

Part-I

Alkaloids:-

Vinca, Rauwolfia, Belladonna, Opium

Presented By;-

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Alkaloids

Definition:- Alkaloids are **naturally occurring nitrogen-containing basic compounds found mainly in plants** that have medicinal or physiological effects.

Characteristics

- a) Contain one or more **nitrogen atoms**.
- b) Usually have a **bitter taste**.
- c) Most are **alkaline** and form salts with acids.
- d) Commonly occur in plants, especially in seeds, bark, roots, and leaves.
- e) Exhibit significant **pharmacological activity**.



Classification

- 1) **True Alkaloids**:-Alkaloids that are derived from amino acids and contain nitrogen in a ring (heterocyclic ring). Examples: Morphine, Atropine, Quinine, Nicotine.
- 2) **Protoalkaloids**:-Alkaloids that are derived from amino acids, but the nitrogen is outside the ring. Examples: Ephedrine, Mescaline.
- 3) **Pseudoalkaloids**:-Alkaloids that are not derived from amino acids, but still contain nitrogen. Examples: Caffeine, Theobromine, Theophylline.

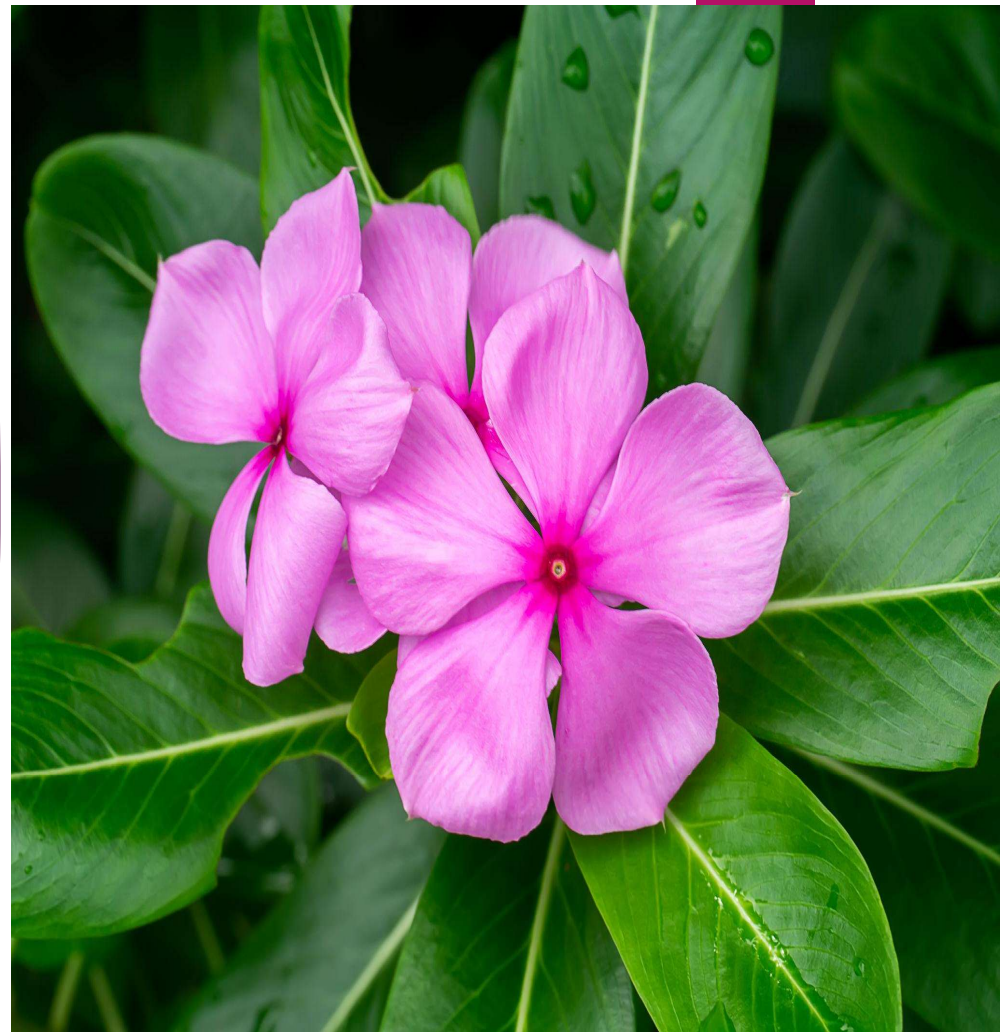
Examples and sources

S.No	Alkaloid	Source	Use/Effect
1	Morphine	Opium poppy	Powerful pain reliever
2	Quinine	Cinchona bark	Treatment of malaria
3	Caffeine	Coffee, tea	Central nervous system stimulant
4	Nicotine	Tobacco	Stimulant; addictive compound
5	Atropine	Belladonna	Dilates pupils; antispasmodic
6	Codeine	Opium poppy	Cough suppressant and pain relief

