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CHARACTERIZATION OF INDIGENOUS NAKED NECK, FULL FEATHERED AND BROILER CHICKENS IN BANGLADESH

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Abstract

The study was planned to determine morphological traits of indigenous naked neck (Nana) and full feathered (nana) chicken, market availability, live weight and price of Nana, nana, broiler (Br), and eggs from exotic and indigenous chickens in Gazipur and Savar, Dhaka, and meat yield of three genetic groups (Nana, nana, and Br). There was a huge variation in morphological traits of Nana and nana chickens considering live weight, length of shank, body conformation, wattle, and comb type, and colour of comb, skin, beak, shank, wattle, plumage, feather, egg shell, and egg weight. However, Nana exhibited single and red comb, whereas nana exhibited single, rose, pea, and red comb. The proportionate market availability and body weight of Br, and egg availability and weight of exotic chicken was higher with a lower price in comparison with Nana and nana chicken. However, availability of nana and its egg was higher than Nana ($P<0.001$).The highest breast and breast: dark meat was obtained in Br, followed by that in Nana and nana, respectively ($P<0.001$). The other meat yield traits were almost similar among the three genetic groups ($P>0.05$). Nana was tended to be better than Br for dark meat, thigh meat, and giblet weight. Therefore, the present study suggests conserving and improving Nana for poultry production in the tropics.

Keywords: Bangladesh, chickens, egg, market availability, meat yield, price.

Introduction

Commercial poultry farming is growing up to meet up the demand of human being for meat and eggs. The total number of chicken in Bangladesh is about 160 million (Das *et al.*, 2008). Poultry meat and eggs are still produced at small holder farmers reared under rural scavenging systems (Das *et al.*, 2008). Scavenging chickens are reared with little or no inputs. They are usually reared in freeness and rely mostly on crop residues, insects and vegetables and kitchen wastes available in and around the homestead.

Varieties of indigenous or exotic chickens depending on their feather colour, types, comb types, shank colour or length, beak colour, and wattle colour or length are found in rural areas of Bangladesh (Islam and Nishibori, 2009). Exotic birds are normally reared under improved farm condition. Productive performance of indigenous chicken is relatively very low (35-40 eggs/bird/year, and matured live weight is 1-1.5 kg/bird), but they are well adapted to harsh tropical environment and looks them promising in productivity with

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adequate nutrition and proper management even genetic improvement is possible through selective breeding (Horst, 1989; Das *et al.,* 2008). Market price of indigenous chicken or their products is 2 to 3 times higher to that of exotic chickens or their products (Aini, 1990; Islam, 2000; Islam *et al.*, 2011; Ahmed *et al.*, 2012). The meat and eggs from indigenous chickens are widely preferred by consumers because of pigmentation, taste, leanness and their suitability for special dishes (Horst, 1989). In addition, unexpected growth promoters, toxic binders, hormones, enzymes, and antibiotics are often used in the diet of exotic chickens that have serious harmful effect on human body. This is why consumers prefer indigenous chicken meat and eggs. Now a days, practically it has been found that the demand of indigenous chicken and their products are increasing which affect increasing price of indigenous chickens or their products. Sometimes, it has also been found that indigenous chickens or their products are completely absent or a very poor in number in the market.

There are two types of indigenous chickens; indigenous naked neck (nana) and full feathered (nana), of these naked neck is the genetic resources of Bangladesh for their better "productive adaptability" as well as quality of their products (Islam, 2006; Islam and Nishibori, 2009). Indigenous naked neck chicken is better at heat dissipation, and more heat tolerant, and is well adapted to tropical climate (Merat, 1986; Horst, 1989; Barua and Howlider, 1991; Islam, 2006). This genetic resource may be used for making future breeding plan to establish a breed suitable for tropical climate (Islam and Nishibori, 2009, and 2010). Indigenous chickens, especially Nana is of our genetic resource to develop a breed either for meat or egg preferred by all classes of people. But still today, this genetic resource has not been characterized either by morphologically or genetically. Therefore, the proposed research work is aimed at assessing morphological traits, information on market availability and price of indigenous naked and full feathered chickens, and its products to conserve and improve their products in tropical climate.

Materials and Methods

The present study was conducted based on the availability, weight, price, morphology and meat yield traits of various types of chicken obtained in different markets of Gazipur and Savar areas in Bangladesh. The two study areas were selected because of availability of Nana, nana and Br, and good communication.

A pre-tested schedule was prepared considering number of chickens in selected areas, live weight of chicken and sale price. The survey schedule was used in collecting information obtained by counting the availability of chicken population, individual live weight, and sale price per kg in case of naked neck (Nana), full feathered (nana) and broiler (Br) in the study areas. All the chickens belonging to Nana and nana, irrespective of sex and live weight

were closely observed to quantify various morphological traits; live weight, length of body, shank, wattle, and comb type and colour, colour of skin, beak, shank, wattle, plumage, feather, egg shell, and egg weight. Representative birds of three different said genetic groups were selected to determine morphological and meat yield traits. Meat yield traits were recorded by slaughtering and eviscerating the parts of dressed meat of three chicken genetic groups.

