

*Research article***Comparative performance of three varieties of turkey (*Meleagris gallopavo*) raised under semi-intensive system**

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ABSTRACT

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This study was carried out to know the performance of locally available turkeys found in Bangladesh. The birds were reared using broiler grower and layer diets. The study was conducted at Abul Kasem farm (Farm 1) and Vai Vai farm (Farm 2), Brahmanbaria, from November 2018 to January 2019. The aim was to observe the growth performance of turkeys (Black, White and Bronze type) under a semi-intensive rearing system. A total of 40 Black, White and Bronze color type birds were included in the study. Birds were maintained under similar management conditions and Nourish layer feeds were bought from the local market. Farm had no effect on the performances of three genetic groups of turkeys. Bronze type turkeys attained the highest live body weight (5.47 kg) while Black type turkeys attained the lowest (3.79 kg). The white type turkeys, however, attained (4.14 kg) body weight. Bronze type turkeys had the highest shank length (10.31cm) and egg weight (79.45 gm) than black and white turkeys. There was a significant difference ($p < 0.05$) in body weight, shank length, egg weight of Bronze variety with Black and White varieties but no significant difference was observed between Black and White variety. Feed conversion ratio (FCR) was the same among the three-color types of turkeys. The growth performance of Bronze type turkey was superior as compared to other color types used in this study. It can be concluded that Bronze color turkey can be reared by feeding commercial broiler and layer feeds under semi-intensive system. The findings of this research could be useful for future breeding programs to improve turkeys existing performance.

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1. INTRODUCTION

Turkey is a newly introduced poultry species in Bangladesh. Farmers of this country has been taken

initiative of turkey farming by importing day old turkey chicks (poult) from the neighboring country, India. The popularity of turkey is increasing gradually because of meat flavor with

lower fat content. Turkey meat has nutritional and sensorial properties which make it almost ideal raw material for rational and curative nutrition. The protein, fat, energy value of turkey meat is 24%, 6.6%, 162 calories per 100 gm of meat (Asaduzzaman et al., 2017). Minerals like potassium, calcium, magnesium, iron, selenium, zinc and sodium are present. So, it may have high potential for production and marketing in Bangladesh.

Poultry meat and egg deficiencies in the country are 78.91% and 65.38 %, respectively per person per year (FAO/APHCA, 2012; Das et al., 2018). Within three decades, the commercial poultry sector has an industrial shape and becomes one of the leading companies that contribute significantly to national economic development. Among 11 poultry species in Bangladesh, chicken is dominant over others and comprises nearly 90% of the total poultry population (Das et al., 2018). Besides chicken, the other poultry species that our rural poultry keepers have traditionally reared and maintained are quail, geese, pigeon and guinea fowl.

In such a situation, focusing on the rearing of alternative poultry species may be appropriate. One of the best options may be the turkey (*Meleagris gallopavo*), which was recently introduced in Bangladesh and slowly expanding across country on a small scale. Turkey is a large gallinaceous bird belonging to the *Meleagridae* family and occupies an important global role next to chicken and duck (Besbes, 2009). Turkey has been competing a pivotal role in providing animal protein all over the world. Turkey's meat is considered by the customers as premium meat. Besides the role in the supply of protein, the birds also have an aesthetic quality because of their beauty (Ogundipe and Dafwang, 1980). More significantly, turkeys have exclusive and amazing adaptability phenomenon to a wide range of climatic conditions and can be successfully raised up almost anywhere in the world if they are well fed.