Identification Tests for Alkaloids

S.No	TEST	OBSERVATION	INFERENCE
1	Mayer's test:- To small amount of crude drug, add Mayer's reagent (potassium mercuric iodide solution).	Gives cream colour or precipitate	Presence of alkaloids
2	Dragendorff's test:- To the small amount of crude drug, add Dragendorff's reagent (potassium bismuth iodide solution).	Gives reddish brown colour or precipitate	Presence of alkaloids
3	Wagner's test: To small amount of crude drug, add Wagner's reagent (iodine–potassium iodide solution).	Gives brown or reddish brown colour or precipitate	Presence of alkaloids
4	Hager's test:- To small amount of crude drug, add Hager's reagent (saturated solution of picric acid).	Gives yellow precipitate	Presence of alkaloids

Vinca



Vinca

1. Vinca (*Catharanthus roseus*), commonly known as **Madagascar Periwinkle** or **Sadabahar**, is a perennial evergreen herb belonging to the **Apocynaceae** family.
2. It is one of the most important medicinal plants because it produces valuable **indole alkaloids** with potent anticancer activity.
3. The plant is native to **Madagascar** but is widely cultivated in India and many tropical and subtropical countries.
4. It grows well in warm climates and is commonly found in gardens as an ornamental plant due to its attractive pink, white, or purple flowers.
5. Its ornamental value, the leaves, stems, roots, and flowers are extensively used in the pharmaceutical industry for the extraction of therapeutic alkaloids.



Chemical Constituents

The plant contains more than **130 indole alkaloids**, along with flavonoids, tannins, and phenolic compounds.

Major Active Constituents

- ☐ Vincristine
- ☐ Vinblastine
- ☐ Vindoline
- ☐ Catharanthine
- ☐ Ajmalicine (Raubasine)
- ☐ Serpentine



