Asian J. Med. Biol. Res. 2017, 3 (1), 72-79; doi: 10.3329/ajmbr.v3i1.32039

Asian Journal of Medical and Biological Research
ISSN 2411-4472 (Print) 2412-5571 (Online)
www.ebupress.com/journal/ajmbr

Article

Breeding for the improvement of indigenous chickens of Bangladesh: evaluation of performance of first generation of indigenous chicken

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Received: 28 February 2017/Accepted: 19 March 2017/ Published: 30 March 2017

Abstract: Pure breeding is necessary for the conservation and improvement of indigenous chicken genetic resources. Present research is a part of the long-term selection program being undertaken to evaluate the performance and expected response to selection of first generation (G_1) of three indigenous chicken genotypes under intensive management in Bangladesh. A total of 1439-day-old chicks comprising of 3 genotypes namely Naked Neck (NN), Hilly (H) and Non-descript Desi (ND) were hatched for this study. In first generation (G_1), selection was practiced on body weight at 8 and 16 weeks of age, on the basis of their breeding value. At 40-week of age, selection will be practiced on the basis of an index comprising the parameters of age at first egg (ASM), body weight (BW), egg production (EP) and egg weight (EW). At 8, 10 and 12 weeks of age, six birds from each genotype were slaughtered to analyze the meat yield traits. Data were analyzed in CRD by General Linear Model Univariate Procedure. Significantly ($P<0.001$) highest body weight of day-old chicks (28.65±0.12 g) and daily weight gain in all stages were found in H genotype than other two genotypes. Although there was significant ($P<0.001$) difference in live weight between ages at slaughter, dressing percent (65.87 - 66.89 %) of different ages was similar ($P>0.05$) but was affected ($P<0.001$) by genotype. Body weight at 8 weeks of age was expected to improve by 58.98 vs. 11.50; 81.56 vs. 40.91 and 53.81 vs. 15.82 g; respectively for ND, H and NN males and females. In terms of body weight and growth traits H genotype was superior and NN genotype was for dressing percentage. As a result of selection; chick weight, body weight at all stages increased and ASM reduced in first generation than foundation stock. These findings give an impetus for continuing the pure breeding research for more generations.

Keywords: indigenous chicken; generation; selective breeding; performance

1. Introduction

Traditionally local chicken perform a variety of functions, e.g. laying eggs, hatching chicks, brooding and caring of them (Shahjahan *et al.*, 2011). Indigenous chickens are generally better for disease resistance and could maintain higher level of performance under poor nutrition and high environmental temperatures compared to commercial strains under village systems (Horst, 1989). Indigenous chickens of Bangladesh are categorized as Non-descriptive Deshi (ND), Naked Neck (NN), Hilly (H), Aseel (AS) and Jungle fowl (Bhuiyan *et al.*, 2005) in respect of the morphological variations as well as production performances. The genetic potential of indigenous

poultry in Bangladesh is poor. Their productivity is low; as a result they are unable to meet the demand for eggs and meat in the country. This is considered as an important constrain to poultry development, which could be overcome through genetic improvement of indigenous stock by appropriate breeding as well as changing their productive environment. The improvement of productivity of native chicken is a long desire in the country. Latest data appeared in a national daily, Bangladesh is producing more than 400 million heads of broilers and 6600 million pieces of eggs from commercial sector which represent 60 to 70% of country's total poultry meat and egg production, the rest (30-40%) is being added from traditionally reared free range scavenging native chickens (Chowdhury, 2011). During the last three decades, the number of commercial hybrids has increased many folds, but the native chicken reared in the villages still remain the main chicken genetic resources for the rural farmers (Yamamoto *et al.*, 2012). But this process has been reversing day by day. Now village farmers are interested to practice industrial poultry. Indigenous chickens are going to be disappearance. As a result, Bangladesh Livestock Research Institute (BLRI) since its inception did initiate programs for the conservation and development of indigenous chicken through several poultry development projects. It is a long-term vision. As a first step, foundation stock was established utilizing the existing stock of BLRI as well as by incorporating variation through screening of males/females/eggs from wider indigenous chicken gene pool of Bangladesh. A total of 32 males (ND=16, H=8, NN=8) and 160 females (ND=80, H=40, NN=40) were selected from foundation stock to produce first generation (G_1) and 1439 progenies (ND=628, H=475, NN=336) were produced for G_1. However, the present study was undertaken to fulfill the objectives of i) to compare the productive and reproductive performances of first generation of 3 native genotypes under intensive management, ii) to select parental birds (males and females) and breed them in an assortative design for the production of second generation birds and iii) to improve the genetic potentiality of Indigenous chicken genotypes for selected economic trait(s) through successive generations of purebreeding

