IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 2, October 2025
Impact Factor: 7.67

A Review On Cathranthus Roseus

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Abstract: *Fungal infections represent a significant health challenge, often complicated by the emergence of drug resistance and adverse effects associated with conventional antifungal agents. In this context, herbal medicines are gaining recognition as safer and more sustainable alternatives. Catharanthus roseus (commonly known as Madagascar periwinkle or Sadafuli) is a well-known medicinal plant used in traditional systems such as Ayurveda and folk practices. Its foliage contains diverse bioactive compounds including alkaloids, flavonoids, tannins, and phenolics, which are linked to strong antimicrobial and antifungal activities. Research findings indicate that leaf extracts of Sadafuli are effective against pathogenic fungi like Candida albicans, Aspergillus niger, and Fusarium species. The antifungal mechanisms are thought to involve disruption of cell membranes, suppression of spore germination, and inhibition of fungal enzymes. Owing to its phytochemical diversity, Sadafuli leaves demonstrate considerable potential as a natural antifungal resource and could serve as a valuable component in polyherbal formulations to enhance therapeutic efficacy.*

Keywords: History, Introduction, Classification, Morphology, Chemical constituents, Mechanism, Activity

I. INTRODUCTION

Sadafuli Leaves (Catharanthus roseus)

The therapeutic value of Catharanthus roseus leaves has been recognized for hundreds of years across various traditional systems. In Ayurveda, the leaves were prescribed for ailments such as diabetes, skin problems, and certain infections. In Caribbean folk practice, decoctions of the leaves were consumed to ease digestive complaints, soothe sore throats, and regulate blood sugar levels. Across African traditions, topical applications of the leaves were used for wound healing, and the plant was also regarded as helpful in managing malaria and fungal diseases.

Scientific interest in the plant rose markedly during the mid-20th century. In 1950, Noble, Beer, and Cutts identified pharmacologically active alkaloids in the leaves, drawing global attention to its potential as an anticancer agent. This eventually led to the discovery of the alkaloids vinblastine and vincristine, which became revolutionary drugs in the treatment of leukemia and Hodgkin's lymphoma.

Subsequent phytochemical investigations demonstrated that the leaves are rich in indole alkaloids, tannins, flavonoids, and phenolic compounds. Early studies indicated promising effects such as antidiabetic, blood pressure-lowering, and antimicrobial activities, though results were sometimes inconsistent. Among its alkaloids, ajmalicine was noted for its temporary blood-pressure-reducing action. More recent research has broadened the recognized pharmacological roles of the leaves, highlighting antioxidant, antifungal, and wound-healing properties. This blend of traditional knowledge and scientific validation underscores the importance of Sadafuli leaves in both ethnomedicine and modern pharmacology.

Introduction:

Sadafuli leaves (Catharanthus roseus), commonly referred to as periwinkle, have long been valued in traditional healing systems for their diverse medicinal benefits. They are enriched with bioactive molecules such as alkaloids, flavonoids, tannins, and phenolic compounds, which contribute to their therapeutic significance. Among the various pharmacological effects attributed to these leaves, their antifungal potential has received considerable attention. Fungal infections remain

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a major health challenge, particularly due to drug resistance and adverse effects associated with conventional antifungal agents. In this context, plant-based remedies like sadafuli represent a natural, safe, and affordable alternative. The phytochemicals in the leaves exert antifungal activity by interfering with the fungal cell wall structure and suppressing fungal growth, making them a promising candidate for herbal antifungal product development. Therefore, exploring the antifungal efficacy of sadafuli leaves not only validates their traditional applications but also emphasizes their importance in the formulation of novel plant-based therapies.

