

INFLUENCE OF HOUSING SYSTEM ON FEED CONSUMPTION AND FEED CONVERSION RATIO OF BROILERS AT DIFFERENT LEVELS OF LYSINE AND METHIONINE

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ABSTRACT

An experiment was conducted by feeding diets with different levels of lysine (1.20, 1.30 and 1.40 % in pre-starter diet, 1.10, 1.20 and 1.30 % in starter diet and 0.95, 1.05 and 1.15 % in finisher diet) and methionine (0.45, 0.55 and 0.65% in pre-starter diet, 0.40, 0.50 and 0.60 % in starter diet and 0.35, 0.45 and 0.55 % in finisher diet) to commercial broilers for a period of five weeks to assess the cumulative feed consumption and feed conversion ratio in environmentally controlled and open sided deep litter housing system. The results of the study revealed that broilers reared in environmentally controlled housing system consumed more feed than in open sided housing system. In addition the housing system also influenced the feed conversion ratio irrespective of various combinations of dietary lysine and methionine in broilers.

Key words: Broilers, Cumulative feed consumption, Feed conversion ratio, Lysine, Methionine

INTRODUCTION

Indian broiler industry has gone through tremendous development and expansion during the last two decades. It is very well established that the cost of feed represents major cost in broiler production

which ranges from 60 to 80% of the production cost. Lysine and methionine are the two limiting amino acids in corn and soybean meal based broiler diets which may influence the growth of broiler chicken. A right proportion of these nutrients are essential to ensure maximum utilization of all nutrients for optimum growth of broilers. 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

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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 °C increase in ambient temperature above 20°C. Environmentally controlled housing system paves way to overcome the ill effects of climatic variation inside the poultry house and also for easy operation and exploiting the maximum genetic potential of the broilers.

MATERIALS AND METHODS

The experiment was conducted with five hundred and seventy six (each 288 in environmentally controlled deep litter house and open sided deep litter house), sex separated, day-old, commercial broiler chicks belonging to single hatch. The chicks were wing banded, weighed and randomly allotted into nine treatment groups with four replicates of eight chicks each under both open and environmentally controlled housing systems. In environmentally controlled house, the brooding temperature was set at 33°C on the first day and gradually reduced to 27°C on tenth day and the same temperature was maintained till the end of the experiment. The humidity was set at

65% from day-one to five weeks of age. The treatment groups of the experiment were given in Table 1

Throughout the study period of 5 weeks, data on feed consumption were recorded at weekly interval and from the collected data feed conversion ratio was calculated. The collected data were subjected to statistical analysis as per the method suggested by Snedecor and Cochran (1989). Angular transformation was applied to percentages wherever needed before carrying out statistical analysis.

RESULTS

Effect of housing system on mean (\pm S.E.) feed consumption (g/bird) of broilers from one to five weeks of age as influenced by different levels of lysine and methionine is given in Table 2

At the end of fifth week, the broilers reared in environmentally controlled housing system had significantly higher feed consumption in the groups T₁, T₂, T₈ and T₉ (2654.69 to 2921.56 g) than the corresponding groups of broilers reared

Table 1. The levels of lysine (L) and methionine (M) for different dietary treatments

Type of feed & number of birds	Treatments																	
	T1		T2		T ₃		T ₄		T5		T6		T7		T8		T9	
	L (%)	M (%)	L (%)	M (%)	L (%)	M (%)	L (%)	M (%)	L (%)	M (%)	L (%)	M (%)	L (%)	M (%)	L (%)	M (%)	L (%)	M (%)
Pre-starter	1.20	0.45	1.30	0.45	1.40	0.45	1.20	0.55	1.30	0.55	1.40	0.55	1.20	0.65	1.30	0.65	1.40	0.65
Starter	1.10	0.40	1.20	0.40	1.30	0.40	1.10	0.50	1.20	0.50	1.30	0.50	1.10	0.60	1.20	0.60	1.30	0.60
Finisher	0.95	0.35	1.05	0.35	1.15	0.35	0.95	0.45	1.05	0.45	1.15	0.45	0.95	0.55	1.05	0.55	1.15	0.55
Number of birds	4 replicates X 8 = 32 birds		4 replicates X 8 = 32 birds		4 replicates X 8 = 32 birds		4 replicates X 8 = 32 birds		4 replicates X 8 = 32 birds		4 replicates X 8 = 32 birds		4 replicates X 8 = 32 birds		4 replicates X 8 = 32 birds		4 replicates X 8 = 32 birds	

in open sided housing system (2143.19 to 2646.41 g); whereas other treatment groups did not differ significantly in feed consumption. This indicated that the housing system influenced the cumulative feed consumption irrespective of various

combinations of dietary lysine and methionine in broilers. The broilers in environmentally controlled housing system consumed 5 to 15 per cent more feed than broilers reared in open sided housing system.