2. Materials and Methods

2.1. Location and agro-climate

The study was conducted at the Bangladesh Livestock Research Institute, under Poultry Production Research Division, Savar, Dhaka, Bangladesh, the largest delta in the world is situated between $88^0 10'$ and $92^0 41'$ East longitudes and between $20^0 34'$ and $26^0 38'$ North latitudes. The station is located at $23^0 53$/N, $90^0 17$/E at an altitude of 1 meter above the sea level. Agro-ecologically belongs to the Madhupur Tract (Agro ecological Zone 28) of Bangladesh, Red-Brown Terrace strong acidic (pH 4.5-5.5) soil with very little (<1.5%) organic matter (Brammer *et al.*, 1988). Bangladesh has tropical and moderate climate with the summer, monsoon, autumn, late autumn, winter and spring seasons. Annual minimum temperature varies from 8.0^0 c to 13.4^0 c and maximum temperature 25.5^0 c to 36.8^0 c. Extreme temperatures range between about 4^0 c and 43^0 c, except on the coast (Bhuiyan *et al.*, 2005).

2.2. Formation of first generation ($_{G1}$) from foundation stock (G_0)

Foundation stock was established utilizing the existing stock of BLRI as well as by incorporating variation through screening of males/females/eggs from wider indigenous chicken gene pool of Bangladesh. A total of 4688 eggs (NN-1683, H- 1546 and ND-1459) were collected from different parts of Bangladesh to form foundation stock and 1585 day-old chicks were used comprising of 918 ND, 378 H and 289 NN. A total of 160 dams (ND=80 hens, H= 40 hens and NN= 40 hens) and 32 sires were selected from foundation stock to produce first generation (G_1). Selection was done using multi trait index selection and independent culling level at 40 weeks of age comprising the parameters of Age at first egg (days), Body weight (g) at 40 weeks of age, Egg production percentage (168-280 days) and Egg Weight (g) at 38 - 40 weeks of age. In foundation stock, selected males and females were mated at the ratio of 1: 5 using artificial insemination. A total of 1439 progenies (ND=628, H= 475 and NN= 336) were hatched in a three batches for first generation (G_1).

2.3. Selection of first generation (G_1) birds

The selection objectives of the study were to improve the egg production, egg weight and / or growth rate of indigenous chicken depending on the genotype of birds. Improvement target of egg weight is to increase by 1 g and improvement target of egg production rate is to increase by 2% per generation. The main target was the mean body weight in Hilly genotype of chicken ND has to be gone up from the initial eight-week body weight of 378 g to 500 g at eight weeks of age after 3 generations of selective breeding. At 8 weeks of age, a total of 460 female birds (ND=230, H= 115 and NN= 115) and 95 male birds (ND=45, H= 25 and NN= 25) were selected according to breeding value on the basis of 8 week's body weight. At 16 weeks of age, a total of 400 female birds (ND=200, H= 100 and NN= 100) and 80 male birds (ND=40, H= 20 and NN= 20) were selected

according to breeding value on the basis of 16 week's body weight. At 40 weeks of age, 16 males and 80 females will be selected according to an index value. A total of 20 male birds (ND=10, H= 5 and NN= 5) and 40 female birds (ND=20, H= 10 and NN= 10) will be kept as spare birds.

2.4. Breeding and experimental design

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
ND	Male	628	45	40	40	16	10
	Female		230	200	200	80	20
H	Male	475	25	20	20	8	5
	Female		115	100	100	40	10
NN	Male	336	25	20	20	8	5
	Female		115	100	100	40	10

2.5. General flock management

Day-old chicks collected from the hatchery were weighed and leg banded individually. After that, all the chicks of three genotypes were transferred into the brooder, which were cleaned and disinfected earlier and 5% glucose solution was supplied for the first three days. After that, all the chicks of three genotypes were transferred into the brooder, which were cleaned and disinfected earlier. One-week later leg bands were removed and wing bands were provided all the experimental birds. Debeaking was performed after 10-12 days of age. The chicks were brooded and reared up to 16 weeks of age with individual wing band in a brooding and growing house with standard feeding and management. All chicks were vaccinated as per schedule given by veterinarian. After 16 weeks of age all female and male birds were transferred into individual cage. Each cage was equipped with an individual feeder and drinker. The house and cages were cleaned, washed and then disinfected before starting the experiment. 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. Cool clean drinking water was supplied all the times. Water also was provided *ad libitum* twice daily in the morning and evening. Feeder and drinker were cleaned twice in a week. Refusals of the feed were measured everyday in the morning.

