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Comparison of different feed restriction methods on growth performance of broilers

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Abstract

In order to investigate the possibility of compensatory growth, three different feed restriction methods (low nutrient density, restricted feed intake and restricted time of feeding) were compared to the control (*ad libitum* feeding). 400 Ross hybrid strain mail broilers were used in a complete randomized design experiment. The treatments were: T1, was low energy diet (2800 Kcal ME/Kg DM) offered *ad libitum*, T2, was high energy diet (2900 Kcal ME/Kg DM) of which 15% was restricted, T3, was high energy diet (2900 Kcal ME/Kg DM) that was restricted twice a week and T4 was the control group that received high energy diet (2900 Kcal ME/Kg DM) *ad libitum*. Results showed that weight gain was significantly high in T2 during starter phase compared to other treatments. Feed intake increased significantly in T2 during starter and finisher phase, thus total feed intake was also higher in the same group. No significant change was observed in feed conversion ratio, carcass characteristics and feed cost during the entire period. It can be concluded that feeding broilers T2 feeding regime had the best results.

Keywords: Feed Restriction, Weight Gain, Feed Conversion Ratio, Cost Of Feed

Introduction

Compensatory growth is an effective tool for bringing about better economic return in poultry industry. It is expected that after a period of reduced growth, offering a rich diet would speed up growth and compensate the former reduction in growth (Plavink et al., 1995). The systematic role of the central nervous system and the genetic potential of compensatory growth have been revealed but, the whole system still needs more study (Fassbinder et al., 2006). The intensity and duration of restriction period are the most effective factors; however, the genetic potential and feeding conditions are important factors influencing growth traits (Novak et al., 2004). Consumed nutrients, specially energy and protein are used for maintenance and the surplus will be used for growth requirements. Feed restriction defines as the unavailability of nutrients that are necessary for maintenance and growth during the breeding period (Zubair and Leeson, 1996).

Broilers are characterized by faster growth rate as they receive rich energy food. Due to the fast growth, the respiratory, blood, Immune and skeletal systems cannot reach to an optimum improvement (Fassbinder et al., 2006). It is accepted that the faster boilers reach marketing weight earlier and have better feed conversion ratio and this is because of the decline in maintenance requirements (Pinhriro et al., 2004). Many studies have been conducted on the effect of different methods of feed restriction (Harms et al., 2000). Ronald et al. (2000) reported an improved compensatory growth in broilers when feed was restricted up to 60-70 percent for about 5-7 days. Lippense et al. (2002) offered a restricted diet to broiler breeders and reported decreased cost of production. Novak et al. (2004) suggested the increase of body weight, protein content and dry matter of carcass and decreased fat content in response to intensive feeding after quantitative feed restriction. Since the growth characteristics are different between poultry hybrid strains, there are varieties of feed restriction methods. Depending on the rate of body growth of the poultry strain, feed restriction may be different at different stages of life (Wu et al., 2005). The beneficial effects of feed restriction is achieved

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through changing feeding behavior of birds, consequently, birds get used to eat more in a shorter time which would improve feed efficiency (Harms et al. 2000). This study was conducted to examine the effect of 3 methods of feed restriction on growth and some carcass characteristics of broilers.

Material and Methods

Four hundred Ross hybrid strain male chicks having 35±1.5 gm average body weight were randomly divided into 4 treatments each of 4 replicates (of 25 chicks each). T1has low energy diet of 2800 Kcal ME/Kg DM offered *ad libitum*; T2 has high energy diet of 2900 Kcal ME/Kg DM offered *ad libitum*; T3 has high energy diet of 2900 Kcal ME/Kg DM and 15% restriction in feed amount offered at days 8-21 of breeding period; T4 has high energy diet (of 2900 Kcal ME/Kg DM) that did not offered two days a week at days 8-21 of breeding period.

The concentrated (high energy) diet contained energy, protein and other nutrients similar to the standards in the Ross hybrid strain broilers catalogue (2003), whereas, the low energy diet contained energy and protein lower than the standard diet. T2 had standard levels of protein and energy but T1 had lower content than standard diet. The examined traits were weight gain, feed intake, feed conversion ratio, cost of feed/weight gain, cost of feed/carcass and carcass characteristics as carcass, abdominal fat, gizzard, pancreas, breast and heart percentages. Data of the examined traits for starter, grower and finisher as well as the whole breeding period were analyzed using SAS (2002) software by one-way analysis of variance. Treatments means were compared using Duncan multiple range test ($\alpha = 0.05$).

Results

Table 1 summarizes the results of the performance traits at the different stages of experimental period. The results showed that treatments differed significantly at the starter stage. The T2 group had the highest ($P<0.05$) weight gain at the starter stage, but at the grower and finisher stages all treatments showed similar results ($P>0.05$). The broilers showed similar total body weight gain for the whole period. Feed intake was significantly high in T2 at starter and grower stage and total feed intake ($P<0.05$). All treatments resulted in similar feed conversion ratio.