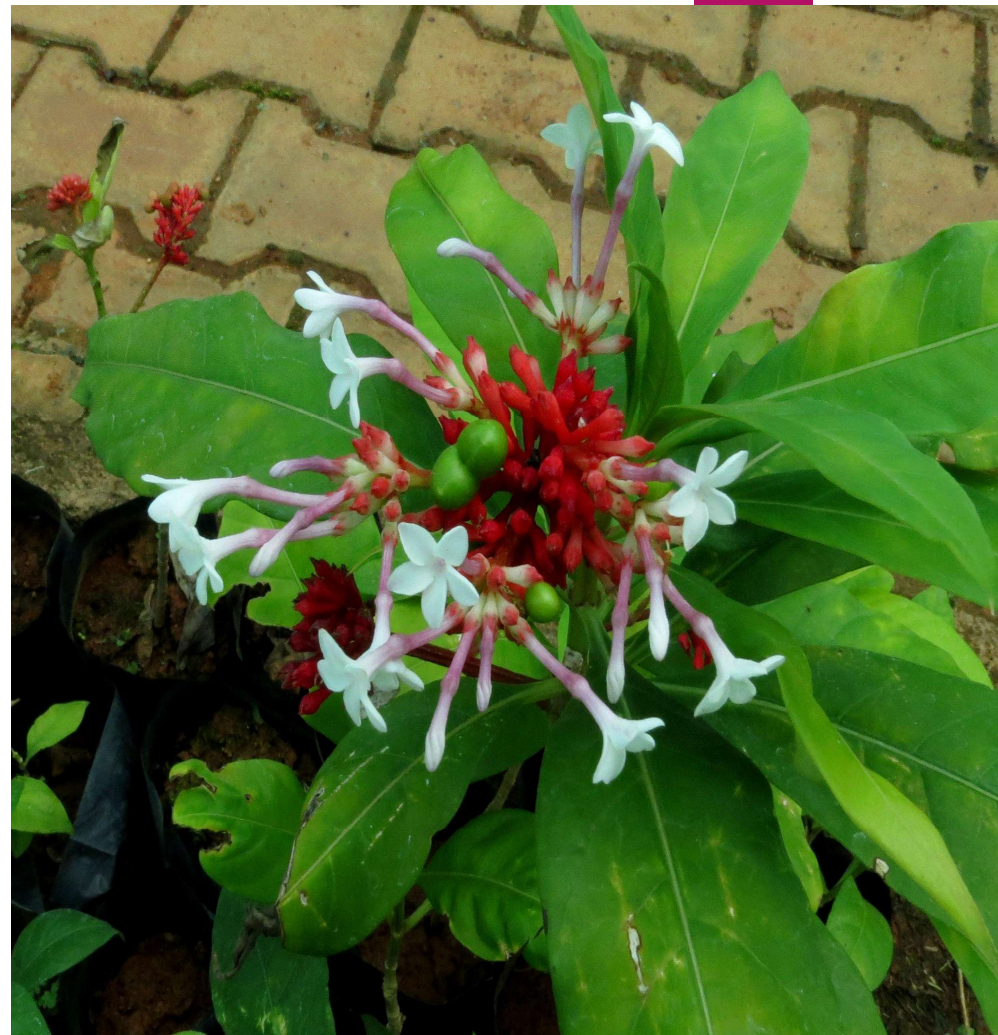
Therapeutic Uses

1. **Anticancer:-** Vincristine and vinblastine are used in the treatment of leukemia, Hodgkin's lymphoma, breast cancer, testicular cancer, and other malignancies.
2. **Antihypertensive:-** Ajmalicine helps lower blood pressure by improving blood circulation.
3. **Antidiabetic:-** Traditionally used to reduce blood glucose levels.
4. **Antimicrobial:-** Shows antibacterial and antifungal activity.
5. **Antioxidant:-** Protects cells from oxidative damage.
6. **Wound Healing:-** Promotes healing due to antimicrobial and antioxidant properties.

Commercial Applications

S.No	Commercial Product	Active Constituent	Medical Use
1	Vincristine Injection	Vincristine	Acute lymphoblastic leukemia, lymphomas
2	Vinblastine Injection	Vinblastine	Hodgkin's lymphoma, testicular cancer
3	Ajmalicine Preparations	Ajmalicine	Hypertension and cerebral circulation disorders
4	Herbal Capsules/Tablets	Whole plant extract	Antidiabetic and antioxidant supplements

Rauwolfia



Rauwolfia

1. Rauwolfia (*Rauwolfia serpentina*), commonly known as **Indian Snakeroot** or **Sarpagandha**, is an important medicinal plant belonging to the **Apocynaceae** family.
2. It is native to India and other tropical regions of Southeast Asia, where it grows in moist, shaded forests.
3. The **dried roots** of the plant are the official medicinal part and are rich in **indole alkaloids**, especially **reserpine**, **ajmaline**, and **ajmalicine**.
4. Rauwolfia has been used in traditional Ayurvedic medicine for centuries to treat **hypertension**, **mental disorders**, **insomnia**, and **snake bites**.
5. Today, it is widely valued in pharmacognosy and the pharmaceutical industry as a natural source of antihypertensive and sedative drugs.



Chemical Constituents

The roots contain **0.7–2.4% total alkaloids**, with more than **50–80 indole alkaloids** identified.

Major Alkaloids

- ☐ Reserpine
- ☐ Rescinnamine
- ☐ Deserpidine
- ☐ Ajmaline
- ☐ Ajmalicine (Raubasine)
- ☐ Serpentine
- ☐ Serpentinine
- ☐ Yohimbine
- ☐ Raubescine



