Effect of Different Level of Stocking Density on Feed and Water Intake of Broiler Chicken

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Abstract

An experiment was conducted on the performance of commercial broiler chicken under different cage densities. Ninety six 21 days old broiler chickens (uniform weight) were randomly divided into four experimental groups, comprising of three replicates. Each replicate was consisted of eight birds. The birds were kept under four different cage densities, viz. control group (T_1) having cage floor area about 11 birds m^{-2}; T_2 having cage floor area about 14.3 birds m^{-2}; T_3 having cage floor area about 18 birds m^{-2}; and T_4 having cage floor area about 21.5 birds m^{-2}. Common basal diets and same feeding and watering space $bird^{-1}$ were provided for each group. Considering the overall mean value of daily feed intake it was observed that the highest feed consumption was found in T_1 group followed by T_2, T_3 and T_4, respectively and in case of daily water intake it was observed that the birds kept with higher density (21.5 birds m^{-2}) consumed highest amount water followed by 18, 14.3 and 11 birds m^{-2}. It can be concluded that the daily feed intake was decreased and daily water intake was increased with increased stocking density.

1. Introduction

Poultry production can play an important role in poverty alleviation and in the supply of quality protein to rural people. The high demand for chicken meat, low capital input required, early market age, rapid return over on invested capital and the small space required for poultry production have increased awareness that chicken farming is a profitable venture in all over the world. For maximization of profit from broiler enterprise two important tools can be used by the entrepreneurs. One is reducing the cost of feeding and the other is minimizing the cost of rearing like housing. The issue of low cost feeding is not in the hand of farmers. So the production cost of broiler may be minimized following optimum rearing condition. The overall effect on broiler chickens of reducing floor space can be reduced growth rate, feed efficiency, liveability and in some cases carcass quality (Puron et al., 1995). According to Biligili and Hess (1995), higher the stocking density lower the airflow resulting into reduced dissipation of body heat to air, inadequate exchange of air and reduced access to feed and water. It was observed that body weight, feed conversion, mortality, carcass scratches and breast meat yield were significantly improved when birds were given more space. Beg et al. (1994) found lower growth rate at higher density in open-sided house. In contrast, Feddes et al. (2002) demonstrated that when density was reduced, live and carcass weight decreased. Cage density involves the floor space $bird^{-1}$ in cage as well as the number of birds $cage^{-1}$. Undoubtedly, this subject has been the basis of more research than any other cage management factor (North, 1984). The effect of cage density on feed intake as well as water intake of birds of different species is a perennial source of interest to the scientists and poultry producers which ultimately affects the growth performance along with feed conversion ratio. With the view of the above, an experimental trial was conducted to find out the effect of different stocking densities on feed intake and water intake of broiler chickens as well as water to feed intake ratio.

2. Materials and Methods

2.1. Site

The present study was carried out in poultry unit under the Department of Animal Production and Management, West Bengal University of Animal and Fishery Sciences, Mohanpur

Campus, Nadia, West Bengal (India).

2.2. Experimental design

Ninety six 21 days old Vencobb chicks were selected randomly on the basis of uniform body weight and were distributed into 4 groups of 24 birds each with 3 replicates of 8 birds each (Table 1).

Table 1: Experimental design

Groups	Cage floor area	Feeding space bird^{-1}	Watering space bird^{-1}
T_1	11 birds m^{-2}	4 cm (linear)	1.5 cm (linear)
T_2	14.3 birds m^{-2}		
T_3	18 birds m^{-2}		
T_4	21.5 birds m^{-2}		

2.3. Ration

A balanced starter ration containing 2785 ME (kcal Kg^{-1}) and C.P. 21.94 (%) and a balanced finisher ration containing 2874 ME (Kcal kg^{-1}) and C.P. 19.43% was supplied up to 4th week of age and 4th to 6th week of age, respectively (Table 2).

2.4. Feed and water intake

Daily feed intake (gm bird^{-1}) and water intake (ml bird^{-1}) was measured in different weeks.

2.5. Statistical analysis

The data obtained from the experimental group were statistically analyzed by the general linear model of SPSS (1997) with individual broiler chick as the experimental unit.

3. Results and Discussion

3.1. Daily feed intake

From Table 3 it is found that average daily feed intake was highest in control group, i.e. 11 birds m^{-2} (122.00 ± 0.40 gm) followed by T_4 (21.5 birds m^{-2}), T_2 (14.3 birds m^{-2}) and T_3 (18 birds m^{-2}), respectively at 4th week of age. As evident from the result that weekly feed intake of broiler bird was significantly (p<0.01) different in all the treatments at 4th week of age. At 5th week also the control group, i.e.11 birds m^{-2} consumed highest amount of feed (152.44 ± 0.68 gm). The result showed that there was no statistically significant difference among T_1, T_2 and T_3 group but feed intake of broiler bird was significantly (p<0.01) lowest in T_4 group, i.e. 21.5 birds m^{-2} group (135.23 ± 0.50 g). At the final week of the experiment, T_2 consumed significantly (p<0.01) highest amount of feed (207.77 ± 0.33 g) followed by T_3, T_4 and T_1, respectively. Considering the overall mean value of daily feed intake it was observed that significantly (p<0.01) highest amount of feed was consumed by T_1 (11 birds m^{-2}) group (156.98 ± 0.41 gm day^{-1}) followed by 14.3, 18 and 21.5 birds m^{-2} (153.93 ± 0.17, 152.30 ± 0.44, 149.58 ± 0.36 gm day^{-1}). The result was identical with the observations of Moore et al. (1965) and Shanwany (1988) who indicated that as stocking density increased, feed intake decreased, because physical access to feed and water was impeded. Several authors also agreed that the feed consumption diminished with increasing stocking density (Scholtyssek and Gschwindt, 1983; Valdivie and Dieppa, 2002; Singh and Sharma, 2003; Thomas et al., 2004; Santos et al., 2005) which is similar to the present findings. But the present finding is not in agreement with the report of Feddes et al. (2002) who observed that the birds in the treatment with 11.9 birds m^{-2} consumed least feed than other higher density groups.

