

INFLUENCE OF THREE DIETARY OIL SOURCES ON GROWTH PERFORMANCE, CARCASS CHARACTERISTICS AND LIPID PROFILE IN BROILER

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ABSTRACT

Two hundred and forty one-day-old Arbor Acre broiler chicks were randomly allotted to 4 dietary treatments with 5 replicates of 12 birds each in a completely randomized design. Diet 1 had no oil (control diet), diets 2, 3 and 4 contained control diet with 2.5% soybean oil, 2.5% shea butter oil and 2.5% fish oil respectively in a study that lasted for 42 days. Performance indices and carcass quality were assessed. On day 42, blood sample was collected from the jugular vein of one bird per replicate and assayed for serum metabolites. Birds fed shea butter supplemented diet had lower ($P < 0.05$) average feed intake (2521.30g/b) compared to birds on other diets. Improved average body weight gain ($P < 0.05$) was observed in birds fed soybean oil supplemented diets which was similar to birds on fish oil diet. Similar feed conversion ratio was recorded in birds on the control diet, soybean oil and shea butter oil diets which were significantly ($P < 0.05$) higher than those on fish oil diet. A resembling trend was recorded for gain: feed of birds on experimental diets. Diet had no effect on weights of wings, breast muscle and thigh of birds on dietary treatments. Live weights of birds fed soybean oil and fish oil diets compared with the control diet. Drumstick of birds on shea butter oil differ ($P < 0.05$) significantly from birds fed fish though both similar to those on the control diet and soybean oil diet. There were significant differences observed in the cholesterol, triglyceride, low density lipoprotein and very low density lipoprotein. Identical high density lipoprotein values were recorded for birds on dietary oil sources which were significantly ($P < 0.05$) lower than values obtained for birds on the control diet. Results obtained in the present study showed that three dietary oil sources improved performance, carcass quality and lipid profile of broiler chickens.

Keywords: Dietary fat sources, Performance, Carcass quality, Lipid profile, Broiler.

INTRODUCTION

Fat supplementation in diets has been proven a valuable method for satisfying the high energy requirements of rapidly growing broiler chickens. It has been well documented that the growth performance and feed conversion of the ratio of the broilers are influenced by dietary supplementation with fat (Sahito *et al.*, 2012). High energy diets have been shown to improve growth and feed efficiency in poultry (Zaman *et al.*, 2008). The addition of fat to diets, besides supplying energy, improves the absorption of fat-soluble vitamins, increases the palatability of the rations, and increases the efficiency of the consumed energy (lower caloric increment). Furthermore, it reduces the passage rate of the digesta in the gastrointestinal tract, which allows a better absorption of all nutrients present in the diet. To date, a number of different fat sources are available for poultry from both vegetable and animal sources and from rendering industry (Sanz *et al.*, 2000). Considering diets with

similar nutritive value, chickens fed rations containing oil showed better performance than birds fed diets without oil inclusion (Moura, 2003). Oils of plant origin, such as soybean oil, contain high levels of unsaturated fatty acids and are more completely digested by fowl than animal fats such as tallow. However, mixtures of saturated and unsaturated fatty acids are fairly well utilized. It is known that there is a synergism between animal fats and vegetable oils when added to the poultry diets. Hence, understanding fats and their metabolism is a critical factor when it comes to efficient utilisation of the dietary energy contributed by fat supplementation. The objective of this study was to determine the effects of feeding three dietary fat sources (soybean oil, shea butter oil and fish oil) performance carcass quality and lipid profile in broiler chicken.

MATERIALS AND METHODS

The study was carried out at the poultry unit of the Teaching and Research Farm, University of Ibadan, Oyo state, Nigeria. Two hundred and forty one-day-old arbor acre broiler chicks strain were randomly allotted into 4 diets with 5 replicates of 12 birds each in a completely randomized design. Diet 1 (corn-SBM diet) had no oil while diets 2, 3 and 4 contained the basal diet with inclusion of 2.5% soybean oil, 2.5% Shea butter oil and 2.5% fish oil respectively in a study that lasted 42 days. The feed for both starter (23% crude protein and 3016Kcal/kg metabolisable energy) and finisher (21.0% crude protein and 3014Kcal/kg metabolisable energy) phases were formulated based on the nutritional requirements recommended by the NRC (1994), using basically corn- soyabean meal. Experimental diets and water were supplied *ad libitum*. Feed intake was calculated as difference between amounts given and left over. The birds were weighed weekly and values were used to calculate body weight gain, feed conversion ratio and protein efficiency ratio. On day 42, blood sample was collected from the jugular vein of one bird per replicate for serum biochemical indices. Total serum cholesterol, triglycerides, and high density lipoprotein (HDL) were assayed by the method of Roschlan *et al.* (1974). Very low density lipoproteins (VLDL) were estimated as (triglycerides/5) (Friedewald *et al.*, 1972), while low density lipoproteins (LDL) were estimated using Friedewald equation [$LDL = \text{Total cholesterol} - (\text{HDL} + \text{Triglycerides}/5)$]. Five birds per treatment were selected for carcass measurements. Data were analyzed using descriptive statistics and ANOVA ($P=0.05$) (SAS, 2012). The treatment means were compared using Duncan Multiple Range Test.