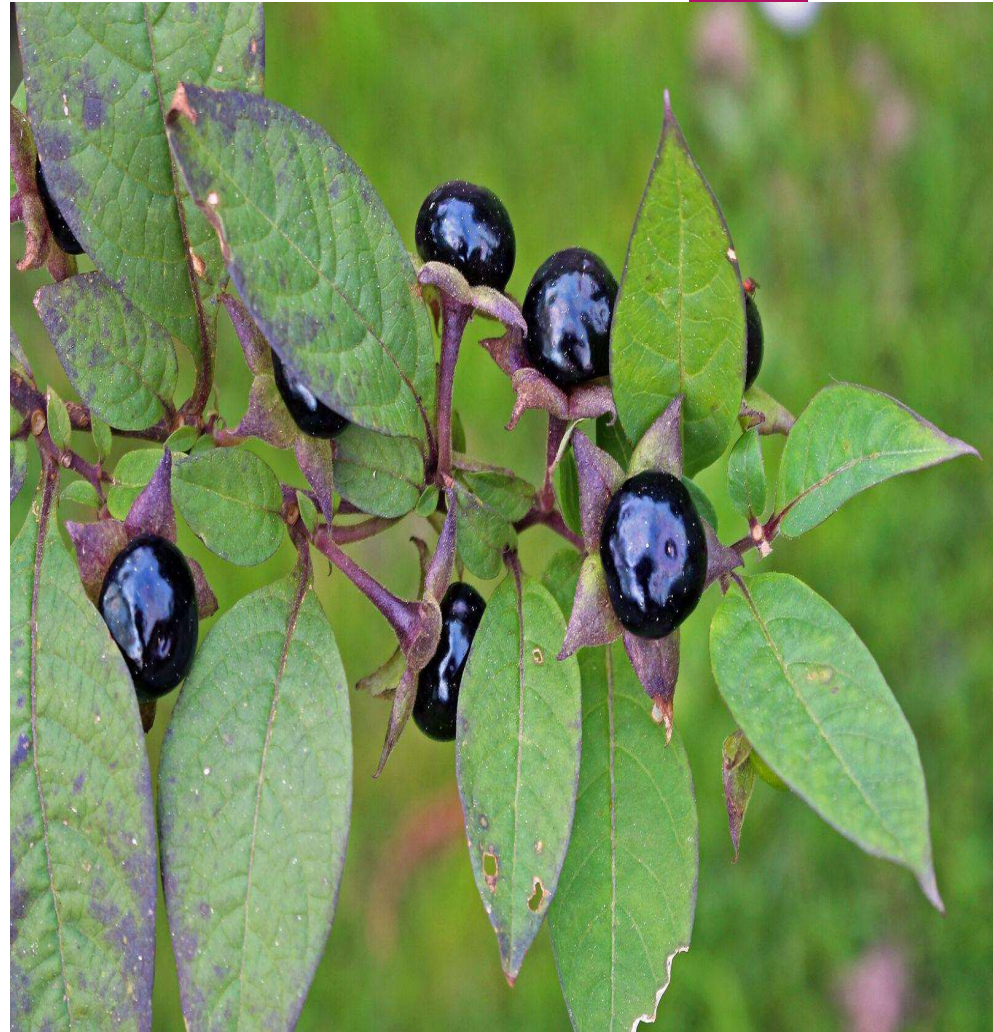
Therapeutic Uses

1. **Antihypertensive** – lowers high blood pressure (Reserpine)
2. **Sedative and tranquilizer** – reduces anxiety and nervousness
3. **Antipsychotic** – used in certain mental disorders
4. **Treats insomnia** by producing a calming effect
5. **Antiarrhythmic** – Ajmaline is used for cardiac arrhythmias
6. **Traditionally used for snake bite, fever, epilepsy, and rheumatism** in Ayurveda.m

Commercial Applications

S.No	Commercial Product / Drug	Active Constituent(s)	Medical Uses
1	Reserpine Tablets	Reserpine	Treatment of hypertension (high blood pressure) and previously used as a tranquilizer/antipsychotic.
2	Ajmaline Injection	Ajmaline	Treatment and diagnosis of cardiac arrhythmias (antiarrhythmic agent).
3	Ajmalicine (Raubasine) Tablets/Capsules	Ajmalicine	Improves cerebral and peripheral blood circulation; used in vascular disorders.
4	Deserpidine Tablets	Deserpidine	Antihypertensive drug used for management of high blood pressure.
5	Rauwolfia Root Extract Capsules	Total indole alkaloids (mainly Reserpine, Ajmaline, Ajmalicine)	Herbal antihypertensive, sedative, and anxiolytic preparation.
6	Sarpagandha Tablets (Ayurvedic Formulation)	Standardized Rauwolfia root extract	Used for hypertension, anxiety, insomnia, and nervous disorders.

Belladonna



Belladonna

1. Belladonna (*Atropa belladonna* L.) is a perennial medicinal herb belonging to the **Solanaceae** family.
2. It is native to Europe, North Africa, and Western Asia, and is cultivated in several countries for its medicinal value.
3. The plant is mainly valued for its dried leaves and roots, which contain important **tropane alkaloids** such as atropine, hyoscyamine, and scopolamine.
4. These alkaloids possess anticholinergic, antispasmodic, and mydriatic properties and are widely used in modern medicine.
5. Belladonna is an important crude drug in pharmacognosy and serves as a major source of pharmaceutical alkaloids.



Chemical Constituents

Belladonna contains **0.3–1.0% tropane alkaloids**, which are responsible for its medicinal activity.

