



A Review On Herbal Plant Vinca

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ABSTRACT:

Vinca species, especially Vinca minor and Catharanthus roseus, represent medicinally useful plants with a variety of bioactive indole alkaloids, belonging to the family Apocynaceae. Vinca minor contains vincamine, which is a cerebrovasodilatory and neuroprotective alkaloid also in common use for cognitive disorders. On the other hand, Catharanthus roseus produces potent anticancer alkaloids such as vinblastine, vincristine, vinorelbine, and vindesine. These represent a number of pharmacological activities that include cytotoxicity, hypoglycemic, antimicrobial, anti-inflammatory, and neuroprotective effects. Recent phytochemical investigation has shown that environmental conditions seem to play a vital role in the alkaloid composition of Vinca plants; therefore, advanced techniques like chromatography and spectroscopy are needed to isolate and quantify bioactive metabolites. Therapeutic benefits from Vinca alkaloids have led to their current global application in cancerous disorders, hypertension, diabetes, dermatology, malaria, and microbial infections. At the same time, recent studies have highlighted vinflunine, and semisynthetic vincamine analogs possessing improved efficacy and safety. This review will provide an overview of the phytochemistry, pharmacological activities, and clinical significance of Vinca alkaloids, which certainly represent an indispensable natural source in the ongoing development of novel drugs for neuroprotection, oncology, and modern herbal therapies.

KEYWORDS:

Alkaloids, Catharanthus Roseus, Vinblastine, Vincristine, Micropropagation

INTRODUCTION:

Vinca rosea is also known as *Catharanthus roseus* or periwinkle or *Nayantara* or *Sadabahar*. ^[1, 2] It is an essential medicinal plant which belongs to the Apocynaceae family. *Vinca rosea* plant is synthesis two types of alkaloids as vinblastin, vinrosidine, vinleurosine and vincristine. ^[1]

These alkaloids are used to fight cancer. In Brazil, the leaves of the *Vinca rosea* plant is used to control hemorrhage and scurvy and also used as a mouth wash for toothache and cleaning and healing of chronic wounds. The related species of *Vinca rosea* have been used for proprietary suppression of the flowing milk in Europe. ^[1] This plant grows 30-60cm in height.

^[3] The plant of *Vinca rosea* Linn (periwinkle) is an ever-blooming, pubescent herb or subshrub which shown to be a source of many alkaloids.

Vinca rosea plant has a popular reputation in indigenous medicine in various parts of the world.

^[3] The native of *Vinca rosea* is mainly Madagascar. The plant *Vinca rosea* is grown commercially for its medicinal uses in Australia, Africa, southern Europe and India. The rainfall of about 100 cm is most suitable for *Vinca rosea*. ^[2]

Vinca alkaloids were discovered in the 1950's by Canadian researchers, Robert Noble and Charles Beer just because. Restorative uses of this plant lead to the observing of these mixes for their hypoglycemic movement, which is of little significance contrasted with their cytotoxic effects ⁽⁴⁾.

They have been utilized to treat diabetes, hypertension and the medications have even been utilized as disinfectants. By and by, the *vinca* alkaloids are so significant for being malignant growth warriors. There are four significant *vinca* alkaloids in clinical use: Vinblastine (VBL), vinorelbine (VRL), vincristine and vindesine (VDS), yet just VCR, VBL and VRL are endorsed for use in the United States ⁽⁵⁾, from 2008, there is additionally another engineered *vinca* alkaloid, vinflunine that is presently affirmed in Europe for restorative treatment ^(6, 7), they have been utilized to treat diabetes, hypertension and the medications have even been utilized as disinfectants.