2.6. Vaccination

All chicks were vaccinated as per schedule given by veterinarian. The vaccination schedule that was practiced in the experiment is shown in the Table 1.

Table 1. Vaccination schedule for layer that will be practiced during the experimental period.

Age (days)	Name of vaccine	Route	Dose
6	IB + ND live (Ma5 + clone-30)	Eye/oral	One drop
9	IBD (live/killed) Live: D78; Killed: G+ND	Eye and S/C	One drop/0.2 ml
18	IBD live, 228E	Eye	One drop
21	IB + ND live (Ma5 + clone-30)	Eye/oral	One drop
42	Fowl pox + AE	Wing web	
47	Infec. Coryza	S/C	Full dose
60	ND Clone 30	Drinking water	Full dose
75	Infec. Coryza (booster dose)	S/C	Full dose
95	Fowl pox	Wing web	
105	ND Clone 30	Drinking water	Full dose
110	IB+ ND+EDS	S/C	Full dose

2.7. Lighting program

The photoperiod for brooding period was started at 24 hours/day reduced @ 1 hour/week. Depending on season and day length photoperiod was maintained for layer birds. All the birds were reared in a natural-ventilated poultry house and a 16h photoperiod with 12h sunlight and 4 h artificial lights.

2.8. Slaughtering and carcass characteristics data

At 8, 10 and 12 weeks of age, six chicks of each genotype were slaughtered to analyze the meat yield traits. The treatments were arranged in a 3 (genotype) × 3 (slaughter age) factorial experiment. All birds were kept off feed overnight before slaughtering but drinking water was provided ad libitum. Birds were slaughtered following 'halal' method (Singh *et al.*, 2003) by severing the jugular vein allowed to bleed completely and then plucked and weighed to determine blood and feather losses (Kotula *et al.* 1960; Pandey and Shyamsunder, 1990). Pre-slaughter live weight, blood loss weight, eviscerated weight, breast meat weight, thigh plus drumstick weight etc. were recorded. All weight related to carcass characteristics were expressed as the percentage of live weight. Carcasses were dissected according to Singh *et al.* (2003) except that birds were not scalded.

2.9. Data recording

All productive and reproductive parameters were recorded for first generation (G_1). Records were kept on day-old weight (g), fortnightly individual body weight up to 8 weeks, monthly weight up to 20 weeks, daily egg production, and egg weight at 40 weeks of age, temperature and humidity, growth rate, feed intake and feed conversion ration (FCR). Feed conversion ratio (FCR) was recorded for the whole period as total feed intake (kg) per kg weight gain. Temperature and humidity were recorded four times a day; (06:00h, 12:00h, 18:00h and 24:00h).

2.10. 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 treatments were arranged in a 3 (genotype) × 3 (slaughter age) factorial experiment.

The following general linear statistical models were used to analyze the different parameters:

i) $\mathbf{Y_{ij} = \mu + g_i + e_{ij}}$,

Where, Y_{ij} is the dependent variable of the experiment; μ is the overall mean; g_i is the effect of *ith* genotype (i=1-3); e_{ij} is the error term specific to each record.

ii) $\mathbf{Y_{ijk} = \mu + g_i + s_j + (g \times s)_{ij} + e_{ijk}}$,

Where, Y_{ijk} is the dependent variable of the experiment; μ is the overall mean; g_i is the effect of *ith* genotype (i=1-3); $\mathbf{s_j}$ is the effect of *jth* slaughter age (j=1-3); $\mathbf{(g \times s)_{ij}}$ is the effect of *ith* genotype (i=1-3) and *jth* slaughter age (j=1-3); e_{ijk} is the error term specific to each record.

