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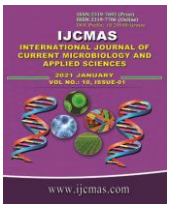

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Effect of Supplementation of Soyabean Oil with Lecithin on Biochemical and Metabolic Study in Broiler

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A B S T R A C T

The experiment was carried out to study the effect of supplementation of soyabean oil with lecithin on biochemical and metabolic study in broiler. Total 240, day old chicks were allotted to 4 groups, T_0-control diet as per BIS 2007 , T_1- T_0+ crude rice bran oil, T_2- T_0+ crude soya oil + Lecithin @ 500gm/ ton of feed and T_3- T_0+ with crude rice bran oil + Lecithin @500gm/ ton of feed with 60 birds in each group having 4 replicates of 15 birds in each. Two birds from each replicate of average body weight were selected and blood samples at the end of 42 days were collected to determine blood biochemical parameters. Metabolic trial was carried out for a period of five consecutive days at the end of 6th week of age and eight experimental birds from each group (two birds from each replicate) representing the average body weight of the group were randomly chosen. From this study, concluded that in case of biochemical study, Cholesterol and Triglyceride found to be significant and HDL and LDL shows non-significant result. In Metabolic study, Nitrogen retention shows significant result and Dry matter digestibility found significant result.

Introduction

India's per capita consumption of poultry meat is estimated at around 3.1 kg per year, which is low as compared to world average of around 17 kg per year. However, oils and oil by products are important components of broiler ration since they are the richest source of metabolizable energy, essential fatty acids and fat-soluble vitamins. They increase the energy density as they yield 2.25 times more calories than carbohydrates and protein. Fat supplemented diets increase the feed efficiency and profitability in poultry. Besides, oil improves the palatability of diets, reduces the dustiness of feed and decreases

the passage rate of feed through the intestinal tract of poultry, which gives more time for the adequate absorption of all nutrients present in the diet (Baiao and Lara, 2005). Studies on adding oil and oil by-products to the poultry diets started in the 1950s and the studies showed that up to 7% oil could be added to the broiler rations successfully (Cullision and Lowrey, 1987).Oils are water-insoluble compounds and their digestion is due to the synergic action of bile salts and pancreatic lipase. Furthermore, bile salts play a key role in the formation of mixed micelles which are subsequently absorbed by the mucosa cells in the small intestine (Krogdahl, 1985). Supplementation of crude soya oil to diets, besides supplying energy, may improve absorption of fat-soluble vitamins, diminishes pulverulence, increases palatability of ration, improve efficiency of consumed energy and reduce the passage rate of digesta in the gastrointestinal tract similar to Refined soya oil contain 180–220 g/kg of good quality oil mainly with a high proportion of linoleic acid (Waldroup, 1982). Rice is the second most important cereal produced in the world and sizeable quantity of rice bran is available as a by-product, which is a good source (12 to 25 g/100g) of edible oil (Roy *et al.,* 2002). Emulsifiers can be used to improve fat digestibility and energy efficiency. Emulsifiers facilitate the formation of emulsion droplets, which lowers the surface tension (Ashraf, 2007), stimulates the formation of micelles, causes high levels of monoglycerides in the intestine and facilitates the nutrient transport through the membrane (Melegy*et al.,* 2010). However, supplementation of emulsifiers in diet elevate digestibility of nutrients, but has less effect on carcass traits and growth performance (Xing *et al.,* 2004; Jones *et al.,* 1992). Low cost emulsifying agents or detergents which transform a hydrophobic surface into a hydrophilic environment have been used to increase fat digestibility in young chicken (Al-Marzooqi and Leeson, 1999). The emulsifier improved digestibility of dry matter and fat and also improves metabolisable energy (AMEn) in broiler diets. Hence, the present experiment was planned to access the effects of different dietary crude oil sources with lecithin on the broiler biochemical and metabolic study.

