J. Bangladesh Agril. Univ. 10(1): 55–59, 2012 ISSN 1810-3030

Effect of density and flock size on growth performance of native chicken

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Abstract

A total of 270 native chickens of two months of age were reared up to their six months of age under three densities D_1, D_2 and D_3 (0.186, 0.279 and 0.372 m^2/bird) and three flock sizes F_1, F_2 and F_3 (20, 30 and 40 birds/flock) to find out the effect of density (D) and flock size (F) on the growth performance of native chicken under intensive system of management. Body weight gain and feed intake were higher (5.62 & 5.39 and 50.17 & 50.42) and feed conversion ratio and mortality were the lower (9.48 & 10.02) in D_2 unit and (12.01 & 13.05) in F_2 unit. On the other hand, body weight gain was the lowest (4.81) in D_3 unit. Feed intake was the lowest (49.25) in D_1 unit with the highest (11.70) FCR value. Body weight gain was found to be the lowest (4.81) in F_3 unit but its FCR and mortality rate were the highest (11.25 and 17.71). Feed intake was observed to be the lowest (49.17) in the F_1 unit. Considering the growth performance of native chickens under different densities and flock sizes, it could be concluded that flock size F_2 (30 birds/flock) performed better at the density level D_2 (0.279 m^2/bird) than other densities and other flock sizes.

Keywords: Density, Flock size, Growth performance, Native chicken

Introduction

The poultry population of Bangladesh is nondescript and indigenous in nature. Indigenous chicken is also called deshi chicken (Okada *et al*. 1988). Indigenous native chickens are the principal supplier of poultry meat and egg of the country, however, their performance in term of egg and meat are poor (Khandoker *et al*., 1996). So there is enough scope of improvement of the performance of native chicken in term of egg and meat through improved management practices. On the other hand, they are well adapted to the environmental conditions of Bangladesh such as poor management, poor nutrition and hot and humid climate (DLS, 1990). The genotype, environment and genotype-environment interactions are the principal factors affecting growth performance of chicken. Feed intake, ambient temperature, relative humidity, density and flock size are the major environmental variables influencing growth of native chicken. Density has an important and marked effect on growth of chicken (Shanawany, 1988). It affects feed intake, feed efficiency, livability (Cocnen *et al*., 1996) that as a whole influence the growth of chicken. Therefore, birds housed with a high density are more likely to be affected by an increased environmental temperature than those of lightly stocked. Bangladesh is a subtropical country with a relatively higher temperature and relative humidity. That is why, density is an important non-nutritional management factor for chicken production in the country like Bangladesh. Group size of chicken also has marked influence on the performance of chicken. Largest group converts their feed less efficiently (Savory, 1974). On the other hand, smaller flocks had higher survivality than those of larger flocks (Tind and Ambrosen, 1988). Density and flock size are important factors influencing the performance of chicken and considerable works have been done with exotic breeds in this aspect. Very little information is available about the growth performance of native chicken under different densities and flock sizes in Bangladesh. Therefore, a study was conducted to investigate the effect of density and flock size on the growth performance of native chicken.

Materials and Methods

The study was conducted between September and December, 2002 in order to compare the effect of density and flock size on growth rate of native chicken. A feeding trial was, therefore, conducted for a period of 4 months with 270 indigenous chicken of two months age collected from local markets in and around Bangladesh Agricultural University (BAU) campus, Mymensingh. The initial body weight of the

birds was recorded and then housed according to the treatment. They were divided into 9 treatment groups (3 densities × 3 flock sizes). The birds were arranged in a 3 (flock sizes) × 3 (densities) factorial experiment and allocated in 9 floor pens. The three densities were 0.186 (D_1), 0.279 (D_2) and 0.372 (D_3) m^2/birds and three flock sizes were 20 (F_1), 30 (F_2) and 40 (F_3) birds per flock.

The house was cleaned, washed and then disinfected with diluted iosan solution (3ml/liter water) before the start of the experiment. After drying, the experimental shed was divided into 9 pens of required size having bamboo materials and wire net. Rice husk, saw dust and dry sand were used in as the 1:1:1 ratios as the litter materials. A commercial grower ration containing 20% CP and 3100 Kcal ME/kg DM was supplied to the experimental birds during the whole experimental period. The ration which was used for the experiment was adopted from Aftab Bahumukhi Farms Limited.

