

The alkaloids

Alkaloids (alkali-like) are defined as organic nitrogenous compounds of plant origin that are physiologically active, ending in the suffix "ine".

Plants have been a rich source of alkaloids but some are found in animals, fungi, and bacteria. Among the plants, the ***angiosperms*** are rich in alkaloids.

The alkaloids

The following families represent good examples of plants which contain alkaloids:

- Leguminosae.
- Papaveraceae.
- Ranunculaceae.
- Rubiaceae.
- Solanaceae.
- Berberidaceae.

the labiatae and rosaceae are almost free of alkaloids ; the ***gymnosperms*** only rarely contain alkaloids.

- The alkaloids , like other amines, form double salts with the heavy metals appear as precipitates ,and are used in their identification . These reagents include :
- **Wagner 's reagent** (iodine in potassium iodine).
- Mayer 's reagent (potassium mercuric iodide).
- Dragendroff 's reagent (potassium bismuth iodide).
- **Hagger 's reagent** (saturated solution of picric acid).

Types of alkaloids :

- ***True alkaloids*** : these characterized by contain nitrogen atom in the heterocyclic ring and derived from amino acids .ex :***Atropine***.
- ***Proto alkaloids*** : which contain nitrogen atom without a heterocyclic ring and also derived from amino acids .
ex:***Adrenaline*** and ***Ephedrine***.
- ***Pseudo alkaloids***: these characterized by heterocyclic ring with a nitrogen atom ,but are not derived from amino acids .ex :***caffeine***.

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

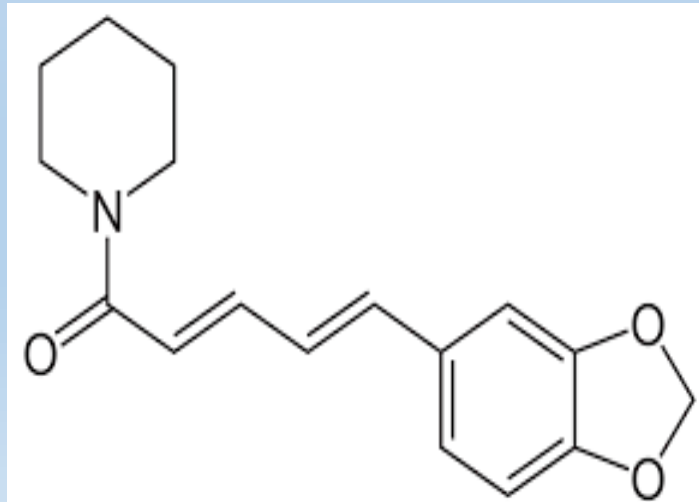
- A- non –heterocyclic or atypical alkaloids or biological amines .
- B- heterocyclic or typical alkaloids, divided in to 14 groups according to their ring structure ,as follows:
 - 1-pyrrol and pyrrolidine8- Norlupinane.
 - 2-Pyrrolizidine.....9 - Indole.
 - 3-pyridine and piperidine10- Indolizidine.
 - 4-tropine.....11-Imidazole .
 - 5-quinolone.....12-purine .
 - 6-Isoquinolone.....13-Steroids.
 - 7- Aporphine14-Terpenoids.

Black pepper

The botanical name :*piper nigrum* of the family Piperaceae .It belongs to the third group of the typical alkaloid, 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 unripe fruit are dried directly under the sun, black pepper is the result . While if the fruit is first soaked, and then removed the outer skin , before drying ,and then the result is ***white pepper***.
- 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 aftertaste .The molecular formula is $C_{17}H_{19}NO_3$,and the chemical structure of piperine is :



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 .

The isolation and identification of piperine from black pepper.

- 1- Extraction :
- Aim : to isolate the piperine alkaloid from black pepper .
- Equipments :
 1. Large beaker& medium size beakers .
 2. Soxhlet instrument.
 3. Funnel & filter paper .
 4. Water bath.

Black pepper

