

Details of Module

Subject	Chemistry
Course Name	M. Sc. IVth Semester
Paper No.	Paper-14 (Organic Chemistry Special) (Chemistry of Natural Products)
Module Name/Title	Terpenoids (Lecture-2)
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- (1) Classification of terpenoids
- (2) Isolation of mono and sesquiterpenoids

(1) Classification of terpenoids

Most natural terpenoid hydrocarbon have the general formula $(C_5H_8)_n$. They can be classified on the basis of value of n or number of carbon atoms present in the structure.

Again each class can be further subdivided into subclasses according to the number of rings present in the structure.

- (i) **Acyclic Terpenoids:** They contain open structure.
- (ii) **Monocyclic Terpenoids:** They contain one ring in the structure
- (iii) **Bicyclic Terpenoids:** They contain two rings in the the structure
- (iv) **Tricyclic Terpenoids:**They contain three rings in the structure
- (v) **Tetracyclic Terpenoids:** They contain four rings in the structure

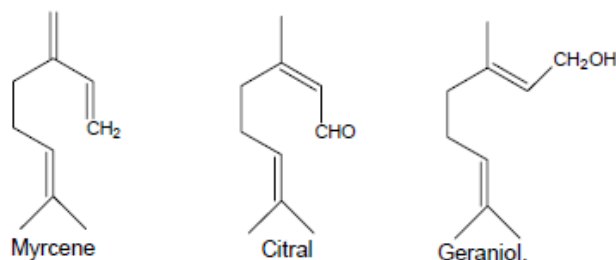
Table-1: Classification of Terpenoids

S.No.	Number of carbon atoms	Value of n	Class
1.	10	2	Monoterpenoids($C_{10}H_{16}$)
2.	15	3	Sesquiterpenoids($C_{15}H_{24}$)
3.	20	4	Diterpenoids($C_{20}H_{32}$)
4.	25	5	Sesterpenoids($C_{25}H_{40}$)
5.	30	6	Troterpenoids($C_{30}H_{48}$)
6.	40	8	Tetraterpenoids($C_{40}H_{64}$)
7.	>40	>8	Polyterpenoids(C_5H_8) _n

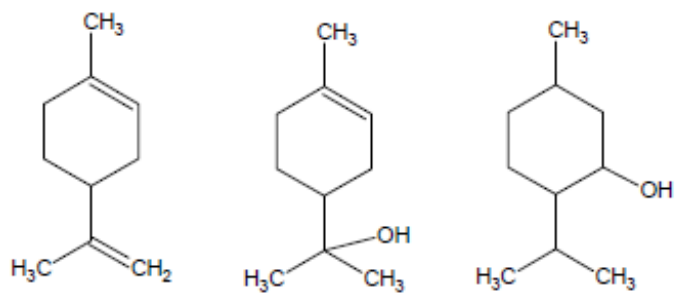
Some examples of mono, sesqui and di Terpenoids:

(A) Mono Terpenoids:

(i) Acyclic Monoterpenoids



(ii) Monocyclic monoterpenoids



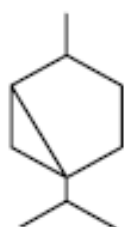
Limonene

α -Terpineol

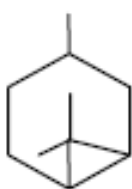
Menthol

iii) Bicyclic monoterpenoids: These are further divided into three classes.

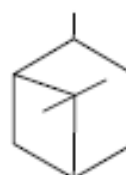
- (a) Containing -6+3-membered rings
- (b) Containing -6+4- membered rings.
- (c) Containing -6+5-membered rings.



