Performance study of Non-descript, Hilly and Naked Neck indigenous chicken at fifth generation

S. Faruque[1*], A.K.F.H. Bhuiyan[2], M.O.A. Rahman[1], M.S.K. Sarker[1] and N.R. Sarker[1]

[1]Bangladesh Livestock Research Institute, Savar-1341, Dhaka; Department of Animal Breeding and Genetics, Bangladesh Agricultural University, Mymensingh-2202

Abstract

The present study was conducted at Bangladesh Livestock Research Institute, Savar, Dhaka to assess the performances of three Indigenous Chicken genotypes under intensive management. A total of 1128-day-old chicks comprising of 3 types of chicken namely Naked Neck (NN), Hilly (H) and Non-descript Deshi (ND) were hatched in one batch for this study. Significant ($p<0.001$) body weight differences among the genotypes were observed at 12th and 16th weeks of age, with the highest body weight observed for H genotype (1250.71±27.71, and 1502.54±36.81g) among the other two genotypes. NN genotype (2.85%) had significantly higher chick mortality than ND (0.68 %) and H (2.08 %) genotypes at 0-8 weeks of age. The age at first egg laid was significantly ($p<0.001$) affected by genotype. The age at which Indigenous Chickens start laying eggs ranged from 152.79 to 161.95 days. The Hen-day egg production (HDEP%) observed in the present study were affected significantly ($p<0.001$) by genotype. In this study, the average HDEP% of ND, H and NN were found to be 38.44±2.18, 30.43±2.10 and 41.95±2.11. Eight week body weight of males ND, H and NN birds were expected to increase by 64.7, 46.1 and 43.9g, respectively. While in females ND, H and NN birds, the expected responses were 21.5, 27.9 and 10.7g, respectively.

(**Key words:** Native chicken, performance, genotype, generation)

Introduction

The need to produce more animal protein in the country has become increasingly urgent in view of the ever rising population. Indigenous chickens are widely distributed in rural and peri-urban where they play the important role of income generation and food production (Thornton *et al*., 2002; Moreki *et al*., 2010). Eggs and meat from indigenous chicken contribute to the protein nutrition of various household in the country. For improving performance of indigenous chickens and hence improved productivity, interventions to improve their genetic potential through appropriate breeding programs are inevitable. Breeding programs involving selection within indigenous chickens have been suggested as the best way of improving their genetic potential (Lwelamira, 2012). The knowledge of performance of economic traits in chicken is important for the formulation of breeding plans for further improvement in production traits. Growth and production traits of a bird indicate its genetic constitution and adaptation with respect to the specific environment (Ahmed and Singh, 2007). The exploitation of genetically diverse stocks for improving economic traits, such as body weights and annual egg production is one of the approaches in the breeding programs of chickens. Therefore, the present study was undertaken to evaluate the performances of 3 genotypes of indigenous chicken under intensive management system.

*Corresponding author: shakila_blri@yahoo.com

Materials and Methods

Production of fifth generation (G5) from fourth generation (G4)

The experiment was conducted in BLRI poultry research farm during the year 2014 to 2015. A total of 1128-day-old chicks comprising of 3 types of indigenous chicken namely Naked Neck (NN-268), Hilly (H-353) and Non-descript Deshi (ND-507) were hatched in one batch to produce fifth generation (G5). Progeny were wing banded and reared separately according to genotypes.

Birds rearing and data collection

The birds were housed in an open sided semi gable type roof with concrete floor. Fences were made from galvanizing wire net. The adult birds were reared in a cage individually. Each cage was equipped with an individual feeder and drinker. All the birds were reared in a natural-ventilated poultry house and a 16h photoperiod with 12h sunlight and 4h artificial lights. The ingredients used to prepare diet were maize, rice polish, soya bean meal, protein concentrates and synthetic methionine and lysine. A premix containing trace minerals and vitamins were mixed with all diets. Also, common salt and Di-calcium Phosphate (DCP) were added to the diets. Concentrate mixtures that contain 20.06% Crude Protein & 2908 Kcal ME/kg DM; 18.13% Crude Protein & 2904 Kcal ME/kg DM and 16.33% Crude Protein & 2845 Kcal ME/kg DM were provided twice daily in the morning and evening during brooding, growing and laying period, respectively. Water was also provided adlibitum twice daily in the morning and evening. Drinkers were cleaned everyday where feeders were cleaned twice in a week. Refusals of the feed were measured everyday in the morning. Performance of NN, H and ND were evaluated by measuring their i) laying performance (hen-day egg production, hen-house egg production, egg weight and age at first laying), ii) hatching performance (fertility and hatchability) and iii) growth performance (weekly body weight and mortality).

