INTRODUCTION

Importance of Fat:

Fats have always had a special place in the diet of man. They are important because of their high calorific value - 2.25 times that of equal weight of carbohydrates or proteins but perhaps more important are the non-caloric functions. These include such things as vitamin carrying function as well as direct vitamin like activity of the essential fatty acids. It improves palatability and other qualities of foods. When properly distributed among the muscle fibres of meat, fats contribute to its tenderness and also have a general lubricating effect for the passage of otherwise dry foods through the mouth.

Dietary fat is not only necessary as a nutritional component but as a component vital to life and to the structure of cell itself. Fat is present in the muscle tissues as visible fat and as invisible fat in the actin and myosin, which are vital protein components of the individual cells of muscles. This fat is very complex and is combined in the protein in the manner still largely unknown. It can not be removed from the living cells without fatal injury to it.
Dietary fat is also essential to many physiological processes in the body. It has a protein sparing value, is needed for optimum utilization of lactose and serves as a carrier for fat soluble vitamins. Dietary fat is beneficial in stress situation, such as injury due to radiation or excessive exposure to cold. The fat deposited around the vital organs, such as kidneys, serves to protect them against mechanical injury, and the fat deposited under the skin serves as an effective heat insulator.

Squalene, the unsaturated hydrocarbon \( \text{C}_{30}\text{H}_{50} \) first observed in certain shark liver oils and later found to be widespread in small amounts, is important as an intermediate between acetate and lanosterol in the biosynthetic pathways leading to cholesterol. Fats also contain new substances such as the ubiquinone, dolicol etc. which are perhaps more important in metabolism than in nutrition.

**Milk fat:**

For a long time, the nutritive value of milk was taken for granted and it was regarded as a perfect food. The reason for this belief was that in countries where milk and milk products contribute a considerable part in the diet the
physical and mental health of the people was observed to be quite superior. Early scientific investigations on milk seem to confirm these experiences. In fact, milk played an important role as a research material in the discoveries of many vitamins and thus found its place in the centre of the growing science of nutrition.

One of the most important constituents of milk is the lipid material, which plays a significant role in milk as such and in its products. Milk-fat is primarily of importance from the viewpoint of (1) Economics (2) Nutrition (3) Flavour (4) Physical properties.

(1) Milk-fat has always an important bearing on the economics of milk and its products. In fact it is only since last decade that the true worth of non-fat milk solids has been recognized and though the picture has been considerably changed in the recent years, milk-fat still plays a very significant role in determining the price of milk and milk products.

(2) Milk-fat serves as a rich source of energy, just as the other fats, yielding approximately 9 kilocalories per gram. It also serves as a carrier of fat-soluble vitamins A, D, E, and K and contains so-called Essential Fatty Acids.
The most important role which the milk-fat plays in dairy products concerns flavour. The rich pleasing flavour of milk-fat is not adequately duplicated by any other types of fat.

The fine body and texture which make the dairy products most appealing to the consumer are primarily determined by the milk-fat. It imparts soft and smooth structures to the milk products.

Among the major food fats, milk-fat is of interest because of its intended use directly as food for the newly born animal. The fat of the egg yolk is the only other animal fat intended solely for this purpose. The milk-fats contain a great variety of fatty acids and are characterised particularly by their content of short chain fatty acids C₄-C₁₀ and of those in the monoethenoid series from decenoic through octadecenoic. These triglycerides of milk-fat are synthesised from feed, depot fat and rumen metabolism. The low melting point and the physical state made it 100% digestible and the specific composition of the fatty acids was considered superior to that of the vegetable fats. As a carrier of fat soluble vitamins, especially vitamin A, milk-fat further contributes
essentially to the supply of this vitamin in the human diet. In addition to vitamin A, milk-fat also contains pro-vitamins A and D and other fat soluble vitamins.

Importance of fatty acid make up:

Both, oils and fats of animal or vegetable origin are mixtures of mixed glycerides of fatty acids of low and high molecular weights. In these again the glycerides of high molecular weights are made up of saturated or unsaturated acids. Whenever the oils or fats are introduced into the human systeme their assimilability and digestibility are dependant upon the nature of the acids. The glycerides of saturated acids of high molecular weights are not digestible and therefore load the human systeme and pass off undigested and unassimilated. They are therefore, likely to do some harm to the systeme and do no good whatsoever. This is mainly due to the fact that the glycerides of the saturated acids of high molecular weights have melting points higher than that of the body temperature itself. The substances like mutton and beef-tallows, having more number of higher fatty acid, are less useful to the human systeme. The liquid glycerides of the unsaturated acids of high molecular weights particularly those of oleic and linoleic acids, on the contrary, are not harmful as those of corresponding stearic glycerides of about the same molecular weights. These
are easily absorbed and are known to be beneficial. The glycerides of low molecular weights ranging from those of butyric to myristic are known to be easily digested and assimilated by the system because of their very low melting points. In the mixed glycerides the proportionate percentage of the glycerides of saturated acids of high molecular weights on the one side and of the glycerides of either unsaturated acids or acids of low molecular weights on the other, decides the comparative assimilability and digestibility of any given oil or fat. The presence of free fatty acids in any oil either arising out of the natural cause or as a product of rancidity is always harmful to the human system and that is why it is always advisable to refine and remove the free fatty acids from all edible fats and oils. Fats, thus play a very important role in the human diet and therefore, it is necessary to know their composition, structure and properties to understand their digestion, absorption and metabolism. In order to have a comparative idea of the nutritive value of any given oil, it is necessary to know its exact fatty acid composition to decide its usefulness as a food. So far the estimations of the fatty acids in oils and fats were more or less limited as the methods of estimations of some fatty acids were not available or they were more laborious and tedious for some. With the advance in the research in analytical methods gas chromatographic methods have
been developed which now make it possible to estimate the fatty acids more accurately and with more details. Consequently the nutritive value of any fat can be judged more minutely.

The present work consists of a comparative study of the fatty acid composition of cow and buffalo butter fats by using gas chromatographic methods. It also includes studies on the effect of some factors on the fatty acid composition of butter fats.