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Estimation of Production Performance of Desi Chicken under Modern Farming Conditions

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ABSTRACT

A total of 200 hatching eggs of non-descriptive *desi* hens were collected and hatched out. The hatched-out day-old chicks were properly brooded for two weeks. After brooding 120 birds were equally distributed among three replications in the experimental shed until 13 weeks of age. The production performance was recorded in terms of feed intake (g), body weight and body weight gain (g), feed conversion ratio (FCR), dressing weight (g), dressing %, and survivability (%). The recorded feed intake for the flock was 3.33 kg. The results indicated that the average body weight and body weight gain of the experimental birds at 13 weeks of age was 1080.33 and 1052.33g, respectively. The estimated FCR for the flock was 3.16. The dressing weight and dressing % of the experimental flock were 744.24g and 68.89%, respectively. Finally, the observed survivability of the flock was 97.07% under intensive farming conditions.

Introduction

Bangladesh is a land of prospects for poultry production, especially for *desi* (indigenous) chicken in rural areas. *Desi* chicken has played an important role economically and culturally in traditional/religious Bengali society. In Bangladesh and many other developing countries, the meat and eggs of indigenous chickens are highly preferred for their taste and suitability for special dishes, resulting in higher market prices for these chickens than their exotic counterpart (Islam and Nishibori, 2009). Villagers who cannot afford to maintain the stock of cattle or goats can easily maintain a few stocks of chicken. However, rural farmers do not have much knowledge of different aspects of poultry management (Besbes 2009). Poultry keeping is an integral part of multi-species subsistence livestock farming in Bangladesh. The method of keeping poultry under subsistence farming has been characterized as backyard poultry farming (FAO 2006). This is the oldest and most traditional system of keeping poultry in almost 95% of the rural households of Bangladesh (BBS 2017). The backyard system in Bangladesh is a low-input and low-output system which mainly comprises indigenous genetic resources and crossbred birds housed with minimum facilities (Alam *et al*., 2014). This system allows the bird free movement for scavenging food sources and in most cases, the birds are supplemented with kitchen waste, family food leftovers, and self-produced food grains by the farmers (Sonaiya 2007). Rural poultry generally survives on

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scavenging feed resources with little or no feed supplementation. The country has got ample opportunity for increasing rural poultry production at the small holders' level. Its success primarily depends on the improvement of the existing feeding system along with its genetic improvement. Despite low productivity, desi chickens are well adapted to rural conditions even in adverse agro-climatic conditions (Das *et al*., 2008). Most of the efforts of poultry development activities in Bangladesh have taken place to improve the native stock through cross-breeding. The productivity of Desi chicken could be improved significantly if the nutrient contents of diets are improved and if such diets are fed under confinement conditions (Chowdhury *et al*., 2006).

Nowadays consumers are preferring eggs and meat from native poultry. This is because they taste good, are leaner, have better pigmentation, and are suitable for preparing different dishes. Habituation is another important factor in consumers' choice of eggs and meat of indigenous chicken. The prices of indigenous poultry are always higher (more than double). A section of urban people is gradually showing a negative tendency towards the consumption of eggs and meat from farms producing commercial chickens because they believe that the feeds of such chickens are manufactured with antibiotic and non-antibiotic growth promoters indiscriminately, even with some harmful ingredients that may affect their health in the long run (Chowdhury 2013). Bangladesh has a rich genetic diversity of indigenous chickens and is one of the homelands of the Red Jungle Fowl (Gallus gallus), the ancestor of all modern domestic chickens (Singh 2000; Islam and Nishibori, 2009). Most Bangladeshi chickens have a colored appearance, slow growth rate, good taste in meat, and low reproductive performance for that broodiness. Despite the higher price of meat and eggs of *desi* chicken, their production performance is still very low or substandard. The indigenous chickens have not attained their full production potential due to exposure to risks that influence their survival and productivity under extensive management conditions. It is noteworthy that the productivity of indigenous chicken breeds may be doubled with improved diets and management conditions (Chowdhury *et al*., 2006). Considering these facts, estimation of production performance of *desi* chicken is prime needed. Therefore, this study was undertaken to estimate the production performance of *desi* chicken and the production of antibiotic-free *desi* chicken in modern farming conditions.

Materials and Methods

Collection of eggs and hatching out

A total of 200 hatching eggs of *desi* hens were collected from reputed farmers around the campus. Collected eggs were cleaned and disinfected with ethanol and 3% hydrogen peroxide solution. The suitable eggs for hatching were selected, stored, and preserved for hatching. Selected hatching eggs were incubated by an automatic incubator in our hatchery. The first and second candling was performed on the 7th and 14th days of setting eggs in the incubator. Infertile eggs were discarded after candling. Finally, eggs were transferred to the hatching tray on the 18th day of incubation. At 21th day of incubation, hatched-out day-old chicks were collected and transferred to the brooder house for brooding (Fig. 1).