Table 2. Effect of housing system on mean (\pm S. E.) cumulative feed consumption (g/bird) of broilers from 1 to 5 weeks of age as influenced by different levels of lysine and methionine

Treatment groups	House	I Week	II Week	III Week	IV Week	V Week
T ₁	OPHS	132.81 \pm 1.72	450.63 \pm 2.07	947.50 \pm 14.73	1676.25 \pm 11.56	2620.00 \pm 39.60
	EC	139.69 \pm 0.18	496.25 \pm 3.50	1061.56 \pm 6.66	1873.44 \pm 13.81	2921.56 \pm 47.48
	"t" value	3.97**	11.22**	7.06**	10.95**	4.88**
T ₂	OPHS	128.75 \pm 0.88	413.44 \pm 13.35	872.50 \pm 20.69	1569.22 \pm 6.71	2515.31 \pm 27.77
	EC	134.38 \pm 1.80	469.84 \pm 6.93	1011.88 \pm 4.58	1806.25 \pm 13.87	2787.81 \pm 41.61
	"t" value	2.80*	3.75**	6.58**	15.38**	5.45**
T ₃	OPHS	129.69 \pm 2.36	436.09 \pm 4.24	917.66 \pm 18.17	1652.81 \pm 17.74	2646.41 \pm 44.51
	EC	138.75 \pm 1.44	486.25 \pm 11.40	1027.50 \pm 20.27	1805.63 \pm 32.58	2803.44 \pm 79.97
	"t" value	3.28*	4.12**	4.04**	4.12**	1.72^{NS}
T ₄	OPHS	126.88 \pm 5.69	421.25 \pm 17.85	920.94 \pm 32.25	1655.16 \pm 28.29	2615.00 \pm 19.63
	EC	136.25 \pm 0.72	459.69 \pm 9.26	984.69 \pm 28.01	1732.81 \pm 59.83	2654.69 \pm 96.40
	"t" value	1.63^{NS}	1.91^{NS}	1.49^{NS}	1.17^{NS}	0.40^{NS}
T ₅	OPHS	129.38 \pm 3.00	420.47 \pm 12.08	879.22 \pm 24.01	1622.34 \pm 29.47	2597.34 \pm 40.73
	EC	132.50 \pm 0.72	472.5 \pm 6.57	1023.13 \pm 24.65	1793.75 \pm 53.61	2801.56 \pm 117.79
	"t" value	1.01^{NS}	3.78**	4.18**	2.80*	1.64^{NS}
T ₆	OPHS	130.00 \pm 0.72	430.31 \pm 11.76	925.63 \pm 27.22	1665.63 \pm 30.95	2596.56 \pm 58.63
	EC	136.88 \pm 3.25	468.75 \pm 1.02	1006.25 \pm 15.02	1792.66 \pm 35.10	2724.06 \pm 84.85
	"t" value	2.07^{NS}	3.26*	2.59*	2.71*	1.24^{NS}
T ₇	OPHS	128.13 \pm 0.36	436.88 \pm 6.72	888.13 \pm 19.40	1629.84 \pm 16.90	2605.63 \pm 10.78
	EC	129.38 \pm 6.13	466.56 \pm 11.48	1009.06 \pm 27.02	1796.41 \pm 38.75	2801.41 \pm 111.10
	"t" value	0.20^{NS}	2.23^{NS}	3.64*	3.94**	1.75^{NS}
T ₈	OPHS	131.56 \pm 1.07	435.00 \pm 3.99	882.81 \pm 13.04	1615.31 \pm 19.03	2537.19 \pm 23.88
	EC	134.38 \pm 1.80	471.88 \pm 8.50	1019.38 \pm 20.88	1807.81 \pm 37.25	2816.25 \pm 77.38
	"t" value	1.34^{NS}	3.93**	5.55**	4.60**	3.45*
T ₉	OPHS	120.63 \pm 2.58	343.19 \pm 12.94	645.69 \pm 30.29	1133.81 \pm 60.63	1843.19 \pm 74.94
	EC	133.75 \pm 1.44	480.63 \pm 7.33	1042.81 \pm 24.28	1835.63 \pm 48.42	2830.00 \pm 96.52
	"t" value	4.44**	9.24**	10.23**	9.05**	8.08**

OPHS - Open sided housing system, EC- Environmentally controlled housing system.