Data were collected strictly and carefully from January to June 2012. The collected data were summarized and scrutinized, and then recorded in master sheets.

Statistical analysis

The recorded data were analysed using GENSTAT statistical computer package program in completely randomized design (CRD). LSD (Least significance difference) value was used to find out the significant difference between means. Availability of egg was analysed using χ^2 test.

Statistical model

In case of availability, live weight and price of chickens, the following statistical model was used for data analysis:

$$Y_{ijk} = \mu + G_i + L_j + (G \times L)_{ij} + e_{ijk}$$

Where, Y_{ijk} is the observation of kth replication of ith genetic group and jth location.

μ is the overall mean

G_i is the fixed effect of ith genetic group (i = 1, 2, 3)

L_j is the fixed effect of jth location (j =1, 2)

$(GxL)_{ij}$ is the interaction of effect of ith genetic group and jth location

e_{ijk} is the random error

In case of egg weight and price, the following statistical model was used for data analysis:

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

Where, Y_{ij} is the observation of jth replication of ith genetic group

μ is the overall mean

G_i is the fixed effect of ith genetic group (i = 1, 2)

e_{ijk} is the random error

In case of meat yield traits, the following statistical model was used for data analysis:

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

Where, Y_{ij} is the observation of jth replication of ith genetic group

μ is the overall mean

G_i is the fixed effect of ith genetic group (i = 1, 2, 3)

e_{ijk} is the random error

Results and Discussion

Morphological traits: Investigated morphological traits of Nana and nana chicken in two districts have been shown in Table 1 and 2. The morphological traits were recorded based on the chickens available in markets. Since age was not considered during investigation, body

weight, body length, shank length, and wattle length varied between genotypes, and even within the genotypes between male and female chickens in both the locations. Comb type and colour of Nana male and female in both the locations were single and red. But nana exhibited different comb types in both sexes and locations like, single, rose, and pea comb. However, pea comb was rare (1.82%), which was found in male nana genotype of Gazipur area. But the comb of all the genotypes in both the locations was red in colour. Skin and wattle colour of Nana and nana genotypes in both the sexes and locations were white and red, respectively.

The colour of beak and shank of both genotypes are predominantly white in both the locations, and other colours; brown, black and yellow were appeared. Similarly different feather colour: white, brown, red, black, orange within the individual of all genotypes and locations was observed. No single feather colour was observed in the chickens. Irrespective of genotypes, egg, shell colour was cream, and brown in both the locations. However, 85-91% cream egg shell colour was appeared, and egg weight of indigenous chicken was almost 39.0g in Gazipur and 43.6g in Savar areas.

Indigenous full feathered chicken exhibited different comb types, which was corroborated with Bhuiyan *et al.*, 2005 and Faruque *et al.*, 2010. They also found different colours of beak, shanks, and feather in both types of indigenous chicken that supported the present study. Melesse and Negesse (2011) reported different shank colours (white and black) of indigenous chicken. The present study showed cream egg shell colour by 85-91.66% and brown egg shell colour by 8.33-15%, which was partially supported the findings of Faruque *et al.,* 2010. They found white, cream, and brown egg shell colour. Bhuyian *et al.* (2005) reported brownish egg shell in indigenous chicken.

Genetic group (G) was significantly different for chicken availability (Table 3). As per market availability, the highest number of chickens was for broiler (Br), intermediate in indigenous full feathered (nana) and the lowest in indigenous naked neck (Nana). Statistically, number of chickens between two locations (L) were almost similar ($P>0.05$). However, interaction effect of G × L was observed for the number of chickens ($P<0.05$). Live weight and price of live chicken varied among the genetic groups and also between locations, respectively. No interaction effect of G × L was observed for live weight and price of live chicken. The live weight of broiler was higher than that of indigenous naked neck and full feathered chicken. Such superiority in weight among Br, Nana, and nana is very much expected. However, live weight was tended to be increased in Nana compared with nana chicken. Live weight of chicken was higher in selected Gazipur area than that in Savar area. Live weight as proportion of genotypes as follows Nana: Br, nana: Br, and nana: Nana is 1:1.51, 1:1.52 and 1:1.004, respectively. Price of live indigenous chicken was around double to the broiler chicken (Table 3). But the

Table 1. Morphological characteristics of naked neck (Nana) and full feathered (nana) chicken in Gazipur.

