



Centurion
UNIVERSITY

PHYTOCHEMICAL S LECTURE 2

Dr. G. V. Ramana

Department of Phytopharmaceuticals

School of Agricultural and Bioengineering

CUTM

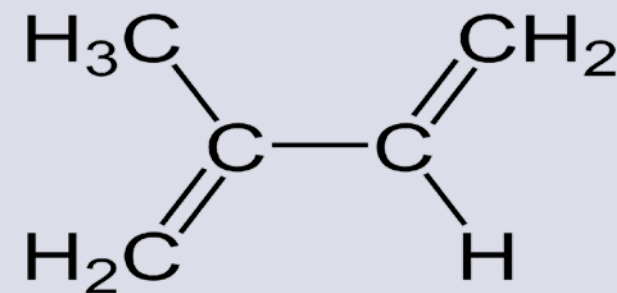
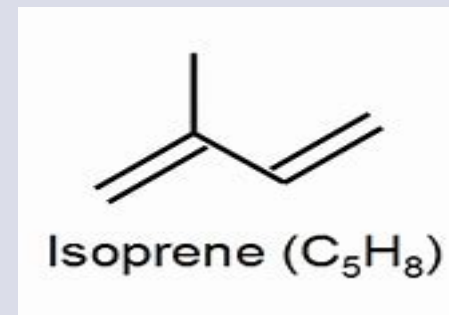
Parlakhemundi



Centurion
UNIVERSITY

TERPENES/TERPENOIDS/ISOPRENOIDS

- ✘ Terpenes are a large and diverse class of organic compounds
- ✘ produced by a variety of plants, (particularly conifers, and by some insects).
- ✘ Terpenes are hydrocarbons
- ✘ Rationalized as derivatives of *Isoprene* (2-methyl-1,3-butadiene),





- ✘ They often have a strong odour (ex: signature odour of Eucalyptus) and may protect the plants that produce them by deterring herbivores and by attracting predators and parasites.
- ✘ Although sometimes used interchangeably with terpenes", terpenoids (or isoprenoids) are modified terpenes
- ✘ Terpenoids contain additional functional groups
- ✘ usually contains oxygen



Centurion
UNIVERSITY

TERPENOIDS CLASSIFICATION

- Terpenoids are modified terpenes, wherein methyl groups have been moved or removed, or oxygen atoms added.
- Hemiterpenoids, 1 isoprene unit (5 carbons)
 Ex: prenol and isovaleric acid
- Monoterpenoids, 2 isoprene units (10C, i.e., derived from monoterpenes)
- Sesquiterpenoids, 3 isoprene units (15C, i.e., derived from sesquiterpenes)
- Diterpenoids, 4 isoprene units (20C, i.e., derived from diterpenes). ginkgolides.
- Sesterterpenoids, 5 isoprene units (25C, i.e., derived from sesterterpenes).
- Triterpenoids, 6 isoprene units (30C, i.e., derived from triterpenes). Example: sterols.
- Tetraterpenoids, 8 isoprene units (40C, i.e., derived from tetraterpenes). Example: carotenoids)



Centurion
UNIVERSITY

TERPENES CLASSIFICATION

- ✘ Hemiterpenes consist of a *single isoprene* unit. Ex:Isoprene
- ✘ Formula:C₅H₈
- ✘ Isoprene itself is considered the only hemiterpene
- ✘ Monoterpenes: 2 isoprene units
- ✘ molecular formula C₁₀H₁₆.
- ✘ Examples: of monoterpenes and monoterpenoids include geraniol, terpineol (present in lilacs), limonene (present in citrus fruits), myrcene (present in hops), linalool (present in lavender) orpinene (present in pine trees). Iridoids derive from monoterpenes.



Centurion
UNIVERSITY

- ✘ Sesquiterpens: *three isoprene* units
- ✘ molecular formula: $C_{15}H_{24}$.
- ✘ Examples of sesquiterpenes and sesquiterpenoids include humulene, farnesenes, farnesol. (The *sesqui-* prefix means one and a half.)
- ✘ Diterpenes Diterpenes: *four isoprene* units molecular formula: $C_{20}H_{32}$
- ✘ The linear triterpene squalene, the major constituent of shark liver oil,



Centurion
UNIVERSITY

- ✘ **Sesquiterpenes:** *seven isoprene* units
- ✘ molecular formula $C_{35}H_{56}$. Sesquiterpenes are typically microbial in their origin.
- ✘ Examples of sesquiterpenoids are ferrugicadiol and tetraprenylcurcumene.
- ✘ Tetraterpenes: *eight isoprene* units molecular formula : $C_{40}H_{64}$.
- ✘ Biologically important tetraterpenoids include the acyclic lycopene,



Centurion
UNIVERSITY

- ✘ **Polyterpenes:** consist of long chains of *many isoprene* units.
- ✘ Ex: Natural rubber consists of polyisoprene in which the double bonds are cis.
- ✘ Some plants produce a polyisoprene with *trans* double bonds, known as gutta-percha.



Centurion
UNIVERSITY

BENEFITS, USES, PROPERTIES

- ✘ food, cosmetics, pharmaceutical and biotechnology industries.
- ✘ The genomes of 17 plant species contain genes that encode terpenoid synthase enzymes
- ✘ Terpenes are useful active ingredients as part of natural agricultural pesticides



Centurion
UNIVERSITY

REFERENCES & FURTHER READINGS

- ✘ Kokate, C. K., A. P. Purohit, and S. B. Gokhale. "Book of Pharmacognosy." *Nirali prakashan 36th edition* (2005).
- ✘ Evans, William Charles. *Trease and Evans Pharmacognosy, International Edition E-Book*. Elsevier Health Sciences, 2009.



Centurion
UNIVERSITY

THANK YOU