Pakistan Veterinary Journal

ISSN: 0253-8318 (PRINT), 2074-7764 (ONLINE)
Accessible at: www.pvj.com.pk

RESEARCH ARTICLE

Influence of Various Growth Patterns on Performance of Ross 308 Broilers

N. Eila[1], A.G. Lavvaf[1], T. Farahvash[2]* and A. Zarei[1]

[1]Department of Animal Science, Karaj Branch, Islamic Azad University, Karaj; [2]Department of Animal Science, Shabestar Branch, Islamic Azad University, Shabester, Iran
*Corresponding Author: t_farahvash@yahoo.co.uk

ARTICLE HISTORY

Received: August 17, 2011
Revised: October 15, 2011
Accepted: November 19, 2011

Key words:
Performance
Carcass characteristics
Economic traits
Ross 308 strain
Broiler

ABSTRACT

In order to compare the effect of different growth patterns (slow, rapid and compensatory), 300 one-day old ROSS male broiler chicks were randomly selected. Chicks were subjected to 4 treatments i.e., (T1-slow grower diet; T2-compensatory grower diet; T3-NRC (1994) based grower diet and T4- growth diet based on Ross catalog based grower diet) having 5 replicates (15 chicks per each replicate). Performance traits were: weight gain, feed intake, feed conversion ratio, carcass characteristics and economic traits. Treatments had significant effect on weight gain, feed conversion ratio and feed intake ($P<0.05$) and T4 had the highest weight gain and feed conversion ratio in chicks. Carcass characteristics were similar for all treatment groups. The percentage of liver was higher in T1 in comparison to T3 ($P<0.05$). The cost of a kilogram of diet was the highest in T3 group that resulted in the lowest economic efficiency, however, other treatments had better efficiencies ($P<0.05$). T1, T2 and T3 had similar growth performance, carcass traits and economic traits. It can be concluded from the results that growth diet based on Ross breeding catalog had the highest production index with low cost of feed. On the basis of results of this study, it can be recommended that Ross catalog based diets result in compensatory growth with higher economic indexes.

To Cite This Article: Eila N, AG Lavvaf, T Farahvash and A Zarei, 2012. Influence of various growth patterns on performance of Ross 308 broilers. Pak Vet J, 32(3): 372-374.

INTRODUCTION

Broiler industry, obviously, is of a great importance in full-filling human protein requirements. In poultry breeding, feed cost may increase up to 70% of breeding costs; however, decreasing feeding cost can result in higher economic efficiency. It is why researchers try to produce rapid growing strains and they have been successful in producing strains that are enabled to reach market weight in shorter breeding period (Bengi and Habi, 1998; Khan *et al*., 2010). More rapid growth would bring about more skeletal and metabolic disorders such as ascites and higher FCR (Leeson and Summer, 1995; Leeson and Zubair, 1997; Balog *et al.*, 2000; Singh *et al.*, 2011; Al-Kassie, 2009). Consequently, in order to decrease possibility of such cases, it is recommended to lower the speed of growth during starter period. It could achieve by using restricted feeding programs (Nir *et al.*, 1996; Bengi and Habi, 1998). Restricted feeding programs may result in synchronizing the speed of growth of different body organs and decreases bad effects of rapid growth (Balog *et al.*, 2000), on the other hand, it is expected that when feed restriction is over, feed intake would increase consequently; growth performance would increase and declines maintenance energy. Fassbinder-Orth and Karossov (2006) conducted an experiment to investigate the effect of feed restriction on performance of gastro-intestinal immune system of Leghorn strain; they showed that feed restriction had no significant effect on the immune and digestive performance of intestine. Zhan *et al*. (2007) studied the effect of early feed restriction on metabolic programming and compensatory growth in broiler chickens. They suggested that early feed restriction might have induced prolonged metabolic programming in chickens. Feed restricting during the starter period improved FCR but decreased abdominal fat percentage that is likely the consequence of compensatory growth (Lippenes *et al.*, 2002). It has been reported that some native strains have slower growth rate after they were exposed to the feed restriction. It has been reported that using feed restriction at starter phase would decrease feed intake during whole breeding period in comparison to control group (Deaton, 1995; Bowes *et al.*, 1998; Pinhriro *et al.*, 2004). It is because of digestive metabolic

adaptation and lower body weight, which consequently, decreases maintenance and feed requirements (Lippense *et al*, 2002; Woyengo *et al.*, 2010). The aim of this study was to compare effect of slow, rapid and compensatory growth ratio on the performance of Ross 308 broilers and to investigate if different growth patterns had significant effect on performance of broilers.

