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Study the Quality of Eggs of Different Genotypes of Chickens under Semi-scavenging System at Bangladesh

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Abstract: The experiment was conducted to know the quality of eggs of different genotypes of chickens under semi-scavenging system. Egg weight and quality of egg such as shape index, egg shell thickness, yolk index, yolk and albumin weight were studied. The large size with best quality of eggs laid by Nera followed by Sonali, RIR ♂ × Hilly ♀ and Hilly ♂ × Fay ♀ crossbred. The weight of egg varies from 42-55 g in four genotypes and found there were significant differences among genotypes. In case of shell thickness, it was significantly higher in Nera (38.0 mm) and there were no significant differences were found among the other 3 genotype. Shape index, yolk index, albumin height and haugh unit was significantly differ of Nera with other genotypes (0.824 Vs 0.72, 0.727 Vs 0.374, 7.38 Vs 5.10 cm 86.25±1.84 Vs 75.78), respectively and there were no significant difference were found among the other three genotype.

Key words: Egg quality, genotypes, crossbreds, egg weight, differences

INTRODUCTION

The egg size and the internal quality of eggs are very much important for both table eggs and hatching eggs. The nutrient content of eggs and the weight of day old chicks are depending on the size of egg. The local chicken of Bangladesh produces the small size eggs the weight of eggs varies from 25-55 g but their shell thickness is good. Among the deshi chickens the Hilly chicken produce on an average 42 g[1]. On the other hand the Rhode Island Red and their graded chickens produce medium sized eggs. Merat[2] reported that the egg size of Fayoumi was smaller than RIR ♂ × Fayoumi ♀ crossbred and they also found that Fayoumi ♂ × RIR ♀ crossbred had lower egg weight. Barua[3] found that the egg weight of Fayoumi, Rhode Island Red and Fayoumi ♀ × RIR ♂ was 37.0, 46.75 and 42.50 g, respectively in scavenging condition. Sazzad[4] observed the egg weight of Fayoumi, Rhode Island Red and Fayoumi ♂ × RIR ♀ was 41.35, 60.76 and 48.43 g respectively, under farm management. Aktaruzzaman[5] found the egg weight RIR ♂ × Fayoumi ♀ was 44.49 g. The standard size chickens egg weight 56.79 g[6] . The egg size of chickens are affected by many factors such as heredity[7] chronological[8] dietary factors[9] body size, feed and water consumptions, ambient temperature and diseases[10].

The egg shell thickness is an important trait for hatchability. For best result of hatchability egg shell thickness should be between 0.33 and 0.35 mm and few eggs with a shell thickness less than 0.27 mm will hatch. The yolk index and the haugh unit are also important measures for the amount of yolk and albumin of eggs.

Crossbreeding is an important tool to improve any traits within a short period of time. For designing a crossbreeding program, the incorporation of genes of exotic chicken to indigenous chicken should be given priority because the indigenous chicken has some good quality like; broodiness, adoptability and resistance to diseases. The high yielding breeds and native chicken may combine to develop a suitable crossbred/graded chicken those possess the desire trait for high production potential. In order to increase the egg size and improve the quality of egg the present study was undertaken by incorporating the RIR and Fayoumi blood to native Hilly type chicken.

MATERIALS AND METHODS

The research work was conducted at Chittagong Government Veterinary College, Pahartali, Chittagong, Bangladesh. Rhode Island Red (RIR) cockerels and Fayoumi (Fa) pullets were procured from Regional Government Poultry Farm, Pahartali, Chittagong and Hilly cockerels and Hilly pullets were collected from the villages and local markets of hilly areas of Chittagong Hill Tract regions on the basis of phenotypic similarities. After collection the chickens the crossbreds of RIR ♂

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x Hilly ♀, Hilly ♂ x Fayoumi ♀ and RIR ♂ x Fayoumi ♀ were produced. The Nera chicks were purchases from a farm. From hatching upto 16 weeks of age the chicks were reared by intensive management. After that the crossbreds' chicken were distributed to the selected farmers for rearing them under semi-scavenging system. Each farmer has given 5 pullets of a genotype, day shelter shed and 65 g supplements feed per day. The chickens were allowed to scavenging to surrounding areas of the farmer's house for 6-8 h at day time.

