Summary and Conclusion
The main function of fats in the body is to provide energy. Fats are the richest source of energy to the body, but they are more expensive than carbohydrates. Apart from energy supply, fats also help in forming the structural materials of cells and tissues such as cell membranes and other organelle components. Fats can also be stored in the body for subsequent use. They fulfill important functions in our diet. It is a source of essential fatty acids i.e., \( \omega 3 \) and \( \omega 6 \) polyunsaturated fatty acids (PUFA). These two types of fatty acids (\( \omega 3 \) and \( \omega 6 \)) maintain physiological homeostasis in animals. Each PUFA synthesize different eicosanoids (prostaglandin and thromboxane). PUFAs cannot be synthesized \textit{de novo} by animals; therefore they must be obtained through diet. Linoleic acid (9,12-octadecadienoic acid, 18:2\text{n}6) and alpha-linolenic acid (9,12,15-octadecatrienoic acid, 18:3\text{n}3), the precursors of PUFAs, are known as essential fatty acids.

Fatty acid profiles of the tissue depend on dietary lipids. PUFAs were shown to reduce blood cholesterol and artherosclerosis in man and animal. In the present study broiler chick, \textit{Gallus domesticus} was selected as experimental model to study the effect of various fats of different origin on lipid metabolism. The work has been aimed to lay emphasis on the quality and quantity of lipid in a diet. Since human beings are consumers of poultry birds, the flesh lipid quality would obviously help us to maintain our physiological homeostasis.

The main problem of the investigation was to increase the sustainable level of \( n3 \) and/or \( n6 \) PUFA so that the consumer of these animals get benefit by synthesizing
sufficient amount of metabolically active compounds required for being in a “well being state”.

Based on the fatty acid compositions three oils were selected (coconut oil, sunflower oil and sardine fish oil). Coconut oil was having around 60% of the saturated fatty acids and 26% of monounsaturated fatty acids. Sunflower oil contained around 60% of linoleic acid (precursor of \(n_6\) series). In contrast, the fish (sardine) oil was having 25% of \(n_3\) fatty acids (including \(\alpha\)-linolenic acid, eicosapentaenoic acid and docosahexaenoic acid). When different concentrations (2.5%, 5% and 10%) of these oils were mixed differently with the commercial feed, it did not alter significantly the proximate composition of the diet except the percent crude fat and to some extent the ash content. Exogenous addition of lipid to the commercial feed also altered the fatty acid and lipid profiles of the diet.

7 days old chicks were fed commercial feed supplemented with different doses (2.5%, 5%, and 10%) of the selected oils for 15 days and 30 days.

Our study with marine bacteria depicted significant conversion efficacy of \(\alpha\)-linolenic acid when they were grown in sodium acetate medium. The diets were formulated by mixing the bacteria with commercial feed and the proximate composition as well as fatty acid profiles were estimated. These prepared diets were fed to different groups of birds.
When the chicks were fed with the commercial feed supplemented with coconut oil and sunflower oil, a significant increase in the level of total protein concentration was observed in all the tissues of the birds after 30 days of feeding. However, when the birds were fed commercial feed supplemented with fish oil, tissue total protein level was elevated 15th day onwards.

When the commercial feed of chick was supplemented with different bacterial strains (with higher concentration of alpha linolenic acid), augmentation of total protein in the liver and pectoral muscle was noticed after 15 days of feeding.

There was a significant change in the lipid (triacylglycerol, cholesterol and phospholipid) content of the liver, pectoral muscle and intestine of the birds fed with coconut oil, sunflower oil and fish oil for 15days and 30 days. With the supplementation of bacterial strains the triacylglycerol and cholesterol concentrations were increased significantly after 15 and 30 days of feeding. The similar change was observed in phospholipid concentration except in birds supplemented with B2 strain of bacteria for 30 days.

The fatty acid profiles of the different tissues were also greatly affected with dietary supplementation of the oils/ bacteria.

There were marked changes in the serum lipid profiles of the chicks supplemented with different oils and bacteria. The significant increase in HDL cholesterol with significant decrease in reduction in LDL cholesterol in serum were prominent with the
supplementation of sunflower oil and fish oil and B2 strain of bacteria. It was evident from the activities of 3-HMG CoA reductase and 3 - HMG CoA synthase that the cholesterol metabolism was modified with the supplementation of different oils and bacteria.

Best results were obtained by supplementing 5% sunflower oil and 10% fish oil and B2 bacterial strain. These were further confirmed by checking the liver function test (by studying the activities of alkaline phosphatase and glutamate pyruvate transaminase) and cardiac functions tests (by studying the activities of glutamate oxaloacetate transaminase and lactate dehydrogenase) and the birds were found to maintain the activities of these enzymes.

From all these facts it is been concluded that varying the dietary levels of EFA and n3 PUFA, the fatty acid composition of n3 and n6 PUFA can be modified. The commercial feed contains about 6% of lipid (of which about 50% is the linoleic acid) required for the better performance of the poultry birds during the post hatching growth and development. However, from the present study it is recommended that the exogenous supplementation of sunflower oil (5%) or fish oil (10%) for better growth performance and to maintain the birds in a healthy state. Some bacteria (for e.g. strain B2) of marine source can meet the demand for the requirement of alpha linolenic acid in the birds.

The changes in the PUFA profiles of the tissues reflect on the production potentiality of different kinds of eicosanoids, which act in antagonistic fashions to
enhance the defense mechanism of poultry birds to give protection against various diseases. It also stimulates steroid biosynthesis and controls the different physiological functions, resulting into a healthy growth.

In conclusion, the amount and type of fat consumed is the focus of much interest on maintaining the good health. It is not the quantity, rather the quality of the fat intake that determines the “well being state”.

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