The feed was supplied twice daily at 7 a.m and 5 p.m. Fresh clean and cool water was provided adlibitum. Feeders and waterers were cleaned daily. No artificial lighting was used in the experimental house. The experimental chicks were provided identical care and management. Strict hygienic measures were undertaken during the experimental period. Birds were vaccinated against Newcastle disease. During the whole experimental period data of body weight gain, feed intake and feed conversion and mortality of the birds were collected and recorded carefully.

Body weight gain

Initial body weights of the individual birds were measured and recorded. Periodic growths for four periods representing four months of growth of the experimental birds were recorded. Growth period one (P_1) included growth between 2nd month to 3rd month, period two (P_2) from 3rd to 4th month, period three (P_3) 4th to 5th month and period four (P_4) from 5th to 6th month of age of the birds.

Feed intake and feed conversion

Feed consumption of different treatment groups from two months of age to the end of the experimental period were recorded.
Feed conversion efficiency and feed conversion ratio are used alternatively.

Mortality

Mortality was recorded for each flock size of the three densities monthly during the whole experimental period. All data were set for a 3 (flock sizes) × 3 (densities) factorial experiment. The recorded data were compiled and tabulated for statistical analysis. Analysis of variance was done with the help of the computer program MSTAT. Significant differences were isolated and compared by calculating Least Significant Differences.

Results and Discussion

The results of the present study are represented in Table 1. The results are stated under following headings to assess the effect of densities and flock sizes.

Body weight gain

The average daily body weight gain of the experimental chicks from 3rd month (P_1) to 6th month (P_4) at different densities and flock sizes and their interactions are presented in Table 1. The body weight gain was not affected either by density (D), flock size (F) or period (P). The D×F interaction was also found to be non-significant ($p>0.05$). The average daily body weight gain was the highest in D2, F2 and at 4th month of age of bird (P_2). The corresponding values were 5.62, 5.39 and 5.99g, respectively. The cumulative monthly body weight gain increased linearly with the age of the birds. The result of the present

study demonstrated that there were no significant ($p>0.05$) differences in the body weight gain of indigenous chicken due to the effect of different densities, flock sizes and the interactions of them. This fact is in agreement with the findings of Ali (1983), Taboada *et al*. (1986). Ali (1983) found no effect of density on body weight gain. Taboada *et al*. (1986) found that live weight was not significantly affected by density, flock size and by interactions between the two. Ali and Cheng (1984), Ali *et al*. (1991), Soares *et al*. (1991), Beg *et al*. (1994), Puron *et al*. (1995) and Iscan *et al*. (1996) partially disagreed with the results of the present study. They found that density had significant effect on body weight gain.

Feed intake and feed conversion

Average daily feed intake, feed conversion ratio of native chicken at different densities and flock sizes are presented in Table 1. Densities and their interactions with flock sizes had no effect on feed intake ($p>0.05$) but flock sizes affected feed intake significantly ($p<0.01$). Feed intake was the highest in F_2, lowest in F_1 and intermediate in F_3. On the other hand, the average daily feed intake was the highest in D_2 and the lowest in D_1 that were 50.17 and 49.25 respectively. Feed intake increased with the increase of age of the birds from P_1 to P_4. No significant differences were observed in feed conversion ratio at different densities and flock sizes and their interactions. The feed efficiency was the highest in D_2, F_2 and P_2 and lowest in D_1, F_1 and P_4.

It is evident from the results of the present study that densities and their interactions with flock sizes had no significant ($p>0.05$) effect on feed intake. This result is partially supported by Goldflus *et al*. (1997). They reported lack of significant differences in feed intake with varying densities in broilers. This result however, contradicts the findings of Shanawany (1988) and Howlider (1988). They observed that feed consumption was significantly lower in higher floor area per bird. Some other researchers (Ali and Cheng, 1984; Kuan *et al*., 1990 and Beg *et al*., 1994) also found that density had significant effect on feed consumption.

No published information is available on interactions of stocking density and group size to compare the data of the present study about feed intake. The results of the present study also indicated that there were no significant differences in feed conversion ratio of native chicken due to the effect of densities, flock sizes and their interactions. This result is in agreement with the findings of Taboada *et al*. (1986). They found that feed conversion was not significantly affected by housing density, flock size and by interactions between the two. Polanco and Lopez (1986) also supported this result and showed that there were no differences in feed conversion among group sizes. Many other scientists (Soares *et al*., 1991; Puron *et al*., 1995 and Goldflus *et al*., 1997) also showed that population density had no significant effect on feed conversion efficiency of broiler chickens. But the obtained data are in disagreement with Kuan et al. (1990) and Al-Shaheedl and Mukhlis (1991), who observed that reducing stocking rate increased feed conversion efficiency in broiler. Howlider (1988) also found significant decline in feed conversion efficiency due to increase rearing temperature at high stocking rate.