It is interesting to note that a large number of farmers have become acquainted with the birds in the recent days, rearing 50-200 birds at the home and benefiting from the high market price of

poult. The market price of poult is around 250BDT/poult, which is significantly higher than the commercial layer, broiler, sonali chick and duckling. Because the birds are newly introduced in Bangladesh, the farmers are unaware of rearing and management aspects such as feeding, housing, prevention and control of diseases, typical growth pattern, feed efficiency, breeding system, and hatching eggs incubation (Jahan et al., 2018; Asaduzzaman et al., 2017). The production of poultry in tropical countries is facing serious challenges, particularly at summer temperatures above 32°C (Farghly et al., 2017). Moreover, heat stress has the potential for slow growth and increased susceptibility to diseases (Bessei, 2006). Furthermore, as the size of birds increases, there is less space between individuals, increasing the birds' contact area with bedding and floor surfaces, making greater chance of disease prevalence. The present study focused on few of the above-mentioned issues such as feed consumption, feed efficiency, growth, bird's management. There are many varieties of turkeys around the globe, but the main commercially important varieties are Broad Breasted, Large White and Broad Breasted Bronze. While White Holland, Beltsville, Small White, Black, Bourbon Red and Narrangansett are the other varieties (Ogundipe and Dafwang, 1980). There are more than three color of turkeys available in Bangladesh, which can be called as heritage turkeys. However, a scanty study on turkey production in Bangladesh has been conducted previously. Hence, the current study was intended to investigate the growth performance under semi-intensive rearing system of three plumage color turkeys namely white, black and bronze that are locally available and to recommend farmers about the breed and type of birds which are to be suitable in the existing socio-economical condition of Bangladesh.

2. MATERIALS AND METHODS

Study area

The study was conducted to observe the growth performance of three genetic groups (black, white and bronze) turkeys at Abul Kasem farm and Vai Vai farm, Brahmanbaria from November 2018 to January 2019 (Figure 1). The place was selected based on the availability of turkey farm.

Farm selection and turkeys

Two commercial farms (Abul Kasem farm- Farm 1 and Vai Vai farm- Farm 2) were randomly selected to conduct the study. A total of 40 Black, White and Bronze color type birds were included in the study. The farms were selected based on the availability of three different color types of turkeys. The climatic condition was cold at that time.



Figure 1: Location of the study area.

Farm management practices

Brooding

In turkey, 0 to 4 weeks period is called a brooding period. However, in the winter season brooding periods was increased up to 5 weeks. Starting brooding temperature was 95°F followed by weekly reduction of 5°F per week up to 4 weeks of age. Brooding management practices in the studied farms are shown in figure 2. Birds were given floor space 1.5 sq. ft per bird.



Figure 2: Brooding of poults

Housing and litter management

The turkey house was run from East to West. All the studied farms were well ventilated. Rice husk was used as litter materials with a thickness of 2 inches. Compared to chicken, the litter used in turkey quickly became damper, possibly due to voluminous dropouts, aggressive attitude and fighting activity inside the house, waterers are fallen on the floor. Therefore, when needed, the moist and wet litter was partially adjusted to keep the litter dry and clean. Das et al. (2018) mentioned that litter management and cleanliness are the important factors to control the diseases in a poultry farm.

Feeding and vaccination of turkeys

All the birds were fed commercial broiler starter feeds up to 8 weeks of age (ME-3000 kcal/kg, CP-23%). The layer grower feed was then given (ME-2800 kcal/kg, CP-20%). Feed conversion ratio (FCR) was found to be the same among the three varieties. Turkeys were always provided with a constant and clean water supply. Most cases the source of water was tube well water. Only a few farmers used tape water. At the age of 3 days, birds were vaccinated with BCRDV and the booster dose was given at the age of 18 days in the farmer's house against Newcastle disease. Fowlpox vaccine was administered by puncturing the wing web (w/w) at 5 weeks of age. During daylight, birds have always been exposed to natural lighting. Fresh chopped grasses were sometimes fed turkeys to reduce the feed cost.

Breeding and farmers knowledge on fertility

All the interviewed farmers adopted natural mating for turkey breeding. Nobody used artificial insemination (AI) for turkey breeding. There was a natural mating system in farms following male and female ratio 1:5 for medium type (black and white), and 1:3 for large type (bronze). The respondent farmers reported an average fertility of turkey egg up to 50%. Farmers described the main reason for low fertility as lack of regular mating, heavyweight of male, disturbance during mating, insufficient and poor nutrition in diet.

