

UNIT – 2

1. Alkaloids:

- General Introduction:

- **Definition:** Nitrogen-containing organic compounds with pharmacological effects.
- **Properties:** Often bitter, alkaline, and have potent physiological activities.

- Composition and Chemistry:

- **Basic Structure:** Typically contain a basic nitrogen atom in a cyclic structure.
- **Chemical Classes:** Vinca alkaloids (vincristine, vinblastine), Rauwolfia alkaloids (reserpine), Belladonna alkaloids (atropine, scopolamine), Opium alkaloids (morphine, codeine).

- Biosources:

- **Vinca:** Vinca rosea (Periwinkle).
- **Rauwolfia:** Rauwolfia serpentina (Indian snakeroot).
- **Belladonna:** Atropa belladonna (Deadly nightshade).
- **Opium:** Papaver somniferum (Poppy).

- Therapeutic Uses:

- **Analgesics:** Morphine for pain relief.
- **Antispasmodics:** Atropine for smooth muscle relaxation.
- **Anticancer Agents:** Vincristine and vinblastine in cancer treatment.

- Commercial Applications:

- **Pharmaceuticals:** Alkaloids serve as the basis for many drugs.
- **Pesticides:** Some alkaloids have insecticidal properties.

2. Phenylpropanoids and Flavonoids:

- General Introduction:

- **Phenylpropanoids:** Derived from phenylalanine.
- **Flavonoids:** A subclass of phenylpropanoids, known for their antioxidant properties.

- Composition and Chemistry:

- **Phenylpropanoids:** Lignans (e.g., from flaxseeds), Tea polyphenols.
- **Flavonoids:** Quercetin (found in onions), Rutin (found in Ruta graveolens).

- Biosources:

- **Lignans:** Flaxseeds (*Linum usitatissimum*).

- **Tea Polyphenols:** *Camellia sinensis* (Tea plant).
- **Flavonoids:** *Ruta graveolens* (Rue), Citrus fruits, onions.

- **Therapeutic Uses:**

- **Antioxidant Properties:** Flavonoids exhibit antioxidant effects.
- **Anti-inflammatory:** Quercetin has anti-inflammatory properties.

- **Commercial Applications:**

- **Food Industry:** Flavonoids contribute to the color and flavor of fruits and vegetables.
- **Pharmaceuticals:** Used in various medications due to their health benefits.

3. Steroids, Cardiac Glycosides & Triterpenoids:

- **General Introduction:**

- **Steroids:** Lipids with a characteristic structure.
- **Cardiac Glycosides:** Compounds affecting the heart.
- **Triterpenoids:** Derived from triterpene precursors.

- **Composition and Chemistry:**

- **Steroids:** Cholesterol, plant sterols.
- **Cardiac Glycosides:** Digitoxin (*Digitalis purpurea*).
- **Triterpenoids:** Glycyrrhizin (from *Liquorice*), Diosgenin (from *Dioscorea*).

- **Biosources:**

- **Steroids:** Plant and animal sources.
- **Cardiac Glycosides:** *Digitalis purpurea* (Foxglove).
- **Triterpenoids:** *Liquorice* (*Glycyrrhiza glabra*), *Dioscorea* species.

- **Therapeutic Uses:**

- **Steroids:** Anti-inflammatory agents (corticosteroids).
- **Cardiac Glycosides:** Used in the treatment of heart failure.
- **Triterpenoids:** Glycyrrhizin has anti-inflammatory and antiviral properties.

- **Commercial Applications:**

- **Pharmaceuticals:** Steroids and cardiac glycosides are vital in medicine.
- **Cosmetics:** Some triterpenoids are used in skincare products.

4. Volatile Oils:

- **General Introduction:**

- **Definition:** Aromatic compounds with a high vapor pressure.

- **Composition and Chemistry:**

- **Examples:** Mentha (from Mentha species), Clove oil (from Syzygium aromaticum), Cinnamon oil, Fennel oil, Coriander oil.

- **Biosources:**

- **Mentha:** Mentha piperita (Peppermint).
- **Clove:** Syzygium aromaticum (Clove tree).
- **Cinnamon:** Cinnamomum verum (Cinnamon tree).
- **Fennel:** Foeniculum vulgare (Fennel plant).
- **Coriander:** Coriandrum sativum (Coriander plant).

- **Therapeutic Uses:**

- **Mentha:** Used for digestive issues, headaches.
- **Clove:** Analgesic and antiseptic properties.
- **Cinnamon:** Antimicrobial and anti-inflammatory effects.
- **Fennel:** Aids digestion, may have diuretic effects.
- **Coriander:** Used in traditional medicine for various ailments.

