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Restricted feeding alters broiler performance

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Abstract

Feeding schedule is one of the main techniques in growth curve manipulation for increasing production efficiency in broiler chicken. This study was conducted to find the effects of changing feeding time on the performance of broiler chicks. A total 120 one d old broiler chicks (Ross 308) were reared on feed having 21.8% protein and 3049 kcal metabolizable energy/kg for 14 days. In the beginning of third week, the chicks were allocated to four treatments having three replicates per group. Each group constituted 30 chicks per group. The first group (T1) was control (*ad libitum*), second group (T2) was offered feed at 3.30 pm (once a day for 1 hour), third group (T2), feeding time was 8.30 pm (once a day for 1 hour) and fourth group (T3) had feeding time at 3.30 and 8.30pm. The results showed that the live body weight, weight gain, feed conversion ratio (FCR), production index improved significantly ($P<0.05$) with no effect on feed intake. The results indicated that intermittent feed intake may improve the production performance of broiler.

Keywords: Broiler; restricted feed; performance

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Introduction

The growth performance of broiler chickens has been increased spectacularly over the last 30 years, mainly due to the genetic progress, improvements of nutrition and controlled environment so that it takes only 33 days to reach finishing body weight of about two kilogram (Wilson, 2005). The very fast growth rate is usually associated with increased body fat deposition, prevention of high incidence of metabolic disorders, mortality and skeletal diseases and these are the results of continuous genetic and improvement in nutrition (Lesson and Zubair, 1997). Early feed restriction programs used to reduce abdominal and carcass fat in broiler chickens rely on the phenomenon called compensatory growth to produce market body weight similar to control groups (Cabel and Waldroup, 1990). A period of low food availability is a challenge that young birds are likely to experience (Schew and Ricklefs, 1998). During development, chickens need to allocate their available energy between maintenance, growth and maturation, and food availability consequently plays an important role during this period (Martin, 1987).

Temporary feed restriction reduces growth at a critical time in a broiler chick's life cycle when it is the feeding highly concentrated energy diets without restriction of feed intake, and it increases the incidence of metabolic disease. These diseases not only lead to economic losses for the producer, but they greatly affect the comfort of the broilers (Lesson and Zubair, 1997).

Onwurah and okejim (2011) revealed that growth parameters may be affected by feed intake and feed efficiency. This implies that feed restriction at the finisher phase does not encourage compensatory growth. Compensatory growth could come if the restriction was early.

The objection of this study was to find out the effect of restricted feeding on the broiler production performance.

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Materials and Methods

This study was conducted at the Bakrajo Poultry Breeding Field, Animal Production Department, Faculty of Agricultural Sciences, University of Sulaimani. 120 one day old Ross 308 broiler chicks were housed in well ventilated room previously disinfected. For the first two weeks, All chicks were fed a uniform starter diet contains 21.8% crude protein and 3049 kcal metabolizable energy/kg feed. At the beginning of the third week, all chicks were weighed and distributed randomly into four experimental treatments, each with 3 replicates, (10 birds per replicate). The first group was control (*ad libitum* feeding), the second group (T1) had feeding time 3.30 pm for 1 hour, the third group (T2) was fed at 8.30 pm for 1 hour, and the fourth group (T3) was fed at 3.30 and 8.30 pm for one hour each time. The light was kept at 16 L: 8d. All the birds were fed a uniform standard feed as described in recommended protocol (NRC, 1994).