Materials and Methods

The experiment was carried out on total 240, day old commercial broiler chicks for a period of 42 days.The day old two hundred fourty commercial broiler chicks (cobb 430) were randomly distributed into four equal treatment groups having four replication of fifteen chicks in each. All the experimental birds were reared on deep litter system replication wise in different pens upto six week period. Uniform standard management practices were followed throughout the experimental period. The broiler control diet pre-starter, starter and finisher in mash form were formulated having CP content 23, 22 and 20 per cent and 3000, 3100 and 3200 Kcal/kg ME, respectively as per BIS 2007.Treatment diets were prepared as T_{0-} Standard broiler chicken diet as per BIS, 2007 with crude soyabean oil; T_{1-} broiler chicken diet as per BIS, 2007 with crude rice bran oil; T_{2-} broiler chicken diet as per BIS, 2007 with crude soyabean oil and lecithin; T_{3-} broiler chicken diet as per BIS, 2007 with crude rice bran oil and lecithin. Blood samples from eight birds of each treatment (two from each replicate) were collected at the end of experiment and serum was separated by centrifugation at 3000 RPM for 10 minutes and stored at -20^0c till further analysis. Biochemical parameters included estimation of Cholesterol, HDL, LDL and Triglyceride using biochemical kits manufactured by AGD Biomedicals (P) Ltd. Mumbai, India with the help of AGD Biochemistry Auto-analyzer. In order to estimate nitrogen retention and dry matter

digestibility, metabolic trial was carried out for a period of five consecutive days at the end of 6th week of age. In this trial, eight experimental birds from each group (two birds from each replicate) representing the average body weight of the group were randomly chosen and housed in metabolic cage with provision of separate feeders and drinkers. The arrangement was also made for collection of excreta using clean dry polythene sheet spread over the dropping trays of metabolic cages. On first day, the polythene sheet was spread over the dropping trays and birds were offered weighed quantity of experimental diets. The representative samples from each group were drawn. As 1/5 th part of excreta preserved in 10 percent H_2SO_4 for Nitrogen analysis and 50 gm for oven drying for further analysis as per A.O.A.C. (2012).The data was analyzed by using Statistical Package for the Social Sciences (SPSS) Version 17.0. The differences between means were subjected to ANOVA by univariate analysis using General Linear Model. The Significant differences among treatment means were separated by using Dunccan's Multiple Range test and considered as significant when P–value was less than 0.05.

Results and Discussion

The data regarding Biochemical study depicted in table 2. The mean value for cholesterol for different treatment groups were T_0 – 141.60±2.54, T_1 – 139.25±2.19, T_2 – 120.01±1.18 and T_3 – 122.88±0.88 respectively with pooled mean value 130.93±1.92. The mean values for HDL were for T_0 – 58.10±1.67, T_1 – 60.49±0.85, T_2 – 58.19±0.89 and T_3 – 59.76±0.76 respectively with pooled mean values 59.14±0.55. The mean value for LDL was for T_0 – 79.66±1.28, T_1 – 79.79±1.37, T_2 – 78.58±1.31, T_3 - 78.28±0.90 respectively with pooled mean value 79.08±0.59. The mean values for triglyceride were for T_0 – 142.14±3.22, T_1 – 134.74±2.51, T_2 – 87.92±0.41, T_3 – 88.16±0.34 respectively, with pooled mean value were 113.24±4.65. The data pertaining to blood biochemical values revealed significant differences for cholesterol and triglyceride where as HDL and LDL were found to be non-significant. In case of Cholesterol, these findings were in accordance with Huang *et al.,* (2007), Lechowski *et al.,* (1999), Kim *et al., (*2008), Siyal *et al., (*2017) who found that diet supplemented with lecithin had lower serum cholesterol. HDL finding corroborate with the Anitha *et al., (*2006), Kim *et al., (*2008), Guerreiro *et al., (*2011) observed that HDL level did not differ significantly between treatment groups. LDL readings corroborate with the Anitha *et al., (*2006) and Melegy *et al.,* (2010) observed that LDL level did not differ significantly between treatment groups. Triglyceride findings were in accordance with Huang *et al.,* (2007), Guerrerio *et al.,* (2011), Siyal *et al., (*2017), Raju *et al., (*2017), Park *et al.,* (2017) found that birds fed with lecithin had lower serum triglyceride. In contrast to the present finding, Kang and Kim (2016) observed that the feeding the diet containing increasing amount of rice bran oil to birds increased the concentration of total cholesterol. Kim *et al.,* (2008) reported that there was increased in the lecithin level of the diet. The data pertaining to metabolic study depicted in table 3. The mean value for dry matter digestibility (%) were T_0 - 62.77±0.79, T_1 - 61.87±0.47, T_2 - 62.96±0.47, T_3 - 63.64±0.60 and the pooled mean was 62.81±0.30. However, dry matter digestibility percent was better in treatment group T_3 (63.64±0.60) as compared to other treatment group.