Selection and mating plan of fifth generation (G5)

i) Breeding design and experimental birds

Experimental birds (Fifth Generation – G5):

Name of genotype	Sex	No. of day old chicks	No. of growing chicks		No. of adult birds	No. of selected bird	
			8 wks	16 wks.		Selected	Spare
NN	Male	268	45	40	40	10	5
	Female		115	100	100	50	10
H	Male	353	45	40	40	10	5
	Female		115	100	100	50	10
ND	Male	507	85	80	80	20	10
	Female		230	200	200	100	20

i i) Selection objectives

The selection objectives of the study were to improve the egg production and / or growth rate of Indigenous chicken depending on the genotype of birds. Improvement target of egg weight is to increase by 1 g, improvement target of egg production rate is to increase by 2% per generation and improvement target of growth rate is to increase by 20 g per generation.

iii) Selection criteria

In each generation, selection was practiced in two stages. Firstly, at 8 weeks of age, selection was performed on the basis of body weight and physical appearance and secondly, at 40 weeks of age on the basis of an index comprising the following parameters.

- ❖ Age at first egg (days)
- ❖ Body weight (g) at 40 weeks of age
- ❖ Egg production (%) (168-280 days)
- ❖ Egg Weight (g) at 40 weeks of age

iv) Mating plan

In flocks of all generations, selected males and females were mated assortatively with a maximum male: female ratio of 1: 5 using artificial insemination avoiding mating among close relatives.

Statistical analysis

All recorded data were analyzed by Generalized Linear Model (GLM) procedure using SPSS 11.5 for Windows (SPSS, 1998). For all statistical purposes the theory of Snedecor and Cochran (1989) were followed. The present data used in the study were from three different genotypes and the structures of data were unbalanced. The number of birds varied from class to class and subclass to subclass. Hence, it confirmed the characteristics of a non-orthogonal factorial experiment. To take this situation into account the data were analyzed by factorial arrangement in a CRD by General linear Model (GLM) Univariate Procedure in SPSS Computer Program.

The following general linear statistical model was used to analyze the different parameters:

Yij = **μ** + **g**i + **e**ij, where, Yij is the dependent variable of the experiment; μ is the overall mean; gi is the effect of ith genotype (i=1-3); eij is the error term specific to each record.

Prediction of expected selection response

Expected selection response in three types of indigenous chicken for body weight at 8 weeks was estimated using the following equation (Falconer, 1981).

$R = h^2 \times S$

Where,

R = Expected response in mass selection

h^2 = heritability, h^2 for BW at 8 weeks of age

S = Selection differential

Results and Discussion

Body weight

The average body weights of ND, H and NN were 979.29±11.58, 1250.71±27.71 and 940.13±17.43g, respectively at 12 weeks (Table 1). The 12th week body weight was significantly ($p<0.001$) affected by genotype. Significantly ($p<0.001$) highest body weight was observed in H genotype (1502.54±36.81g) compared to ND (1300.39±20.26g) and NN (1213.39±24.96g) genotypes at 16th weeks of age. The gap narrowed at 12th and 16th week weight with H and NN genotypes by

310.58 and 289.15g, respectively. Faruque (2016) observed that body weight of ND, H, NN at 12 and 16 weeks of age averaged 778, 921, 770 and 1071, 1282, 1036g; respectively, those were much lower than the present findings. Islam and Nishibori (2009) reported the body weight of Bangladeshi NN to be 1214g at 16 weeks of age. The NN birds of the present study weighed 1213g at the same age.

The estimated age at 1st egg of ND, H and NN were 159.95, 161.95 and 152.79 days; respectively. Hilly genotype started laying eggs at a higher age (161.95 days) compared to NN genotype (152.79 days) in G5 generation. The average age at first egg of NN (152.79 days) was 9.16 days earlier than that of H (161.95 days). The average age at first egg of NN (152.79 days) was comparable to that of NN (152.7 days)

Table 1. Body weight ofindigenous chicken up to 16 weeks of age

Parameter	Genotype			Level of sig.
	ND (Mean±SE)	H (Mean±SE)	NN (Mean±SE)	
12^{th} week weight (g)	979.29^{b}±11.58 (315)	1250.71^{a}±27.71(155)	940.13^{b}±17.43 (139)	p<0.001
16^{th} week weight (g)	1300.39^{b}±20.26(208)	1502.54^{a}±36.81 (140)	1213.39^{c}±24.96 (137)	p<0.001

ND=Non-descript Deshi; H=Hilly; NN=Naked Neck; figures in the parentheses indicate the number of observations; least squares means without a common superscript along the row within a factor differed significantly (p<0.001).