Fig1 . Cathranthus Roseus

Taxonomical Classification:

Kingdom	**Plantae**
Division	Magnoliophyta (flowering plant)
Class	Magnoliopsida (dicotyledons)
Order	Gentianales
Family	Apocynaceae
Genus	*Catharanthus*
Species	roseus

Vernacular Name:

The Sadafuli plant (*Catharanthus roseus*) is known by many vernacular/local names in different regions:

Marathi	Sadafuli
Hindi	Sadabahar
English	Madagascar Periwinkle, Rosy Periwinkle
Sanskrit	Nityakalyani, Ushira
Tamil	Nithyakalyani
Kannada	Sada Pushpa

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Malayalam	Ushamalari, Nithyakalyani
Gujarati	Sadaphuli
Bengali	Nayantara
Telugu	Billaganneru

Morphology of Sadafuli Plant:

Fig 2. Morphology of sadafuli plant

Sadafuli is a small, long-lived evergreen shrub.
It generally reaches a height of about 30 to 100 cm.
Develops a compact, bushy appearance with numerous branches.

1. Root

The plant has a taproot system.
Its roots are cylindrical, brown in color, and somewhat woody.
Shows numerous secondary and tertiary rootlets.

2. Stem

The stem ranges from herbaceous to partially woody.
It grows upright, has a cylindrical shape, and a smooth surface.
Young stems are green, gradually turning brown as they mature, with clearly defined nodes and internodes.

3. Leaf

Fig 3. Leaf of sadafuli

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Arrangement: Leaves are opposite and decussate.
Type: Simple and without stipules.
Shape: Elliptic to oblong.
Size: Measures 2.5–9 cm in length and 1–3.5 cm in width.
Margin: Entire**.**
Apex: Acute**.**
Venation: Pinnate and reticulate.
Surface: Upper surface smooth and glossy dark green; lower surface lighter in color.
Petiole: Short, ranging from 0.5 to 1.8 cm.

4. Inflorescence

Flower Type: Flowers are solitary or form small cymes in the leaf axils.
They may appear alone or in pairs at the junction of the leaf and stem.

5. Flower

Fig 4. Flowers of cathranthus Roseus

Flowers are complete, actinomorphic, bisexual, and hypogynous.
Calyx: Consists of 5 free, green, linear-lanceolate sepals.
Corolla: Composed of 5 petals fused into a salver-shaped (rotate) structure; colors range from pink, white, rose, red, to violet.
Androecium: Contains 5 stamens that are epipetalous, attached to the corolla tube.
Gynoecium: Bicarpellary and syncarpous, with a superior ovary that is bilocular and contains numerous ovules.
Nectar Disc: Present at the base of the ovary.

6. Fruit

Consists of a pair of cylindrical follicle (2–4 cm in length)
Each containing numerous seeds.

7. Seed

Fig 5. Seeds of cathranthus Roseus

Small, oblong, dark brown to black in color
Rough surface

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Endospermic in nature.

CHEMICAL CONSTITUENTS OF CATHRANTHUS ROSEUS

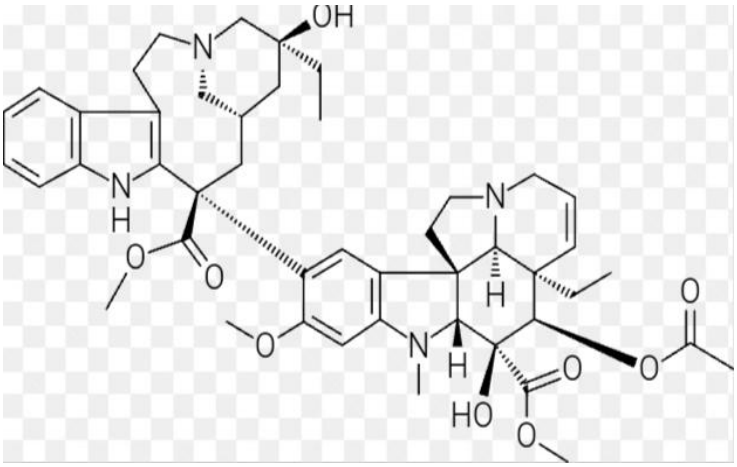
Catharanthus roseus (syn. Vinca rosea), a member of the Apocynaceae family, is renowned for its diverse secondary metabolites, especially alkaloids, which possess significant medicinal properties.