The FCR of native chicken of the study was slightly higher than the findings of several researchers (Sazzad *et al*. 1990; Khandoker, 1993 and Yeasmin, 2000). The higher FCR was may be due to the parasitic infection (Page *et al*., 1982 and Tumova *et al*., 2001). But the parasitic infection was not included in the present study.

Mortality

The percentage of mortality of native chicken at different densities, flock sizes and their interactions are presented in Table 3 to Table 5. Cumulative mortality percentages are represented in Table 5. The percentage of mortality was statistically highly significant ($p<0.01$) at different densities, flock sizes, age of the birds and $D\times F$ interactions. The mortality was the lowest in D_2 and F_2 and the highest in D_1 and F_3. The mortality percentage was increased with the age of the experimental birds.

In the present study, the mortality is significantly ($p<0.01$) affected by densities, flock sizes, their interactions and periods. Cocnen *et al*. (1996) supported this result. They reported that mortality was lower with reducing density in broilers. Many other researchers (Baikov *et al*.1984 and Howlider, 1988) also partially supported that increasing stocking density increased mortality.

Many workers disagreed with the present findings (Puron *et al*., 1995 and Valancony, 1988). They reported that mortality did not significantly differ among densities. Tind and Ambrosen (1988) supported the result. They stated that mortality was increased with increasing group size. However, the findings of Taboada *et al*. (1986) contradict with the obtained result. He found that mortality was not significantly affected by density, flock size or by interactions between the two. Polanco and lopez (1986) reported that there was no significant difference in mortality among group sizes.

Table 1. Growth parameters of indigenous chicken under different densities and flock sizes

Parameter	Density (D)	Flock size				LSD (SED) values and level of significance		
		F1	F2	F3	Mean±SD	D	F	D×F
Body weight gain (g/d)	D_1	5.085	5.212	4.320	4.873±0.48	(0.605^{NS})	(0.605^{NS})	(1.048^{NS})
	D_2	5.380	5.795	5.675	5.617±0.21			
	D_3	4.837	5.158	4.438	4.811±0.36			
	Mean±SD	5.101±0.27	5.388±0.35	4.811±0.75				
Feed intake (g/d)	D_1	48.000	50.000	49.750	49.250±1.09	(0.497^{NS})	(1.026^{*})	(0.861^{NS})
	D_2	49.500	51.500	49.500	50.167±1.15			
	D_3	50.000	49.750	48.500	49.417±0.80			
	Mean±SD	49.167^{b}±1.04	50.417^{a}±0.95	49.250^{b}±0.66				
FCR	D_1	11.668	11.058	12.340	11.695±0.64	(1.562^{NS})	(1.562^{NS})	(2.705^{NS})
	D_2	9.575	8.860	10.013	9.482±0.58			
	D_3	11.540	10.135	11.395	11.023±0.77			
	Mean±SD	10.434±1.18	10.018±1.10	11.249±1.17				
Mortality (%)	D_1	20.000^{ab}	24.165^{a}	21.250^{ab}	21.805^{a}±2.14	2.882^{**}	2.882^{**}	4.992^{**}
	D_2	17.500^{bc}	4.165^{c}	14.375^{cd}	12.013^{b}±6.97			
	D_3	12.500^{cd}	10.832^{d}	15.500^{bc}	13.611^{b}±2.37			
	Mean±SD	16.667^{a}±3.82	13.054^{b}±10.18	17.708^{a}±3.69				

$^{**}p<0.01$; $^{*}p<0.05$; NS (non-significant), $p>0.05$. (For both column and rows)

D_1 = 0.186 m^2/bird D_2 = 0.279 m^2/bird D_3 = 0.372 m^2/bird
F_1 = 20 birds/flock F_2 = 30 birds/flock F_3 = 40 birds/flock

Conclusion

As the basis of present findings, it was concluded that the body weight gain, feed intake and feed efficiency were the highest in the density of 0.279 m^2/bird and the flock size of 30 birds than any other densities and flock sizes. Mortality was the lowest in the density of 0.279 m/bird and the flock size of 30 birds. The optimum stocking density and flock size for native birds under intensive system of management may be 0.279 m^2/bird and 30 birds /flock respectively.

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