

FATS AND OILS

1. Fats and oils are those which are saponifiable.
2. Fats are composed of solid tri-esters of glycerol, while oils are composed of liquid tri-esters of glycerol at room temperature.
3. Fat and oils (oils are just fats which are liquids at ordinary temperature), also referred to as lipids, constitute one of the three major classes of food, the other two being carbohydrate and proteins.

Chemically, there is no difference between oils and fats. The differentiation between fat and oils is mainly based upon the difference in melting points.

Oils and fats are natural products. These are widely distributed in plant and animal kingdoms.

Classification

Oils may be classified on two basis-

A. Depending on their origin

- a. Vegetable oils
 - b. Animal oils
 - c. Mineral oils
 - d. Essential oils
- a. Vegetable oils-** Plants store large quantity of fat in their seed, root and fruit. They contain phytosterol. They are used in food and high fat content, eg. peanut, soyabean oil, corn oil, coconut oil.
- b. Animal oil-** In animals, fats are deposited around skin and around kidney and intestine. They contain cholesterol eg. lard oil. They are used in industries for soap making.
- c. Mineral oils-** They are obtained from petroleum and consist of a mixture of saturated and unsaturated hydrocarbons. They are insoluble in water and non-edible. They are used for burning purpose. Example: Kerosene, gasoline.
- d. Essential oils-** These are found in various plants. These are named due to their fragrance (essence). These are highly volatile liquid. These are used in perfumes and pharmaceutical industries. Eg. Clove oil.

B. Depending on their drying ability

On this basis, oils are of three types-

1. Drying oils
 2. Semidrying oils
 3. Non drying oils
- 1. Drying oils-** These spread in thin layers over a smooth surface and when exposed to light and air for few hours set as a hard (water-proof film). This process is called drying.
- The mechanism of drying appears to be complicated process involving oxidation, polymerisation and colloidal gel formation. It is catalysed by various metallic oxides (eg. lead oxide).

They have iodine value above 120. These are glycerides of highly unsaturated acids. They are used in paints and in manufacture of oil cloth, eg. linseed oil.

2. **Semidrying oils**- They have some degree of unsaturation in C chains. They have a tendency of becoming thick in air without actually undergoing drying at ordinary temperature. It is due to slow oxidation.

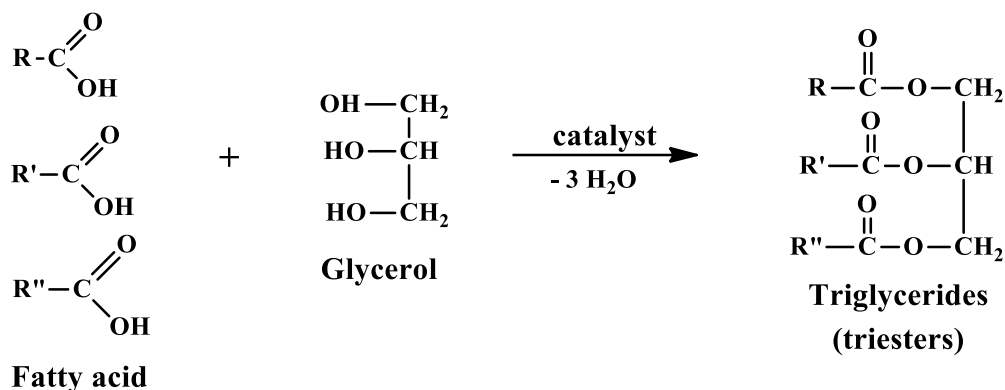
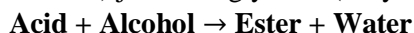
Iodine value = 90 to 120.

These are used as a cooking oils and low grade oils used in manufacture of soaps, eg. cotton- seed oil.

3. **Non-drying oils**- In these oils, C chain is saturated. They do not thicken on exposure to air. Iodine value less than 90. They are used as edible oils, soap making and for lubrication purpose. Eg. Castor oil, olive oil.

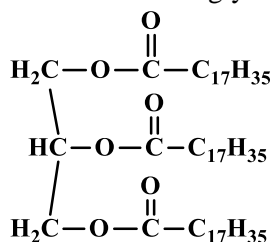
Chemistry of Oils/ Fats

- Oils and fats are mostly triacyl glycerol / triglycerides. These triglycerides are triesters composed of three long chain fatty acids (C-12 to C-22) joined to glycerol (trihydroxyl alcohol).

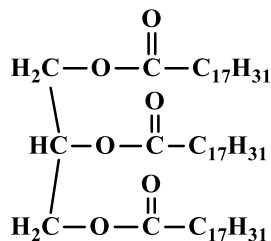


where R,R', R'' may be same or different.

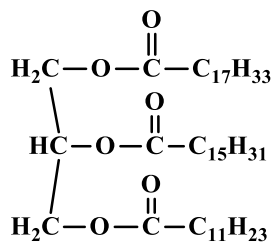
- If all the three hydroxyl groups (-OH) are esterified with same fatty acids, the resulting ester is called simple triglyceride. However naturally occurring fats and oils contains two or three different fatty acids component are called mixed triglyceride.



**Glyceryl stearate
(tristearin)
Fat (simple glyceride)
mp= 71⁰C
Contains saturated acid moiety**



**Glyceryl linoleate
(trilinolein)
Oil (simple glyceride)
mp= 90⁰C
Contains unsaturated acid moiety**



**Glyceryl lauropalmitooleate
(mixed triglyceride)**

**Contains saturated and unsaturated
acid moiety**

- These triglycerides are further classified on the basis of their physical state at room temperature. It is called fat, if solid at 25° C whereas oil, if liquid at same temperature.
- It is found that fats contain greater proportion of saturated fatty acid, whereas oil contains greater percentage of unsaturated fatty acids.
- Oils and fats are made up largely of mixed triglycerides oils contain more of short chain saturated acid residue and unsaturated acid residue whereas fat contains more of long chain saturated acid residue.