2.11. Estimation of heritability (h^2)

Some dams either did not lay or had no chicks at hatching and records from chicks that lost their wing bands were not included. Only data on birds having proper identified number (Pedigree and performance) were used to estimate heritability for the considered trait. After data editing, a total of 1329 chicks of 30 sires and 129 dams were available for heritability estimation. Variance component of the body weight trait was estimated using Residual Maximum Likelihood (REML) approach by VCE4 computer program (Groeneveld, 1998). The animal model for 8 week body weight included the fixed effects of hatch number and sex of the chicken and birds itself as a random effect. The analysis was done in a single trait animal model.

2.12. 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

3. Results and Discussion

3.1. Body weight, weight gain and FCR

Body weights, body weight gain, feed consumption and feed conversion ratio from day-old to 8 weeks, day-old to 10 weeks and day-old to 12 weeks of age are shown in Table 1. The average initial body weight of day-old chicks of ND, H and NN were 27.67, 28.65 and 27.89 g, respectively and the difference was significant (P<0.001). Faruque *et al.* (2011b) found that the body weight at hatch for ND, H and NN genotypes was 27.74, 28.00 and 24.96 g, respectively which were more or less similar to the present study. The body weight at hatch for ND, H and NN genotypes was 31.2, 30.5, 31.7 g, respectively under intensive management system which was much higher than the present study (Faruque *et al.*, 2007). Significantly (P<0.001) the highest daily weight gain and total weight gain were found in H genotype at all stages. Mean daily weight gains and total gain between 0-8, 0-10, 0-12 weeks of age were 7.68, 8.19, 8.19 g vs. 430.12, 573.34, 688.02; 8.32, 9.64, 9.66 g; vs. 465.77, 674.43, 811.53 g; 7.35, 8.23, 8.08 g vs. 411.88, 576.58, 679.46 g; respectively for ND, H and NN genotypes. The lowest and highest mean body weight gain per bird were recorded for ND (329.38±3.32g) and NN (351.56±5.08 g) genotypes, which indicated that there were an average daily growth rate of 5.88±0.05 and 6.27±0.09 g per bird per day at their 8 weeks growth phases, respectively (Faruque *et al.*, 2011a**).** Daily weight gains between 0-4, 5-18, 0-18 weeks of age were 2.45 vs. 1.45; 8.65 vs. 6.75; 7.25 vs. 5.55, respectively for Normal Deshi (DN) and Desi dwarf (DD) genotypes (Yeasmin and Howlider, 1998). There was a non-significant (P>0.05) variation in FCR among the native chicken genotypes (Table 3). Similar result was found by Faruque *et al.* (2011a**)** who found that the FCR of indigenous chicken at 8th week of age was 3.58, 3.45 and 3.34 respectively for ND, H and NN genotypes. Yeasmin (2000) conducted an experiment on normal feathered indigenous birds under farm condition and found that the daily feed intake was 33.95 g at 5-18 weeks of age and FCR was 3.95 at 5-18 weeks of age.

The results of this study show the heavier weight of H genotype than other two genotypes (Figure 1). The growth rates of H genotype sharply increase after 8 weeks of age.

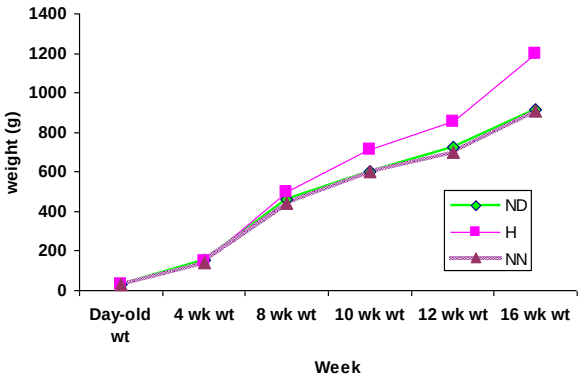

Figure 1. The average weight of first generation of indigenous chicken until the age of sixteen weeks.

3.2. Mortality

H genotype (8.00%) had non-significantly (χ^2 = 0.905; P > 0.05) higher chick mortality than ND (7.16%) and NN (6.25%) at 0-8 weeks of age which is shown in Table 2. NN genotype (3.46%) had non-significantly (χ^2 = 3.62; P > 0.05) higher chick mortality than ND (1.63%) and H (2.11%) at brooding period (0-4 weeks) (Faruque *et al.*, 2011b). Mortality rate was slightly lower in Naked Neck than Deshi and Hilly chicken (Khatun *et al.*, 2005). Better survivability was observed in NN genotype in this study.