MATERIALS AND METHODS

This experiment was conducted at Agricultural and Research Farm (Karaj Branch, Islamic Azad University) in April and June, 2008. Three hundred Ross 308 strain male chickens with 38±2g BW were randomly divided into 20 pans (15 chicks per each pan). Statistical design used was a CRD design with 4 treatments and 5 repetitions. Treatments were: T1: Slow growth with 2940 kcal/kg metabolizable energy, T2: Compensatory growth with 2940 kcal/kg metabolizable energy at starter, 3070 kcal/kg at grower and 3200 kcal/kg at finisher, T3: growth diet based on NRC (1994) and T4: growth diet based on Ross breeding catalog (2003). Measured traits were i) Growth traits: daily weight gain (WG), feed intake (FI), feed conversion ratio (FCR), ii) Carcass characteristics: carcass efficiency (CE), tibia efficiency (TiE), thorax efficiency (TrE), abdominal fat to live weight ratio (AFR), heart to live weight ratio (HR) and iii) Economic traits:

a. Cost of feed (CF) consumed for one kg of weight gain was calculated as follows:

b. $$CF(Rial) = \frac{C1F1 + C2F2 + C3F3}{W1G1 + W2G2 + W3G3}$$

Where: C_1, C_2, C_3: Price of one kg feed at starter, grower and finisher, respectively.

F_1, F_2, F_3: Feed intake at starter, grower and finisher, respectively.

WG_1, WG_2, WG_3: Weight gain at starter, grower and finisher, respectively.

c. Production index (PI)

$$PI = \frac{\text{Survival rate (\%)} \times \text{Average weight gain}}{\text{FCR (\%)} \times \text{length of breeding period (day)}}$$

d. Economic efficiency (EE)

$$EE = \frac{(WG1 + WG2 + WG3) \times (\text{price of live hen})}{(FI1 \times CF1) + (FI2 \times CF2) + (FI3 \times CF3)}$$

Where:

WG_1, WG_2, WG_3: Weight gain at starter, grower and finisher, respectively.

FI_1, FI_2, FI_3: Feed intake at starter, grower and finisher, respectively.

CF_1, CF_2, CF_3: Cost of feed consumed at starter, grower and finisher, respectively.

Data analyzed by using SAS (2002) software and means compared by Duncan procedure.

RESULTS

T2 and T4 respectively had the highest and lowest weight gain at starter and grower but the differences were not significant, however, difference between T2 and T4 at finisher was significant (P<0.05). Broilers showed the highest weight gain in T4 group (Table 1). Chickens showed similar feed intake in whole breeding period, however T2 group had higher feed intake at starter and finisher. Feed conversion ratio significantly differed at starter and T4 showed the highest feed conversion ratio (P<0.05). All treatments had similar feed conversion ratio at grower and whole breeding period. CE, TiE, TrE, AFR and HR were similar between treatments, which mean different energy levels did not affect carcass performance in this experiment (Table 2). Economic traits such as cost of feed, production index and economic efficiency determined (Table 3). T2 had the highest production index, which means compensatory grower diet could improve production. However differences were not significant. T3 had the highest cost of feed, it is likely because NRC based ratios are not fully flexible in changing ingredients, which some of them could be expensive. T3 had the lowest economic efficiency, it is likely in association with lower weight gain and feed intake and higher cost of feed which means it is better to try T1, T2 and T4 rather than T3.

Table 1: Means and standard errors from growth traits by treatment during a growing period

