

# Unit IV B.Sc II P. III Classification of Lipids

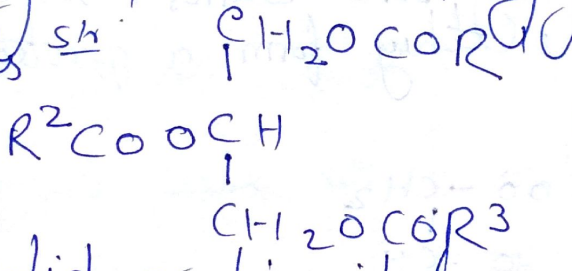
6  
Vandana

Conn & Stumpf (1978) classified lipids into:

- 1 Acyl glycerols
- 2 waxes
- 3 Phospholipids
- 4 Sphingolipids
- 5 glycolipids.
- 6 Terpenoid lipids containing Carotenoids & steroids.

## ① Acyl glycerols

most commonly spread. = Triglycerides / neutral lipids



(RCO- (Acyl group)

- exists in solid or liquid form.
- Most plant triacyl glycerols are liquid at room temperature  $\Rightarrow$  since they contain a large proportion of unsaturated FA such as oleic, linoleic or linolenic acids.

## 2. Waxes

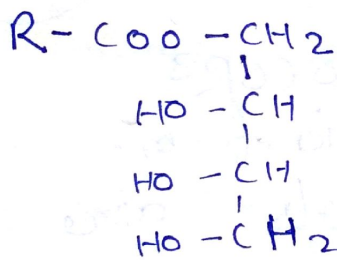
Simple lipids containing one molecule of F.As. esterified with one molecule of long chains alcohols or cholesterol instead of glycerols.

A molecule of wax c/o of an odd number of carbon atoms ranging from C<sub>25</sub> to C<sub>35</sub>

They do not have double bonds in their hydrocarbon chains

- waxes generally have appreciably higher melting points than fats.
- waxes may be saponified by fats but with great difficulty.

Waxes are found widespread in nature commonly as thin coating in stems, stalks, leaves, fruits etc, where they form a protective covering.



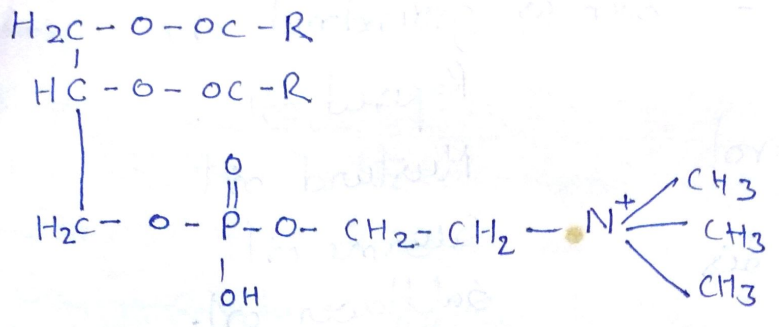
wax formula.

3. Phospholipids - contain phosphorus atom.

- Most important class of lipids from biological point of view
- Present in all living cells, frequently associated with membranes & are related to various vital functions such as regulation of cell permeability & transport processes.
- Their key components are - glycerol, FA & nitrogenous bases.
- Their key phospholipids - Lecithin.  
Cephalin.  
Plasmalogen.  
Inositol phospholipid



