J. Bangladesh Agril. Univ. 8(1): 79–82, 2010 ISSN 1810-3030

Phenotypic characterization of Native Chicken reared under intensive management system

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Abstract

The Phenotypic characteristics of three genotypes of native chicken comprising of Non-descript Desi (ND), Hilly (H) and Naked Neck (NN) were studied. A total of 180 individual chickens (Male: ND= 20; H= 20 and NN=20; Female: ND= 40, H=40 and NN = 40) were characterized under intensive management system for qualitative and quantitative traits. The results indicated that the predominant plumage color of three types of native chickens was black brownish (33.33%) followed by white with black tips (28.33 %) and red brownish (18.33%). Values indicate that 35% of native chickens had whitish shank color followed by yellowish 31.68%; black 11.66 % and others 21.67 %. All hens of ND, H and NN laid light brown (62.42%) to cream or off white (30.28%) colored eggs. Variations were also found on quantitative traits such as shank length, body weight and reproductive traits on intensive management system. number of eggs/ hen from starting to ten months of laying were 108, 104 and 112, respectively in ND, H and NN genotypes. Three native chicken genotypes showed distinct physical variations for both qualitative and quantitative traits under intensive management system.

Keywords: Native chicken, Quantitative traits, Qualitative traits

Introduction

Native chicken have several valuable characters that are not found in “exotic” chicken and appropriate traditional low input/low output farming system. Most of the original chicken in Bangladesh are of non-descript except few game bird like Sarail Aseel and Chittagong (Malay). These indigenous chicken types have a good adaptability for climate and resistance against diseases. There is wide variability in respect of performance in these chicken types. The improvement of domestic animals including chickens to meet human needs is dependent on variations (variations within and between breeds). Such variation among individuals or groups of chickens gives room and opportunity for breeding and selection. Limited work pertaining to the phenotypic and genotypic constitution of the indigenous chicken of Bangladesh was carried out (Okada, *et al*. 1988; Huque, *et al*. 1993 and Ali and Faruque, 1998). Thus the present study was aimed for phenotypic characterization and to know about some quantitative characteristics of three indigenous chicken genotypes reared in Poultry Farm of Bangladesh Livestock Research Institute (BLRI) based on some phenotypic traits.

Materials and Methods

The experiment was carried out at poultry farm, Poultry Production Research Division, Bangladesh Livestock Research Institute, Savar, Dhaka to study the phenotypic characteristics of three genotypes of native chicken comprising of non-descript Desi (ND), Hilly (H) and Naked Neck (NN). Sixty birds (40 females and 20 males) of about 80 weeks age from each genotype were randomly selected to record the quantitative traits. Body length was determined by measuring the length from beak to toe with a measuring tape. Comb and wattle length were measured using a measuring tape as a distance between the upper and the lower point of the organ. Semen was collected by abdominal massage technique. Egg production was recorded on hen day basis and egg wt. was taken by egg measuring balance. Ejaculate volume (ml) was measured using 1 ml pipette. Shank length was determined by measuring the length from top of hock joint to the footpad. The data collected from the quantitative variables were analyzed to obtain descriptive statistics, using General Linear Model (GLM) multivariate analyses (SPSS, 1996). Similarly, the qualitative parameters were analyzed using descriptive statistics and compared as percentages using the same software package.

