition	
Crude protein (%) =	17.00
Metabolizable Energy (Kcal/kg) =	2899.80
Crude fiber (%) =	3.97
Calcium (%) =	2.05
Phosphorus (%) =	0.33

The haugh unit for the egg produced by each breed was calculated using the following formula (Panda, 1996).

Haugh unit = $100 \log (H + 7.57 - 1.7W^{.37})$

Where , H = Observed albumen height in millimeters

W = Observed weight of the egg in grams.

For this purpose, egg weight and albumen height was recorded to calculate haugh units of the eggs produced. Yolk height and yolk diameter was also noted to calculate yolk indices of the eggs following the formula of Panda (1996).

$$\text{Yolk Index} = \frac{\text{Yolk Height}}{\text{Yolk Diameter}}$$

Eggs collected from trap nests were kept in the incubator. On 18th day of incubation, candling was performed to check clear (infertile) or having dead germs. Then the eggs were transferred in to the hatcher with separate partitions of eggs for each hen to get pedigreed offspring to be used for further studies. At the time of hatch, dead in shell were also recorded. Finally, the chicks hatched and their birth weight for each unit was recorded to calculate hatchability, fertility and average birth weight of the chicks of each breed (Jull, 1952). The hatchability was calculated both over the total eggs set and the fertile eggs. The data thus collected were analyzed between breeds and weeks by Analysis of Variance Technique using Completely Randomized Design (CRD). The difference between the means was compared by Least Significance Difference test (Sokal & Rholf, 1995).

RESULTS AND DISCUSSION

Egg weight. Egg weight (Table II) of RIR was significantly ($P<0.05$) higher as compared to LSB birds. Minimum egg mass (g) produced/bird/week by LSB (114.23±16.41) and RIR (102.16±21.30) was recorded at the start of the experiment; whereas, maximum by LSB (202.78±21.77) and by RIR (315.62±16.37) was recorded at 16th and 12th week of the experiment. As the eggs produced by RIR were heavier than those produced by LSB, therefore, obviously egg weight produced/bird/week by RIR bird (256.21±6.47) was higher than that produced by LSB (163.138 ± 4.75). Similar findings have also been reported previously (Sadiq, 1968; Ahmad *et al*., 1972b; Bokhari & Chaudhry, 1972). Higher egg weight of RIR birds may be due to their superior genetic make up because of continuous selective breeding produced through a long time.

Egg shell thickness. Statistical analysis of the data showed significant ($P<0.05$) difference between the breeds (Table II). LSB birds produced thicker shelled egg (0.383 mm) as compared to RIR (0.367 mm). LSB has also been reported to produce thicker shelled eggs than White leghorn (Ahmad *et al*., 1972b). More thickness of the egg shell in LSB seems to be an inherited character as breed difference in egg shell has also been reported (Mahmood *et al*., 1984) between LSB and Fayoumi breeds.

Haugh unit (HU). There was no difference ($P<0.05$) in the HU values between LSB and RIR (Table II). However, the interaction between breeds and weeks was significant ($P<0.05$) (Table II). Minimum HU of LSB (97.72±1.82) and of RIR (99.25±1.66) was recorded at 12th and 10th experimental weeks. The maximum HU of LSB (106.86±1.45) and of RIR (106.88±1.80) was recorded at 8th and 4th weeks of experiment. As HU determines the albumen quality, thus better HU means better the quality of eggs produced. Parallel HU values in the present study

Table II. Overall performance of Lyallpur Silver Black and Rhode Island Red Breeds

Description	Lyallpur Silver Black	Rhode Island Red	Mean ± SEM
Egg weight (g)	47.23 ± 0.34 b	53.10 ± 0.30 a	50.17 ± 0.30
Haugh Unit	102.24 ± 0.73	102.57 ± 0.59	102.40 ± 0.47
Yolk index	0.450 ± 0.005	0.446 ± 0.004	0.448 ± 0.003
Egg shell thickness (mm)	0.383 ± 0.005a	0.367 ± 0.004 b	0.375 ± 0.003
Fertility (%)	97.50 ± 1.57	96.87 ± 1.53	97.19 ± 1.07
Hatchability (%)	83.93 ± 3.55	88.17 ± 3.30	86.05 ± 2.41
Weight of day old chick (g)	31.62 ± 0.48b	36.66 ± 0.36a	34.14 ± 0.60

Means not sharing a letter in common in a row differ significantly ($P<0.05$)

indicated that the albumen quality of the both breed is similar.

Yolk index. There was no difference (P<0.05) in the yolk index between LSB and RIR. The interaction between weeks was also found to be non-significant. Minimum yolk index for LSB (0.398 ± 0.012) and for RIR (0.413 ± 0.008) was recorded at the 20th week of experiment. Whereas, maximum yolk index for LSB (0.470 ± 0.005) and RIR 0.470 ± 0.017) was recorded at 8th and 4th weeks of the experiment.

Fertility. There was no difference (P<0.05) in the fertility between LSB and RIR and their interaction, but between the hatches the difference was significant (P<0.05). Therefore, LSB (97.50 ± 1.57) and RIR birds (96.87 ± 1.53) showed parallel fertility percentage. Less fertility percentage was recorded in the 2nd hatch and high fertility was recorded in the 1st hatch of the both breeds. Both the breeds showed a higher percentage value for fertlity. Significantly lower fertility in LSB than White Leghorns has been reported previously (Ahmad *et al*., 1972a).

Hatchability. There was no difference (P<0.05) in the hatchability between LSB and RIR, hatches as well as their interaction. Therefore, LSB (83.93 ± 3.55) and RIR (88.17 ± 3.30) showed parallel hatchability percentage. The least hatchability (82.15 ± 3.28) was recorded in the 2nd hatch and high hatchability (89.94 ± 3.28) was recorded in the 1st hatch in the both breeds.

Weight of day old chicks. Statistically, weight of day old chicks of LSB and RIR was non significant between the hatches and the interaction of the both breeds. However, the difference was found to be significant (P<0.05) between the breeds. The LSB chicks showed significantly less weight (31.62 g ± 0.148) than those of RIR's (36.66 g ± 0.36). Higher chick weight of RIR's than those of LSBs may be due to the higher egg weight of RIRs. Therefore, better chick weight of RIR chicks may be attributed to their higher egg weight than those produced by LSB's.

CONCLUSION

It was found that both the breeds showed non-significant differences for most of the characters studied regarding egg quality and reproductive efficiency. Therefore, both the breeds may be equally useful when reared in climatic conditions like Pakistan

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(Received 01 September 2003; Accepted 23 September 2003)