RESULTS

Effects of different dietary fat sources on the performance of broiler chickens

The effect of different dietary oil sources on performance of broiler chicken is shown in Table 1. Birds fed shea butter supplemented diet had lower ($P < 0.05$) average feed intake (2521.30g/b) compared to birds on other diets. Improved average body weight gain ($P < 0.05$) was observed in birds fed soybean oil supplemented diets which was similar to birds on fish oil diet. Improved performance was

observed in birds on dietary treatments especially those on fish oil supplemented diet. This result is similar to the reports of Marium *et al.* (2016) who revealed that fish oil positively affected the feed intake, body weight gain, feed conversion ratio. Similar feed conversion ratio was recorded in birds on the control diet, soybean oil and shea butter oil diets which were significantly ($P < 0.05$) higher than those on fish oil diet. A resembling trend was recorded for gain: feed of birds on experimental diets. Das *et al.* (2014) reported that among the dietary oils, birds fed fish oil diet consumed higher amount of feed during the experimental period, which differed from those on other dietary treatments, but this is in contrast with our findings.

Effects of different dietary fat sources on lipid profile of broiler chicken

The effect of different dietary oil sources on lipid profile of broiler chicken is shown in Table 3. There were significant differences observed in the cholesterol, triglyceride, low density lipoprotein and very low density lipoprotein. It was postulated that variation in lipid content is more influenced by bird's genetic strains than diet. Lecerf and Delongier (2011) reported that body compensates for any absorption of additional cholesterol by reducing cholesterol synthesis. Identical high density lipoprotein values were recorded for birds on dietary oil sources which were significantly ($P < 0.05$) lower than values obtained for birds on the control diet. This result was also similar to Schuman *et al.* (2000) who found that laying hens fed with flaxseed, flax oil, or n-3-fatty acid supplement had a reduction in liver lipid content.

CONCLUSION

Results obtained in the present study showed that three dietary oil sources improved performance, carcass quality and lipid profile of broiler chickens.

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Table 1: Effect of different dietary fat sources on performance of broiler chicken

Parameters	Treatments				SEM	P-value
	Control	Control+2.5% soybean oil	Control +2.5% shea butter	Control + 2.5% fish oil		
Average Feed intake g/bird	3399.20 ^a	3142.70 ^a	2521.30 ^b	3097.20 ^a	133.6	0.002
Average body weight gain, g/bird	1552.97 ^b	1658.81 ^a	1477.88 ^b	1583.88 ^{ab}	41.44	0.05
Feed conversion ratio	2.19 ^a	1.89 ^a	2.10 ^a	1.60 ^b	0.1	0.004
Gain feed	0.46 ^b	0.53 ^b	0.48 ^b	0.63 ^a	0.03	0.001

^{ab} Means along the same row with different superscripts are significantly (P > 0.05) different

Table 2: Effects of different dietary fat sources on carcass characteristics of broiler

Parameters (g)	Treatments				SEM	P-value
	Control	Control+2.5% soybean oil	Control +2.5% shea butter	Control+ 2.5% fish oil		
Live weight	1591.40 ^{ab}	1683.40 ^a	1510.00 ^b	1659.80 ^a	47.48	0.08
Wings	104.80	115.00	112.00	115.20	7.58	0.75
Breast muscle	326.40	341.60	328.40	339.40	23.91	0.96
Thigh	139.20	161.20	147.20	132.60	9.88	0.24
Drumstick	161.80 ^{ab}	158.20 ^{ab}	137.40 ^b	179.60 ^a	11.40	0.12

^{ab} Means along the same row with different superscripts are significantly (P > 0.05) different

Table 3: Effects of different dietary fat sources on lipid profile in broilers

Parameters (mg/dL)	Treatments				P value
	Control	Soya oil	Shea butter	Fish oil	
Cholesterol	114.94	98.89	113.31	104.87	0.69
Triglyceride	88.49	98.89	91.56	95.91	0.69
High density lipoprotein	131.56 ^a	84.43 ^b	87.09 ^b	100.84 ^b	0.01
Low density lipoprotein	5.39	6.66	4.09	4.87	0.23
Very low density lipoprotein	19.99	19.77	18.31	19.18	0.73