Table 1: Weight gain, feed intake and feed conversion ratio of control and experimental groups

	T1	T2	T3	T4
Weight gain (g/period)				
Starter	492.18±12.02^{b}	547.70±10.23^{a}	446.03±12.20^{c}	461.71±10.02^{c}
Grower	751.25±20.05	775.57±20.12	809.58±23.18	804.06±21.15
Finisher	271.4±8.10	275.68±8.23	267.87±8.00	319.00±10.10
Total body gain (g)	1514.75±102.32	1598.37±108.34	1523.50±106.24	1585.00±102.04
Feed Intake (g/period)				
Starter	756.44±23.03^{b}	819.08±26.08^{a}	661.20±16.98^{c}	665.49±15.54^{c}
Grower	2161.74±112.08^{b}	2328.58±118.54^{a}	2160.48±102.54^{b}	2198.30±103.00^{b}
Finisher	799.74±18.00	779.57±18.05	818.89±17.09	822.54±17.23
Total feed intake (g)	3717.92±124.00^{ab}	3927.24±128.09^{a}	3640.57±134.58^{b}	3686.34±132.00^{b}
Feed Conversion Ratio, FCR (g of feed intake/g of body gain)				
Starter	1.53±0.04	1.49±0.01	1.47±0.01	1.43±0.02
Grower	2.98±0.01	3.01±0.04	2.69±0.02	2.73±0.01
Finisher	2.8±0.02	2.98±0.02	3.18±0.03	2.66±0.01
Total period FCR	2.45±0.04	2.45±0.02	2.39±0.03	2.33±0.01

Different letters for means on the same row indicate the significant difference between means ($P<0.05$)

Table 2: Costs of feed (Rials) per live weight and carcass weight for the different diet treatments

Cost feed (Rials) per	T1	T2	T3	T4
Live weight	4048.5±23.09	4065.5±21.00	4170.7±27.06	4060.0±21.23
Carcass weight	6157.5±54.00	5989±60.87	6223.0±65.00	6216.0±43.04

Table 3: Some carcass characteristics of broilers in the experimental treatments

Trait (% of live body weight)	T1	T2	T3	T4
Carcass	65.83±0.12	67.92±0.14	66.99±0.24	65.74±0.14
Pancreas	5.28±0.02	5.20±0.05	4.76±0.02	4.92±0.08
Heart	7.50±0.02	7.26±0.01	6.68±0.07	7.57±0.09
Gizzard	0.14±0.01	0.13±0.01	0.13±0.02	0.13±0.01
Breast	27.90±0.05	29.30±0.08	27.62±0.32	30.06±0.27
Abdominal fat	0.11±0.07	0.12±0.03	0.13±0.02	0.12±0.06

In Table 2, the results of feed cost and production are shown. Feed cost per live body weight and cost of production in term cost of feed per carcass weight, the differences between treatments were not significant. The results of some carcass traits are represented in Table 3. The results showed that the different methods of feed restriction had no significant effect on these carcass traits.

Discussion

It is clear in the results (Table 1) that the group received T2 diet had higher feed intake at starter and grower periods (P<0.05) than the other groups but at finisher period they had the lowest feed intake, moreover, this group (T2) had the highest total feed intake in whole breeding period. These results were in agreement with Harms et al. (2000) and Leeson et al. (1996) who mentioned that by increasing energy content of a diet, feed intake decreased. Offering concentrated ration in the whole experimental period did not result in compensatory growth at finisher stage (P<0.05), it was likely because of slower growth rate at finisher (Ronald et al., 2000, Palo et al., 1995).

T4 had the best feed conversion ratio but the cost of production in T4 was not the lowest, which means having the best feed conversion ratio did not guaranty the best economic efficiency (Leeson et al., 1996; Skinder-Nober et al., 2001). Carcass characteristics were not significantly affected by treatments. T1 had higher pancreas and gizzard weight percentage which is likely because when chickens received diluted rations (T1), they had to eat more feed and it resulted in high enzyme activation in pancreas and big gizzard (Leeson et al., 1996; Balog et al., 2000; Pinhriro et al., 2004). T3 had slightly increased abdominal fat weight percentage which may be due to the fact that after feed restriction, chicks received more energy that was converted into abdominal fat as reported by Pinhriro et al. (2004) and Leeson et al. (1996).

Offering concentrated ration could improve the weight gain and carcass yield with low cost of production. Using feed restriction (T2) compensated the growth rate in Ross hybrid strain male chicks, improved feed conversion ratio and reduced carcass fat. It can be concluded that concentrated diet of 2900 Kcal ME/Kg DM offered at 15% restriction during the experimental period would have the best weight gain, feed conversion ration and economic efficiency.

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