Results and Discussion

Qualitative traits such as plumage colour, comb colour, shank colour, earlobe colour and egg colour were evaluated in three types of native chickens under intensive management system (Table 1). The results indicated that the predominant plumage colour of three types of native chickens was black brownish (33.33%) followed by white with black tips (28.33 %) and red brownish (18.33%). Non-descript Desi chickens have no definite plumage colour. Black brownish constituted the maximum proportion (40 %) of plumage colour followed by red brownish (35%). Hilly birds are covered with plumage of white with black tips (85%) followed by multicolour (15%). Naked Neck birds are very colourful-black brownish, multicolour, red brownish and black feather combinations were found. The presence of such large variations in plumage colours revealed that much genetic dilutions have occured with native chickens which is about 60% (Bhuiyan *et al*., 2005). No variations were observed in comb type and shank feather among three types of native chcickens. The comb type of ND, H and NN was 100% single and in 100% cases, no feather was observed in the shank. The shank colour of ND was 40% white or whitish. While, the shank colour of H was whitish 35%; yellowish 25% and others 35%. The highest proportion of shank colour of NN was 45% yellowish followed by whitish 30% and black 15%. The overall mean indicated that 35% of native chickens had whitish shank colour followed by yellowish 31.68%; black 11.66 % and others 21.67 %. The results are not consistent with the observations of Bhuiyan et al. (2005) and Ahmed and Ali (2007). Variations were also observed in earlobe colour and eggshell colour. The earlobe colour of ND and H was 80% white followed by red and admixture of red and white. These results are similar to the findings of the highest proportion Ahmed and Ali (2007) who found 80.55% white earlobe colour of Desi chicken.

Table 1. Morphological characteristics of Native chicken under intensive management system

Parameters (%)	ND	H	NN	Over all mean
Sample size	40	40	40	
Plumage color				
Black	5	-	10	5.00
Black Brownish	40	-	60	33.33
Multicolor	15	15	5	11.67
White with black tips	-	85	-	28.33
Red brownish	35	-	20	18.33
White with red stripes	5	-	-	1.67
Brown	-	-	5	1.67
Comb type				
Single	100	100	100	100.00
Rose	-	-	-	
Pea comb	-	-	-	
Comb Color	-	-	-	
Red	70	55	40	55.00
Brown	20	30	55	35.00
Pale	10	15	5	10.00
Shank feather				
Present				
Absent	100	100	100	100.00
Shank color				
White/whitish	40	35	30	35.00
Black	15	5	15	11.67
Yellow	25	25	45	31.67
Greenish	20	35	10	21.67
Ear lobes color				
Red	5	-	-	1.67
White	80	80	45	68.33
Admixture of red and white	10	15	35	20.00
yellow	-	-	20	6.67
Others	5	5	-	
Egg shell color				
White	61.60	69.05	56.61	62.42
Brown	7.70	4.76	9.44	7.30
Cream	30.70	26.19	33.96	30.28

But dissimilar to the results of Biswas (2005) who found red earlobe colour of Desi chicken was 58 % followed by white earlobe of 45.8%. The highest proportion of earlobe colour in NN was 45 % white followed by 35% admixture of red and white and yellow 20%. All hens of ND, H and NN laid light brown (62.42%) to cream or off white (30.28%) coloured eggs. However, considerable numbers of chickens laid white coloured eggs accounted for 7.30 %. It was reported that the indigenous chickens in Bangladesh laid light brown (67%) and white (27%) eggs (Bhuiyan *et al. 2005), which* is more or less similar to the results of our findings. Body weight, body length, shank length, wattle length and semen volume are shown in Table 2. Data presented in Table 2 showed that the live performance parameters as affected by genotype. There was highly significant difference among genotypes for body weight, shank length, wattle length and semen volume. In terms of shank length, the Hilly cocks had shank length of 11.09 cm at 80 weeks of age, which was significantly longer compared to the other genotypes in this study. Significantly (P<0.01) the highest wattle length was observed in Naked Neck genotype.

Table 2. Shank length, wattle length, body length, body weight and semen volume of Non-descript Desi, Hilly and Naked Neck males

Parameter	Genotype			F-value and level of significance
	ND	H	NN	
Shank Length (cm)	10.35^{b}	11.09^{a}	11.09^{a}	5.493^{**}
Wattle length (cm)	4.98^{a}	4.09^{b}	5.12^{a}	6.333^{**}
Body length (cm)	43.64^{ab}	45.74^{a}	43.21^{b}	3.145^{NS}
Body weight (kg)	2.48^{a}	2.60^{a}	2.15^{a}	9.007^{***}
Semen volume (ml)	0.213^{b}	0.224^{b}	0.371^{a}	5.493^{**}
Correlation coefficient between shank length with body weight	0.60^{***}	0.64^{***}	0.48^{*}	
Correlation coefficient between shank length with semen volume	-0.15	-0.12	0.45^{*}	
Correlation coefficient between body weight with semen volume	0.019	-0.40^{*}	0.63^{**}	