Table 2: Composition of ration

Sl. no.	Ingredients	Starter	Finisher
		Amount (%)	Amount (%)
1	Maize (yellow)	32.0	41.0
2	Jower	17.6	16.0
3	Rice polish	9.0	10.0
4	Sunflower meal	3.0	0.0
5	Soyabean meal	27.0	24.0
6	Fish meal	8-0	6.0
7	Mineral mixture*	3.0	2.5
8	Vitamin mixture**	0.4	0.5
Total		100	100

*Contains: 28% calcium, 5% phosphorus, 0.35% iron, 23% sodium chloride; 100 ppm copper, 50 ppm cobalt, 2000 ppm manganese, 10 ppm iodine; **Contains: 10,000 IU of vitamin A, 5 mg vitamin B_2 and 1250 IU of vitamin D_3 kg^{-1} feed

Table 3: Least square mean±SE values of daily feed intake (g) of broiler birds under different stocking densities

Treatments	4th week	5th week	6th week	Overall mean
T_1	122.00 ± 0.40^a	152.44 ± 0.68^a	196.52 ± 0.47^c	156.98 ± 0.41^a
T_2	103.51 ± 0.50^c	150.52 ± 0.44^a	207.77 ± 0.33^a	153.93 ± 0.17^b
T_3	98.71 ± 1.36^d	152.42 ± 1.17^a	205.77 ± 0.31^b	152.30 ± 0.44^c
T_4	116.30 ± 1.16^b	135.23 ± 0.50^b	197.22 ± 0.41^c	149.58 ± 0.36^d

Mean with dissimilar superscripts (column-wise) differ significantly (p<0.01)

3.2. Daily water intake

Water intake of broiler fowls was calculated daily (ml) in different groups which is presented in the Table 4. Table reveals that daily water intake was significantly (p<0.01) highest in T_1 group (194.64 ± 0.67 ml) followed by 21.5, 18, and 14.3

birds m^{-2} at 4th week of age. At 5th week it was found that control group consumed significantly ($p<0.01$) highest quantity of water (220.95 ± 0.97 ml) followed by 21.5 and 14.3 and 18 birds m^{-2} (218.00 ± 0.70, 214.76 ± 1.19 and 212.09 ± 0.84 ml), respectively. But the result did not show any significant difference between T_1, T_4 and T_2, T_3 groups. At the final week of experiment, i.e. at 6th week 18 birds m^{-2} consumed significantly ($p<0.01$) highest amount of water (282.66 ± 0.42 ml), whereas 21.5, 14.3 and 11 birds m^{-2} consumed 279.30 ± 0.36, 271.11 ± 0.22 and 252.08 ± 1.76 ml, respectively. The result showed statistically significant ($p<0.01$) difference among all the treatments. From the overall mean of daily water intake it could be observed that 21.5 birds m^{-2} consumed significantly ($p<0.01$) highest amount water (228.17 ± 0.67 ml) followed by 18, 14.5 and 11 birds m^{-2} (226.34 ± 0.82, 222.26 ± 0.28 and 222.55 ± 0.42 ml day^{-1}), i.e. the daily water intake was increased with increased stocking density. The difference between T_1 and T_2 group was insignificant. The similar result was also reported by Feddes et al. (2002) who observed that the amount of water consumed by broiler fowls was highest in 23.8 birds m^{-2} and lower in 11.9 and 14.3 birds m^{-2}. Some of this effect might have been due to lower feed consumption. But the result indicated contradictory observation with Deaton et al. (1967) who observed that at higher density birds consumed less water.

Table 4: Least square mean ± SE values of daily water intake (ml) of broiler birds under different stocking density

Treatments	4th week	5th week	6th week	Overall mean
T_1	194.64 ± 0.67^a	220.95 ± 0.97^a	252.08 ± 1.76^d	222.55 ± 0.42^c
T_2	180.91 ± 0.97^d	214.76 ± 1.19^b	271.11 ± 0.22^c	222.26 ± 0.28^c
T_3	184.28 ± 0.77^c	212.09 ± 0.84^b	282.66 ± 0.42^a	226.34 ± 0.82^b
T_4	188.57 ± 1.50^b	218.00 ± 0.70^a	279.30 ± 0.36^b	228.17 ± 0.67^a

Mean with dissimilar superscripts (column-wise) differ significantly ($p<0.01$)

Table 5: Ratio of overall mean of daily feed and water intake

Treatments	Overall mean of daily feed intake	Overall mean of daily water intake	Water to feed intake ratio (ml g^{-1})
T_1	156.98	222.55	1.42
T_2	153.93	222.26	1.44
T_3	152.30	226.34	1.48
T_4	149.58	228.17	1.53

3.3. Water to feed intake ratio

From Table 5 it is evident that the amount of water consumed and the water to feed ratio was highest in T_4 (21.5 birds m^{-2}). Similar finding was reported by Feddes et al. (2002) who reported that the water to feed intake ratio was highest in higher stocking density group.

4. Conclusion

It can be concluded that the birds having lower cage density showed lower water consumption but higher feed consumption and birds having higher cage density showed higher water consumption but lower feed consumption, i.e. daily water intake was increased and daily feed intake was decreased with increased stocking density. In case of water intake, a positive linear correlation was observed. But incase of feed intake, negative linear correlation was observed. The amount of water consumed and water to feed intake ratio was highest in higher stocking density group.

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