Data collection

Data were collected through an established study questionnaire, direct observation, interview and farm record analysis. The primary data from turkey farmers was collected on the personal information of the farmers), housing, feeding, breeding, management, disease, marketing, problems and prospects. Some parameters such as flock size, egg production number, egg weight, male and female ratio etc. were taken. To ensure consistency in data quality, the researcher performed all the interviews.

Data analysis

Collected data were compiled, tabulated and analyzed. Data were entered into MS Excel 2010. Data were analyzed using the Statistical Package for Social Sciences (SPSS) package version 16. Simple descriptive statistics i.e. mean and standard error of mean (SEM) were applied to interpret the results. The results were processed by one-way ANOVA. The significance of differences between means for all parameters was estimated by Least Significance Difference (LSD) test. Body weight, shank length, egg weight of turkey was the main variables considered in the study.

3. RESULTS AND DISCUSSION

Productive and reproductive performance

The productive and reproductive performances of turkey are presented below in different sub-headlines. Farmers' interactions indicated that both tom and hen attained puberty at the same age (7.35 ± 0.05 months). Hens were started laying from the 30th week of age and its production period is 24 weeks from the point of lay. A hen laid on an average of 70 eggs per annum. Under proper feeding and artificial lightening management, turkey hens lay as much as 100 eggs annually.

Farm effect on performance

Effect of farm management practices on the performance of the turkey genotypes also studied (Figure 3). From the result, the performance of different turkey genotypes was more or less similar and there were no significant differences. It

indicated that both farms provided similar management practices for their turkey.

Genotypic effect on performance

Shank length

Shank length of Black, White and Bronze varieties are presented in Table 1. Shank length is higher in bronze color turkey which was significantly different ($p < 0.05$) from black and white. But there were no differences between Black and White color turkey.

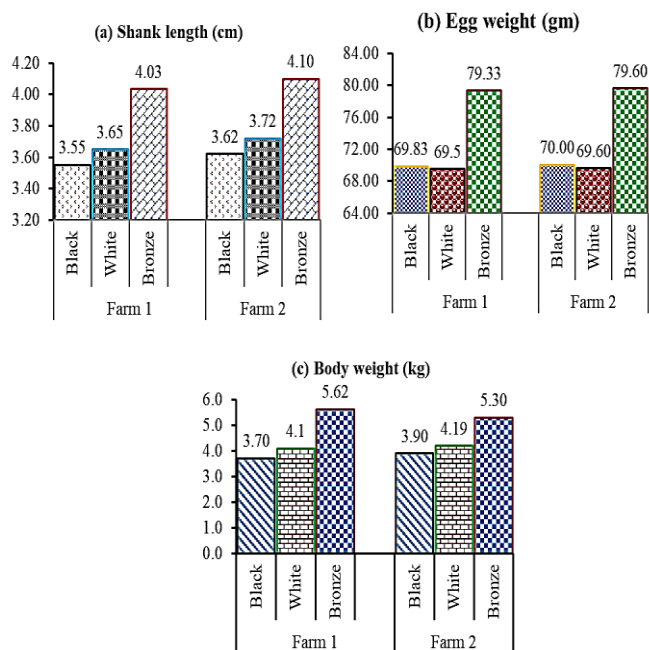


Figure 3: Comparative performances of three genotypes of turkey considering farm effect

Lalev (1993) observed a highly positive correlation (0.5-0.6) in turkeys and recommended the use of femur and metatarsal lengths for increasing live body weight. They determined a positive statistically significant correlation ($p < 0.5$) between live body weight and shank length. Sokolnikov (1973) observed a high positive correlation between live body weight and metatarsal length (0.78). Oblakova (2006) reported that different parts of the body and the live body weight are used in the selection work to improve the meat production characteristics of turkeys. In order to make selection and choice more effective, the interrelationships between economic characteristics must be established (Akimov and Beliaeva, 1996; Mitrovic et al., 1987).

