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Macroscopical & microscopical studies of some medicinal plants from kalsubai region of western ghat

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Abstract
Introduction: The chosen plants are well-known traditional and natural medicines throughout the world; they are used to cure a variety of illnesses. According to studies, this possesses antibacterial, antiviral, antifungal, anticancer, anthelmintic, analgesic, hypotensive, anti-inflammatory, and immune-enhancing qualities that can be utilised to treat disorders. Despite having a number of therapeutic uses and qualities.
Methods: The macroscopical and microscopical properties are investigated in this research investigation.
Results: According to the transverse slice of the leaves, the study plant could be identified by its upper cuticle, upper epidermis, palisade cells, vascular bundle, spongy mesophyll, phloem fibres, lignified vessels, xylem vessels, collenchyma, lower epidermis, lower cuticle, and parenchyma.
Conclusion: The pharmacognostic study of the plant can be formed based on this research discovery, making it easier to recognise and ascertain the macroscopic and microscopic characteristics of the plants.

Keywords: macroscopical, microscopical, medicinal plants, pharmacognostical evaluation

Introduction

Plant Profile

1. *Catharanthus roseus*

Description
- Catharanthus roseus is an evergreen subshrub or herbaceous plant growing 1 m (39 in) tall.
- leaves are oval to oblong, 2.5–9 cm (1.0–3.5 in) long and 1–3.5 cm (0.4–1.4 in) wide, glossy green, hairless, with a pale midrib and a short petiole 1–1.8 cm (0.4–0.7 in) long; they are arranged in opposite pairs.
- The flowers range from white with a yellow or red center to dark pink with a darker red center, with a basal tube 2.5–3 cm (1.0–1.2 in) long and a corolla 2–5 cm (0.8–2.0 in) diameter with five petal-like lobes.
- The fruit is a pair of follicles 2–4 cm (0.8–1.6 in) long and 3 mm (0.1 in) wide.

Botanical Source
- Cataranthus roseus dried entire plants are used to make vinca. It also goes by the name Vinca rosea.

Family
- Apocynaceae

Synonym
- Periwinkle, Sadabahar

Common Name
- bright eyes, Cape periwinkle, graveyard plant, Madagascar periwinkle, old maid, pink periwinkle, rose periwinkle

Geography and Distribution
Although Catharanthus roseus is native to Madagascar, it has been grown as an attractive plant for centuries in the tropics and occasionally in the subtropics. As a result, it has naturalised in many places. From seeds brought back from Madagascar, it was initially cultivated in Paris during the first part of the 18th century, and from there it was spread to the tropics by European botanical gardens. Some of its alkaloids' antimitotic abilities were unintentionally discovered in the late 1950s while looking for antidiabetic compounds.

Habitat
Catharanthus roseus is most commonly associated with coastal habitats (e.g. cliff faces, rocky ocean ledges and sand dunes)

Classification
- **Scientific name:** Catharanthus
- **Family:** Apocynaceae
- **Subfamily:** Rauvolfioideae
- **Higher classification:** Dogbanes
- **Rank:** Genus
- **Order:** Gentianales
- **Kingdom:** Plantae

Medicinal Uses
- Used as a antineoplastic agent.
- Used in Hodgkin’s lymphomas.
- Used in acute lymphocytic leukemia in child.
- Antidiabetic action.

Pharmacognostical Evaluation
- **Section A - Macroscopical Studies**
- The leaves are opposite, simple, and petiolate; the petioles are long, glabrous or lightly pubescent; the lamina are elliptic, obovate or oblong-elliptic, obtuse or retuse, mucronulate, and their bases are frequently cuneate or subcuneate and slightly decurrent; the margins are entire, and they may or may not be hairy,

membranous, or The main lateral nerves are rather close together and arcuate, and the nervation is not particularly obvious. Upper surface puberulus or glabrescent, dark brilliant green. Lower surface pubescent or practically glabrous, light green.