Studied characteristics

Weight of individual chick was weighed with sensitive scale at the end of each week. The average daily body weight gain was calculated by subtracting the average initial live weight of a certain period (which was usually weekly) from the average final live weight of the same period for each chick. Chicks in each replicate were provided with a certain amount of feed every week. The residuals were obtained at the end of the same week and the amount of feed consumed was calculated by difference between the feed introduced to the birds at the beginning of each week and the feed remained at the end of the week. The feed intake and feed conversion ratio (FCR) were calculated using method of Al-hadme (1994). Production index was calculated by the following equation:

$$\text{Production index} = \frac{\text{Mean weight} \times \text{viability}}{\text{Age (day)} \times \text{FCR}} \times 100$$

Statistical analysis

Data were analyzed using XLStat (Version 7.5, 2004). The following model was used: Yij = μ+ Ti+ eij

Where:
μ = The overall means of traits
Ti = The effect of treatments (C, T1, T2 and T3)
eij= Random error, assumed to be equal to zero and variance is $\sigma 2e$ (N~ 0, $\sigma 2e$)

The significant differences between means of traits included in this study were determined using Duncan's multiple range test under the probability (P<0.05) (Duncan, 1955).

Results

The effect of different feeding time on body weight of broilers is given in Table 1. Compared to control group, the values of body weight (BW) during the most periods of experiments increased. It was noticed from Table 1 that all treated groups in the 5th and 6th weeks tended to have higher (P<0.05) BW than control group.

Mean body weight gain (BWG) is summarized in Table 2. BWG remained constant during the third week, however, it increased significantly (P<0.05) in fourth

Table 1: Effect of different time feeding on body weight (g; mean ± SE)

	Days			
Treatment	21	28	35	42
Control	370.67±21.46^{b}	916.67±44.10^{a}	1380.00±39. 69^{b}	2091.17±98.91^{b}
T1	466.67±9.62^{a}	900.00±79.39^{a}	1940.83±37.92^{a}	3135.67±127.13^{a}
T2	455.56±14.69^{a}	900.00±104.09^{a}	2104.33±62.32^{a}	3005.833±236.49^{a}
T3	444.44±11.11^{a}	850.00±28.87^{a}	2151.67±46.04^{a}	3225.17±193.86^{a}

Table 2: Effect of different time feeding on body weight gain (g; mean ± SE)

	Days			
Treatment	21	28	35	42
Control	546.00±22.72^{a}	463.33±72.59^{b}	711.17±127.83^{a}	812.17±49.94^{a}
T1	433.33±83.887^{a}	1040.83±43.73^{a}	1194.83±167.04^{a}	944.17±132.44^{a}
T2	444.44±98.29^{a}	1204.33±165.93^{a}	901.50±266.06^{a}	1506.33±440.09^{a}
T3	405.56±30.93 ^{a}	1301.67±96.93^{a}	1073.50±186.68^{a}	1074.50±190.63^{a}

C: control group; T1: feeding at 3.30 pm, T2: feeding at 8.30 pm; T3: feeding at 3.30 and 8.30 pm; ^{a,b}Values within columns followed by different letters differ significantly (P<0.05)

Table 3: Effect of different time feeding on feed intake (g; mean ± SE)

	Days			
	21	28	35	42
Control	688.25±88.301[a]	1747.22±39.057[a]	2934.849±93.15[a]	4413.33±63.59[a]
T1	850.21±29.84[a]	1806.20±24.689[a]	2345.20±69.68[a]	4406.67±87.62[a]
T2	830.73±19.82[a]	1806.20±14.83[a]	2195.96±81.36[a]	4956.67±51.75[a]
T3	731.20±36.26[a]	1531.62±63.05[a]	2641.41±104.17[a]	4406.67±94.44[a]

C: control group; T1: feeding at 3.30 pm, T2: feeding at 8.30 pm, T3: feeding at 3.30 and 8.30 pm; Values within columns followed by different letters differ significantly (P<0.05)

Table 4: Effect of different time feeding on feed conversion ratio (mean ± SE)

	Days			
	21	28	35	42
Control	1.85±0.15[a]	1.90±0.25[a]	1.54±0.35[a]	2.11±0.20[b]
T1	1.82±0.11[a]	2.00±0.01[a]	1.16±0.14[a]	1.40±0.10[a]
T2	1.82±0.12[a]	1.33±0.01[b]	1.50±0.31[a]	1.64±0.30[a]
T3	1.64±0.02[b]	1.80±0.05[a]	1.59±0.19[a]	1.36±0.22[a]