Fig. 1: *Brooding and rearing of the DOC*

After collection from the hatchery, DOCs were brooded under a standard brooding condition until 2 weeks of age. The brooder house was prepared properly and was ready for the chicks before they were put in the house. First, the brooder house was scrubbed and cleaned one week before the chicks arrive in the brooder house. The old litter present in the brooder house was removed and all the required equipment was disinfected. Then the house was allowed to dry out thoroughly. A deep litter system was used for rearing chicks using rice husk as litter materials. The litter materials were spread to a depth of 3-4 cm for better insulation. For the first few days, a simple paper or newspaper was spread on litter materials along with sprinkle feed. After 3 days the paper was removed and the feeder and waterers were evenly distributed around the brooder. The brooder was switched on at least 24 hours before the chicks arrive. The electric brooder was adjusted for 24 hours before the arrival of chicks and the temperature was adjusted to 95°F (35°C) at the edge of the brooder 2 inches (5cm) above the litter during the first week. The temperature was decreased by 5°F (2.8°C) each week until it reaches 70°F. A temperature of 21°C appeared was considered to be ideal during the growing period. After brooding 120 birds were equally distributed among three replications in the experimental shed until 13 weeks of age.

Formulation of a hand-mixed ration for the desi chicken

Supplementation of a balanced ration is very much necessary for the improvement of the production performances of deshi chicken. Therefore, to accelerate the production performances of the *desi* chicken a hand-mixed balanced ration was formulated and supplemented with the experimental birds (Table 1). *The ad-labium* feeding method was practiced for the present research work.

Adoption of a vaccination schedule

Disease prevalence is the major problem in poultry production and it is identified that Newcastle disease is one of the major constraints to the production of village chickens. Therefore, vaccination is a must to strengthen preventive measures for desi chicken. Therefore, a standard vaccination schedule was adopted for this study (Table 2).

Data collection

The body weights of birds were recorded at 7 d of an interval, and cumulative body weight was determined at the end of the experiment (13 weeks). The average body weight gain was calculated by subtracting the initial body weight from the final body weight, where body weight on day 1 was considered initial body weight. Feed consumption of each replicate was recorded at weekly intervals, on a cumulative basis and final feed consumption per bird was determined at the end of the experiment. The FCR was calculated as feed intake per unit of body weight gain using equation No. (1).

$$FCR = \frac{Total\ amount\ of\ feed\ consumed}{Final\ live\ weight\ gain} \ldots\ldots\ldots (1)$$

The survivability of birds was recorded until the end of the experiment (13 weeks or 91 days).

It was calculated by using equation No. (2).

$$\text{Survivability} = \frac{Total\ survived\ birds}{Total\ birds\ housed} \times 100 \ldots\ldots\ldots (2)$$

At the end of the experimental period, four birds from each dietary group (one bird/replicate) were sacrificed, and dressing yield was estimated by using equation No. (3).

$$\text{Dressing \%} = \frac{Carcass\ weight\ of\ birds}{Live\ weight\ of\ birds} \times 100 \ldots\ldots\ldots (3)$$

Data Analysis

All data were presented as means ± standard deviation (SD). Analysis of variance (ANOVA) was conducted to evaluate the recorded data using Kaleida Graph (Synergy Software, Reading, PA, USA), and significant differences were analyzed by Fischer's LSD comparison test. The differences were considered statistically significant when the p-value was smaller than 0.05 ($p<0.05$).

Results

Feed intake

The average feed consumption of experimental birds until 13 weeks of age is presented in **Table 3.** The recorded mean feed consumed for the flock was 3333.67±16.84 g. The result revealed that the average total feed intake of the flock is increased from the beginning to the end because of the increased requirement of growing birds.