Major Active Constituents

- ☐ **Hyoscyamine** (major alkaloid)
- ☐ **Atropine** (formed by racemization of hyoscyamine)
- ☐ **Scopolamine (Hyoscine)**
- ☐ Belladonine
- ☐ Apoatropine (minor alkaloid)
- ☐ Flavonoids
- ☐ oumarins
- ☐ Tannins



Therapeutic Uses

1. Used as an **anticholinergic (parasympatholytic) agent**.
2. Relieves **gastrointestinal, biliary, and urinary tract spasms**.
3. Used as a **mydriatic** to dilate the pupil during eye examinations.
4. Reduces **salivary and bronchial secretions** before surgery.
5. Used in the treatment of **Parkinson's disease** (adjunct therapy).
6. Helps relieve **motion sickness** (mainly due to scopolamine).
7. Used in cases of **organophosphate poisoning** as an antidote (atropine).

Commercial Applications

S.No	Commercial Product / Drug	Active Constituent(s)	Medical Uses
1	Atropine Injection	Atropine	Used to treat bradycardia (slow heart rate), as a pre-anesthetic medication, and as an antidote for organophosphate poisoning.
2	Atropine Eye Drops (1%)	Atropine	Produces mydriasis (pupil dilation) and cycloplegia for eye examination and treatment of uveitis.
3	Hyoscine (Scopolamine) Transdermal Patch	Hyoscine (Scopolamine)	Prevents motion sickness, nausea, vomiting, and postoperative nausea.
4	Hyoscine Butylbromide Tablets/Injection	Hyoscine Butylbromide	Relieves gastrointestinal, biliary, and urinary tract spasms (antispasmodic).
5	Belladonna Alkaloid Tablets	Atropine, Hyoscyamine, Scopolamine	Used as antispasmodic agents for gastrointestinal disorders and abdominal cramps.
6	Belladonna Extract	Tropane alkaloids (Atropine, Hyoscyamine, Scopolamine)	Used in pharmaceutical formulations for antispasmodic, anticholinergic, and mydriatic effects.

Opium



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Opium

1. Opium is the dried latex obtained by making incisions on the unripe capsules of *Papaver somniferum* L., a medicinal plant belonging to the family **Papaveraceae**.
2. It is commonly known as the **Opium Poppy** and is cultivated in countries such as India, Turkey, Australia, and France under strict government regulations.
3. Opium is a rich source of important alkaloids, including **morphine, codeine, thebaine, papaverine, and noscapine**.
4. These alkaloids possess potent analgesic, antitussive, antispasmodic, and narcotic properties, making opium an important crude drug in medicine.
5. Due to its therapeutic value and potential for abuse, the cultivation, production, and use of opium are strictly regulated worldwide.



Chemical Constituents

Opium contains about **20–25% alkaloids**, along with carbohydrates, proteins, organic acids, gums, resins, sugars, and water. The major alkaloids include:

Major Active Constituents

- ☐ Morphine
- ☐ Codeine
- ☐ Thebaine
- ☐ Papaverine
- ☐ Noscapine (Narcotine)
- ☐ Narceine

Therapeutic Uses

1. **Morphine** – Potent analgesic used for severe pain (cancer pain, postoperative pain, myocardial infarction).
2. **Codeine** – Used as an antitussive (cough suppressant) and mild analgesic.
3. **Papaverine** – Smooth muscle relaxant and vasodilator; used for gastrointestinal, biliary, and vascular spasms.
4. **Noscapine** – Non-narcotic cough suppressant.
5. **Thebaine** – Not used directly as a medicine but serves as a precursor for several semisynthetic opioids.
6. Opium alkaloids may also be used to control **severe diarrhea** in selected clinical situations.

Commercial Applications

S.No	Commercial Product	Active Constituent(s)	Medical Uses
1	Morphine Injection/Tablets	Morphine	Potent analgesic for severe pain (cancer pain, postoperative pain, myocardial infarction)
2	Codeine Phosphate Tablets/Syrup	Codeine	Mild to moderate analgesic and cough suppressant (antitussive)
3	Noscapine Syrup/Tablets	Noscapine (Narcotine)	Non-narcotic cough suppressant used in dry cough
4	Papaverine Injection/Tablets	Papaverine	Smooth muscle relaxant; used in biliary, urinary, and vascular spasms
5	Oxycodone Tablets	Thebaine (precursor)	Strong opioid analgesic for moderate to severe pain
6	Naltrexone Tablets/Injection	Thebaine (precursor)	Management of opioid and alcohol dependence
7	Paregoric (Camphorated Opium Tincture)*	Morphine and other opium alkaloids	Antidiarrheal (historically used; now rarely prescribed in many countries)



Thank you

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