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Sudharsan Chinnasamy
 Department of Animal
 Nutrition, CVAS, Pookode,
 Wayanad, Kerala, India

Senthil Murugan S
 Department of Animal
 Nutrition, CVAS, Pookode,
 Wayanad, Kerala, India

Solomon Rajkumar
 Department of Livestock
 Products Technology, CVAS,
 Pookode, Wayanad, Kerala,
 India

Shelcy S Akkara
 Department of Livestock
 Products Technology, CVAS,
 Pookode, Wayanad, Kerala,
 India

Ashitha K
 Department of Livestock
 Production and Management,
 CVAS, Pookode, Wayanad,
 Kerala, India

Renuka Nayar
 Department of Livestock
 Products Technology, CVAS,
 Pookode, Wayanad, Kerala,
 India

Corresponding Author
Sudharsan Chinnasamy
 Department of Animal
 Nutrition, CVAS, Pookode,
 Wayanad, Kerala, India

Effects of oil source on breast muscles of broiler chicken

Sudharsan Chinnasamy, Senthil Murugan S, Solomon Rajkumar, Shelcy S Akkara, Ashitha K and Renuka Nayar

Abstract

Oil source used in broiler diet influences carcass composition by altering fat deposition and fatty acid profile. Thus the study was carried out to evaluate the effect of incorporation of rapeseed oil in broiler ration on breast muscle in broiler chicken. A total of 160 day-old straight run broilers (Vencobb 400) were randomly allotted into four treatment groups (G1, G2, G3 and G4) having four replicates of ten chicks each. The basal diets (G1) were prepared to meet Bureau of Indian Standards (IS 1374; 2007) nutrient requirements included at the rate of 1.5, 3, and 4.5 per cent in pre-starter, starter and finisher ration, respectively. The experimental broiler rations prepared with rapeseed oil replacing 25, 50 and 100 per cent of palm oil in basal diets fed to G2, G3 and G4 group birds, respectively. Six birds from each group were randomly selected and slaughtered on 42nd day to study carcass composition. The dietary inclusion of rapeseed oil decreased ($P<0.001$) crude fat content of its breast muscles compared to completely palm oil fed group. However, other parameters like yield, meat bone ratio, moisture and crude protein were not affected by the dietary fat source. Polyunsaturated rich rapeseed oil and their combination had no negative effects on breast muscle yield but improved meat quality by reducing crude fat content without affecting protein content which is desirable character in consumer's preference.

Keywords: Rapeseed oil, palm oil, carcass composition, broiler

Introduction

In India, poultry industry had a registered growth rate of 16.8 per cent and poultry meat production increased by 7.8 per cent according to 20th census (DAHD, 2020). The poultry nutritionists invariably incorporate various sources of oil (palm oil, mineral oil, rice bran oil) in broiler ration as energy source. The broiler is known to be an efficient food converter into high-quality human food. The broiler meat contains higher protein and low fat content with comparatively better omega-3-fatty acids than other livestock meat. However, dietary fatty acid composition influences carcass quality by altering fat deposition and fatty acid profile (Abdulla *et al.* 2015) ^[1]. Awareness among human beings increased, to include polyunsaturated fatty acids (PUFA) in their diet to prevent diseases like coronary heart disease, hypertension and diabetes etc (Bhalerao *et al.*, 2014) ^[3] and inclusion of polyunsaturated fatty acids rich diet has been shown to have beneficial effects on human health (Katan *et al.*, 1995) ^[9]. The proposed study is to ascertain the effect of rapeseed oil on breast muscle yield and its composition of broiler chicken.