Variables	Genotype			
	Nana		nana	
	M	F	M	F
Body wt (g)	1130.9 (22)	875 (10)	1311.30 (54)	881.25 (53)
Body length (cm)	18.86 (22)	17.4 (10)	20.75 (54)	18.28 (53)
Comb type and colour	Single Red (22)	Single Red (10)	Single (90 .90 %) Rose (7.22 %) Pea (1.82%) Red (55)	Single (90.57%) Rose (9.43%) Red (53)
Skin colour	White (22)	White (10)	White (54)	White (53)
Beak colour	White (77.27%) Brown (13.64%) Black (9.09%) (22)	White (90%) Brown (10%) (10)	White (55.55%) Brown (18.52%) Yellow (16.67%) Black (9.26%) (54)	White (58.49%) Brown (24.53%) Black (13.21%) Yellow (3.77%) (53)
Shank colour	White (95.46%) Yellow (4.54%) (22)	White (10)	White(75.93 %) Yellow(16.67 %) Brown (3.7%) Black (3.7%) (54)	White (90.57%) Black (7.54%) Yellow (1.89%)(53)

Table 1. Cont'd.

Variables	Genotype			
	Nana		nana	
	M	F	M	F
Shank length (cm)	8.35 (22)	6.77 (10)	9.10 (54)	7.67 (53)
Wattle colour	Red (22)	Red (10)	Red (54)	Red (53)
Wattle length (cm)	3.13 (22)	1.12 (10)	3.70 (54)	1.17 (53)
Feather colour	Brown, Black, White, Yellow, Red, White, Orange (22)	Brown, Black, White, Yellow, Red, White, Orange (10)	Brown, Black, White, Yellow, Red, White, Orange (54)	Brown, Black, White, Yello w, Red, White, Orange (53)
*Egg colour and wt (g)	Cream (85.18%), brown (14.81), and 39.33 g (27)			

The values in parenthesis indicate the number of observations or markets in the selected area.
*Indigenous chicken eggs were collected directly from the market but not marked whether the eggs from Nana or nana chicken.

price of live chicken was almost similar between Nana and nana chicken. The higher price for live chicken was in Savar than in Gazipur area (P<0.001).

The highest available number of chickens was observed in genetic group Br followed by nana and Nana, respectively. Such distributions of available number of chickens to genetic groups indicate a clear-cut invasion of exotic chicken on the local chicken genotypes. The heaviest body weight was recorded in Br, followed by that of Nana and nana, respectively, which is supported by Barua and Howlider, 1991; Islam, 2000; Islam and Nishibori, 2009.

The price of Nana and nana chicken are higher than that of broiler, which is almost double to broiler, is supported by Islam and Nishibori, 2009, 2010. In terms of location, the higher price was appeared in Savar than in Gazipur area. Availability, weight and price of eggs from exotic and indigenous chicken in Gazipur area. Table 4 is showing significant difference among genetic groups for egg availability, weight, and price (P<0.001). The available number and weight of eggs are higher in exotic chicken compared with the indigenous chicken.

Table 2. Morphological characteristics of naked neck (Nana) and full feathered (nana) chicken in Savar, Dhaka.

Variables	Genotype			
	Nana		nana	
	M	F	M	F
Body wt (g)	983.3 (12)	875.71 (7)	1082.5 (24)	881.25 (24)
Body length (cm)	19.8 (12)	18.5 (7)	20.19 (24)	18.46 (24)
Comb type and colour	Single Red (12)	Single Red (7)	Single (87.5%) Rose (12.5%) Red (24)	Single Red (24)
Skin colour	White (12)	White (7)	White (24)	White (24)
Beak colour	White (83.33%) Brown (16.67%) (12)	White (85.71%) Brown (14.29%) (7)	White (50%) Yellow (25%) Brown (25%) (24)	White (66.66%) Brown (16.67%) Black (16.67%) (24)
Shank colour	White (12)	White (7)	White (70.83%) Yellow (29.17%) (24)	White (83.33%) Black (16.67%) (24)
Shank length (cm)	7.47 (12)	7.31 (7)	8.23 (24)	7.37 (24)
Wattle colour	Red (12)	Red (7)	Red (24)	Red (24)
Wattle length (cm)	3.31 (12)	1.11 (7)	3.68 (24)	1.12 (24)
Feather colour	Brown, Black, White, Yellow, Red (12)	Brown, Black, White, Yellow, Red (7)	Brown, Black, White, Yellow, Red (24)	Brown, Black, White, Yellow, Red (24)
*Egg colour and wt (g)	Cream (91.66%), brown (8.33%), and 43.6g (24)			

The values in parenthesis indicate the number of observations or markets in the selected area.

*Indigenous chicken eggs were collected directly from the market but not marked whether the eggs from Nana or nana chicken.

Availability, live weight and price of chicken from 3 genetic groups.

Table 3. Availability, live weight and sale price of indigenous naked neck (Nana) and full feathered chicken (nana) in Gazipur and Savar areas.

