www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(11): 621-623

www.thepharmajournal.com
Received: 16-08-2022
Accepted: 23-09-2022

Rajendran K
Ph.D., Assistant Professor, Department of Poultry Science, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

Vasanthakumar T
Ph.D., Assistant Professor, Department of Poultry Science, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

Kathirvelan C
Assistant Professor, Department of Animal Nutrition, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

Kavitha R
Ph.D., Assistant Professor, Animal Feed Analytical and Quality Assurance Labortatory, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

Shamsudeen P
Ph.D., Professor, Department of Poultry Management, College of Poultry Production and Management, Hosur, Tamil Nadu, India

Santhi D
Ph.D., Assistant Professor, Livestock Farm Complex, Veterinary College and Research Institute, Orathanad, Tamil Nadu, India

Corresponding Author:
Rajendran K
Ph.D., Assistant Professor, Department of Poultry Science, Veterinary College and Research Institute, Namakkal, Tamil Nadu, India

Influence of different levels of energy and protein on the abdominal fat content of broilers reared in different systems of housing

Rajendran K, Vasanthakumar T, Kathirvelan C, Kavitha R, Shamsudeen P and Santhi D

Abstract
An experiment was conducted by feeding diets with different levels of energy (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 (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 abdominal fat content in environmentally controlled and open sided housing system. In both the housing systems, feeding different levels of energy and protein had a significant influence on abdominal fat yield in broilers. As the energy and protein level increases, there was a proportionate increase in the abdominal fat yield. The interaction between feeding different levels of energy and protein and housing system showed that the abdominal fat yield was significantly differed only within T_6 (optimum energy and high protein) and T_7 (high energy and low protein) group birds, whereas other treatment groups showed a non significant effect with respect to dietary treatments.

Keywords: Energy, protein, abdominal fat content, broilers

Introduction
Indian poultry sector has been growing at around 8-10 per cent annually over the last decade and at more than 12 per cent in last three years. The domestic poultry meat production is estimated to have increased from less than one million tonne in 2000 to 5.0 million tonne in 2020 with per capita availability from 0.8 kg to 3.6 kg. However, the per capita poultry meat consumption in India remains one of the lowest with vast gap even between NIN (National Institute of Nutrition) recommended levels of 11 kg. This offers a tremendous opportunity for further growth in industry. However, broiler production in tropical countries like India faces many challenges which results lower production performance of broilers. One of the major challenges is the fluctuations in poultry house temperature and relative humidity especially on higher side. The detrimental effects of high ambient temperature on feed intake, growth rate and feed efficiency of broilers are well documented (Hacina *et al*., 1996) [5]. Environmentally controlled housing system pave way to overcome the ill effects of climatic variation inside the poultry house. Accordingly now-a-days, as advancement in production system, broiler rearing in environmentally controlled houses are coming up for easy operation and exploiting the maximum genetic potential of the broilers. Further, it is very well recognized that feed represents the major significant cost in broiler production which ranges from 60 - 80% of the production cost (Durunna *et al.,* 2005) [3]. Generally energy and protein are key nutrients required for normal body functioning and acting as essential constituents of animal body. Among these, protein having major effect on growth performance of the bird and is also the most expensive nutrient in broiler diets apart from energy (Kamran *et al*., 2004) [7].

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 10th day and the same temperature was maintained till the end of the experiment. The humidity was set at 65 per cent from day one to 5 weeks of age. The treatment groups of the experiment were given in table-1.

Table 1: Treatment groups with different levels of energy and protein

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)			
T_1	Pre-starter	21.5	2850	4	8	32
	Starter	20.5	2950			
	Finisher	19.0	3050			
T_2	Pre-starter	22.5	2850	4	8	32
	Starter	21.5	2950			
	Finisher	20.0	3050			
T_3	Pre-starter	23.5	2850	4	8	32
	Starter	22.5	2950			
	Finisher	21.0	3050			
T_4	Pre-starter	21.5	2950	4	8	32
	Starter	20.5	3050			
	Finisher	19.0	3150			
T_5	Pre-starter	22.5	2950	4	8	32
	Starter	21.5	3050			
	Finisher	20.0	3150			
T_6	Pre-starter	23.5	2950	4	8	32
	Starter	22.5	3050			
	Finisher	21.0	3150			
T_7	Pre-starter	21.5	3050	4	8	32
	Starter	20.5	3150			
	Finisher	19.0	3250			
T_8	Pre-starter	22.5	3050	4	8	32
	Starter	21.5	3150			
	Finisher	20.0	3250			
T_9	Pre-starter	23.5	3050	4	8	32
	Starter	22.5	3150			
	Finisher	21.0	3250			
Total						288