Table.1 Percent ingredient composition of broiler

Ingredient	Prestarter				Starter				Finisher			
	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3	T_0	T_1	T_2	T_3
Maize	51	50.16	51	50.16	52.02	52.49	52.02	52.49	57.01	56.41	57.01	56.41
Soybean (DOC)	40.91	41.08	40.91	41.08	38.5	38.4	38.5	38.4	33.05	33.17	33.05	33.17
Crude oil	3.74	4.33	3.74	4.33	5.25	5.48	5.25	5.48	6.05	6.73	6.05	6.73
L-Lysine	0.1	0.18	0.1	0.18	0.05	0.05	0.05	0.05	0.05	0.03	0.05	0.03
DL-Methionine	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.18	0.19	0.18	0.19
Limestone powder	1.05	1.11	1.05	1.11	1.12	1.05	1.12	1.05	1.12	1.1	1.12	1.1
Dicalcium Phosphate	1.65	1.60	1.65	1.60	1.93	1.4	1.93	1.4	1.57	1.40	1.57	1.40
Trace-mineral mix	0.5	0.5	0.5	0.5	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Vitamin mixture	0.3	0.3	0.3	0.3	0.15	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Salt	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Choline chloride	0.1	0.1	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Coccidiostat*	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
Toxin binder*	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Lecithin*	-	-	0.05	0.05	-	-	0.05	0.05	-	-	0.05	0.05
Total	100	100	100	100	100	100	100	100	100	100	100	100

Table.2 Blood biochemical observations

Parameter / Treatment	Cholesterol	HDL	LDL	Triglyceride
T_0	$141.60^{b} \pm 2.54$	$58.10^{a} \pm 1.67$	$79.66^{a} \pm 1.28$	$142.14^{c} \pm 3.22$
T_1	$139.25^{b} \pm 2.19$	$60.49^{a} \pm 0.85$	$79.79^{a} \pm 1.37$	$134.74^{b} \pm 2.51$
T_2	$120.01^{a} \pm 1.18$	$58.19^{a} \pm 0.89$	$78.58^{a} \pm 1.31$	$87.92^{a} \pm 0.41$
T_3	$122.88^{a} \pm 0.88$	$59.76^{a} \pm 0.76$	$78.28^{a} \pm 0.90$	$88.16^{a} \pm 0.34$
Pooled Mean	**130.93 ± 1.92**	**59.14 ± 0.55**	**79.08 ± 0.59**	**113.24 ± 4.65**

Treatment means in the end column bearing common superscripts does not differ significantly (P<0.05).

Table.3 Metabolic trial

Treatment	T_0	T_1	T_2	T_3	Pooled mean
Dry matter Digestibility,%	62.77^{a} ±0.79	61.87^{a} ±0.47	62.96^{a} ±0.47	63.64^{a} ±0.60	**62.81 ±0.30**
Nitrogen Retention, %	68.45^{a} ±0.82	68.65^{a} ±0.34	70.80^{b} ±0.41	70.03^{ab} ±0.47	**69.48 ±0.31**

Treatment means in the end column bearing common superscripts does not differ significantly (P<0.05)

The differences among all treatments were found to be non-significant. All the treatment groups exhibited better nitrogen retention as compared to control group (T_0). However, nitrogen retention percent was significantly better in treatment group T_2 (70.80±0.41) as compared to other treatment groups. Significant differences were observed among different groups. The results of nitrogen retention in the study are in accordance with Schwarzer and Adams (1996) reported that addition of phospolipid in feed supplement promotes the absorption of nutrients. Huang *et al.*, (2007) observed that different soyaoil and soy-lecithin had no-significant effect on dry matter digestibility. Zampiga *et al.*, (2016) reported that the emulsifier had no significant effect on digestibility of dry matter. However, Park *et al.*, (2017) stated that effect of dietary supplementation of lysolecithin emulsifier has higher nutrient retention.

In conclusion, broiler chicken fed crude soybean oil with lecithin in diet lead to decrease cholesterol and triglyceride and improved dry matter digestibility and nitrogen retention.

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