INFLUENCE OF DIFFERENT LEVELS OF ENERGY AND PROTEIN ON CUMULATIVE FEED CONSUMPTION AND FEED CONVERSION RATIO OF BROILERS IN ENVIRONMENTALLY CONTROLLED HOUSING SYSTEM

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ABSTRACT

Two hundred and eighty eight chicks were divided into nine groups and provided with diets with three different levels of energy in three periods (2850, 2950 and 3050 kcal/kg in pre-starter diet, 2950, 3050 and 3150 kcal/kg in starter diet and 3050, 3150 and 3250 kcal/kg in finisher diet) and protein levels in three periods (21.5, 22.5 and 23.5% in pre-starter diet, 20.5, 21.5 and 22.5% in starter diet and 19, 20 and 21% in finisher diet) to commercial broilers for a period of five weeks to assess the production performance. Result of the experiment revealed that the energy and protein content of the diet had significantly influenced body weight, cumulative feed intake and feed conversion ratio in broilers.

Key words: Metabolizable energy, Crude protein, Cumulative feed consumption, Feed conversion ratio, Broilers

INTRODUCTION

Indian broiler industry has gone through tremendous development and expansion during the last two decades. Increased genetic potential of broilers coupled with higher placements helped in rapid development of broiler production in hot climates and requires greater emphasis on finding solutions to alleviate growth depression due to heat stress. Ambient temperature is an important determinant of bird performance. The main consequence of heat exposure is reduction in feed intake in order to reduce metabolic heat production. In broilers this reduction is approximately 1.5 to 2.5 per cent per ^{0}C increase in ambient temperature above 20^{0}C. The reduction in growth is often greater than the reduction in feed intake resulting in lower feed efficiency.

MATERIALS AND METHODS

A biological experiment was carried out with 288 sex separated, day-old, commercial broiler chicks belonging to a single hatch purchased from a local hatchery. The chicks were wing banded, weighed and randomly allotted into nine treatment groups with four replicates of eight chicks each in an environmentally controlled house. Throughout

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the study period of five weeks, data on body weight, feed intake were recorded at weekly interval. The data collected on feed intake, body weight and calculated data on feed conversion ratio were subjected to statistical analysis as per the method suggested by Snedacor and Cochran (1989). Angular transformation was applied to percentages wherever needed before carrying out statistical analysis. The treatment applied to the nine groups of the experiment are provided in Table I.

RESULTS AND DISCUSSION

Mean (± S.E.) body weight, cumulative feed intake and feed conversion ratio of broilers reared in environmentally controlled house from 1 to 5 weeks of age as influenced by various combinations of energy and protein are presented in Table II,III and IV respectively.

The analysis of variance of data showed no significant difference on mean body weight in first two weeks period, but significant difference ($P<0.05$) on mean body weight was observed in third and fourth week between different treatment groups. In the third week group T9 recorded significantly higher body weight (875 g) than T1, where as the rest of the treatment groups did not differ significantly either with T9 or T1 (811.38 to 860.28 g). At fifth week there was no significant difference in body weight between treatment groups, however the group T9 (high energy and high protein) recorded comparatively higher mean body weight (2022.19 g); which did not differ significantly among treatment groups (1852.84 to 1989.59 g).

The analysis of variance of data on cumulative feed consumption revealed a significant difference ($P<0.05$) in the first three week period between treatments and a highly significant difference ($P<0.01$) in fourth and fifth week of age.

At the end of fifth week, group T7 and T6 recorded lower feed consumption (2640.16 g) and the group T3 recorded significantly higher cumulative feed consumption (2866.77 g), while rest of the treatment groups recorded intermediate feed consumption (2675.88 to 2855.32 g) and were comparable.

The results are in accordance with the earlier works of Al-Batshan and Hussein (1999), Ghaffari et al. (2007b), Kamran et al. (2008a), Kabir et al. (2010), Moosavi et al. (2011) and Elagib and Elzubeir (2012) who also reported that broilers fed with diet containing high energy had less feed consumption.