At the end of the experimental period (35th day), four males and four females, totally eight birds from each treatment group were randomly selected and were slaughtered as per the method of Arumugam and Panda (1970) [2] and the abdominal fat was removed and the weight was recorded. The collected data were subjected to statistical analysis as per the method suggested by Snedecor and Cochran (1989) [12]. Angular transformation was applied to percentages wherever needed before carrying out statistical analysis.

Results and Discussion

Table 2: Mean (± S. E.) abdominal fat yield of broilers (expressed as per cent live weight) reared in environmentally controlled housing system at 5 weeks of age as influenced by different levels of energy and protein

Treatment groups	Abdominal fat yield (%)
T_1	$0.81^{a}\pm0.08$
T_2	$0.97^{ab}\pm0.05$
T_3	$0.92^{ab}\pm0.04$
T_4	$1.09^{b}\pm0.04$
T_5	$1.03^{ab}\pm0.05$
T_6	$1.04^{ab}\pm0.06$
T_7	$1.13^{b}\pm0.08$
T_8	$1.02^{ab}\pm0.07$
T_9	$1.16^{b}\pm0.10$

Value given in each cell is the mean of 8 observations

[a & b] Means within a column with no common superscript differ significantly ($P < 0.05$)

Table 3: Mean (± S. E.) abdominal fat yield of broilers (expressed as per cent live weight) reared in open sided housing system at 5 weeks of age as influenced by different levels of energy and protein

Treatment groups	Abdominal fat yield (%)
T_1	$0.89^{ab}\pm0.09$
T_2	$0.73^{a}\pm0.04$
T_3	$0.88^{ab}\pm0.09$
T_4	$0.88^{ab}\pm0.03$
T_5	$0.87^{ab}\pm0.07$
T_6	$0.73^{a}\pm0.06$
T_7	$0.89^{ab}\pm0.04$
T_8	$0.99^{b}\pm0.07$
T_9	$0.87^{ab}\pm0.11$

Value given in each cell is the mean of 8 observations

[a & b] Means within a column with no common superscript differ significantly ($P < 0.05$)

Table 4: Effect of housing system on mean (± S. E.) abdominal fat yield (expressed as per cent live weight) of broilers at 5 weeks of age as influenced by different levels of energy and protein

House/ Treatment	Abdominal fat yield (%)								
	T1	T2	T3	T4	T5	T6	T7	T8	T9
OPHS	0.99	0.73	0.88	0.88	0.87	0.73	0.89	0.99	0.87
EC	0.81	0.97	0.92	0.97	1.03	1.04	1.09	1.02	1.16
't' value	1.49^{NS}	3.67^{NS}	0.45^{NS}	2.06^{NS}	1.82^{NS}	3.79^{**}	2.19^{*}	0.27^{NS}	1.83^{NS}

OPHS - Open sided housing system, EC- Environmentally controlled housing system.
NS- Non significant, * - significant ($p < 0.05$) and ** - highly significant ($p < 0.01$)

The mean (± S.E.) abdominal fat yield of broilers reared in environmentally controlled and open sided housing system as influenced by different levels of energy and protein at 5 weeks of age is presented in Table 2 and 3, respectively and their interaction is presented in 4. The result revealed that in both the housing system, feeding of different levels of energy and protein had significant ($P<0.05$) influence on abdominal fat yield in broilers. In environmentally controlled housing system maximum abdominal fat yield was noticed in T_9 group (1.16%) followed by T_7 group (1.13%) and lowest fat yield was observed in T_1 group (0.81%). In open sided housing system, maximum abdominal fat yield was noticed in T_8 group (0.99%) and lowest fat yield was observed in T_2 and T_6 groups (0.73%). The result indicates that feeding high energy diet resulted in higher fat yield in broilers.

The interaction between feeding different levels of energy and protein and housing system showed that the abdominal fat yield was significantly differed only within T_6 and T_7 group birds, whereas other treatment groups showed a non significant effect with respect to dietary treatments.

