

## LIPIDS/ FATS

“Lipids are group of compounds soluble in organic solvents (chloroform, ether, carbon tetrachloride and petrol) and insoluble in water.”

This group includes: waxes, carotenoids, steroids, fats and oils.

Chemically, lipids consist of carbon, hydrogen and they also contain oxygen in their structure.

### Fats and Oils

“Fats and oils are esters of saturated or unsaturated fatty acids with glycerol.”

**Fatty acids** are building block of fats.

When one molecule of fatty acid combines with one glycerol then **monoglyceride** is formed.

When two molecules of fatty acid combine with one glycerol then **diglyceride** is formed.

Three molecules of fatty acids reacting with one glycerol give rise to **triglyceride**.

### Types of fatty acids

1. **Saturated fatty acids** have only single bond.

Examples: Butyric in butter

Caproic in butter

Caprylic in coconut

2. **Unsaturated fatty acid** contains more than one double bond.

Further 2 types:

□ **Monounsaturated fatty acids** contains one double bond

Example: Palmitic acid in palm oil , Oleic acid in olive oil

□ **Polyunsaturated fatty acid** contains more than one double bond

Examples: Linoleic acid in linseed, Linolenic in soybean

### **Properties of fats and oils**

1. Fats are solid at room temperature due to presence of more saturated fatty acids and they have high melting point.
2. Oils are liquid at room temperature due to presence of more unsaturated fatty acids and they have low melting point.
3. Fats and oils are immiscible in water but they can be mixed with the help of emulsifier.
4. Fats and oils react with alkalies to form soap.

### **Smoke point**

Fats and oils produce smoke when heated above 200°C. The smoke point of vegetables oils is higher than that of animal fat. That's why vegetable fat should be used for deep frying.

## **Flash point**

The temperature at which fats and oils start ignite, completely burned and broken in to its constituents known as Flash point.

Triglycerides -----□ Glycerol + free fatty acid

Free fatty acids are not good for health. These free fatty acids become carcinogenic on continuous burning.

## **RANCIDITY**

“When fats and oils are stored for long periods, changes in odour occur and the commodity is regarded as spoiled.”

### **2 Types of rancidity**

#### **Oxidative rancidity**

In this type oxygen is responsible for the rancidity which is catalyzed by inorganic elements in the presence of light and high temperature .Oxygen initiates / starts this reaction and free fatty acid radicals produce at the start of oxidative process. After that hydroperoxides and peroxides are produced which later breakdown into odorous compounds such as aldehydes, ketones and alcohols having bad smell and taste.

#### **Hydrolytic rancidity**

Fats and oils react with water in the presence of lipase enzyme. Lipase enzyme is naturally present in fats and oils. This enzyme breakdown fatty acid glycerol bond and produce free fatty acid radicals. After that hydroperoxides and peroxides are produced which later breakdown into odorous compounds such as aldehydes, ketones and alcohols having bad smell and taste.

#### **Prevention of Oxidative and Hydrolytic rancidity**

□ Lipase enzyme can be denatured by heat.

- Store fats and oils in air tight containers in a dark and cool place.
- Addition of antioxidants such as tocopherol (vitamin E) which helps to retain the natural characteristics of fats and oils.

### **Applications and sources of fats and oils**

#### **Applications:**

- Baking
- Frying
- Cooking
- Preservation

#### **Sources:**

- Animal source (Butter, ghee, tallow)
- Plant source (cotton seed oil, ground nut, soybean oil, canola oil, corn and sunflower oil)

## **Nutritional significance of fats and oils**

- Fats and oils after digestion provides 9 kcal of energy/ gram
- The excess fat consumed by individual is stored in the body and serve as energy reserve in time of need.
- The stored fat in adipose tissues provides insulating layer between skin and body
- Fat around the delicate organs such as kidneys protects them from physical injury
- Fats and oils are good source of essential fatty acids and fat soluble vitamins (A, D, E, K).