Str of Lecithin



(4) Sphingolipids -

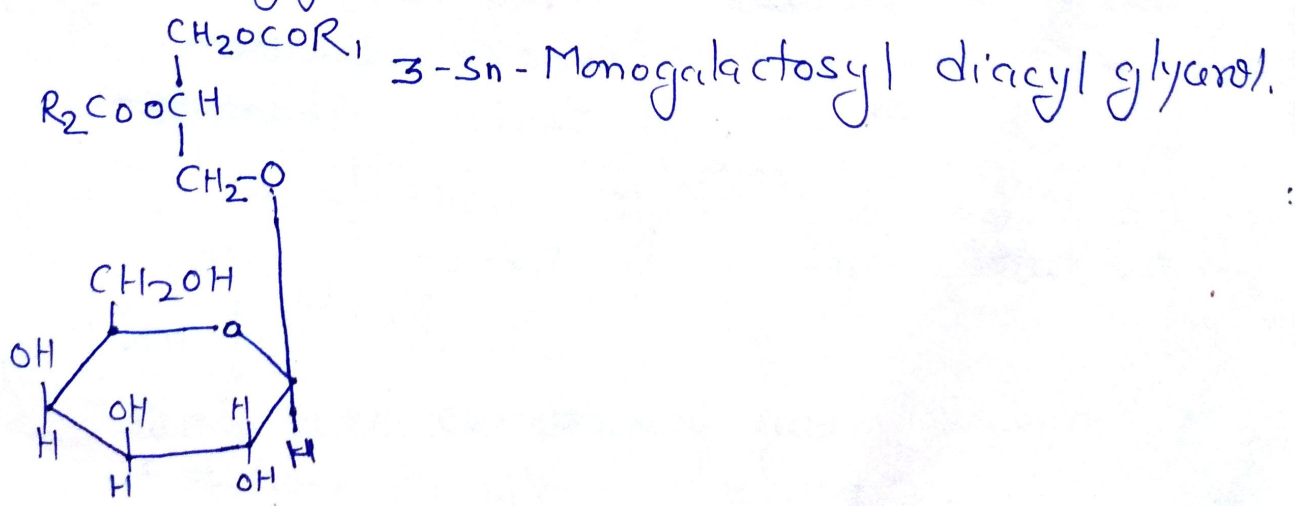
This class of lipids is apparently lacking in plants.

(5) Glycolipids.

phosphorous

These are conjugate lipids which contain no phosphorous but give sugar on hydrolysis generally a hexose, a nitrogenous compound & a fatty acid.

- primarily carbohydrates - glyceride derivatives.
- These includes the galactolipids & the sulfolipids, found commonly in chloroplast stroma simple glycolipids.





6. Terpenoids

- Large & imp class of lipids.
- Buildup of repeated isoprenoid (C<sub>5</sub>H<sub>8</sub>) units.
- Some of these Hydrocarbons are essential oils responsible for odour of many plants such as *Mentha piperita*, *Ocimum basilicum*, *Citrus spp.*.  
E.O are colourless compounds extracted by steam distillation. some eg, Limolin, pinene, Camphor etc.
- Rubber, carotenoids & steroids, squalene, cholesterol also belong to Terpenoids.
- Hemiterpenes are components of quinones & help in oxidation-reduction reactions.
- Monoterpenes are components of essential volatile oil of plants - menthol, camphor, mint.
- Sesquiterpenes - include several E.O as well as ABA.
- GA - diterpenes
- Tetraterpenes includes carotenoids.

some terpenes are

- ① sterols - certain cyclic alcohols of high molecular weight.
  - aromatic alcohols
  - characterised by presence of few hydroxyl group & high solubility in fat solvents.
  - sterols are composed of fused carbon rings & a long hydroc side chain.



• Cholesterol is by far the most imp sterol found in animals only.

- progesterone
- estradiol

It is also a precursor of hormones such as Testosterone & Cortisol.



•  $\beta$ -sitosterol & ergosterol (characteristic of fungi) - are also ch<sup>c</sup> of plants.

