D.PHARM • FIRST YEAR

Pharmacognosy

CHAPTER 4

Alkaloids, Terpenoids, Glycosides, Volatile Oils, Tannins and Resins

ENGLISH CHAPTER NOTES



DIPLOMA IN PHARMACY

SECONDARY METABOLITES: QUICK OVERVIEW

CORE IDEA

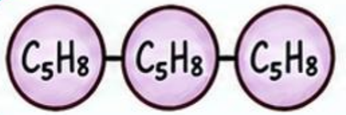
Secondary metabolites are specialized natural compounds. They help plants in defence, attraction or interaction and many have medicinal value.

ALKALOIDS



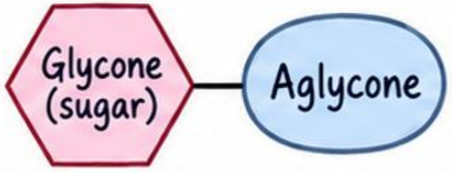
usually basic nitrogen-containing compounds; examples: morphine, quinine

TERPENOIDS



compounds built from isoprene-derived units; examples: menthol, artemisinin

GLYCOSIDES



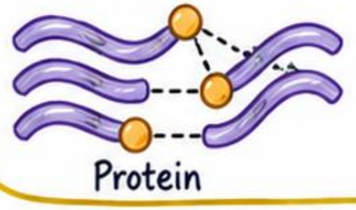
glycone (sugar) + aglycone joined by a glycosidic bond; examples: digoxin, sennosides

VOLATILE OILS



aromatic plant oils that evaporate readily; examples: peppermint oil, clove oil

TANNINS

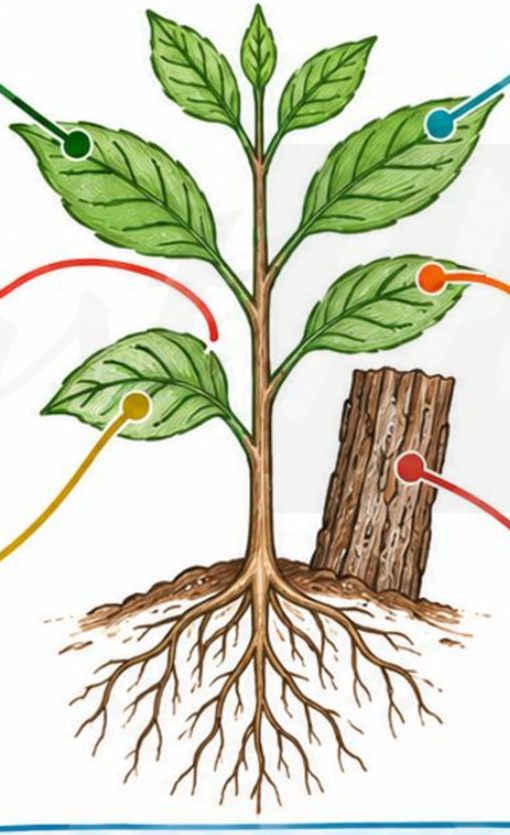


astringent polyphenols that bind proteins; examples: catechins, tannic acid

RESINS



water-insoluble solid or semi-solid plant products; examples: benzoin, colophony



QUALITY CONTROL

Identity is supported by characteristic properties, extraction behaviour and specific chemical tests.