Similar to the findings, Al-Batshan and Hussein (1999) [1], Maiorka *et al.* (2005) [9], Zaman *et al.* (2008) [13], Zhuyeniu *et al.* (2009) [14] and Kabir *et al.* (2010) [6] also reported that feeding high energy diet significantly increased the abdominal fat in broilers. Similarly the results are in accordance with the findings of Rezaei *et al.* (2004) [11], Kamran *et al.* (2008) [8] and Manoochehri and Chamani (2012) [10] who also stated that reducing the dietary protein had increased abdominal fat percentage significantly in broilers. This might be due to the reason that decreasing the crude protein content may increase the feed consumption which leads to more fat accumulation in broilers.

Conclusion

In both environmentally controlled and open sided housing system, feeding different levels of energy and protein showed significant ($P<0.05$) influence on abdominal fat yield in broilers. Maximum abdominal fat yield was noticed in T_9 group in environmentally controlled house and in T_8 group in open sided housing system. The interaction between feeding different levels of energy and protein and housing system showed that the abdominal fat yield significantly differed only within T_6 and T_7 group birds, whereas other treatment groups showed a non significant effect with respect to dietary treatments.

Reference

1. Al-Batshan HA, Hussein EOS. Performance and carcass composition of broilers under heat stress: The effects of dietary energy and protein. Asian-Australian Journal of Animal Sciences. 1999;12(6):914-922.
2. Arumugam MP, Panda B. Processing and inspection of poultry. Indian Veterinary Research Institute, Izatnagar, U.P.; c1970.
3. Durunna CS, Udedibie ABI, Uchegbu MC. Effect of dietary inclusion of *Anthoata macrophyla* meal on the performance of starter chicks. Nigerian Journal of Animal Science. 2005;32:268-273.
4. Ghaffari M, Shivazad M, Zaghari M. Effect of energy levels of diets formulated on total and digestible amino acid basis on performance of female broiler. Pakistan Journal of Biological Science. 2007;10(23):4323-4326.
5. Hacina AB, Geraert PK, Padilha JK, Solanage G. Chronic heat exposure enhances fat deposition and modifies muscle and fat partition in broiler carcasses. British Poultry Science. 1996;75:505-513.
6. Kabir MA, Islam KMS, Debi MB, Das SK, Biswas M. Effect of different levels of energy and protein diets on productivity, meat quality and production cost of broilers. International Journal of Biological Research. 2010;2(11):1-5.
7. Kamran Z, Aslam Mirza M, Ahsan-ul-haq, Mahmood. Effect of decreasing dietary protein levels with optimal amino acids profile on the performance of broilers. Pakistan Veterinary Journal. 2004;24(4):248-254.
8. Kamran Z, Sarwar M, Nisa M, Nadeem MA, Mahmood S, Babar ME, *et al*. Effect of low protein diets having constant energy to protein ratio on performance and carcass characteristics of broiler chickens from one to thirty-five days of age. Poultry Science. 2008;87:468-474.
9. Maiorka A, Dahlke F, Penz AM, Kessler AM. Diets formulated on total or digestible amino acid basis with different energy levels and physical form on broiler performance. Brazilian Journal of Poultry Science. 2005;7:47-50.
10. Manoochehri AH, Chamani M. Fortify low protein diet with supplemented essential amino acids on performance, carcass characteristics and whole-body female broiler chickens. Annals of Biological Research. 2012;3:2208-2212.
11. Rezaei M, Moghaddam HN, Reza JP, Kermanshahi H. The effects of dietary protein and lysine levels on broiler performance, carcass characteristics and N excretion. International Journal of Poultry Science. 2004;3(2):148-152.
12. Snedacor GW, Cochran WG. Statistical methods, (8th edn.) Lowa state University Press, Ames, Lowa; c1989. p. xx+503.
13. Zaman QU, Mushtaq T, Nawaz H, Mirza MA, Mahmood S, Ahmad T, *et al*. Effect of varying dietary energy and protein on broiler performance in hot climate. Animal Feed Science Technology. 2008;146:302-312.
14. ZhuyeNiu JSH, Liu F, Wang X, Gao C, Yao L. Effects of dietary energy and protein on growth performance and carcass quality of broilers during starter phase. International Journal of Poultry Science. 2009;8(5):508-511.