Materials and Method

The feeding experiment was conducted in Instructional Livestock Farm Complex, College of Veterinary and Animal Sciences, Kerala Veterinary and Animal Science University, Wayanad. The growth performance feeding trial was conducted in 160 day-old broilers (vencobb 400) with four treatment groups (G₁, G₂, G₃ and G₄) with four replicates of ten chicks each. The basal diet (R₁) was prepared with palm oil included at the rate of 1.5, 3, and 4.5 per cent in pre-starter, starter and finisher ration, respectively and fed to G₁. The other treatment groups G₂, G₃ and G₄ received R₂, R₃ and R₄ experimental rations respectively. The experimental rations R₂, R₃ and R₄ were prepared with rapeseed oil replacing 25, 50 and 100 per cent of palm oil which was included in R₁. Six birds from each group was slaughtered on 42 day of the study to study the carcass yield.

The birds were euthanized by cervical dislocation and slaughtered. The yield of carcass, cut parts, edible organ and inedible offal's, were calculated based on pre-slaughter live weight basis (Choo *et al.*, 2014) ^[6] and breast muscles were deboned and weighed separately. The

fresh meat was chopped at meat chopper at 3 mm size and mixed thoroughly for chemical composition (AOAC. 2016) [2] analysis. The data obtained in this study were analyzed statistically as per the methods described by Snedecor and Cochran (1994) [12] using the SPSS version 21.0 ® software.

Result and Discussion

The yield and chemical composition of experimental birds of G1, G2, G3 and G4 breast muscles are presented in Table 5. The dietary inclusion of rapeseed oil decreased ($P<0.001$) crude fat content of its breast muscles compared to completely palm oil fed group. However, other parameters like yield, meat bone ratio, moisture and crude protein were not affected by the dietary fat source. The reason for the difference in body fat accumulation was attributed to various

metabolic use of the absorbed dietary PUFA levels, n-6/n-3 ratio and decreased rate of fatty acid synthesis (shahid *et al.*, 2019) [11]. Similar to our findings, Ghasemi *et al.* (2015) [8] and Bostami *et al.* (2017) [5] also reported that crude fat content in meat of canola oil fed group is less than sunflower oil fed group ($P<0.05$) when included at 5 per cent in the broiler ration in the breast muscle. Kavouridou *et al.* (2008) [10] concluded in his research that body fat content of the birds consuming the linseed oil was lower ($P<0.001$) than the body fat of the birds fed the soya bean oil and palm oil which is similar to our findings. Bharath *et al.* (2014) [4] concluded that lower fat content on intramuscular fat in both breast and thigh muscle when vegetable fat of sunflower oil was replaced by linseed oil and fish oil.

Table 1: Effect of oil source on breast muscle in broiler chicken

Attribute	G1	G2	G3	G4	SEM	p-value
Live weight (gm)	2112.00± 66.05	2122.50± 16.94	2251.50± 82.60	2109.50± 24.30	32.429	0.074
Carcass (% L.W)	72.97 ± 0.79	73.85 ± 0.31	73.14 ± 1.04	70.63 ± 1.90	0.607	0.279
Breast Muscle						
Yeild (% L.W)	20.81 ± 0.75	20.78 ± 0.81	21.09 ± 0.21	20.74 ± 0.27	0.261	0.971
Meat : bone	6.26± 0.57	5.59 ± 0.35	6.48 ± 0.44	6.28 ± 0.34	0.213	0.518
Moisture	75.42 ± 0.19	74.44 ± 0.32	75.08 ± 0.25	74.96 ± 0.23	0.145	0.098
Crude protein	20.02 ± 0.10	20.63 ± 0.24	20.50 ± 0.18	20.68 ± 0.25	0.112	0.139
Crude fat	1.68 ^a ± 0.01	1.40 ^b ± 0.04	1.35 ^b ± 0.05	1.36 ^b ± 0.03	0.039	0.000**

^{a,b} and ^c Mean values with different superscripts within a row differ significantly

**Significance at $p<0.01$

*Significance at $p<0.05$

^{ns} Non- significant

Conclusion

It may be concluded that, dietary inclusion that Polyunsaturated rich rapeseed oil and their combination had no negative effects on breast muscle yield but improved meat quality by reducing crude fat content without affecting protein content which is desirable character in consumer's preference.

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