NS- Non significant, * - Significant (P < 0.05) and ** - Highly significant (P < 0.01)

The result of the study indicates that in environmentally controlled housing system, the feed consumption was higher in the T₁ group. The T₁ group was fed with broiler pre-starter diet with 1.20% lysine and 0.45% methionine; broiler starter diet with 1.10% lysine and 0.40% methionine; and broiler finisher diet with 0.95% lysine and 0.35% methionine. In case of open housing system, the feed consumption was higher in the T₃ group. The T₃ group was fed with broiler pre-starter diet with 1.40% lysine and 0.45% methionine; broiler starter diet with 1.30% lysine and 0.40% methionine; and broiler finisher diet with 1.15% lysine and 0.35% methionine.

While environmentally controlled housing system had a constant comfortable temperature throughout, the open sided housing system had higher environmental temperature (28.7 °C) resulting in lower feed intake. From the feed intake data of open sided housing system, it is clearly observed that high lysine and low methionine resulted in highest feed intake by the birds.

Effect of housing system on mean (\pm S.E.) feed conversion ratio of broilers from first to fifth week of age as influenced by different levels of lysine and methionine is given in Table 3. The broilers reared in environmentally controlled housing system had significantly better feed conversion ratio (1.31 to 1.42) than the broilers reared in open sided housing system (1.45 to 1.52). Interaction of dietary treatments and housing system recorded highly significant difference between treatment groups on fifth week feed conversion ratio. This indicated that the housing system influenced the feed conversion ratio irrespective of

various combinations of dietary lysine and methionine in broilers.

The result of the study indicated that the feed conversion ratio was significantly better in the T₄ group which was fed with broiler pre-starter diet with 1.20% lysine and 0.55% methionine; broiler starter diet with 1.10% lysine and 0.50% methionine; and broiler finisher diet with 0.95% lysine and 0.45% methionine in environmentally controlled housing system. In case of open housing system, the feed conversion ratio was comparatively better in the T₈ group, which was fed with broiler pre-starter diet with 1.30% lysine and 0.65% methionine; broiler starter diet with 1.20% lysine and 0.60% methionine; and broiler finisher diet with 1.05% lysine and 0.55% methionine.

DISCUSSION

The results are in accordance with the earlier findings of Hussein and Al-Batshan (1999), Labadan *et al.* (2001), Abdel-Maksoud *et al.* (2010) and Adeyemo (2012). On the other hand, Rezaei *et al.* (2004) and Ullah *et al.* (2012) reported that increasing the dietary lysine had increased the feed consumption in broilers which might be due to combination of lysine with low energy diet.

The results are in accordance with the previous works of Rezaei *et al.* (2004) and Café and Waldroup (2006), who reported that broilers fed diet containing high lysine, resulted in poor feed conversion ratio. Similarly, the results of the present work is in accordance with the earlier findings of Hickling *et al.* (1990), Toriki (2000), Ojano-Dirainand Waldroup (2002) and

Ahmed and Abbas (2011) who also reported that broilers fed diet with high level of methionine improved the feed conversion ratio in broilers.