3.3. Carcass characteristics

Although there was significant (P<0.001) difference in live weight between ages at slaughter, dressing percent (65.87 - 66.89 %) of different ages was similar (P>0.05) but was affected (P<0.001) by genotype (Table 3 & Table 4). Significantly (P<0.001) higher dressing percentage was found in NN (68.08) genotype than ND (66.29) and H (64.50) genotypes. Similar result was found in NN (64.58) genotype than ND (60.26) and H

(61.70) genotypes (Faruque *et al.*, 2011b). Jaturasitha *et al.* (2008) reported live weights at slaughter at the same age clearly differed ($p<0.001$) among genotypes, with a lower growth rate of the indigenous genotypes, especially Black boned chickens, compared with the imported. Dressing percentage did not differ ($p>0.05$) among genotypes. They also reported dressing percentage of 63.7, 65.9, 63.6 and 64.4 for Black boned, Thai, Bresse and Rhode Island Red genotypes. Breast meat weight as percentage of live weight and thigh plus drumstick weight as percentage of live weight were highly affected ($P<0.001$) by genotype but were not affected ($P>0.05$) by slaughter age.

Table 1. Performance of indigenous chicken of first generation (G_1) up to 12 weeks of age.

Parameter	Age (week)	Genotype			Significance
		ND	H	NN	
Day-old weight (g)		27.67^b	28.65^a	27.89^b	P<0.001
Daily weight gain (g/b)	0-8	7.68^b	8.32^a	7.35^c	P<0.001
	0-10	8.19^b	9.64^a	8.23^b	P<0.001
	0-12	8.19^b	9.66^a	8.08^b	P<0.001
Total weight gain (g/b)	0-8	430.12^b	465.77^a	411.88^c	P<0.001
	0-10	573.34^b	674.43^a	576.58^b	P<0.001
	0-12	688.02^b	811.53^a	679.46^b	P<0.001
Feed conversion ratio (kg feed/kg gain)	0-8	3.55	3.31	3.63	NS

^{abc}Mean within a row with no common superscripts differ significantly

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

Genotype	ND	H	NN	χ^2 (df=2)	P-Value
Mortality (%)	7.16	8.00	6.25	0.905	P >0.05

Table 3. Effect of genotype on carcass characteristics.

Parameter	Genotype			P-value
	ND	H	NN	
Live weight (g)	789.21	728.11	690.00	P>0.05
Dressing %	66.29^b	64.50^c	68.08^a	P<0.001
Breast meat weight as % of live weight	15.80^a	13.30^b	15.08^a	P<0.001
Thigh plus drumstick weight as % of live weight	20.22^a	19.44^b	20.62^a	P<0.05

^{abc}Means with dissimilar superscripts in a row are significantly different

Table 4. Effect of slaughter age on carcass characteristics.

Parameter	Slaughter age			P-value
	8 wk	10 wk	12 wk	
Live weight (g)	554.33^c	702.03^b	872.67^a	P<0.001
Dressing yield (%)	65.87	65.98	66.89	P>0.05
Breast meat weight as % of live weight	13.68	14.54	15.26	P>0.05
Thigh plus drumstick weight as % of live weight	19.29^b	19.25^b	21.09^a	P<0.001

^{abc}Means with dissimilar superscripts in a row are significantly different

Table 5. Variance components and heritability (±SE) estimates of 8 week body weight of indigenous chicken.

Traits	Variance matrices				h^2± SE
	Additive genetic (σ^2_A)	Environmental (σ^2_{PE})	Residual (σ^2_E)	Phenotypic (σ^2_P)	
ND	2356.962	9.887	2356.962	4723.811	0.499±0.034
H	3703.302	171.500	3703.302	7578.104	0.489±0.027
NN	1986.355	184.822	1986.355	4157.532	0.478±0.034

Table 6. Expected response to selection for 8 weeks body weight (g) in first generation (G_1).