*(P<0.05)**(P<0.01)***(P<0.001); ^{a,b,c} Means within rows with different superscripts differ significantly

There was highly significant difference among genotypes for semen volume. Significantly positive relationship between body weight and shank length was observed in all genotypes. Non-significant negative relationship between shank length and semen volume was observed in non-descript Desi and Hilly genotypes, except Naked Neck genotype whereas the association between shank length and semen volume was significantly positive (r=0.45). The present result indicated that the live body weight was significantly negatively correlated with semen volume in Hilly genotype (r= -0.40) but positively correlated in Naked Neck genotype (r=0.63). Several authors (Harris *et al*., 1984; Marks, 1985 and Slegel and Dunnington, 1985) observed a positive relationship between live body weight and semen volume. Inversely, Scogin *et al.,* (1982) found a negative correlation between body weight and semen volume. Day-old weight (g), body weight (g), shank length, comb length and other reproductive traits are presented in Table 3. The non-descript Desi hens were significantly heavier than the other two genotypes (P<0.001). But body length did not differ significantly among the genotypes. In terms of shank length, the Non-descript Desi and Hilly hens had shank lengths of 9.63 cm and 9.20 cm, respectively at 80 weeks of age, which is relatively long compared to Naked Neck genotype. As to comb length, the Non-descript Desi and Naked Neck hens had significantly largest comb length than Hilly. Other economical traits that showed morphological variation were body weight at day-old (28.56-29.83 g), age at first egg (21.73-22.44 wks.), egg weight (40.32-44.15g), fertility (84.98-91.55 %), hatchability on fertile eggs 57.66-88.63 %). Number of egg/ hen from starting to ten months of laying were 108, 104 and 112, respectively in ND, H and NN genotypes. Sazzad (1992) in Bhuiyan *et al.* (2009) reported that egg laying potential could be increased to 64 eggs/hen/year under intensive conditions. But in our study it was observed that on an average egg laying performance could be increased to 108 eggs/hen from starting to ten months of laying. This result was much higher than the Sazzad (1992). Fitzpatnick and Ahmed (2000) in Bhuiyan *et al.* (2009) stated that the mother of all these chickens, the Red Jungle Fowl, used to lay only 5-6 eggs/hen/production cycle. This reveals that egg production have been increased many fold due to genetic dilution of various level (Bhuiyan *et al.,* 2009). So, molecular characterization is of prime importance.

Table 3. Comparison of economically important traits (performance profile) among native chickens

Traits	Genotype			Over all mean
	ND	H	NN	
Day-old wt (g)	29.83[a] (342)	28.56[b] (205)	29.49[a] (143)	29.30
Body weight (kg)	1.61[a] (40)	1.58[ab] (40)	1.43[b] (40)	1.54
Body Length (cm)	37.03 (40)	37.12 (40)	37.07 (40)	37.07
Shank length (cm)	9.63[a] (40)	9.20[ab] (40)	8.86[b] (40)	9.23
Comb Length (cm)	5.21 (40)	4.97 (40)	5.08 (40)	5.08
Age at first egg (wks.)	22.44[a] (109)	22.17[ab] (47)	21.73[b] (81)	22.11
Egg production (no) (from starting to 10 months	108 (148)	104 (75)	112 (63)	108
Egg weight (g)	42.94[b] (187)	40.32[c] (89)	44.15[a] (35)	42.47
Fertility (%)	89.65	91.55	84.98	88.72
Hatchability (%)	88.63	79.23	57.66	75.03

[a,b.c] Means within rows with different superscripts differ significantly *Values in the parentheses indicate the number of observations

Conclusion

From this study it may be concluded that three genotypes of native chickens had distinct physical variations for both qualitative and quantitative traits under intensive management conditions. There is a scope to improve native chicken and further research is needed to explore full potentiality of indigenous chicken by conservation and molecular characterization.

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