SIX GROUPS IN THIS CHAPTER

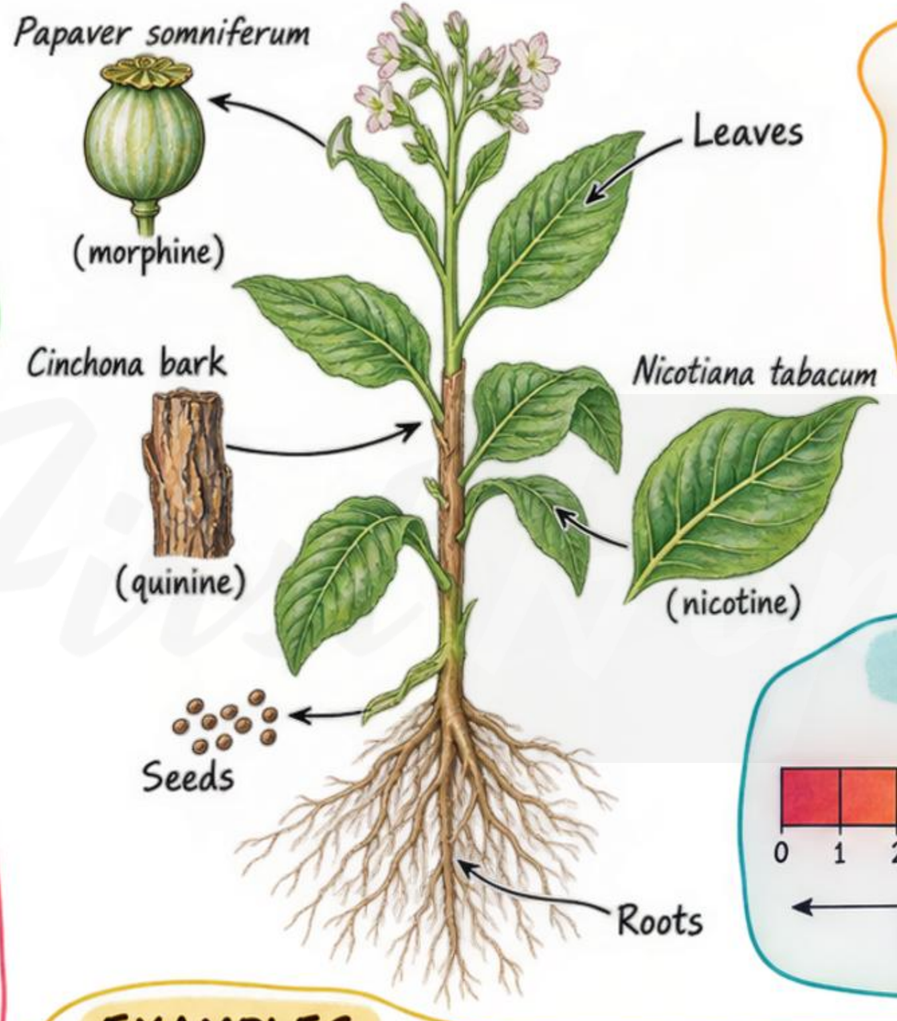
ALKALOIDS: OCCURRENCE AND PROPERTIES

DEFINITION

Alkaloids are naturally occurring nitrogen-containing organic compounds; most are basic and many are formed biosynthetically from amino acids. They often produce marked physiological effects.

PROPERTIES

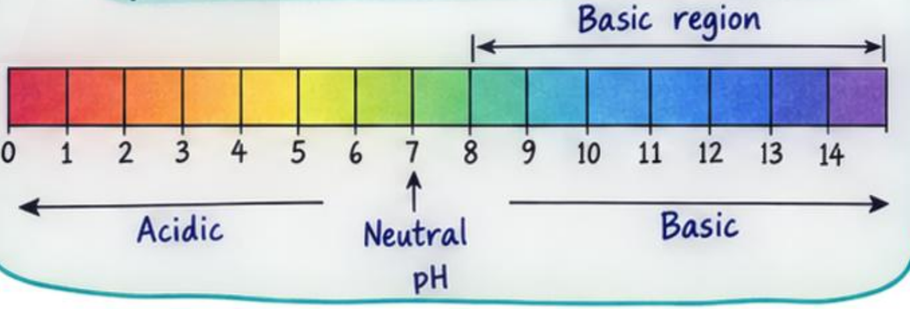
- Usually bitter and alkaline.
- Free bases are commonly soluble in organic solvents and poorly soluble in water.
- Alkaloid salts are usually more water-soluble.
- Many have analgesic, stimulant, sedative or other pharmacological actions.



OCCURRENCE AND DISTRIBUTION

- Widely distributed in higher plants; some also occur in fungi, bacteria and animals.
- Important families: Solanaceae, Papaveraceae, Rubiaceae and Apocynaceae.
- Commonly concentrated in roots, bark, seeds and leaves.

pH SCALE (SHOWING BASIC REGION)



EXAMPLES



Morphine — *Papaver somniferum*



Quinine — *Cinchona species*



Nicotine — *Nicotiana tabacum*

ALKALOIDS: ISOLATION AND USES

PRINCIPLE

Acid-base extraction changes alkaloids between water-soluble salt form and less water-soluble free-base form.

ISOLATION

1. Powder and moisten the plant material.
2. Extract with dilute acid: alkaloids form salts in the aqueous layer.
3. Filter to remove insoluble plant material.
4. Make the filtrate alkaline: free alkaloid bases are released.
5. Extract free bases with a suitable immiscible organic solvent.
6. Separate, concentrate and purify the alkaloid fraction.