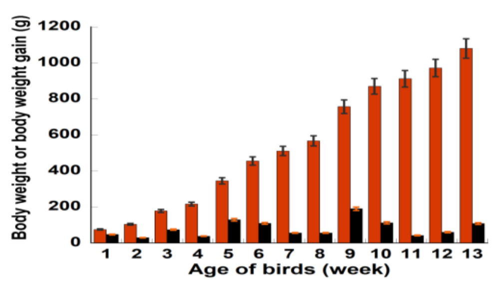

Fig. 2: *Feed conversion ratio (FCR)*

Body weight and body weight gain

The recorded average live weight of the experimental birds at 13 weeks of the flock was 1080.33±1.45g (Table 3). The weekly body weight and body weight gain of the birds of the flock are presented in Fig. 2. The average final body weight gains of birds in the current study were recorded and analyzed. The results indicated that the average body weight gain of experimented birds at 13 weeks of age was 1052.33g. On the other hand, the highest weekly body weight gain was observed for the 9th week (190.00g) followed by the 5th, 10th,

Table1. Ingredients and nutrient composition of supplied hand-mixed ration

Ingredient	**Amount (%)**
Corn (Maize)	55.0
Rice Polish	12.0
Soybean mealS	24.0
Steam Dried F. Meal	6.5
Limestone (CaCO3)	1.0
D.C.P. (18% - P)	0.10
EON Grower	0.35
Lysine 93%	0.20
DL-Methionine 99%	0.15
Table salt	0.25
Toxo-MX	0.20
Fysal (Salmonila Killer)	0.20
Robust	0.05
Total	100.00
Calculated nutrient content	
ME (Kcal/Kg)	2800
Crude Protein (%)	21.50
Crude Fat (%)	5.11
Linoleic acid (%)	1.72
Crude Fiber (%)	3.83
Calcium (%)	1.40
Total phosphorus (%)	0.60

Table 2. Adopted vaccination schedule for ***Desi*** chicken

Parameters	**Value** (mean± SD)
Feed intake (g/bird)	3333.67±16.84
Body weight (g/bird)	1080.33±1.45
Body weight gain (g/bird)	1052.33±0.33
Dressing weight (g/bird)	744.24±17.5
Dressing %	68.89±0.89
FCR	3.16± 0.02
Survivability (%)	97.07± 0.12

Table 3. Effects of supplementation of balanced feed on the performance of non-descriptive desi chicken

Disease name	**Vaccine**	**Age**	**Route of administration**
ND	NDV or Lasota	1-7 days	D/W
IBD	Gumboro Vaccine or Georgia	10-15 days	D/W
ND	Lasota	20-22 days	Water
Fowl Pox	Fowl Pox Vaccine	30-35 days	Wing punching method
Fowl Cholera	Fowl Cholera Vaccine or AP+	55-60 days	D/W
ND	R2B/K	70-80 days	I/M
ND	R2B/K	Continue after every 60 days	I/M

and 6th week (129.00, 112.00, and 109.00 g, respectively). The computed FCR during the experimental period of the flock was 3.16 (Table 3). The results indicated that all the supplementation of feed had significantly affected the FCR of the experimental birds.

Dressing weight and percentage

The effect of supplementation of feed on dressing weight and dressing percentage is shownin Table 3. The estimated dressing weight and dressing for birds under the flock were 7.44.24g and 68.89%, respectively.

Survivability

Survivability was recorded during the experimental period and expressed in terms of percentages for the experimental flock. The recorded survivability from day until 13 weeks of age in the experimental birds is presented in Table 3. The result indicated that the percent survivability with supplements was 97.07% for the flock.

Discussion

Feed intake

Feed intake of the experimental birds was influenced by the age of the birds. The result revealed that the average total feed intake of the flock increased from the beginning to the end because of the increased requirement of growing birds. It was reported that during the growing period under free-range rearing (5-12 weeks), the Hilly chicken (HC) group consumed the highest amount of feed (2697.02 g/bird), and the lowest feed consumption (2666.13 g/bird) was observed in non-descriptive native (ND). Improved native (IN) consumed 2674.63 g/bird and BLRI improved naked neck (NN) consumed 2668.13 g/bird, which was significantly ($p<0.01$) lower than any other treatment group (Akhter et al., 2018). In the current study, the estimated feed intake was 3333.67 g/bird, in comparison, which was higher than the previous studies in non-descriptive desi chicken. However, Faruque et al. (2015) experimented with various indigenous chicken genotypes of Bangladesh and found a result of a non-significant ($p>0.05$) difference in total feed consumption. In the current study, feed intake at 13 weeks of age was comparatively higher than in the previous study might be due to a higher growth rate.