Egg weight

Egg weights of Black, White and Bronze varieties were 69.91 ± 0.46 , 69.55 ± 0.25 and 79.45 ± 0.28 gm, respectively (Table 1). This result is following the findings of Özçelik et al. (2009) who reported the mean weight of turkey eggs ranged 67.4 to 70.3 gm. The average egg weight of Bronze turkeys varied significantly ($p < 0.05$) in comparison with Black and White variety. These findings agreed with Anandh and Jagatheesan (2015) under hot humid climatic condition. They observed the mean average egg weight (gm) in the Beltsville Small White and Broad Breasted Bronze turkeys were 69.79 ± 0.01 and 71.21 ± 0.01 gm, respectively. Broad Breasted Bronze turkeys produced higher egg weight as compared to Beltsville Small White turkeys. The average flock egg weight is determined by the age of the breeder hen. The egg weight is not highly variable and has a standard coefficient of variation about 6–7%. The variation can be higher in the first week of lay, around 8–9%. Egg weight is influenced by strain, age of the flock and age at photo stimulation. High environmental temperatures (above 25°C) reduce egg size and weight. Non-standard lighting regimes and nutritional factors such as linoleic acid and amino acid levels affect egg size and weight in laying hens. Egg weight affects chick weight at hatching, and it influences subsequent chick performance (Mróz et al., 2014; Wilson, 1991).

Body weight

The body weight of Black, White and Bronze varieties was 3.79 ± 0.13 , 4.14 ± 0.15 and 5.47 ± 0.33 kg, respectively (Table 1). Das et al. (2018) found lower body weight in Black, White and Bronze varieties were 3.55 ± 0.11 , 3.28 ± 0.02 and 3.72 ± 0.06 kg, respectively. In the current study, the results for body weight in all color types were a little bit higher than the average body weight observed by

Karki (2005). Several researchers (Austic and Neshein, 1990; Waibel et al., 2000; Prasad, 2000) observed that the hybrid turkeys attain higher growth performance, and their live weight recorded as much as higher. A Broad Breasted Bronze variety turkey could achieve a body weight of 10.90kg at 24 weeks of age (Austic and Neshein, 1990). Sampath et al. (2012) published nearly similar results. Genotype, feeding and other managerial practices may influence the body weight of turkeys. Increasing production can be made possible through the gradual development of production systems, using growing awareness of housing, diet and disease management (Yilmaz et al., 2011). However, the dramatic increase of production volume and production efficiency per bird is largely due to the continuing genetic improvement of turkey stocks (Buddiger and Albers, 2009).

4. CONCLUSIONS

Turkey is attaining acceptance among the rural community because of its increased potential higher meat production, low production cost and the development of self-employment opportunities in Bangladesh. Based on the results of the present study, the shank length, egg weight and body weight of Bronze color type was higher than the Black and White type turkeys under the semi-intensive system. From these results, it can be concluded that Bronze turkeys are more suitable to obtain better performance under the same housing and feeding condition than the Black and White turkey. In conclusion, the phenotypic variations among different varieties of turkeys used in this study indicate that these differences serve as basic information for the poultry breeders as well as academia and could be useful for future breeding programs in order to enhance the existing performances of heritage turkeys.

Table 1: Performance variations among the three genotypes of turkey

Variables	Turkeys variety		
	Black	White	Bronze
Shank length (cm)	$9.09a \pm 0.13$	$9.35a \pm 0.13$	$10.31b \pm 0.15$
Egg weight (gm)	$69.91a \pm 0.46$	$69.55a \pm 0.25$	$79.45b \pm 0.28$
Body weight (kg)	$3.79a \pm 0.13$	$4.14a \pm 0.15$	$5.47b \pm 0.33$

N.B. The mean difference is significant set at the $p < 0.05$ level.

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