Thujane



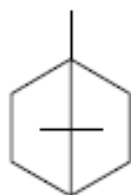
Carane



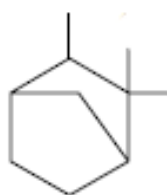
Pinane

Containing -6+3-membered rings

-6+4-membered rings



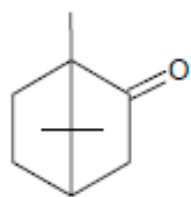
Bornane
(Camphane)



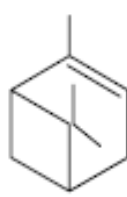
non bornane
(iso camphane)

-6+5-membered rings

Some bicyclic monoterpenes are:



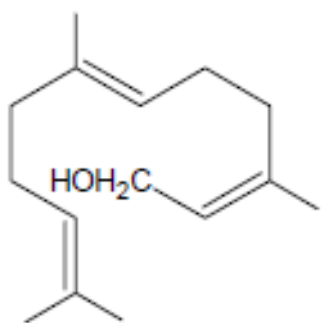
camphor



α -pinene

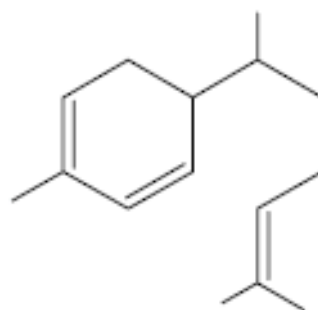
(B) Sesquiterpenoids:

i) Acyclic sesquiterpenoids



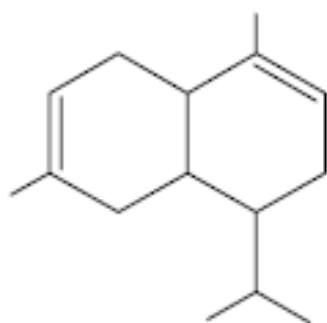
Farnesol

ii) Monocyclic sesquiterpenoids



Ziniberene

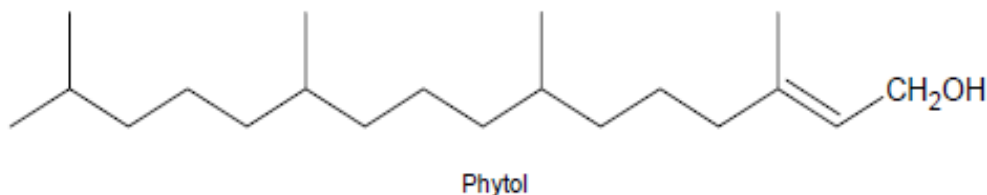
iii) Bicyclic sesquiterpenoids.



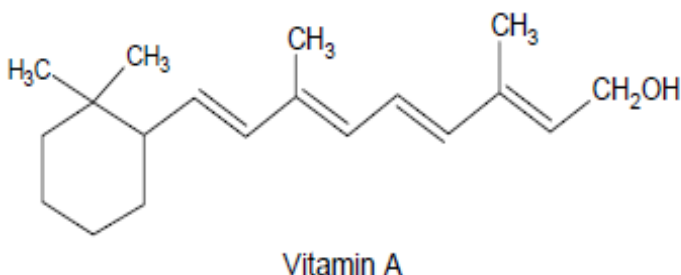
Cadinene

(C) Diterpenoids:

i) Acyclic diterpenoids



ii) Mono cyclic diterpenoids:



(2) Isolation of mono and sesquiterpenoids

Both mono and sesquiterpenoids have common source i.e essential oils. Their isolation is carried out in two steps:

- (i) Isolation of essential oils from plant parts
- (ii) Separation of Terpenoids from essential oils.

(i) Isolation of essential oils from plant parts:

The plants having essential oils generally have the highest concentration at some particular time. Therefore better yield of essential oil plant material have to be collected at this particular time. e.g. From jasmine at sunset. There are four methods of extractions of oils.

- (a) Expression method

- (b) Steam distillation method
- (c) Extraction by means of volatile solvents
- (d) Adsorption in purified fats

Steam distillation is most widely used method. In this method macerated plant material is steam distilled to get essential oils into the distillate form these are extracted by using pure organic volatile solvents. If compound decomposes during steam distillation, it may be extracted with petrol at 50°C. After extraction solvent is removed under reduced pressure.

(ii) Separation of Terpenoids from essential oil:

A number of terpenoids are present in essential oil obtained from the extraction. Definite physical and chemical methods can be used for the separation of terpenoids. They are separated by fractional distillation. The terpenoid hydrocarbons distill over first followed by the oxygenated derivatives. More recently different chromatographic techniques have been used both for isolation and separation of terpenoids.