		Growth traits		
Period	Treatment	WG (gr)	FI (gr)	FCR (gr/gr)
Starter	T1	145.4±6.2	115.3±9.0	0.79±0.03b
	T2	148.9±7.7	133.8±15.0	0.82±0.07ab
	T3	143.9±21.4	120.0±19.5	0.83±0.04ab
	T4	136.7±14.4	118.4±13.0	0.86±0.03a
Grower	T1	858.6±150.0	1465.0±103.4	1.7±0.27
	T2	908.0±134.7	1421.4±141.7	1.6±0.18
	T3	836.7±57.9	1410.7±120.5	1.7±0.13
	T4	803.0±60.7	1438.5±165.0	1.7±0.98
Finisher	T1	894.0±189.0b	1866.8±179.1	2.2±0.55
	T2	921.6±227.3ab	1895.6±158.2	2.2±0.60
	T3	918.4±100.9ab	1853.1±143.0	2.0±0.12
	T4	1132.0±32.8a	1838.8±130.9	1.6±0.42
Total	T1	1898.0±130.0	3447.0±272.0	1.8±0.03
	T2	1978.5±176.0	3441.0±289.0	1.7±0.06
	T3	1899.0±163.0	3384.0±158.8	1.7±0.11
	T4	2072.0±78.0	3394.0±170.6	1.7±0.05

Different letters in each group indicates difference between means at P<0.05.

Table 2: Means and standard errors of carcass traits by treatments

	Carcass traits				
	CE %	TiE %	TrE %	AFR %	HR %
T1	69.2±1.2	22.6±1.3	19.7±1.9	2.3±0.5	0.5±0.07
T2	70.9±2.9	21.4±1.5	20.1±2.0	1.9±0.4	0.6±0.09
T3	71.0±1.4	22.7±1.9	20.9±1.8	2.0±0.5	0.6±0.09
T4	71.7±1.2	22.8±2.0	20.6±2.3	2.0±0.3	0.5±0.02

Different letters in each group indicates difference between means at P<0.05.

Table 3: Means and standard errors of economic traits by treatments

	Economic traits		
	PI (Rial)	CF (Rial)	EE (Rial/Rial)
T1	242.2±15.8	5540.7±82.0b	2.8±0.04a
T2	253.3±33.8	5708.4±199.0b	2.7±0.09a
T3	249.2±45.8	6163.3±395.2a	2.5±0.10b
T4	281.7±31.3	5706.8±169.0b	2.7±0.08a

Different letters in each column indicates difference between means at P<0.05; Rial: is the currency of Iran.

DISCUSSION

The mean DG of chickens at the finisher was different (P<0.05) and T4 and T1 had the highest and lowest DG, respectively. It seems that higher metabolizable energy in T4 likely increased the DG of broiler. It was in agreement with some other researchers (Deaton, 1995; Leeson and Summer, 1998; Skiner-nober *et al.* 2001). Leeson and Summers (1998) suggested that daily gain of chickens was affected by the energy

concentration of diet, highest energy content of diet, increased the growth rate in broiler.

FI was similar in T1 - T4. Picard *et al*. (1999) and Fassbinder and Karossov (2006) reported that chickens that received low energy diets didn't have increased FI during the early weeks. They suggested that it is likely because broiler had energy in their yolk which they used to fulfill their energy requirements at this time.

Energy level of diets had significant effect on the FCR at starter, and chickens in T1 group ($P<0.05$) had better FCR. It seems that FCR increased as energy concentration of diet increased. FCR is correlated with FI and WG (Balog *et al*., 2000; Singh *et al*., 2011) and because T1 group had lower FI to WG ratio which results in better FCR in this group. Young broilers are disable in consuming fat, furthermore, T4 has higher fat content that it makes T1 as a better treatment at starter than T4 (Picard *et al*., 1999). Leeson and Zubair (1997) suggested that broiler improved their efficiency of diet energy content when they received low energy content diets, consequently they can improve their FCR, which is likely in this study there is no different FCR at grower and finisher. Lippense *et al*. (2002) reported no different FCR when they compared low energy content diet with control group during the whole breeding period.

Carcass traits were mainly affected by genetic factors (Lippense *et al*., 2002; Hosseini-Vashan *et al*., 2010) and it is why there was no difference between these traits. LP was significantly higher when broiler chicks received T1 ($P<0.05$). It is because their liver had higher metabolism to fulfill metabolically requirements of body and it caused liver to grow more and become bigger. Skiner-nober *et al*. (2001), Tolkamp *et al*. (2005) and Zhan *et al*. (2007) reported similar results.T3 had the highest FC between treatments ($P<0.05$), and it had the lowest EE ($P<0.05$) and it showed that T3 was inferior in economic traits.

Conclusions: Results showed that T2 (Compensatory growth with 2940 kcal/kg metabolizable energy at starter, 3070 kcal/kg at grower and 3200 kcal/kg at finisher) and T4 (growth diet based on Ross breeding catalog) groups had similar weight gain, FCR and carcass traits. According to the economic traits, growth diet based on Ross breeding catalog had the highest production index with low cost of feed. Ross catalog based diets which result in compensatory growth with higher economic indexes is recommended.