- **Section B - Microscopical Studies**

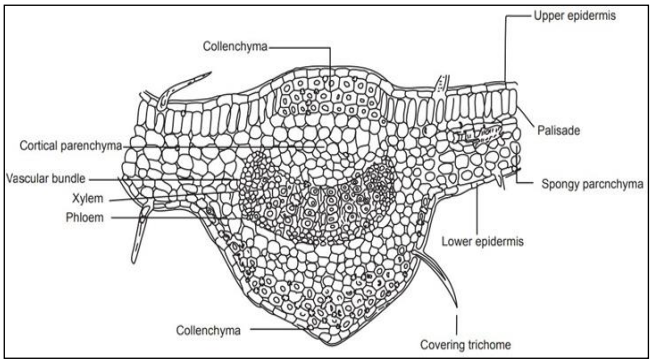

Fig 1

- Upper surface shows presence of single layer of rectangular celled epidermis with unicellular covering trichomes.
- Spongy parenchyma.
- Cruciferous stomata / Anisocytic stomata present.

Chemical Constituents
- Vincristine
- Vinblastine

2. *Rauvolfia serpentine*
Description
- The outward characteristics of the roots and rhizomes are quite similar. The substance is found in sections that are cylindrical or slightly tapered, tortuous, 2–10 cm long, and 5–22 mm in diameter. Rarely are the roots branched. Rare are rootlets with a diameter of 0.5–1 mm. The exterior is brown, light brown, or greyish-yellow. While older pieces feature longitudinal ridges, younger pieces have minor wrinkles. There are root-let scars that are round. Old samples have bark exfoliation, which leaves exposed wood in places. Short fracture is present. The smooth transverse surface has a short, yellowish-brown bark and a dense, pale yellow wood at both ends. Rhizome fragments resemble roots in appearance, but can be distinguished by a small central pith.
- **Biological source:** Rauwolfia is obtained from dried roots and rhizomes of plant *Rauwolfia serpentina*.
- **Synonym:** Chhotachand, Sarpagandha
- **Family:** Apocynaceae

Geographical Distribution
It is a tiny, erect, evergreen shrub that is indigenous to the Orient and can be found from Sumatra to India. Additionally, it can be found in Pakistan, Java, Indonesia, Malaysia, Philippines, Thailand, Burma, and Thailand. In India it occurs in the sub-Himalayan tracts from Sirhind eastwards to Assam, especially in Dehradun, Siwalik range, Rohelkhand, Gorakhpur ascending to 1,300 m, east and west ghats of Tamil Nadu, in Bihar (Patna and Bhagalpur), Konkan, Karnataka and Bengal.

Habitat
- Grows well in hot humid climate, temperature ranging between 10-38º C, preferring partial shade in tropical or subtropical belt having the benefit of monsoon rains, rainfall ranging from 250-500 cm. It prefers sandy alluvial loam to red lateritic loam or stiff dark loam.

Classification
- Kingdom- Plantae
- Phylum -Tracheophytes
- Subphylum -Angiospermae
- Class -Magnoliopsida
- Order -Gentianales
- Family -Apocynaceae
- Genus- Rauwolfia
- Species -serpentina

Medicinal Uses
- Therapeutically Rauwolfia is antihypersensitive in nature.
- Used in neuropsychiatric disorder.
- Ajmaline is used in the treatment of arrhythmia.
- Ajmalacine used in the relief of obstruction of normal cerebral blood flow.

Pharmacognostical Evaluation
- **Section A-Macroscopical Studies**

The outward characteristics of the roots and rhizomes are essentially the same. The substance is found in sections that are cylindrical or slightly tapered, tortuous, 2–10 cm long, and 5–22 mm in diameter. Rarely are the roots branched. Rare are rootlets with a diameter of 0.5–1 mm. The exterior is brown, light brown, or greyish-yellow. While older pieces feature longitudinal ridges, younger pieces have minor wrinkles. There are root-let scars that are round. Old samples have bark exfoliation, which leaves exposed wood in places. Short fracture is present. The smooth transverse surface has a short, yellowish-brown bark and a dense, pale yellow wood at both ends. Rhizome fragments resemble roots in appearance, but can be distinguished by a small central pith. They are attached to them with small pieces of aerial stem. Slight odour is felt in recently dried drug which decreases with age; taste is bitter.