- **Commercial Applications:**

- **Food Industry:** Used as flavoring agents.
- **Pharmaceuticals:** Essential oils may have medicinal applications.

5. Tannins:

- **General Introduction:**

- **Definition:** Polyphenolic compounds that bind and precipitate proteins.

- **Composition and Chemistry:**

- **Examples:** Catechu (from Acacia catechu), Pterocarpus (from Pterocarpus species).

- **Biosources:**

- **Catechu:** Acacia catechu (Khair tree).
- **Pterocarpus:** Pterocarpus marsupium (Indian kino tree).

- **Therapeutic Uses:**

- **Catechu:** Used in traditional medicine for its astringent properties.
- **Pterocarpus:** May have anti-inflammatory and anti-diabetic effects.

- **Commercial Applications:**

- **Tanning Industry:** Used in the tanning of leather.
- **Pharmaceuticals:** Some tannins may have medicinal applications.

6. Resins:

- General Introduction:

- **Definition:** Amorphous, translucent substances produced by certain plants.

- Composition and Chemistry:

- **Examples:** Benzoin, Guggul (from *Commiphora wightii*), Ginger, Asafoetida, Myrrh, Colophony.

- Biosources:

- **Guggul:** *Commiphora wightii* (Indian bdellium tree).
- **Ginger:** *Zingiber officinale* (Ginger plant).
- **Asafoetida:** *Ferula assa-foetida* (Ferula plant).
- **Myrrh:** *Commiphora* species.
- **Colophony:** Resin from pine trees.

- Therapeutic Uses:

- **Guggul:** Used in traditional medicine for various conditions.
- **Ginger:** Anti-inflammatory and anti-nausea effects.
- **Asafoetida:** Digestive aid, anti-flatulent.
- **Myrrh:** Antiseptic and anti-inflammatory.
- **Colophony:** Used in plasters and varnishes.

- Commercial Applications:

- **Pharmaceuticals:** Used in various medicinal formulations.
- **Adhesives and Varnishes:** Colophony is used in the production of adhesives and varnishes.

7. Glycosides:

- General Introduction:

- **Definition:** Compounds containing a sugar molecule and a non-sugar molecule (aglycone).

- Composition and Chemistry:

- **Examples:** Senna glycosides (from *Senna* species), Aloes glycosides, Bitter Almond glycosides.

- Biosources:

- **Senna:** *Senna alexandrina* (Senna plant).
- **Aloes:** *Aloe vera*.
- **Bitter Almond:** *Prunus dulcis* (Almond tree).

- Therapeutic Uses:

- **Senna:** Used as a laxative.
- **Aloes:** Used for wound healing and skin conditions.
- **Bitter Almond:** Source of amygdalin, with potential anti-cancer effects.

- Commercial Applications:

- **Pharmaceuticals:** Used in various medications.
- **Cosmetics:** Aloes is used in skincare products.

8. Iridoids, Other Terpenoids & Naphthaquinones:

- General Introduction:

- **Iridoids:** Monoterpenoids derived from iridodial.
- **Other Terpenoids:** Diverse group derived from terpene precursors.
- **Naphthaquinones:** Compounds with a naphthalene-based structure.

- Composition and Chemistry:

- **Examples:** Gentian (source of iridoids), Artemisia (source of terpenoids), Taxus (source of taxol), Carotenoids.

- Biosources:

- **Gentian:** *Gentiana lutea* (Gentian plant).
- **Artemisia:** *Artemisia annua* (Sweet wormwood).
- **Taxus:** *Taxus* species (Yew tree).
- **Carotenoids:** Found in various fruits and vegetables.

- Therapeutic Uses:

- **Gentian:** Used in traditional medicine as a bitter tonic.
- **Artemisia:** Source of artemisinin, used in malaria treatment.
- **Taxus:** Taxol (from *Taxus brevifolia*) is an anticancer agent.
- **Carotenoids:** Antioxidant properties, provitamin A activity.

- Commercial Applications:

- **Pharmaceuticals:** Taxol is a vital cancer medication.
- **Food Industry:** Carotenoids used as natural colorants.

These secondary metabolites play diverse roles in plants, ranging from defense mechanisms to attracting pollinators. Additionally, they have significant applications in medicine, food, and various industries. Always consult experts and follow appropriate guidelines when using these compounds for therapeutic or commercial purposes.

PHARMACY PEERS