C: control group; T1: feeding at 3.30 pm, T2: feeding at 8.30 pm, T3: feeding at 3.30 and 8.30 pm; [a,b]Values within columns followed by different letters differ significantly (P<0.05)

Table 5: Effect of different time feeding on production index (mean ± SE)

	Days			
	21	28	35	42
Control	549.05±67.45[a]	314.44±64.84[b]	472.71±12.99[a]	663.34±11.31[b]
T1	857.77±151.11[a]	964.57±7.64[ab]	801.28±12.95[a]	950.71±25.12[a]
T2	857.77±133.50[a]	1029.25±179.64[a]	661.65±22.21[a]	1054.84±54.71[a]
T3	731.57±15.503[a]	654.21±26.95[bc]	606.51±11.69[a]	992.28±76.54[a]

C: control group; T1: feeding at 3.30 pm, T2: feeding at 8.30 pm, T3: feeding at 3.30 and 8.30 pm; [a,b,c]Values within columns followed by different superscripts differ significantly (P<0.05)

week. In the 5th and 6th weeks, no significant difference among all experimental groups was found concerning this trait.

The effect of different feeding time on feed intake (FI) is shown in Table 3. FI did not differ between the groups during the entire period of the experiment.

Data of the FCR is given in Table 6. The results indicated that FCR improved in T3 compared to other groups in third week. In the following week, the improvement shifted to T2 and no change was observed in fifth week. In the last week, the FCR dramatically improved in all the treated groups compared to the control.

As shown in Table 5, the production index did not differ significantly between the groups during third week of the experiment. It was significantly high in T2 during the fourth week. In the fifth week, again no significant change was observed, however, in the sixth week, the production index increased significantly in the treated groups compared to the control.

Discussion

In the present study, it was observed that intermittent feeding system given either once day or twice produced better results compared to *ad libitum* feeding. Further, it was observed that the two intermittent system of feeding used in this study had no significant difference. Our results are supported by findings of some previous reports (Svihus et al., 2010; Sacranie et al., 2012; Svihus et al., 2013). The responses observed in present study partially agreed with those reported by Plavink and Hurwits (1991), conversely, Hssanabadi and Moghaddam (2006) and Sahrawi and Shariatmadari (2007) that the feed restriction increase feed intake. The higher feed intake can be related to the hypertrophy of the gastrointestinal tract that occurs after the restriction period when the birds are fed *ad libitum*.

In view of fast growth and efficient feed conversion in broiler, *ad libitum* feed intake often causes overconsumption, leg problems and ascitis (Sacranie et al., 2012). In the current study, it was noticed that intermittent feeding caused improved performance. In line with our results, Svihus et al. (2010) concluded that broiler chickens have remarkable ability to enhance growth performance during intermittent feeding and suggested that during such kind of feeding may probably due to the efficiency in gizzard. Thus intermittent feeding is a solution to many problems such as leg weakness, overfeeding and ascitis. Barash et al. (1993) found a significant increase in weight and feed holding capacity of crop and gizzard when the chickens were feed intermittent diet

consisting of 1-2 times/day compared to *ad libitum*. Under intermittent feeding system, the temporary storage capacity of crop and gizzard are very important. Furthermore, an increase in retention time during such kind of feeding system may possibly increase the flow of digestive enzymes (Svihus et al., 2010) resulting in better feed utilization. Svilhus et al. (2013) found that intermittent feeding system improved the performance of broiler in a similar fashion as phytase added feed and concluded that chickens quickly adapt themselves to intermittent feeding system with no effect on final body weight. Tumova et al. (2002) reported that feed restriction reduced mortality as it slows down fast growth and more compact body that impedes disease infection. The responses observed in present study partially agree with those reported by (Plavink and Hurwits, 1991; Leeson and Zubair, 1997). Conversely, (Hssanabadi and Moghaddam (2006) and Sahrawi and Shariatmadari (2007) that the feed restriction increases feed intake.

From the present study, it can be concluded that intermittent feeding system is beneficial for broiler; however, feeding once or twice a day for limited time had no significant effect.

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