The results on feed conversion ratio revealed that there was no significant difference in first week, but significant difference ($P<0.05$) was noticed in second week and a highly significant difference ($P<0.01$) from third to fifth week between treatment groups. When compared to control group (T5), the feed conversion ratio was better in high energy fed groups (1.37 to 1.38), whereas the high protein fed groups revealed poor feed conversion ratio (1.49 to 1.52). The low protein fed groups (T1 and T2) also revealed significantly poor feed conversion (1.52) than rest of the groups.

Al-Batshan and Hussein (1999), Maiorka et al. (2005), Ghaffari et al. (2007a), Kabir et al. (2010), Jafarnejad and Sadegh (2011), Moosavi et al. (2011), Malomo et al. (2013) also reported similar results, that broilers fed with diet containing high energy showed better feed conversion.

Table I

Treatment groups for each system of rearing	Particulars			Number of replicates per treatment	Number of birds per replicate	Total number of birds per treatment
	Type of feed	CP (%)	ME (kCal/ kg)			
T1	Pre-starter	21.5	2850	4	8	32
	Starter	20.5	2950			
	Finisher	19.0	3050			
T2	Pre-starter	22.5	2850	4	8	32
	Starter	21.5	2950			
	Finisher	20.0	3050			
T3	Pre-starter	23.5	2850	4	8	32
	Starter	22.5	2950			
	Finisher	21.0	3050			
T4	Pre-starter	21.5	2950	4	8	32
	Starter	20.5	3050			
	Finisher	19.0	3150			
T5	Pre-starter	22.5	2950	4	8	32
	Starter	21.5	3050			
	Finisher	20.0	3150			
T6	Pre-starter	23.5	2950	4	8	32
	Starter	22.5	3050			
	Finisher	21.0	3150			
T7	Pre-starter	21.5	3050	4	8	32
	Starter	20.5	3150			
	Finisher	19.0	3250			
T8	Pre-starter	22.5	3050	4	8	32
	Starter	21.5	3150			
	Finisher	20.0	3250			
T9	Pre-starter	23.5	3050	4	8	32
	Starter	22.5	3150			
	Finisher	21.0	3250			
Total						**288**

Table II

Mean (± S. E.) body weight (g) of broilers reared in environmentally controlled housing system from 1 to 5 weeks of age as influenced by different levels of energy and protein

Treatment groups	I Week	II Week	III Week	IV Week	V Week
T_1	165.63±2.40	415.91±7.04	801.41^{b}±15.73	1317.13^{b}±28.41	1878.28±46.30
T_2	158.00±2.99	413.41±7.05	811.38^{ab}±14.11	1316.97^{b}±26.08	1852.84±35.85
T_3	161.63±2.49	432.41±7.00	859.22^{ab}±14.39	1382.06^{ab}±20.77	1930.44±32.86
T_4	162.09±2.49	428.91±7.40	840.69^{ab}±14.66	1376.69^{ab}±27.73	1911.66±42.97
T_5	157.94±2.68	428.28±7.60	839.81^{ab}±13.92	1369.66^{ab}±24.66	1908.16±36.38
T_6	159.75±2.75	426.16±7.13	855.25^{ab}±14.55	1389.41^{ab}±26.90	1937.78±39.99
T_7	164.00±2.13	434.97±7.29	860.28^{ab}±15.27	1388.06^{ab}±27.18	1976.44±55.46
T_8	160.56±3.09	426.97±10.29	852.34^{ab}±22.9	1411.38^{ab}±30.20	1989.59±38.26
T_9	158.19±2.65	432.47±7.25	875.06^{a}±15.51	1448.47^{a}±26.35	2022.19±41.40

Value given in each cell is the mean of 32 observations

^{a} and ^{b} Means within a column with no common superscript differ significantly (P<0.05)