Genotype	Sex	Population tested		Population selected		Expected response to selection (R)
		Number	Aver.	Number	Aver.	
ND	M	285	500.36	45	618.55	58.98
	F	295	416.72	230	439.76	11.50
H	M	185	554.29	25	721.08	81.56
	F	264	452.36	115	536.02	40.91
NN	M	148	478.63	25	591.20	53.81
	F	162	404.57	115	437.67	15.82

Table 7. Expected and observed response to selection for 8 weeks body weight (g).

Genotype	Generation	Mean of all measured	Mean of those selected	Selection differential	Response	
					Expected	Observed
ND	Parent (G_0)	340.71	424.42	83.71	38.59	-
	Offspring (G_1)	458.54	-	-	-	117.83
H	Parent (G_0)	378.30	464.48	86.18	42.12	-
	Offspring (G_1)	503.32	-	-	-	125.02
NN	Parent (G_0)	335.46	395.43	59.97	28.67	-
	Offspring (G_1)	441.60	-	-	-	106.14

3.4. Heritability for 8 week body weight trait

The variance components and heritability estimates along with corresponding standard errors of 8 week body weight is presented in Table 5. Calculated heritability for 8 week body weight of ND, H and NN were 0.499 ± 0.034, 0.489 ± 0.027 and 0.478 ± 0.034 respectively. In case of ND, H and NN genotypes; 49.9%, 48.9% and of 47.80% variation of 8 week body weight due to heredity and rest is controlled by environment. Lwelamira *et al*. (2009) reported that heritability estimates for Bwt8, Bwt12, Bwt16 and Bwt20 for Kuchi chicken were o.38±0.10, 0.41±0.07, 0.44±0.08 and 0.45±0.09, respectively. Corresponding estimates for medium ecotype were 0.39±0.09, 0.43±0.10, 0.42±0.08 and 0.43±0.07, respectively. Kinney (1969) reported, using data from the literature and estimates based on ANOVA procedures, mean heritability values of 0.43 (range 0.19-0.66), 0.38 (range 0.01-0.88), 0.40 (range 0.38-0.73) for body weights of 4, 8 and 12 weeks old chickens, respectively. He also reported only one value of heritability at 16 weeks of age (0.47).

3.5. Expected and observed response to selection

Genotype wise expected response and observed response to selection for 8 week body weight is shown in Table 6 & Table 7. As a result of selection, body weight at 8 weeks of age was expected to improve by 58.98 vs. 11.50; 81.56 vs. 40.91 and 53.81 vs. 15.82 g; respectively for ND, H and NN males and females (Table 7). Expected and observed response for 8 week body weight were found as 38.59 vs. 117.83 g; 42.12 vs. 125.02 g and 28.67 vs. 106.14 g, respectively for ND, H and NN genotypes (Table 7)

3.6. Comparison between first generation (G_1) and foundation stock (G_0)

Changes of body weight, age at sexual maturity (ASM), egg production (EP) and egg weight (EW) for first generation (G_1) are shown in Table 8. Weight gains in indigenous chicken at hatch, 8, 20 weeks of age and hen weight at maturity were -0.07, 0.65, 2.93 g; 115.82, 120.52, 110.39 g; 110.19, 228.66, 75.07 g; and 63.62, 224.67, 42.92 g respectively for ND, H and NN genotypes. It was observed that all genotypes came to sexual maturity as 8.82 -10.60 days earlier in the first generation (G_1) than in the foundation stock (G_0). Egg production and egg weight were recorded for G_1 up to 36 weeks of birds' age while EP and EW were recorded for G_0 up to 40 weeks of Age. So comparison between (G_1) and (G_0) were not explained.

4. Conclusions

In terms of body weight and growth responses at all stages of age, H genotype was superior and NN genotype was for dressing percentage. NN genotype was also found to have a higher survivability rate, reaching maturity earlier but attaining a lighter mature weight. Body weight increased at all stages in the first generation than in the foundation stock. All genotypes attained to sexual maturity on an average nine days earlier in the first generation than in the foundation stock. It is being expected that EP and EW will be increased if comparison is done at the same ages. These findings give an impetus for continuing the pure breeding research for more generations.

Conflict of interest
None to declare.

References

Bhuiyan AKFH, MSA Bhuiyan and GK Deb, 2005. Indigenous chicken genetic resources in Bangladesh: Current status and future outlook. Animal Genetic Resources Information's Bulletin, No. 36: 73-84.