The eggs were collected daily from the different genotype and weighed them by a electrical and/or top loading balance. Clean, washed and air dried egg shell was measured for thickness by using a micrometer. Albumin and yolk height was measured by using sperometer. The yolk length and the length and width of eggs were measured by Slide Calipers. In order to correct for differences in egg weight the albumin height as converted into haugh unit as reported by Haugh[11].The formula was as follows:

$$HU = 100 \log (H + 7.57 - 1.7W^{0.37})$$

Where:
H = Height of albumin
W = Egg weight
HU = Haugh Unit

Data on most of the parameters studied were unequal. Therefore statistical analysis of the collected data was performed by Statistical Package for Social Sciences (SPSS), (Windows Base 7.5 Version, 2000). For the significant factors the sub-class mean was compared using least significant different test[12].

The general linear model for analyzing numerical collected data on different traits was:

$$Y_{ij} = \mu + G_i + e_{ij}$$

Where:
Y_{ij} = Individual observation
μ = Overall mean
G_i = Effect of genotype
e_{ij} = Uncontrolled genotypic and environmental deviation which is distributed as N (0, σ2)

RESULTS AND DISCUSSION

Egg weight: The highest egg weight were observed in Nera from age at sexual maturity to after 40 weeks of age and lowest egg weight were observed in Hilly ♂ × Fayoumi ♀, crossbred (Table 1). There was a significant ($p<0.01$) difference in egg weight were observed between genotype. Overall egg weight of different genotype were 44.37±0.48, 42.35±0.29, 46.23±0.41 and 55.02±0.8 g for RIR ♂ × Hilly ♀, Hilly ♂ × Fayoumi ♀, crossbred, Sonali and Nera, respectively. Kumar[13] found the egg weight of Deshi, RIR ♂ ×Deshi ♀ and Deshi ♂ × RIR ♀ were 44.99±0.60, 48.47±0.37 and 47.96±0.40 g, respectively. Barua[3] observed the egg weight of Fayoumi ♂ × RIR ♀ was 42.50 g. Aktaruzzaman[5] observed the egg weight of RIR ♂ × Fayoumi ♀ was 44.40 g. In this research the egg weight of RIR ♂ × Fayoumi ♀ was obtained 46.23±0.41 g which was slightly different from the previous result.

From Table 1 it can be seen that the egg weight of different genotypyes was increased with the increase of age this result was similar with other researchers[8,14,15]. Weather up and Foster[16] reported considerable difference in egg weight at different age.

Egg quality: The egg weight of Nera were significantly ($p<0.01$) higher (55.38±0.63 g) than three genotype (Table 2). The egg weight depends on genetic and environmental factors.

The average shell thickness of different genotype was ranges from 0.34 to 0.38 mm. The egg shell thickness of Nera (0.38±0.008 mm) were significantly ($p<0.05$) higher than the three genotype. There were no difference for egg shell thickness between RIR ♂ × Hilly ♀, Hilly ♂ × Fayoumi ♀, crossbred and Sonali. These results are agreed with the results of Yesmin[17] and Doyon[18] who also reported that there was no significant effect of type of birds on the egg shell thickness. Egg shell thickness is important to hatchability. From this present finding it was observed that all the genotype having egg shell thickness within the range.

The shape index varies from 0.72 to 0.824. For shape index all the genotype were significantly ($p<0.01$) different from each other (Table 2). The highest shape index was observed in Nera (0.824±0.001) and the lowest shape index was observed in Hilly ♂ × Fayoumi ♀ (0.72±0.007) crossbred. From this result it might be say that the shape index of the chickens varies due to genetic factor.

