



Extraction of Alkaloids

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Extraction of Alkaloids

- Alkaloids occur in plants usually in mixtures of related compounds together with inert constituents, such as tannins, proteins, fats, resins, and pigments, which generally hinder their isolation.
- Procedures adopted for isolation of alkaloids include the major following steps:
 - preparation of the plant sample
 - liberation and extraction of the free alkaloidal bases
 - purification and fractionation of the crude extract
 - isolation of individual alkaloids.

Preparation of the plant sample

- **The collected plant material is carefully**
 - dried,
 - reduced to a suitable size and,
 - if necessary, defatted with petroleum ether (e.g. in case of seeds).
- ***Although most alkaloids are insoluble in petroleum ether, yet the extract should be tested before rejection.***

Extraction & purification

For extraction of alkaloids, one of the following methods are applied:

Method I:

- 1. The powder is treated with lime water, that liberates the free bases if present as salts, and combines with acids, tannins or other phenolics.**
 - 2. The alkaline extract is then shaken with a suitable organic solvent, generally chloroform.**
 - 3. The organic layer is separated and concentrated (containing free alkaloids and lipophilic impurities).**
 - 4. The concentrated organic extract is then shaken with aqueous acid and allowed to separate.**
 - 5. This separates alkaloids as their salts (in the aqueous layer) from most other impurities, which remain in the organic layer (purification).**
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Extraction & purification

Method II:

- 1. The powdered material is extracted with water or aqueous alcohol containing dilute acid.**
 - 2. Alkaloids are extracted as their salts together with accompanying soluble impurities.**
 - 3. The acidic extract is shaken with chloroform or other suitable organic solvent to remove pigments and other undesirable impurities (weak bases may be present).**
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Liberation and extraction of alkaloidal bases:

- **The acid extracts (alkaloidal salts) resulting from either methods I or II are treated with dilute alkali**
 - **generally sodium bicarbonate or ammonia to liberate the free bases**
 - **These free bases are separated by filtration or extraction with organic solvents.**
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Separation of individual alkaloids

Separation could be carried by:

- **Fractional precipitation or crystallization:**

- This is generally performed after derivatization to salts such as oxalates, tartrates and picrates.

- **Gradient pH extraction:**

- This method is suitable for separating alkaloids of different basicity (weakly, moderately and strongly basic).
- The crude mixture is dissolved in 2% tartaric acid and extracted with organic solvent.
- The pH of the aqueous solution is gradually increased to pH 9,
- after each increment in pH, it is extracted with organic solvent.

- **Chromatographic techniques:**

- These are the most suitable in case of complex mixtures.