Mortality

NN genotype (2.92%) had significantly ($\chi 2$ = 9.023; p < 0.05) higher chick mortality than ND (0.68%) and H (2.08%) at 0-8 weeks of age (Table 2). The mortality rate was slightly lower in NN than ND and H chicken (Khatun *et al*., 2005). This finding is not similar to our present findings. Better survivability was observed in ND genotype in this study. The mortality rate of indigenous chickens in brooding period (0-8 weeks) was 3.10, 4.05 and 2.92%, respectively under intensive system of rearing (Faruque *et al*., 2015). Khan (2008) reported 70% mortality of indigenous chickens under free range management system.

reported by Faruque (2016). Feed consumption from 9 to 16 weeks (Table 3) showed that there was significant (p<0.001) variation in feed intake among the Indigenous Chickens. At the age of 16 weeks, the lowest (62.96g) and highest (83.46g) daily feed intake were recorded for ND and H genotypes, respectively. The effect of genotype on HDEP (%) of Indigenous Chicken was presented in Table 3. Hen-day egg production (HDEP %) observed in the present study were affected significantly (p<0.001) by genotype. In this study, the average HDEP% of ND, H and NN were found to be 38.44±2.18, 30.43±2.10 and 41.95±2.11, respectively (Table 3).

Table 2. Effect of genotype on chick mortality (%) during 0-8 weeks of age

Genotype	ND	H	NN	X^2 (df=2)	P-Value
Mortality (%)	0.68	2.08	2.85	9.023	p <0.05

Productive and reproductive performance

The age at first egg laid was significantly (p<0.001) affected by genotype (Table 3). Significant effect of genotype on HDEP% found in this study confirms with the result of previous report by Miah *et al*. (2002) who found that breed had significant (p<0.05)

Table 3. Productive and reproductive performance of native chicken genotypes

Parameter	Genotype (Mean ±SE)			Level of Significance
	ND	H	NN	
Age at first egg (d)	159.95^{b} ±0.49	161.95^{a}±0.62	152.79^{c}±0.77	p<0.001
Feed Intake (9-16 weeks) (g/b/d)	62.96^{b}±1.48	83.46^{a}±1.43	66.94^{b}±1.41	p<0.001
HDEP (21-30 weeks) (%)	38.44^{a}±2.18	30.43^{b}±2.10	41.95^{a}±2.11	p<0.001

Least squares means without a common superscript along the row differed significantly (p<0.001)

effect on hen-day egg production. In this study, the highest HDEP% was found in NN genotype (41.95) at 21-30 weeks of age. This finding is not in agreement with the finding of Faruque *et al*. (2010) who found the highest HDEP% in ND genotype (38.72) at 23-52 weeks of age. In the previous study reported by Faruque (2016), the average HDEP% of ND, H and NN were found to be 51.4±0.4, 44.0±0.4 and 48.1±0.4, respectively at 24-45 weeks of age. This finding is much higher than the present finding.

Table 4. Selection differential, selection intensity for 8 weeks body weight (g) in fifth generation (G5) of Native Chicken

Genotype	Sex	Before selection		After selection		Selection Differential (S) (g)	Selection Intensity (i)	Phenotypic Standard Deviation (SD)	Expected Response to Selection ®
		No.	Aver.	No.	Aver.				
ND	M	281	650.2	85	780.0	129.8	1.13	114.7	64.7
	F	302	525.4	230	568.5	43.1	0.42	102.5	21.5
H	M	62	844.5	30	938.9	94.4	0.88	106.8	46.1
	F	135	677.4	100	734.5	57.1	0.48	118.5	27.9
NN	M	121	661.5	45	753.4	91.9	0.99	92.8	43.9
	F	121	540.2	100	562.6	22.4	0.29	78.0	10.7

Expected response

As shown in Table 4 that 8th week body weight of males ND, H and NN birds were expected to increase by 64.7, 46.1 and 43.9g, respectively. While in females, ND, H and NN birds, the expected responses were 21.5, 27.9 and 10.7g, respectively. The response to selection for 8 weeks body weight in male and female for three genotypes (ND, H and NN) were expected to increase and higher in H genotype than other two genotypes. Faruque (2016) found 8th week body weight of males ND, H and NN birds were expected to increase by 52.03, 53.98 and 37.40g, respectively. While in females ND, H and NN birds, the expected responses were 20.92, 24.70 and 12.43g, respectively.

Conclusion

In conclusion, it may be stated that Hilly chicken genotype can be chosen for meat production and Naked Neck genotype for egg production. For further improvement selection should be continued.

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