1. Alkaloids (Major Constituents)

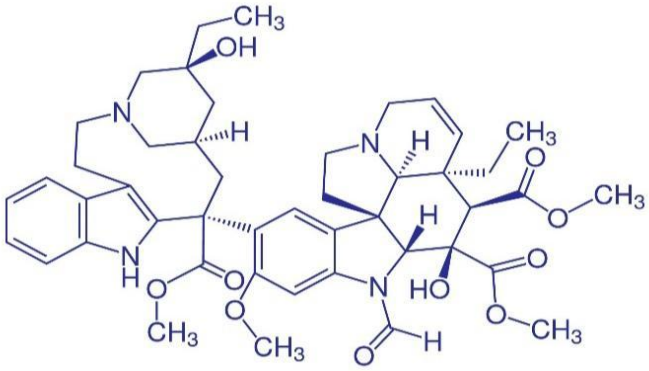
Over 130 distinct indole alkaloids have been identified in various parts of Catharanthus roseus, most of which are monoterpenoid indole alkaloids (MIAs).

Leaves & Stems contain the most pharmacologically important alkaloids:

Vinblastine



Vincristine



Other important alkaloids:

Ajmalicine (Raubasine),Serpentine , Reserpine , Vindoline, Catharanthine, Lochnericine , Leurosine , Vindecline, Tabersonine – precursor for semi-synthesis of vinorelbine

2. Flavonoids & Phenolic Compounds

Kaempferol

Quercetin , Rutin.

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3. Phenolic acids :(e.g., caffeic acid, ferulic acid, chlorogenic acid)
Triterpenoids & Sterols , β-sitosterol , α-amyrin, Ursolic acid, Oleanolic acid, Tannins

4. Other Constituents
Carbohydrates – glucose, sucrose, starch
Proteins and amino acids – tryptophan (precursor for indole alkaloids)
Pigments – anthocyanins (petal coloration: pink, white, purple)
Organic acids – citric acid, malic acid

Mechanism of Antifungal Action
The antifungal activity is exerted through multiple mechanisms:

Disruption of fungal cell wall and membrane integrity
Alkaloids and tannins interact with **ergosterol** (a key component of fungal membranes), leading to leakage of cell contents and fungal death.
Inhibition of fungal enzymes
Phenolics and flavonoids inhibit enzymes like **chitin synthase** and **β-glucan synthase**, impairing cell wall biosynthesis.

Oxidative stress induction
Reactive oxygen species (ROS) generated by flavonoids cause damage to fungal DNA, proteins, and lipids.

Prevention of fungal adhesion and biofilm formation
Flavonoids and tannins reduce fungal adhesion on host tissues, preventing colonization.

Biological Activities of Catharanthus roseus
Catharanthus roseus is a medicinal plant abundant in alkaloids, flavonoids, tannins, saponins, phenolic compounds, and terpenoids. These bioactive compounds contribute to a wide array of pharmacological effects, including antifungal, anticancer, antidiabetic, antimicrobial, antioxidant, anthelmintic, antidiarrheal, gastroprotective, wound healing, anti-inflammatory, antihypertensive, cardioprotective, antiviral, and antimalarial activities.

Catharanthus roseus:
Catharanthus roseus, commonly called Vinca rosea or Madagascar periwinkle, is a flowering plant well known for its wide range of therapeutic properties. Below is a detailed summary of its pharmacological activities:
1. Anticancer Activity
Catharanthus roseus is a notable source of vinca alkaloids, such as vinblastine and vincristine, which are extensively used in cancer chemotherapy.
Vinblastine and Vincristine: These alkaloids interfere with microtubule formation, thereby blocking cell division and triggering apoptosis in cancer cells.
Mechanism of Action: They bind to tubulin, preventing microtubule assembly and causing cell cycle arrest at metaphase.
Pharmacological Effects: Inhibit cancer cell proliferation, induce programmed cell death, and demonstrate effectiveness against multiple cancers, including leukemia, lymphoma, breast, lung, and bladder cancers.

2. Antimicrobial Activity:
The antimicrobial activity of Vinca rosea was evaluated against various pathogenic microorganisms, including bacterial strains (Bacillus subtilis, B. licheniformis, and Azotobacter sp.) and fungal strains (Aspergillus niger, Alternaria solani, and Rhizopus oryzae), using the agar well diffusion method. Methanolic extracts from different sources—such as in vivo leaves, in vitro leaves, leaf and nodal callus cultures, and fruit explants—were tested. These extracts exhibited notable antimicrobial effects, as indicated by their minimum inhibitory concentration (MIC) values.