Table III

Mean (± S. E.) cumulative feed consumption (g/bird) of broilers reared in environmentally controlled housing system from 1 to 5 weeks of age as influenced by different levels of energy and protein

Treatment groups	I Week	II Week	III Week	IV Week	V Week
T_1	145.60^{b}±1.29	348.32^{ab}±6.10	1018.91^{ac}±23.27	1861.41^{AB}±29.67	2855.32^{BC}±15.44
T_2	138.13^{a}±2.35	348.13^{ab}±4.42	995.31^{abc}±13.20	1824.07^{AB}±8.62	2807.50^{ABC}±29.78
T_3	145.16^{ab}±1.00	346.88^{ab}±3.09	1028.60^{ab}±12.03	1815.63^{B}±22.83	2866.77^{C}±34.81
T_4	140.63^{ab}±0.25	333.13^{ab}±13.71	963.44^{bc}±30.01	1830.78^{AB}±14.14	2771.41^{ABC}±11.41
T_5	137.13^{a}±0.63	350.69^{ab}±3.62	1033.44^{c}±7.40	1797.82^{AB}±16.23	2703.28^{AB}±29.76
T_6	143.28^{ab}±1.18	332.03^{ab}±5.53	954.85^{a}±15.40	1754.22^{AB}±29.09	2675.88^{A}±54.02
T_7	143.13^{ab}±1.48	326.10^{a}±10.75	980.47^{abc}±14.13	1726.72^{A}±20.91	2640.16^{A}±16.31
T_8	142.35^{ab}±3.55	352.66^{b}±7.23	995.32^{abc}±34.60	1837.50^{AB}±43.35	2746.25^{ABC}±56.80
T_9	137.50^{a}±0.76	350.63^{ab}±6.32	990.00^{abc}±17.10	1874.06^{AB}±32.36	2780.31^{ABC}±41.63

Value given in each cell is the mean of 4 observations

$^{A-C}$ Means within a column with no common superscript differ significantly (P<0.01)

$^{a-c}$ Means within a column with no common superscript differ significantly (P<0.05)

Table IV

Mean (± S. E.) cumulative feed conversion ratio of broilers reared in environmentally controlled housing system from 1 to 5 weeks of age as influenced by different levels of energy and protein

Treatment groups	I Week	II Week	III Week	IV Week	V Week
T_1	0.88±0.01	1.19^{c}±0.01	1.27^{C}±0.01	1.41^{C}±0.01	1.52^{C}±0.02
T_2	0.87±0.02	1.18^{bc}±0.01	1.23^{BC}±0.01	1.39^{BC}±0.02	1.52^{C}±0.04
T_3	0.90±0.01	1.14^{abc}±0.02	1.20^{ABC}±0.01	1.39^{BC}±0.01	1.49^{BC}±0.01
T_4	0.87±0.01	1.11^{ab}±0.03	1.15^{AB}±0.04	1.33^{AB}±0.02	1.45^{ABC}±0.02
T_5	0.87±0.01	1.14^{abc}±0.01	1.23^{BC}±0.01	1.31^{AB}±0.02	1.42^{AB}±0.01
T_6	0.90±0.02	1.12^{abc}±0.03	1.12^{A}±0.03	1.26^{A}±0.03	1.38^{A}±0.03
T_7	0.88±0.02	1.09^{a}±0.04	1.15^{AB}±0.03	1.25^{A}±0.01	1.37^{A}±0.03
T_8	0.89±0.02	1.16^{abc}±0.03	1.17^{AB}±0.03	1.30^{A}±0.03	1.38^{A}±0.02
T_9	0.87±0.02	1.13^{abc}±0.01	1.13^{A}±0.01	1.29^{A}±0.01	1.38^{A}±0.01

Value given in each cell is the mean of 4 observations

$^{A-C}$ Means within a column with no common superscript differ significantly (P<0.01)

$^{a-c}$ Means within a column with no common superscript differ significantly (P<0.05)

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