PHARMACOGNOSY
3RD CLASS, 2ND SEMESTER

LAB.1

ALKALOIDS







Introduction

- Are defined as organic nitrogenous compounds of plant origin that are physiologically active.
- In addition to carbon, hydrogen and nitrogen, alkaloids may also contain oxygen, sulfur and more rarely other elements such as chlorine, bromine, and phosphorus.
- The following families represent good examples:-

- ✓ Leguminosae
- ✓ Papaveraceae
- ✓ Ranunculaceae
- ✓ Rubiaceae
- ✓ Solanaceae
- ✓ Berberidaceae

Sources of Alkaloids

- **Natural sources**

a) Plants (ephedrine) *Ephedra sinica*

b) Animal (bufotenin) from skin

c) Bacteria

d) Fungi (psilocybin) from *Psilocybe*

- **Industrial sources**

✓ Nicotinic acid can be synthesized from tryptophan or aspartic acid.

The names of alkaloids are obtained in various ways:-

1) From the generic name of the plant as atropine *Atropa belladonna*
2) From the specific name of the plant as cocaine *Erythroxylum coca.*
3) From the common name of the drug ergotamine .
4) From their physiologic activity as emetine producing emesis.
5) From the discoverer as pelletrine.
6) Other – e.g. morphine derived from ancient Greek mythology – Morpheus – god of dreams

Classification

- True alkaloids characterized by a heterocyclic ring with a nitrogen atom, and are derived from amino acids for example: are atropine, nicotine, and morphine.
- Proto alkaloids characterized by absence of the heterocyclic ring but also derived from amino acids for example: adrenaline and ephedrine .
- Pseudo alkaloids characterized by a heterocyclic ring with a nitrogen atom, but are not derived from amino acids.

In general the alkaloids are classified according to the chemical structure in tow broad divisions:-

A) Non-heterocyclic or atypical alkaloids or biological amines.

B) Heterocyclic or typical alkaloids, divided into (14) group according to their structure, as the follows:-

1) Pyrrol and Pyrrolidine.
2) Pyrrolizidine.
3) Pyridine and Piperidine.
4) Tropane.
5) Quinoline.
6) Isoquinoline.
7) Aporphine
8) Norlupinane.
9) Indole.
10) Indolizidine.
11) Imidazole.
12) Purine.
13) Steroid.
14) Terpenoid

Alkaloid Description

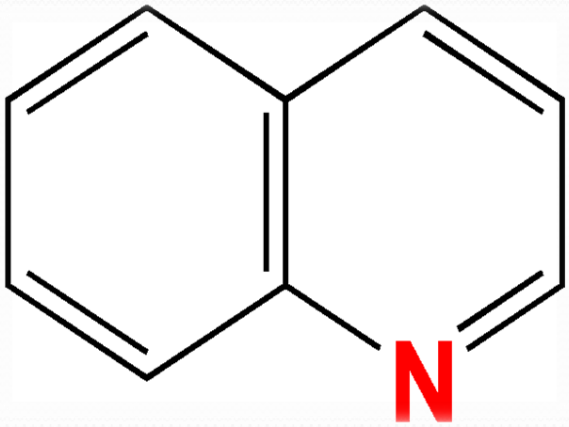
- Contains nitrogen - usually derived from an amino acid
- Bitter tasting
- Usually colorless
- Some alkaloids are colored, yellow or orange.
- Generally solids (exception - nicotine is a brown liquid).
- They give a precipitate with heavy metal iodides, except Caffeine.

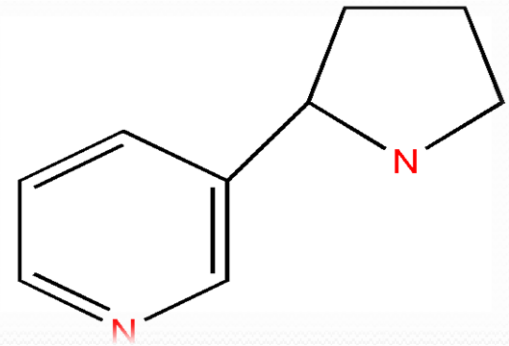
Cont…

- Most alkaloids are weak bases, but some are amphoteric, for example theobromine and theophyllin.
- Most alkaloids are poorly soluble in water but its dissolve in organic solvents, such as diethyl ether, chloroform. However, caffeine dissolves well in boiling water
- Toxic ex cyclopamine which is present in the leaves of corn lily.