THERAPEUTIC ACTIVITIES

- Analgesic
- antimalarial
- antihypertensive
- antitumour
- CNS actions

PHARMACEUTICAL EXAMPLES



Morphine
— pain relief



Quinine
— antimalarial



Atropine
— anticholinergic



Vincristine and vinblastine
— anticancer



Ephedrine
— bronchodilator

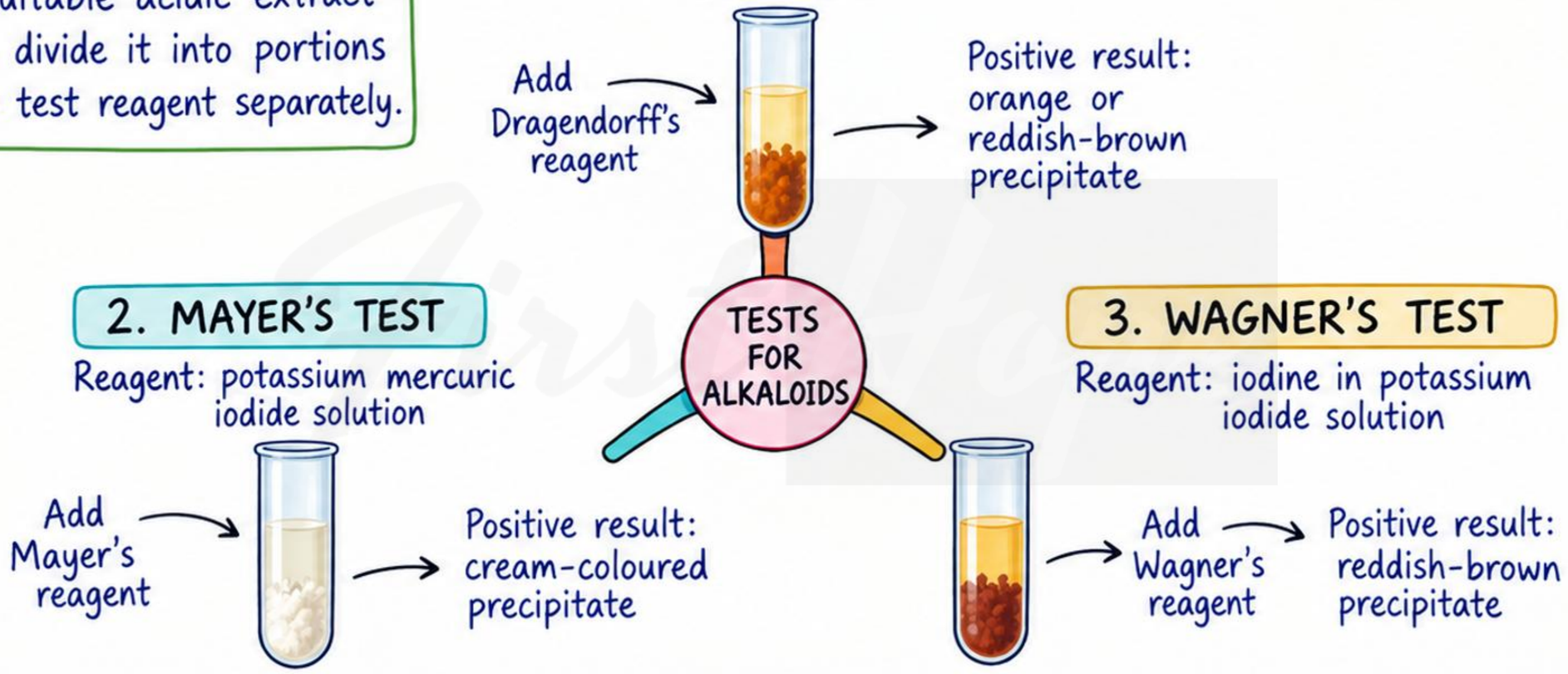
QUALITY NOTE

Solvent choice and pH control are essential for efficient separation.

IDENTIFICATION TESTS FOR ALKALOIDS

GENERAL STEP

Prepare a suitable acidic extract of the drug, divide it into portions and add the test reagent separately.



1. DRAGENDORFF'S TEST

Reagent: potassium bismuth iodide solution

Add Dragendorff's reagent

Positive result: orange or reddish-brown precipitate

2. MAYER'S TEST

Reagent: potassium mercuric iodide solution

Add Mayer's reagent

Positive result: cream-coloured precipitate

3. WAGNER'S TEST

Reagent: iodine in potassium iodide solution

Add Wagner's reagent

Positive result: reddish-brown precipitate

INTERPRETATION

A characteristic precipitate supports the presence of alkaloids. Confirm identity with suitable chromatographic or instrumental methods because group tests are not compound-specific.

These are preliminary group tests for alkaloids.

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