- **Section B Microscopical Studies**
- T.S section of root shows externally by stratified cork with 2-7 layers of small cells that is followed by phellod

Both bark and wood contains abundant starch.
- Xylem is entirely lignified.
- Sclerenchyma is absent
- Tetrastichious arrangement present

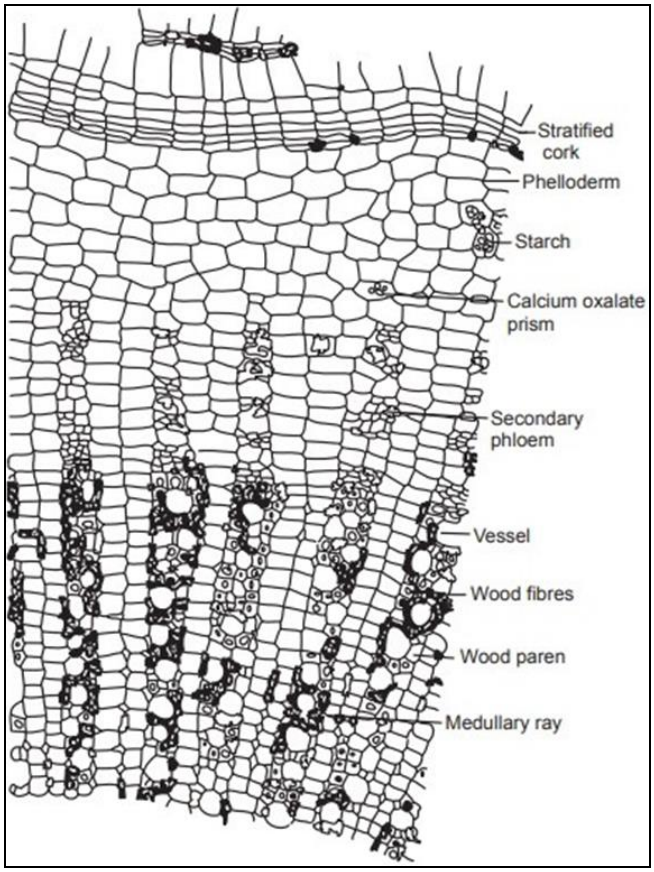

Fig 2

Chemical Constituents

- Contains more than 30 alkaloids –
- Ajmaline (Rauwolfine), Ajmaliline, Ajmalacine, Serpentine, Serpentinine.
- Chief important therapeutically active alkaloids – Reserpine, Rescinnamin

3. *Lachryma papaveris*

Synonym: Afim.

Biological Source: Opium is obtained from dried latex obtained by incision of the unripe capsule of *Papaver somnifarum*.

Variety : *Papaver somnifarum album* (Indian) *Papaver somnifarum glabrum* (Turkey) *Papaver somnifarum nigrum* (European)

Family: Papaveraceae.

Microscopy

- Microscope shows agglomerated latex granules in irregular mass.
- Stomata – Anomocytic
- Pointed trichomes, few starch granules present.

Chemical constituents

- The present alkaloids has combined with organic acid i.e. Meconic acid.

OPIUM ALKALOIDS

Benzylisoquinoline	Phenantherene ring
- Noscapine	- Morphine
- Narceine	- Codeine
- Narcotine	- Thebaine
- Papaverine (optically inactive)	

- Morphine is monoacidic, phenolic alkaloids.
- Morphine is laevorotatory in nature.
- Opium alkaloids are present as salt of meconic acid.
- Opium also contains sugar, wax, mucilage and salt of calcium, potassium and magnesium.

