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EFFECT OF DIETARY FATS ON CHICKS BODY GROWTH AND SERUM LIPIDS OF BROILER

SHAFIQ AHMAD KHAN, AFTAB BEG CHUGHTAI, LUBNA KHALID, AKMAL JAVED AND SAGHIR AHMAD JAFRI*
PCSIR Laboratories Complex, Lahore, Pakistan

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Blood lipid profile as a function of dietary fat was studied by carrying out nutritional trials on day old chicks (120) that were fed rations containing palm oil, hydrogenated cottonseed oil and soyabean oil (control) for six weeks. The parameters studied were total serum lipids, triglycerides, total cholesterol, low density and high density lipoprotein cholesterols as well as feed efficiency of the birds. A comparison of these parameters in the three fat treatments is discussed.

Key words : Fats, Lipid, Broiler chicks.

Introduction

In recent studies, the physiological effects of palm oil on humans [1] and albino rats [2] were compared with those of hydrogenated vegetable oils and butter oil. It was observed that diets containing palm oil resulted in better blood lipid picture than the other fats studied. The former lowered the low density lipoprotein cholesterol and raised the high density lipoprotein cholesterol. A literature survey revealed that no work has so far been carried out on the influence of different vegetable fats on the chick growth and blood lipids. As these were important aspects, the present study was undertaken to compare diets containing palm oil, hydrogenated cottonseed oil and soyabean oil (a polyunsaturated fat) not only to look into the blood lipid picture but also to see its effect on the body growth of the broiler chicks. The ratio of fat calories to total diet calories has also been taken into consideration; this was necessary as Hyghebarert *et al.* [3] claimed that the addition of 9% vegetable fat to rations high in soyabean meal did not in any way prove superior for the body growth rate and did not improve the free fatty acid distribution in the serum. It had also been pointed out that chicks diets containing different amounts of saturated fatty acids resulted in inferior meat quality compared with a control diet containing soyabean meal [4].

Materials and Methods

One hundred and twenty broiler chicks (day old) were reared for a period of six weeks. The birds were divided into groups of 40 each on the basis of diet fed during the trial period.

1. Hydrogenated cottonseed oil group.
2. Palm oil (refined, bleached and deodrised) group.
3. Control group (without any added fat).

The diets of first two groups had 3% fat added to them. Every feed supplied on the average, 3160 calories per kg and contained 21.7% crude protein. The oil fed groups had about 19.9% calories supplied through fat in comparison with control group where the fat supplied 11.2% calories. However, all the groups were fed isonitrogenous and isocaloric rations. The weight gain and feed consumption were recorded weekly (Table 1). The blood samples for plasma lipids were collected from the hearts of the chicks after every two weeks interval. They were submitted to determination of total lipids, cholesterol, low density lipoproteins, high density lipoproteins and total glycerides by using diagnostic kits from Boehringer-Mannheim. The absorbances were noted on a Schmidzu double beam spectrophotometer at wavelengths prescribed by the manufacturers of these kits.

TABLE 1. THE AVERAGE FEED CONSUMPTION, WEIGHT GAIN AND FEED EFFICIENCY AS INFLUENCED BY DIFFERENT FAT TYPES.

Rations	No. of chicks	Initial weight (gm)	Final weight (gm)	Weight gain (gm)	Feed Consumed (gm)	Feed effi-ciency	Morta-lity
Control	40	40	1249	1209	2200	1.81	1
Cottonseed oil based	40	40	1150	1110	2225	2.00	2
Palm oil based	40	40	1220	1180	2175	1.84	1

TABLE 2. AVERAGE BLOOD LIPID PROFILE AS INFLUENCES BY DIFFERENT FAT TYPES.

Rations	Weeks fed	Total lipids	Total glycerides	Total cholesterol	Low density lipoproteins	High density lipoproteins
Control	2	1070.94	145.09	202.96	174.51	56.25
	4	1023.65	170.24	195.05	06.52	49.10
	6	952.71	156.56	169.05	102.53	39.01
Cotton seed oil based	2	1075.42	165.72	165.03	38.06	33.22
	4	1083.36	174.58	179.52	60.03	26.41
	6	942.57	141.74	135.41	45.85	25.34
Palm oil based	2	969.50	173.78	217.92	121.82	31.67
	4	1198.00	169.48	213.18	138.08	34.63

The statistical analysis of the data was performed using randomised block design as described by Steel *et al.* [5]. The oils incorporated in the diets were converted into their methyl

*College of Veterinary Sciences, Lahore.

TABLE 3. FATTY ACID COMPOSITION OF THE OILS USED.

	Saturated fatty acids						Mono-unsaturated		Polyunsaturated		
	C_{10}	C_{12}	C_{14}	C_{16}	C_{18}	C_{20}	$C_{16:1}$	$C_{18:1}$	$C_{18:2}$	$C_{18:3}$	C_{20}
Hydrogenated cottonseed oil	–	T*	0.08	23.9	3.6	0.5	–	48.6	23.08	0.5	–
Soybean oil	T*	T*	0.5	11.0	4.5	0.5	–	22.0	53.0	8.0	0.5
Palm oil	–	–	1.0	43.0	5.0	0.5	0.5	40.0	10.0	T*	–

*Traces

esters by the method of Kumar *et al.* [6] and analysed by gas liquid chromatography (Table 3).

Results and Discussion

The average weight gain and feed efficiency after six weeks of feeding for control, hydrogenated cottonseed oil and palm oil groups were 1209 g and 1.81, 1110 g and 2.0 and 1180 g and 1.84 respectively. Statistically the differences were non-significant. However, the control and palm oil groups showed better feed efficiency (Table 1).

The blood chemistry data corresponding to blood samples taken after second, fourth and sixth weeks is presented in Table 2. The overall total lipids values correlated with that of Sturkie [7]. The triglyceride contents of plasma did not show any consistent pattern in control and cottonseed oil groups. However, the palm oil group showed significant decrease as the period increased. The cholesterol contents showed a significant and consistent decrease in control and palm oil groups. In the hydrogenated cottonseed oil group, cholesterol levels increased in the fourth week and significantly decreased after sixth week in all the groups. The high-density-lipoprotein cholesterol contents decreased as the feeding period increased in the case of control and cottonseed oil groups but in palm oil group this parameter increased significantly with increase in time of feeding; a plus point for any fat from the point of view of cardiovascular diseases.

The fatty acid composition of the hydrogenated cottonseed oil and palm oil that were used in this study are shown in Table 3. The other feed components except added fat were the same in all the three groups. The palm oil addition lowered cholesterol and low density lipoprotein cholesterol and increased the high density lipoprotein cholesterol. This might well be the effect of tocotrienol contents of palm oil which is known to have cholesterol lowering property. The overall weight gains trend may be due to the influence of stress of hot and humid July-Aug. weather in which the experiment was conducted.

It may be concluded that the fatty acid profile of extra fat added to the ration in order to make it cheaper might be a factor to be considered if the blood lipid levels have to be normalised. Further trials would be followed to determine the detailed effect of individual fatty acids on blood lipid fractions in serum of chicks.

Mortality. One bird died in control group, two in hydrogenated cottonseed oil group and one in palm oil group. The mortalities were faced in the second week of the experiment.

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