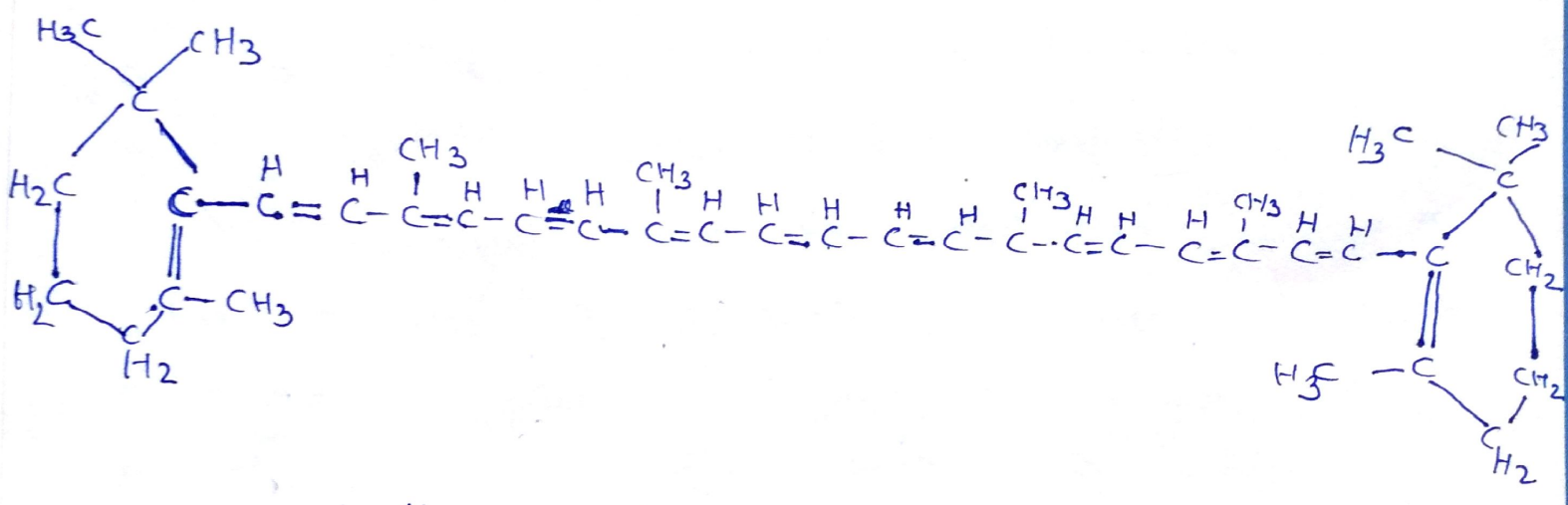
• Another steroid compound diosgenin produced by Yam plant (Dioscorea) is used in the manufacture of antifertility pills.

② Carotenoids are most distantly related to lipids which contain fatty-acid like carbon chains containing conjugated double bonds & carrying 6-membered carbon ring at each end. These compounds are pigments producing red, orange, yellow, cream & brown colours in plants.

Carotenoids are further divided on the basis of presence & absence of oxygen into

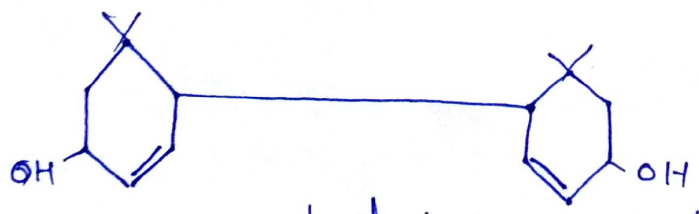
Carotenes -  $C_{40}H_{56}$ . contain only C & H

VitA is derivative of carotene.  
 abundant in Carrots, Tomatoes. leaves etc  
str of  $\beta$ -carotene



xanthophylls contain oxygen in addition to hydrogen & C. eg.