Traits	Genetic group (G)	Location (L)		Mean	LSD value and level of significance +		
		Gazipur	Savar		G	L	G x L
Availability (no./market)	Nana	4.12	4.41	4.26	118.0***	NS	166.9*
	nana	150.23	99.19	124.74			
	Br	586.25	837.44	711.84			
	Mean	246.88	313.68	280.28			
Live wt (g/bird)	Nana	1044.22	1005.06	1024.64	54.98***	44.89***	NS
	nana	1065.31	975.00	1020.15			
	Br	1565.78	1545.94	1555.86			
	Mean	1225.10	1175.33	1200.22			
Price (Tk/kg live bird)	Nana	253.91	280.62	267.26	6.75***	5.16***	NS
	nana	249.84	284.47	267.15			
	Br	131.72	150.16	140.94			
	Mean	211.82	238.42	225.12			

+ NS, P> 0.05; *, P< 0.05; ***, P< 0.001.

However, the price of indigenous chicken egg is higher than in exotic chicken (Table In the current study, the market available number of eggs indicate the reduction of egg number from indigenous chicken in the selected area that may be the reason for increasing the price of indigenous chicken eggs compared to the exotic chicken eggs. Consumer preference is also another reason for the higher price of indigenous chicken egg compared to exotic chicken egg, which is supported by Islam and NIshibori, 2010; Ahmed *et al.* 2012. The present study also recorded the higher egg weight in exotic chicken than in indigenous chicken, which is supported by Islam 2000; Ahmed *et al.* 2012.

Meat yield traits: Genetic group affected breast meat, breast: dark meat (P<0.001) but not affected other meat yield traits; live weight, dressed yield, total meat, dark meat, thigh meat, drumstick meat, and giblet weight (P>0.05) (Table 5). The highest breast meat yield, and breast: dark meat ratio was recorded in broiler followed by Nana and nana chicken. In addition, dark meat, thigh meat, Drumstick meat and Giblet weight tended to be higher in Nana compared to that of Br or nana chicken.

Table 4. Egg availability, egg weight and sale price of egg from exotic and indigenous chicken in Gazipur area.

Traits	Genetic group (G)		LSD or χ^2 value and level of significance+
	Exotic chicken	Indigenous chicken	G
Egg availability (no./market)	4962.85	21	χ^2=701. 55***
Egg weight (g/egg)	59.65	38.15	8.42***
Egg price (Tk/egg)	7.09	9.31	0.6***

+ ***, P< 0.001

Table 5. Meat yield of broiler (Br), indigenous naked neck (Nana) and full feathered (nana) chicken at 1.0 kg live weight.

Traits	Genetic group (G)			SED value and level of significance+
	Br	Nana	nana	
Live weight (g/bird)	988	1018	1039	25.1^{NS}
Dressed yield (%)	65.00	62.40	62.46	1.595^{NS}
Total meat yield (%)	36.00	33.86	32.38	1.387^{NS}
Breast meat (%)	17.67	14.45	13.44	0.694**
Dark meat (%)	18.33	19.41	18.94	0.864^{NS}
Breast: Dark meat	0.89	0.75	0.71	0.019**
Thigh meat (%)	7.81	9.09	8.49	0.502^{NS}
Drumstick meat (%)	6.67	6.68	6.76	0.300^{NS}
Giblet (Liver+Heart+Gizzard)(%)	4.92	5.66	5.46	0.314^{NS}

+NS, P□0.05; **, P<0.01; All SED's against 18 error degrees of freedom.

Broiler was found to be better than indigenous chicken in terms of breast meat yield and breast: dark meat. Within the indigenous chickens, Nana performed better than nana in terms of meat yield traits. In the case of dark meat, thigh meat and giblet weight, Nana tended to be performed better than broiler. This finding was consistent with the findings of Islam 2000; Islam and Nishibori, 2009, 2010.

Conclusion

The present study reveals that indigenous naked neck, and full feathered chicken exhibited huge variation in morphological traits. However, Nana exhibited single and red comb, whereas nana exhibited single, rose, pea and red comb.

The highest number of chickens was recorded in broiler followed by nana and Nana, respectively. Broiler showed the

highest body weight followed by Nana and nana. However, indigenous chicken was superior to broiler in respect of sale price. The number and weight of exotic chicken egg was higher with a lower sale price in comparison with indigenous chicken. Broiler yielded higher breast, breast: dark meat ratio than that of Nana and nana chicken. Of the indigenous chickens, Nana yielded higher meat than in nana chicken, even tended to be superior to Br in terms of higher dark, thigh and giblet meat yield. Therefore, the present study suggests conserving and improving Nana chicken for poultry production in Bangladesh. However, a comprehensive study considering different markets of Bangladesh is needed to make final conclusion.

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