The yolk index of different genotype and were varies from 0.374±0.001 to 0.4274±0.0069. Here, the RIR ♂ × Fayoumi ♀ crossbred showed significantly ($p<0.001$) lower yolk index than any other genotype (Table 2).

The albumin height of Nera were significantly ($p<0.001$) higher (7.38±0.28 mm) than other three genotype. There were no significant differences for albumin height between RIR ♂ × Hilly ♀, Hilly ♂ × Fayoumi ♀ and Sonali crossbred. This difference might be due to size of egg and nutrition.

Table 1: Egg weight (g) of different genotypes at various production periods

	Genotypes				
Periods	RIR ♂ x Hilly ♀	Hilly ♂ x Fay ♀	Sonali	Nera	Level of significance
Age at sexual maturity	41.84±1.43^{bc}	39.49±0.46^{c}	43.52±1.43^{b}	52.04±0.60^{a}	**
At peak	43.90±0.56^{bc}	42.46 ±0.51^{c}	45.64±0.54^{b}	54.91±0.46^{a}	**
After 40 weeks	46.36±0.60^{c}	44.45±0.53^{c}	49.19±0.50^{b}	58.13±0.54^{a}	**
Over all	44.37±0.49^{c}	42.35±0.29^{d}	46.23±0.41^{b}	55.02±0.28^{a}	**

Same letter(s) do not differ significantly, *Significant at 5% level of significance ** Significant at 1% level of significance

Table 2: Quality of eggs in different genotypes

	Genotype				
Traits	RIR ♂ x Hilly ♀	Hilly ♂ x Fay ♀	Sonali	Nera	Level at significant
External quality:					
Egg weight (g)	43.80±0.527^{bc}	41.95±0.45^{c}	45.88±0.71^{b}	55.38±0.63^{a}	**
Egg shell thickness (mm)	0.034±0.005^{b}	0.35±0.804^{b}	0.362±0.0049^{ab}	0.38±0.008^{a}	**
Shape index	0.79±0.006^{c}	0.720±0.007^{d}	0.800.±0.006^{bc}	0.824±0.0010^{a}	**
Internal quality:					
Yolk index	0.374±0.005^{d}	0.408±0.006^{ab}	0.386±0.0038^{b}	0.4274±0.006^{a}	**
Albumin height (mm)	05.30±0.075^{b}	5.10±0.058^{b}	5.22±0.068^{b}	7.38±0.284^{a}	**
Yolk weight (g)	19.76±4.60	15.15±0.181	14.94±1.65	16.61±0.22	NS
Albumin weight (g)	24.0±0.16^{c}	25.43±0.277^{bc}	25.66±0.249^{b}	28.88±0.497^{a}	**
Haugh unit	77.99±0.52^{b}	77.45±0.427^{b}	75.78±0.55^{b}	86.25±1.84^{a}	**

The same letter(s) do not differ significantly, *Significant at 5% level of significance, ** Significant at 1% level of significance, NS = Non-Significant

The yolk weight of different genotype were varies from 14.94 to 19.76 g and there were no significant differences were found between different genotype in yolk weight. These findings were agreed with the result Islam[19], who found no significant difference on yolk weight between different breeds.

The albumin weight were significantly ($p<0.01$) differed from genotype to genotype and the lowest albumin weight were found in RIR ♂ × Hilly ♀, crossbred (24.0 g) and highest in Nera (28.88 g). The albumin weight of different genotype might be with the difference of egg size and nutrition (Table 2).

The haugh unit of egg of Nera significantly ($p<0.01$) higher than other three genotype and there were no significantly differences among them. The haugh unit depends on the albumin height so, it might be difference with the difference with size of eggs.

From the results it revealed that the quality of eggs of Nera were showed superior then other three genotype namely RIR ♂ x Hilly ♀, Hilly ♂ x Fayoumi ♀ and RIR ♂ x Fayoumi ♀ crossbred chickens.

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