Brammer H, J Antonie, AH Kassam and HT van Velthuizen, 1988. Land resources appraisal of Bangladesh for agricultural development. Report-2 (BGD/81/035). FAO of United Nations, Rome.

Chowdhury SD, 2011. Commercial poultry farming in Bangladesh: the rolling tears of farmers and its consequences. Seventh International Poultry Show and Seminar, WPSA-BB, 25-27 March 2011, Dhaka, Bangladesh.

Faruque S, AKFH Bhuiyan, MM Rahman and MN Islam, 2011b. Breeding for the improvement of indigenous chickens of Bangladeh. Proceedings of the Annual Research Review Workshop, 28-29 June 2011, Bangladesh Livestock Research Instiute, Savar, Dhaka, pp. 51-52.

Faruque S, MM Rahman and MN Islam, 2011a. Evaluation of the performance of native chickens and estimation of genetic parameter for body weight. Proceedings of the Seventh International Poultry Show and Seminar, WPSA-BB, 25-27 March 2011, Dhaka Bangladesh, pp.199-206.

Faruque S, NR Sarker, MN Islam and MSK Sarker, 2007. Performance of native chickens under intensive system. Journal of Bangladesh Agricultural University, 5: 283-288.

Horst P, 1989. Native fowls as reservoir for genomes and major genes with direct and indirect effect on the adaptability and their potential for tropically oriented breeding plans. Archiv fur Geflugelkunde, 53: 93-101.

Jaturasitha S, T Srikanchai, M Kreuzer and M Wicke, 2008. Differences in Carcass and Meat characteristics Between Chicken Indigenous to Northern Thailand (Black-boned and Thai Native) and Imported Extensive Breeds (Bresse and Rhode Island Red). Poult. Sci., 87: 160-169.

Khatun R, MS Islam, S Faruque, SA Azmal and MS Uddin, 2005. Study on the productive and reproductive performance of 3 native genotypes of chicken under intensive management. Journal of Bangladesh Agricultural University, 3: 99-104

Kinney TR. Jr, 1969. A summary of reported estimates of heritabilities and of genetic and phenotypic correlations for traits of chickens. Handbook No. 363 Agricultural Research Service. 44pp.

Kotula AW, JE Thomson and JA Kinner, 1960. Weight increase during chilling of broilers as influenced by methods of opening the abdominal cavity during evisceration. Poult. Sci., 39: 26-27.

Lwelamira J, GC Kifaro and PS Gwakisa, 2009. Genetic parameters for body weights, egg traits and antibody response against Newcastle Disease Virus (NDV) vaccine among two Tanzania chicken ecotypes. Trop. Anim. Health Prod., 41: 51-59.

Pandey NK and G Shyamsunder,1990. Carcass characteristics, meat yield and physicochemical properties of meat from white leghorn cockerels. Indian Journal of Poultry Science, 25: 249-252.

Shahjahan M, MR Amin and AKFH Bhuiyan, 2011. Diversity in performance of the Indigenous chicken *in-situ* in some selected areas of Bangladesh. Seventh International Poultry Show and Seminar, WPSA-BB, 25-27 March 2011, Dhaka, Bangladesh.

Singh PK, VK Khatta, RS Thakur, S Dey and ML Sangwan, 2003. Effects of phytase supplementation on the performance of broiler chickens fed maize and wheat based diets with different levels of non-phytate phosphorus. Asian-Australas J. Anim. Sci., 16: 1642-1649.

Snedecor GW and WG Cochran, 1989. Statistical Methods, 8th edn. The Iowa State University Press, Ames, IA, USA.

SPSS, 1998. SPSS Base 10.0 Application Guide, SPSS Inc., USA.

Yamamoto Y, T Oka, MO Faruque and T Amano, 2012. Genetic diversity and genetic relationship of Bangladeshi native chikens. Proceedings of the 7^{h} International Poultry Show and Seminar. World's Poultry Science Association Bangladesh Branch, pp. 207-215.

Yeasmin T, 2000. Effects of incorporating dwarf gene from indigenous (deshi) to exotic breeds of chicken. Ph.D. Thesis, Department of Poultry Science, Bangladesh Agricultural University, Mymensingh.

Yeasmin T and MAR Howlider, 1998. Comparative physical Feature Egg production and Egg quality characteristics of normal and dwarf indigenous (Deshi) hens of Bangladesh. Journal of Applied Animal Research, 13: 191-196.