Chemistry of Alkaloids

- Alkaloids usually contain one nitrogen atom, but some may contain up to (5) the nitrogen may exist as a primary amine (RNH_2), as a secondary amine(R_2NH), or as tertiary amine (R_3N) .





Applications

- In medicine

Alkaloid	Action
Colchicine	Remedy for gout
Morphine	Analgesic
Quinine	Anti malarial
Vinblastine, vincristine	Antitumor
Codeine	Cough medicine

Black pepper



Botanical name ***Piper nigrum***

Family name **Piperaceae**

- It belongs to the third group of the typical alkaloids, which is the pyridine and piperidine group.

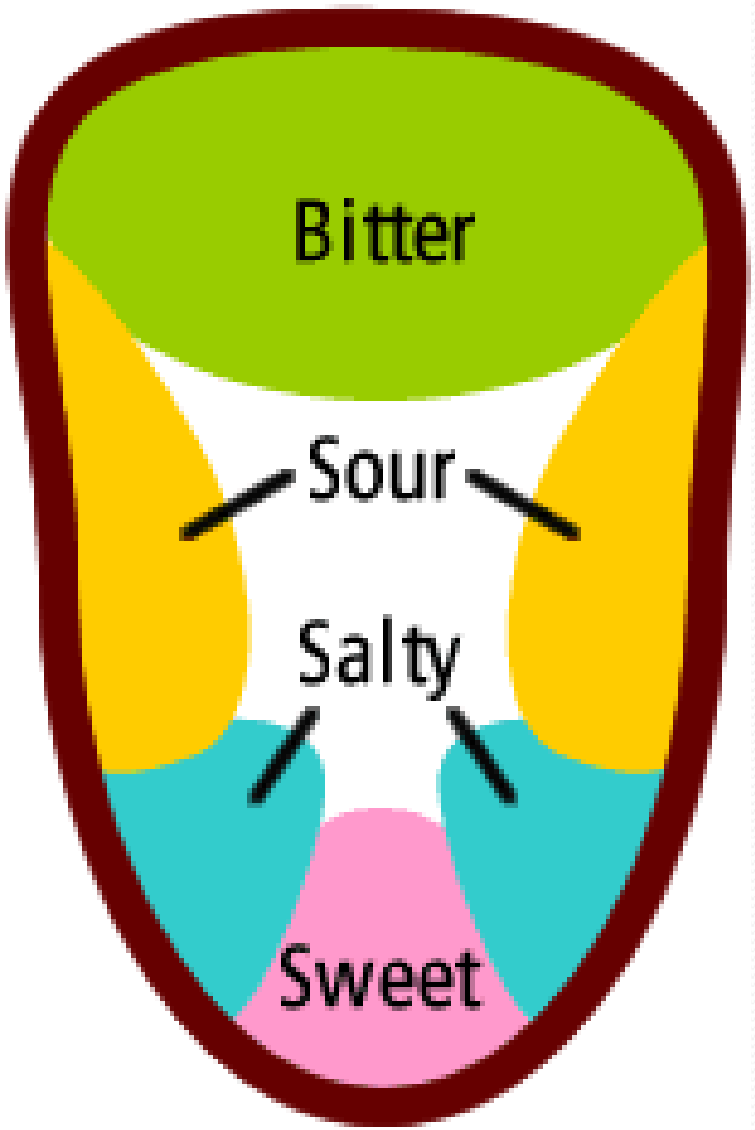
- This plant is a perennial plant producing berry-like and aromatic pungent fruits, that are green when unripe and become red at mature, then the dried berries become black and wrinkled producing black pepper.

- The pepper yields both, black and white pepper according to the method of drying.

- In that when the ripe and the unripe fruit are dried directly under the sun, black pepper is the result. While if the fruit is soaked, and then removed the outer skin, before drying and then the result is white pepper.

Cont…

- The alkaloid extracted from the black pepper is piperine.
- Piperine alkaloid is a solid substance essentially insoluble in water. It is a weak base that is tasteless at first, but leaves a burning after taste.
- The molecular formula is C17H19NO3.


Bitter
Sour
Salty
Sweet

The Pharmacological Activity of Piperine

1) Piperine aid in the digestion of food due to its stimulation to the digestive enzymes.

2) There is some evidence that it has an anticonvulsant activity in the treatment of epilepsy.

3) There is some evidence that it has an anticancer and anti-inflammatory activity due to its antioxidant property.