Body weight and body weight gain

The highest weekly body weight gain was observed for the 9th week 190.00 g/bird in this study. Akhter et al., (2018) recorded weekly live weight gain (g/b/wk) of four different types of indigenous chicken namely Non-descriptive Native, BLRI Improved Native Chicken, BLRI improved Hilly, BLRI improved Naked Neck, and revealed that weekly live weight gain of experimental birds was differed significantly ($p<0.01$) among the four treatment groups from beginning to end of the experiment. Further, Rashid et al. (2004) reported that supplementation with 60 g feed daily to scavenging Non-descriptive Native hens ($p<0.01$) improved body weight gain significantly compared to without supplementation. They mentioned weekly body weight gain of Naked Neck, Hilly, and Non-descriptive Natives at the 8th week of age were 41.16, 43.19, and 43.89 g/bird, respectively. In the current study, the body weight gain at the 8th week of age was 56.00 g/bird might be due to better management and feeding. In another study, the body weight gain at the 9th week of age of Non-descriptive Native Chicken, BLRI Improved Native Chicken, BLRI Improved Hilly Chicken, and BLRI Improved Naked Neck Chicken was observed at 80.25, 91.88, 92.25, and 91.00 g/bird, respectively (Akhter et al., 2018). In the current study, body weight gain at 9th weeks of age of non-descriptive desi chicken was 190.00 g/bird indicating superior performance. However, it was noticed that the overall weekly body weight gain was inconsistent.

Feed conversion ratio (FCR)

In the present study, the estimated FCR at the 13th week of age of the flock was 3.16. The supplementation of feed significantly affected the FCR of the experimental birds. In a previous study, the best feed conversion ratio was observed in BLRI improved Hilly Chicken (2.85) while the highest value i.e., poor FCR was found in Non-descriptive Native Chicken (5.99) at the end of the experiment. FCR of the rest two groups such as BLRI Improved Native Chicken and BLRI Improved Naked Neck chicken were 3.20 and 4.06, respectively (Akhter et al., 2018). The FCR value in normal feathered indigenous birds under farm conditions during 12th weeks of age was 3.95 which was almost similar to the FCR of BLRI improved Naked Necked genotype (Yeasmin 2000). On the contrary, in the present study, the estimated FCR of non-descriptive native chicken was 3.16 which was much better than the previous study.

Dressing weight and percentage

The carcass characteristics and meat yields of the birds were estimated. The dressing weight and dressing percentage are important parameters in terms of production performance. Akhter et al., (2018) studied the carcass characteristics and meat yields of four genotypes of indigenous chicken reared under a free-range system and concluded that in BLRI improved Hilly chicken, live weight (1180.38 g) and dressing percentage (69.08%) were significantly higher than other remaining genotypes. Further, Rahman et al. (2013), found native Hilly chicken has better potential for meat production. In a previous study, it was noticed that thigh meat, drumstick, and wing meat percentage were significantly higher in BLRI improved Hilly, Naked Neck, and native chicken as compared to non-descriptive native chicken. It was mentioned that the carcass yield of Naked Neck was better than the indigenous native chicken. No significant difference was however found among the four genotypes of indigenous chickens (Akhter et al., 2018).

Survivability

The chick losses or mortality by diseases or any other causes in poultry stock are of paramount importance. It is a serious concern in non-descriptive desi chicken. Therefore, the survivability of non-descriptive desi chicken was recorded during the experimental period and expressed in terms of percentages. The percent survivability with supplements was 97.07% for the flock. However, Akhter et al., (2018) stated 98.61% overall survivability in their study, and statistical analysis showed no significant difference in survivability among the four genotypes of indigenous chicken. Faruque et al. (2016) found that the survivability of Hilly and Naked Neck genotypes during the growing period (5-12 weeks) was 93.11% and 95.34%, respectively under intensive rearing. In the present study, better survivability found in non-descriptive native chicken flocks might be due to the standard level of supplementation, optimized nutrients received in confinement, and adoption of a standard vaccine schedule. It is reported from a previous study that the body weight gain, FCR, and survivability of desi chicken at 20 weeks of age were 858g/bird, 6.32, and 80.60%, respectively whereas in the current study the body weight gain, FCR and survivability of desi chicken at 13 weeks of age were 1052 g/bird, 3.16 and 97.07%, respectively (Jahan et al., 2018). Therefore, it may assume that the production performance of desi chicken can be improved by providing modern farming facilities.

Conclusion

Indigenous chicken farming is a traditional practice in Bangladesh and still, it might be an important tool to improve the rural socio-economy. The present findings revealed that poor management, lack of vaccination program, malnutrition, and several diseases outbreak are the main causes of poor performance of our native non-descriptive chicken. It was revealed from the study that production performances of the non-descriptive deshi chickens could be accelerated and improved by supplementation of a balanced diet, adaptation of a perfect vaccination schedule, and intensive farming.

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Authors' Contribution

Conceptualization, MSI; Formal analysis, MSI; Methodology, AHH and MZI; Investigation, AHH, Writing-original draft preparation, JR and MSA; Writing-review and editing, SSJ; Supervision, MSI. All authors have read and agreed to the published version of the manuscript.

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