Common xanthophyll of leaves is lutein  $C_{40}H_{56}O_2$  imparting yellow colour to autumn foliage.



str of Lutein (xanthophyll)

Fucoxanthin  $C_{40}H_{56}O_6$  is another important xanthophyll found in algae



Tetrapyrroles / porphyrins

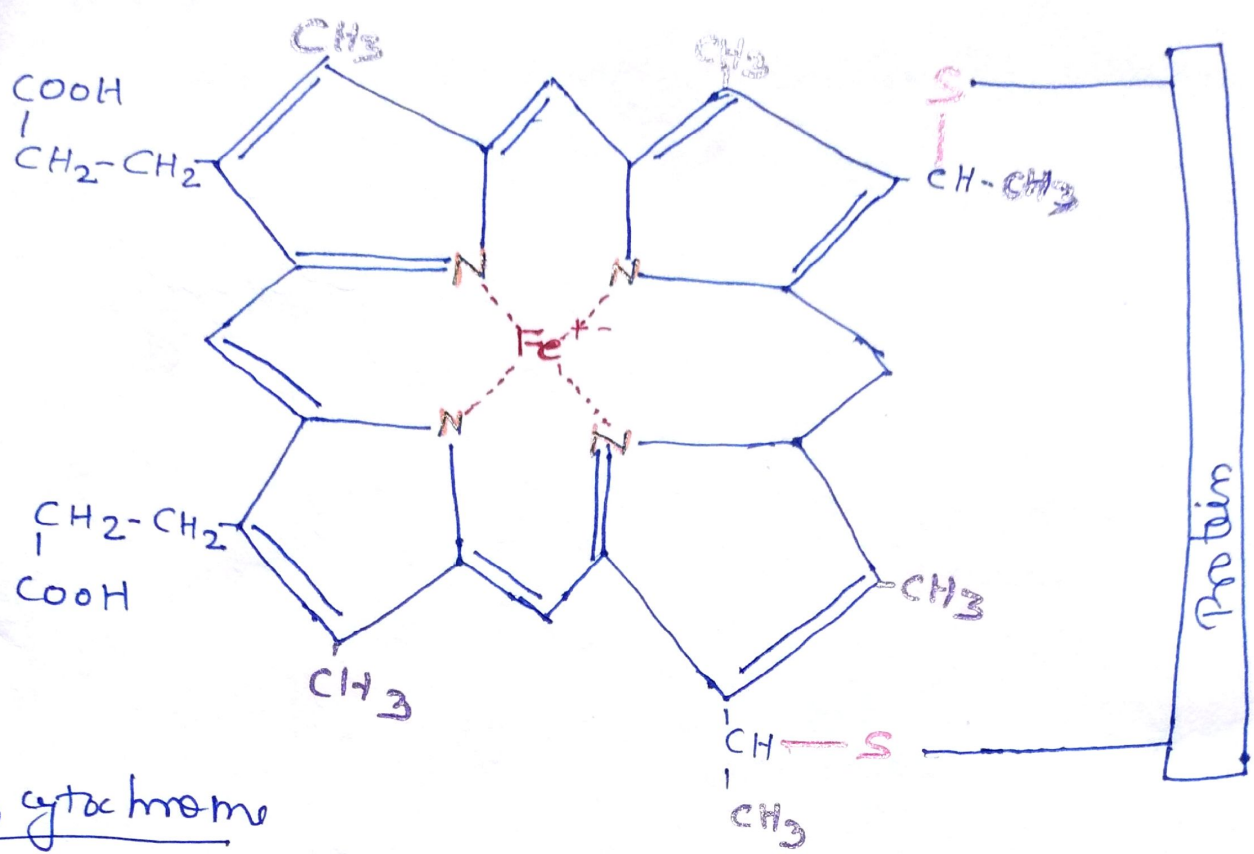
It is a group of pigmented compounds serving variety of functions in plants.

Each pyruol compound of tetrapyrrole has a skeleton of 5-atoms (4C & 1N.) arranged as a ring & 4 such pyrrol rings are joined together. Four rings may be arranged in a straight chain eg. blue, red, yellow & other varieties of pigment found among members of algae or joined to form a larger ring in heme, in the centre of which is attached a single atom of metal eg. cytochrome c contains Iron & chlorophylls contain Mg

act as Hydrogen carrying Coenz in respiration

In nature cytochromes are not normally found in free state but are attached to carrier protein





Chlorophylla