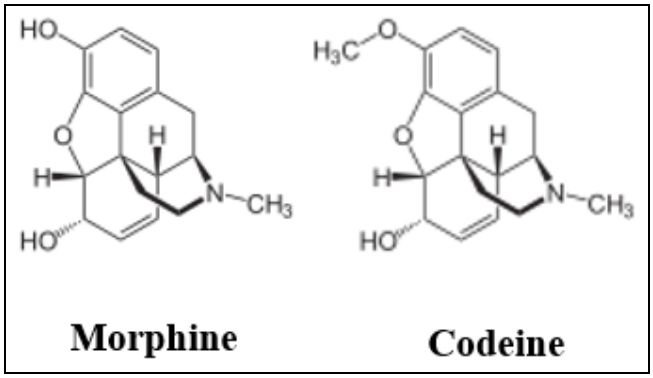

Fig 3

Other Species (Allied plants)

Papaver bracteum contains no morphine, they contains high percentage of thebaine so causes no addiction.

Chemical Constituents

1. Marquis test – Morphine + Conc. H2SO4 + HCHO Dark violet color
2. Meconic acid + FeCl3 Deep reddish purple color
3. Morphine + SiO2 Blue color
4. Papaverine solution in HCl and potassium ferricyanide develops a lemon yellow color.

5. Morphine, when sprinkled with concentrated HNO3, shows an orange red color, this is not allowed by codeine.

Morphine solution when treated with ferric chloride and potassium ferricyanide gives a bluish-green color.

Uses
- Morphine is used as a Analgesic.
- Sedatives and hypnotics
- Morphine also produces respiratory depression and constipation.
- Codeine – Cough syrup preparation.
- Papaverine – smooth muscle relaxants.
- Apomorphine – Emetic (for treating poisoning cases).

Phenylpropanoids and Flavonoids Phenylpropanoids
- The phenylpropanoids are diverse family of organic compounds that are synthesized by plants from the amino acids phenylalanine and tyrosine.
- The name is derived from the six-carbon, aromatic phenyl group and the three-carbon propene tail of coumatic acid, which is the central in phenylpropanoid biosynthesis.

Flavonoids
- Flavonoids are synthesized through the phenylpropanoid pathway transforming phenylalanine into 4 coumaroyl-CoA, which finally enters the flavonoids synthesis pathway.

4. *Glycyrrhiza glabra*
Synonym: Mulethi
Biological Source: Liquorice is obtained from dried peeled or unpeeled root an stolon of *Glycyrrhiza glabra var.typica* (Spanish liquorice) *Glycyrrhiza glabra var.glandulifera* (Russian liquorice) *Glycyrrhiza glabra var.violacea* (Persian liquorice)
Family: Leguminaceae
Macroscopy: The color of unpeeled liquorice is yellowish brown externally and yellowish internally while the peeled liquorice is pale yellow in color.

Table 1

T.S of Liquorice root	T.S of Liquorice stolon
Shows presence of polyhedral tubular brownish cork cells.	Also shows presence of polyhedral tubular brownish cork.
Absence of pith, shows tetrarch xylem.	Presence of pith.
Presence of medullary rays	Absence of medullary rays
Presence of cortex	Presence of cortex