REFERENCES

Al-Kassie GAM, 2009. Influence of two plant extracts derived from thyme and cinnamon on broiler performance. Pak Vet J, 29: 169-173.

Balog JM, NB Anthony, MA Cooper, BD Kidd, GR Huff, WE Huff and NC Rath, 2000. Acites syndrome and related pathologies in feed restricted broilers raised in a hypobaric chamber. Poult Sci, 79: 318-320.

Bengi H and H Habi, 1998. Effects of food restriction during the finishing period on the performance of broiler chicks. Archive-fur Gefluyel kunde, 60: 153-159.

Bowes VA, RJ Julian, S Lesson and T Sritzinger, 1998. Effect of feed restriction on feed efficiency and incidence of sudden death syndrome in broiler chickens. Poult Sci, 67: 1102-1104.

Deaton JW, 1995. The effect of early feed restriction on broiler performance. Poult Sci, 74: 1280-1286.

Fassbinder-Orth CA and WH Karossov, 2006. Effects of feed restriction and realimentation on digestive and immune function in the leghorn Chick. Poult Sci, 85: 1449-1456.

Hosseni-Vashan SJ, AR Jafari-Sayadi, A Golian, Gh Motaghinia, M Namvari and M Hamedi, 2010. Comparison of growth performance and carcass characteristics of broiler chickens fed diets with various energy and constant energy to protein ratio. J Anim Vet Adv, 9: 2565-2570.

Khan RU, FR Durrani, N Chand and H Anwar, 2010. Influence of feed supplementation with *Cannabis sativa* on quality of broilers carcass. Pak Vet J, 30: 34-38.

Leeson A and JD Summers, 1998. Some nutritional implication of leg problems with poultry. British Vet J, 144: 81-92.

Leeson SL and AK Zubair, 1997. Nutrition of the broiler chicken around the period of compensatory growth. Poult Sci, 76: 992-999.

Leeson SL and JD Summers, 1995. Broiler response to energy or energy and protein dilution in the finisher diet. Poult Sci, 75: 527-528.

Lippense M, G Huy ghbaert and G Degroote, 2002. The efficiency of nitrogen retention during compensatory growth of food restricted broilers. British Poult Sci, 43: 669-676.

Nir I, Z Nitsan, EA Dunington and PB Siegel, 1996. Aspects of food intake restriction in young domestic fowl metabolic and genetic considerations. Worlds Poult Sci J, 52: 251-266.

NRC, 1994. Nutrition Requirements of Poultry: 9th Ed, Subcommittee on Poultry Nutrition. National Research Council, pp: 176.

Picard M, PB Siegal, C Leterrier and PA Geraert, 1999. Diluted starter diet, growth performance, and digestive tract development in fast and slow-growing broiler. Applied Poult Res, 8: 122-131.

Pinhriro DF, VC Cru, JR Sartori and MLM Vicentini Panlino, 2004. Effect of early feed restriction and enzyme supplementation on digestive enzyme activities in broilers. Poult Sci, 83: 1544-1550.

SAS Institution, 2002. Statistical analysis system software. Version 9.0. SAS Inset. Inc. Cary. NC.

Singh PK, P Shekhar and K Kumar, 2011. Nutritional and managemental control of Ascites syndrome in poultry. Int J Livest Prod, 2: 117-123.

Skiner-Nober DO, JG Berry and RG Teeter, 2001. Use of a single diet feeding program for female broiler. Animal Science Research Report, Oklahoma University, USA.

Tolkamp BJ, V Sandilands and I Kyriazakis, 2005. Effect of qualitative feed restriction during rearing on the performance of broiler breeders during rearing and lay. Poult Sci, 84: 1286-1293.

Woyengo TA, A Golian, C Bennet, H Muc and W Guenter, 2010. Performance of tow 1970s and Ross 308 broiler strains fed drug-free low-protein and recommended-protein diets. Appl Poult Res, 19: 101-111.

Zhan XA, M Wang, H Ren, RQ Zhan, JX Li and ZL Tan, 2007. Effect of early feed restriction on metabolic programming and compensatory growth in broiler chickens. Poult Sci, 86: 654-660.