Table 3. Effect of housing system on mean (\pm S. E.) feed conversion ratio of broilers from 1 to 5 weeks of age as influenced by different levels of lysine and methionine

Treatment groups	House	I Week	II Week	III Week	IV Week	V Week
T ₁	OPHS	0.84 \pm 0.02	1.08 \pm 0.01	1.28 \pm 0.03	1.38 \pm 0.03	1.52 \pm 0.02
	EC	0.79 \pm 0.01	1.07 \pm 0.01	1.17 \pm 0.01	1.28 \pm 0.01	1.42 \pm 0.01
	"t" value	2.21^{NS}	0.48^{NS}	3.46[*]	3.09[*]	4.06^{**}
T ₂	OPHS	0.85 \pm 0.01	1.11 \pm 0.03	1.22 \pm 0.03	1.31 \pm 0.03	1.49 \pm 0.03
	EC	0.81 \pm 0.02	1.09 \pm 0.02	1.18 \pm 0.02	1.31 \pm 0.02	1.40 \pm 0.02
	"t" value	2.59[*]	0.66^{NS}	1.11^{NS}	0.07^{NS}	2.35[*]
T ₃	OPHS	0.82 \pm 0.01	1.09 \pm 0.01	1.25 \pm 0.02	1.32 \pm 0.01	1.51 \pm 0.01
	EC	0.81 \pm 0.01	1.07 \pm 0.02	1.16 \pm 0.02	1.27 \pm 0.02	1.40 \pm 0.02
	"t" value	0.96^{NS}	1.07^{NS}	2.81[*]	2.38^{NS}	4.49^{**}
T ₄	OPHS	0.85 \pm 0.03	1.08 \pm 0.02	1.22 \pm 0.02	1.33 \pm 0.02	1.52 \pm 0.02
	EC	0.82 \pm 0.01	1.05 \pm 0.01	1.14 \pm 0.01	1.24 \pm 0.01	1.31 \pm 0.04
	"t" value	0.97^{NS}	1.39^{NS}	3.17[*]	4.10^{**}	5.01^{**}
T ₅	OPHS	0.84 \pm 0.01	1.11 \pm 0.03	1.24 \pm 0.01	1.35 \pm 0.01	1.50 \pm 0.01
	EC	0.80 \pm 0.01	1.05 \pm 0.01	1.16 \pm 0.01	1.26 \pm 0.01	1.37 \pm 0.03
	"t" value	2.46[*]	2.17^{NS}	4.90^{**}	6.08^{**}	4.05^{**}
T ₆	OPHS	0.82 \pm 0.02	1.09 \pm 0.03	1.22 \pm 0.01	1.34 \pm 0.01	1.49 \pm 0.01
	EC	0.83 \pm 0.03	1.09 \pm 0.02	1.20 \pm 0.01	1.32 \pm 0.02	1.42 \pm 0.01
	"t" value	0.42^{NS}	0.07^{NS}	1.24^{NS}	1.29^{NS}	4.23^{**}
T ₇	OPHS	0.84 \pm 0.02	1.06 \pm 0.02	1.23 \pm 0.01	1.34 \pm 0.02	1.49 \pm 0.03
	EC	0.78 \pm 0.03	1.05 \pm 0.02	1.15 \pm 0.02	1.29 \pm 0.02	1.40 \pm 0.01
	"t" value	1.64^{NS}	0.55^{NS}	3.90^{**}	2.02^{NS}	3.16[*]
T ₈	OPHS	0.86 \pm 0.01	1.10 \pm 0.01	1.25 \pm 0.01	1.34 \pm 0.01	1.45 \pm 0.02
	EC	0.85 \pm 0.01	1.11 \pm 0.01	1.20 \pm 0.02	1.29 \pm 0.01	1.40 \pm 0.01
	"t" value	0.67^{NS}	1.59^{NS}	2.33^{NS}	2.26^{NS}	3.18[*]
T ₉	OPHS	0.95 \pm 0.02	1.30 \pm 0.02	1.53 \pm 0.07	1.42 \pm 0.03	1.46 \pm 0.02
	EC	0.82 \pm 0.01	1.11 \pm 0.01	1.20 \pm 0.00	1.29 \pm 0.02	1.39 \pm 0.01
	"t" value	5.26^{**}	8.20^{**}	4.89^{**}	3.14[*]	2.40^{NS}

OPHS - Open sided housing system, EC- Environmentally controlled housing system.

NS- Non significant, * - Significant (P < 0.05) and ** - Highly significant (P < 0.01)

In contrast to the present findings, Saima et al. (2009) reported that increasing lysine level by 0.1% improved the feed conversion in broilers which was mainly because of the low protein diet used in the experiment.

In conclusion, the broilers reared in environmentally controlled housing system consume more feed than in those reared in open sided housing system. The housing system also influences the feed conversion ratio irrespective dietary lysine and methionine levels in broilers.

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