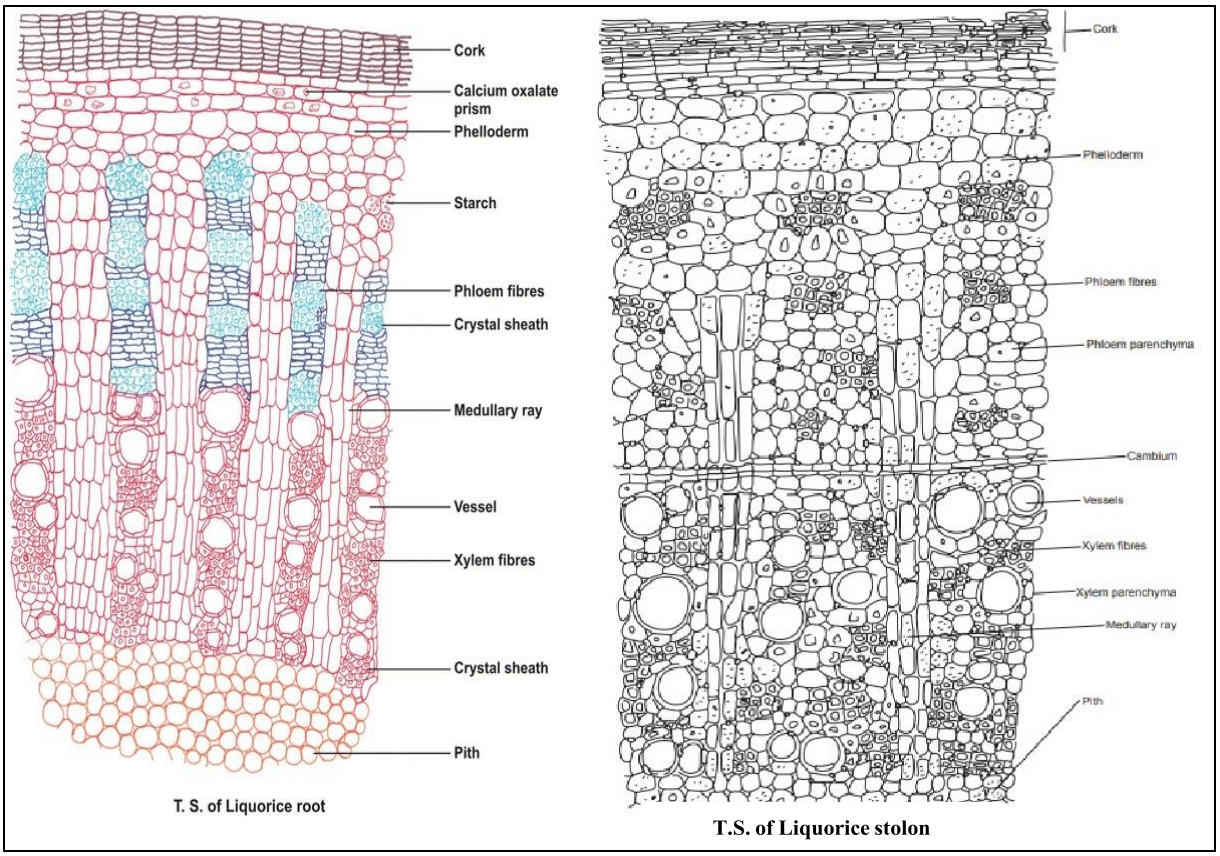

Fig 4

- Unpeeled drug shows presence of polyhedral tubular brownish cork cells.
- Thick, lignified fibres in phloem and xylem.
- Calcium oxalate are present in parenchyma.
- In stolons pith is present and it is parenchymatous.
- Root is characterized by presence of tetrarch xylem and absence of pith.

Chemical Constituents
- Chief constituent is pentacyclic triterpenoid saponin known as glycyrrhizin (glycyrrizic acid) which is a potassium and calcium salts of glycyrrhizinic acid.
- Presence of flavonoid (liquiritin and isoliquiritin) cause antigastric effect and it is useful in peptic ulcers.
- Carbenoxolone (used as anti-ulcer drug) is an oleandane derivative prepared from glycorrhiza.

Chemical Test
Section of drug + 80% H2SO4 □ Show Yellow Color

Uses
1. Used as expectorant, demulcent.
2. It is used in peptic ulcer in the form of deglycyrrhized liquorice (DGL).
3. It is having minerocorticoid activity (due to glycyrrhetinic acid). It is employed in place of corticoids for the treatment of rheumatoid arthritis, inflammation and addison's disease.
4. Flavouring a

Adulterants and Substitute
- Manchurian liquorice (Glycyrrhiza uralensis)
- Russian liquorice (Glycyrrhiza glandulifera)

5. *Dioscorea bulbifera*
Synonym: Yam plant
Biological source: Dioscorea is obtained from dried tubers of plant Dioscorea deltoidae.
Family: Dioscoreaceae

Chemical Constituents:
- Rhizomes contain 75% starch in rhizome.
- Chief active constituents is diosgenin (Sapogenin) and its glycosides smilagenin and yammogenin.
- Diosgenin is the hydrolytic product of saponin-dioscin.