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3. Antifungal Activity

Catharanthus roseus has demonstrated activity against several fungal pathogens, such as:
Candida albicans
Aspergillus fumigatus
Fusarium solani
Key compounds like *catharanthine* and *vindoline* contribute to its antifungal effects by:
Damaging fungal cell membranes
Blocking ergosterol biosynthesis, which is essential for maintaining fungal cell membrane structure

4. Antidiabetic Activity:

Flavonoids and phenolic compounds in the plant extracts have been reported to:
Promote glucose absorption by peripheral tissues
Trigger the release of insulin
Boost glycogen formation in the liver
Possibly help lower blood sugar levels and support better glycemic regulation

5. Antioxidant Activity

Catharanthus roseus is rich in flavonoids and phenolic compounds, which are known to:
-Scavenge free radicals
-Shield cells from oxidative stress and damage
-Potentially slow the development of conditions such as diabetes, cancer, and neurodegenerative diseases

6. Anthelmintic Activity

Flavonoids and phenolic compounds help neutralize free radicals, thereby protecting cells from oxidative stress and damage.
Extracts of the plant have demonstrated potential against helminthic parasites by:
Interfering with their neuromuscular activity and coordination
Suppressing parasite metabolism and reproductive processes

7. Antidiarrheal Activity.

Catharanthus roseus has a history of traditional use in managing diarrhea. Its extracts, particularly those containing ***alkaloids and flavonoids***, have been shown to:
Slow down intestinal movement and fluid secretion
Improve absorption within the intestines

8. Gastroprotective Activity

Flavonoids and phenolic compounds *help in:*
Safeguarding the stomach lining from ulcers and inflammatory damage
Lowering oxidative stress and inflammation within the gastrointestinal system

9. Wound Healing

Catharanthus roseus supports wound repair through:
-Boosting collagen production and aiding tissue regeneration
-Encouraging the formation of new blood vessels (angiogenesis)
-Minimizing inflammation and oxidative damage

10. Anti-inflammatory Activity

The plant's bioactive compounds :

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Alkaloids and Flavonoids:
- Inhibit pro-inflammatory mediators and cytokines
- Reduce inflammation and alleviate symptoms of various diseases

11. Antihypertensive and Cardioprotective Activity

While not extensively studied, Catharanthus roseus may have potential benefits for hypertension and cardiovascular health due to its:
- Bioactive compounds with vasodilatory and antioxidant properties
- Potential to reduce blood pressure and cardiovascular risk factors

12. Antiviral Activity

Limited research is available on the antiviral potential of Catharanthus roseus.
However, its antimicrobial properties suggest possible applications in antiviral therapy.

13. Antimalarial Potential

The plant's compounds have shown promise in combating malaria parasites by:
- Disrupting parasite metabolic processes and survival
- Inhibiting parasite growth and replication

14. Biopesticidal Property:

The effectiveness of solvent-based extracts of Catharanthus roseus was evaluated against the larvae of gram pod borer (Helicoverpa armigera). Among the tested extracts, the ethyl acetate fraction of C. roseus leaves demonstrated significant biopesticidal activity

II. CONCLUSION

Catharanthus roseus is regarded as a highly significant medicinal plant due to its wide range of pharmacological properties. Its indole alkaloids, particularly vincristine and vinblastine, transformed modern cancer treatment and continue to play a crucial role in oncology. In addition to their anticancer potential, extracts of this plant have shown antimicrobial, antifungal, antidiabetic, and antioxidant activities, validating its use in traditional medicine. Nevertheless, the plant also carries a risk of toxicity if misused, which highlights the importance of precise dosage and proper standardization in herbal preparations.

In conclusion, C. roseus exemplifies how traditional medicinal practices can guide the discovery of groundbreaking therapeutic agents. Owing to its diverse pharmacological actions, it remains a focal point of scientific research aimed at developing new treatments for cancer, infectious conditions, and metabolic disorders.

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