pharmacognosy

3rd stage/2nd term

Alkaloids

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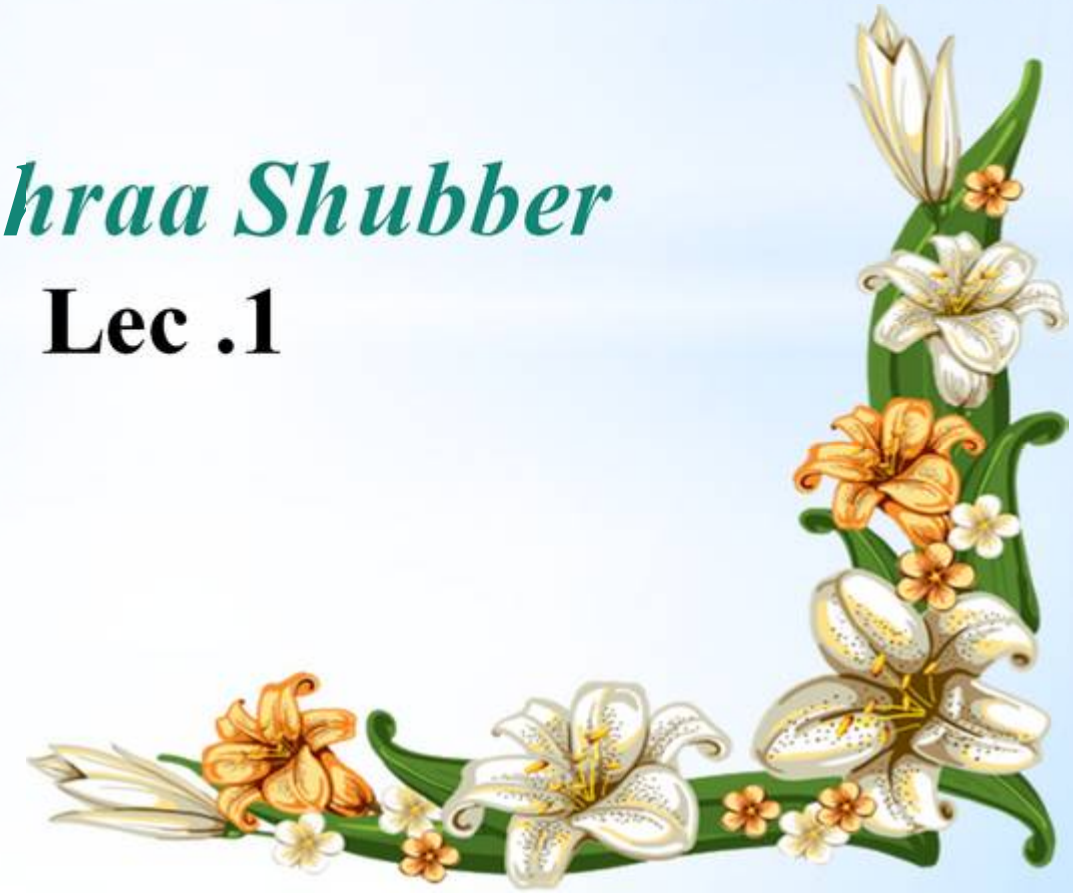
Lec .1



Alkaloids

- Alkaloids are natural compounds with wide array of biological activities.
- Wide distribution in living being.
- Many well known drugs and poisons are alkaloids such as

Morphine, codeine, nicotine and cocaine.

Distribution of Alkaloids

- In plant kingdom, they appear to have a restricted distribution in certain families
- Among angiosperms, apocynaceae, papaveraceae, Ranunucleaceae, Rubiaceae, Solanaceae, and berberidaceae.
- Specific alkaloids to specific plant families
  - **Hyoscyamine in Solanaceae**
  - **Colchicine in Liliaceae**
- There are an exception Such as **nicotine** (widely in scattered plant families).

Distribution in plant parts

Alkaloids may occur in various parts of the plants

- In seeds (Physostigma)
- In underground stems (sanguinaria).
- In roots (belladonna root)
- In rhizome and root (ipecac)
- In barks (Cinchona)
- Fungi (Ergot)

Nomenclature

1.From the generic name of the plant yielding them as atropine (Atropa belladona).

2.From the specific name of the plant yielding them as belladonine (Atropa belladona).

3.From the common name of the drug yielding them as ergotamine (Ergot).

4.From their physiologic activity as emetine (Ipecac causes emesis).

5.From the discoverer as pelletrine.