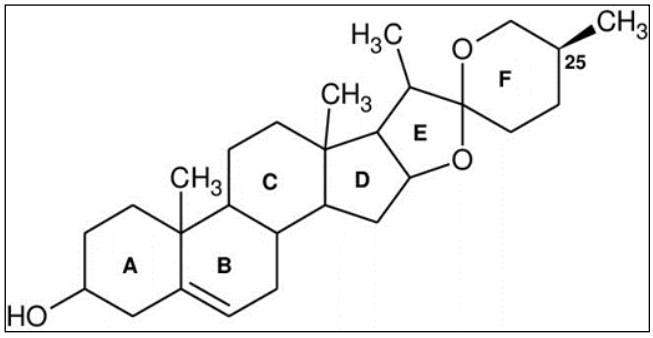

Fig 5

Uses
- As a precursor for the synthesis of corticosteroids, sex hormones and oral contraceptives.
- Used in the treatment of rheumatic arthritis.

6. *Digitalis purpurea*
Synonym: Foxglove leaves
Biological Source: Digitalis is obtained from dried leaves of plant Digitalis purpurea and Digitalis lanata.
Family: Scrophulariaceae
Description
- Contains not less than 0.3% of total cardinolides calculated as digitoxin.
- Dried at temperature below 60ºC, immediately after collecting the leaves.
- In leaves should contain not more than 5% of moisture.

Microscopy
- Dorsiventral leaf.
- Anomocytic stomata in upper epidermis.
- Numerous covering trichomes and few glandular trichomes present.
- Covering trichomes are uniseriate and multicellulars.
- Glandular trichomes are unicellular stalk and bicellular head.
- Collapsed cell trichomes are important characteristic of digitalis leaf.
- Free of Calcium Oxalate crystals and sclerenchyma (stone cells.
- Colenchyma at 3 different places: (characteristic of digitalis leaf).

1. Upper epidermis
2. Lower epidermis
3. Ppericyclic part

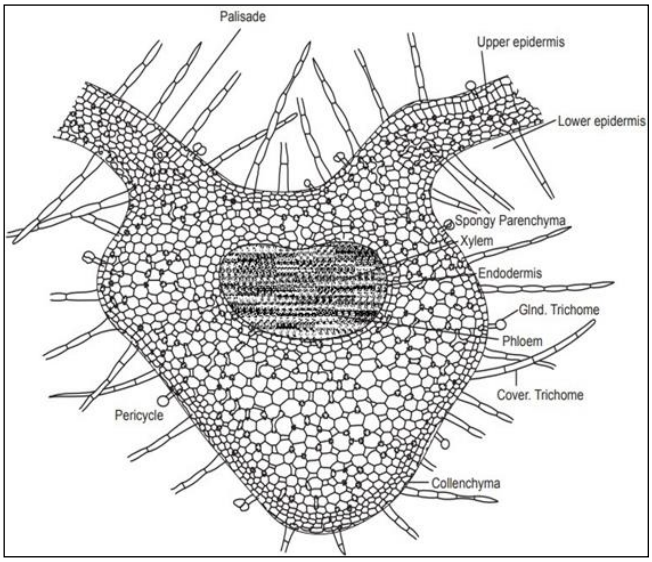

Fig 6

Chemical Constituents
- Contains – 0.2 to 0.45% mixture of both primary and secondary glycosides.
- Primary glycoside: Purpurea glycoside A and B. Contain linear chain of 3 digitoxose sugar terminated by glucose.
- Secondary glycoside (less absorbable): digitoxin, gitoxin and gitaloxin.

Uses
- Digitalis increase the force of systolic contraction, cardiac stimulant and cardiotonic.
- Used in congestive heart failure.
- Arterial flutter and arterial fibrillation.

Volatile Oils
- Volatile oils are defined as the odorous and volatile constituent of plant and animal species.
- Volatile oils are also termed as ethereal oil because they evaporate when exposed to air at an ordinary temperature.

- They are also called as essential oil as they are the essences or active constituent of the plant.
- They are composed of terpenes, monoterpene, sesqueterpenes, diterpenes, polyterpenes and their derivatives.

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