- A suffix is added sometimes to designate the alkaloids which are similar in structure but differ in their stereochemistry. For example quinine and quinidine.
- A prefix is added to designate alkaloids found in the same plant example hydroquinine.
- Alkaloids name should end with ine.

Classification of alkaloids

1.True alkaloids (characterized by a heterocyclic ring with a nitrogen atom within this ring and are derived from amino acid).

2.Proto alkaloids (characterized by absence of the heterocyclic ring but derived from amino acid).

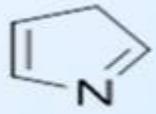
As Ephedrine: It has the N-atom only in the side chain and not embedded in the aromatic ring

3.Pseudo alkaloids (characterized by a heterocyclic ring with a nitrogen atom, but are not derived from amino acids) (steroidal alkaloids).

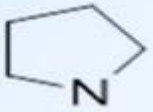
Classification of alkaloids

According to the chemical structure alkaloids divided into two broad divisions

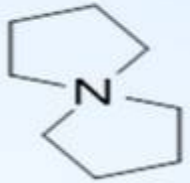
1. Non heterocyclic or atypical alkaloids or biological amines
2. Heterocyclic or typical alkaloids which divided into 14 groups according to their structure.



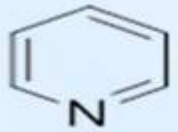
pyrrole



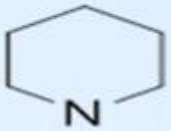
pyrrolidine



pyrrolizidine

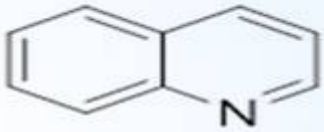


pyridine

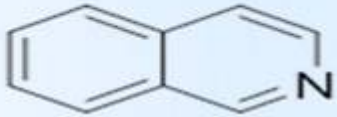


piperidine

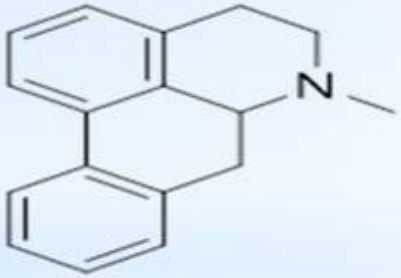
tropane



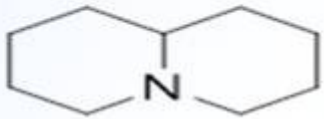
quinoline



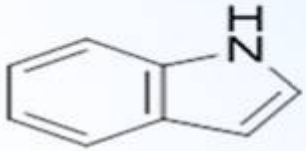
isoquinoline



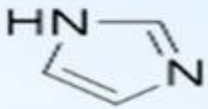
aporphine



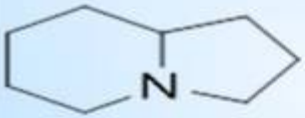
nor-lupinane



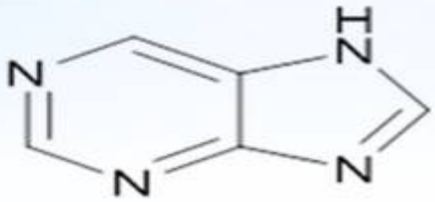
indole



imidazole



indolicidine



purine

Chemistry of alkaloids

- They are difficult to define because non homogenous group
- Basic nitrogenous compounds
- Various degree of basicity depending on structure + functional groups(presence and locations)
- Alkaloids + aqueous mineral acids ⟶ **Alkaloidal salts**
- Alkaloids + hydroxide ion ⟶ **free amine**
- Usefulness in extraction
- Alkaloids (insoluble in water), Alkaloidal salts (soluble)
- Alkaloids (soluble in organic solvent), Alkaloidal salts (insoluble)

- This property is also important in isolation, purification and quantitative estimation.
- Most of Alkaloids are crystalline solids, few are amorphous
- Few alkaloids are liquids e.g Nicotine
- Alkaloidal salts are crystalline (microscopic identification).

Function of Alkaloids in Plants

- Poisonous agents against insects.
- End products of detoxification reactions.
- Regulatory growth factor.
- Reserve substances capable of supplying nitrogen or other element necessary to the plant.

Identification of alkaloids

- The alkaloids may precipitate from neutral or acidic solution by a reagent.

These reagents include

1. Wagner's reagent (iodine in potassium iodide)
2. Mayer's reagent (potassium mercuric iodide)
3. Dragendroff's reagent (potassium bismuth iodide)
4. Some of the alkaloids did not precipitate e.g Caffeine, so use specific test such as muroxide test.
5. TLC with detecter

Thank You