Fig. 1: The flowers of *Catharanthus roseus* G. Don. *Catharanthus* (syn. *Vinca rosea*) an evergreen shrub, it grows to a height of 1 m with a spread of 1 m. The stem is short, erect and branching, the leaves are glossy green, oval, 5 cm long and opposite acuminate; the towers are soft pink, tinged with red, 5 petal, open,

tubular and 4 cm across, appearing in spring and autumn (three colors: maroon, purple and white)

SCIENTIFIC CLASSIFICATION:

Botanical Name	Vinca Rosea (<i>Catharanthus roseus</i>)
Family Name	Apocynaceae
Kingdom	Plantae
Division	Magnoliophyta (Flowering plant)
Class	Magnoliosida (Dicotyledons)
Order	Gentianales
Family	Apocynaceae
Genus	Catharanthus
Species	Catharanthus roseus

VERNACULAR NAMES:

English: cayenne jasmine, old maid, periwinkle

Hindi: sada bahar, sadabahar

Kannada: batla hoo, bili kaasi kanigalu, ganeshana hoo, kempu kaasi kanigalu

Malayalam:	banappuvu, usamalari nityakalyani, savanari,
Marathi:	sadaphool, sadaphul, sadaphuli
Sanskrit:	nityakalyani, sadapushpi rasna, sadampuspa

Botanical Description:

It is an herbaceous plant or an evergreen subshrub growing to 32 in 80 cm high. It has glistening, dark green, and flowers all summer long. The flowers of the naturally appear pale pink withma purple "eye" in their centres. Erect or accumbent suffrutex, to 1 m, usually with white latex Stems is green, often permeate with purple or red.

LEAVES:

The leaves of *Catharanthus roseus* are simple, opposite, and decussate, meaning each successive pair of leaves is arranged at right angles to the pair beneath it. They are:

- **Shape:** Oval, elliptic, obovate, or narrowly obovate
- **Size:** Typically 1–2 inches (2.5–5 cm) in length
- **Apex:** Distinctly mucronate, ending in a short, sharp tip
- **Base:** Cuneate to rounded
- **Petiole:** Present (petiolate), short but clearly visible
- **Surface:** Glabrous, smooth, and glossy
- **Venation:** Pinnate with a prominent pale midrib
- **Color:** Deep green above, lighter beneath.

The lamina displays slight variability in shape depending on sunlight exposure, soil nutrients, and developmental stage.

FLOWERS:

The flowers of *C. roseus* are highly attractive and a key ornamental feature. They exhibit the following characteristics:

- **Diameter:** 4–5 cm
- **Corolla:** Salver-shaped with five lobes AQA
- **Colors:** Usually white or pink, though hybrids produce shades of rose, magenta, and red
- **Centre (eye):** Distinctly colored—purple, red, pale yellow, or white, depending on variety
- **Fragrance:** Mild or absent
- **Arrangement:** Axillary and solitary.

The flowers are resilient and capable of blooming abundantly under warm conditions.

FRUIT AND SEEDS:

The fruit is a paired follicle, characteristic of the Apocynaceae family.

- **Size:** 1.2–3.8 cm long and 0.2–0.3 cm wide
- **Orientation:** Susceptible on the axial side, splitting longitudinally when mature
- **Seeds:**
 - o Size: Small (1–2 mm)
 - o Surface: Grooved on one side
 - o Number: Numerous
 - o Color: Dark brown to black.

Seed viability is high, contributing to easy propagation.

CLIMATE, SOIL, AND CULTIVATION REQUIREMENTS:

Flowering Period:

- Flowers throughout the year in tropical or equatorial climates.
- In warm temperate regions, flowering occurs from spring to late autumn.
- Cooler temperatures reduce or halt flowering.
- **Light Requirements:**
 - Prefers full sunlight for optimal growth and abundant flowering.
 - Requires at least 3–4 hours of direct sunlight daily.
 - In shaded conditions, the plant becomes lanky and produces fewer blooms.

Temperature:

- Thrives at normal room temperatures (20–30°C).
- Not frost tolerant.
- Temperatures below 10°C (50°F) cause growth retardation, leaf drop, or death.

Soil

- Prefers well-drained, sandy-loam or loamy soil.
- Tolerates poor or slightly alkaline soils but deteriorates in waterlogged conditions.
- Ideal pH: 5.5–7.5.

Watering / Irrigation:

- Requires regular moisture, especially during the active growing season.
- Avoid overhead watering to prevent fungal infections.
- Once established, the plant is moderately drought tolerant.
- Excess watering leads to root.

Watering advice:

- Keep soil moist but not waterlogged.
- Allow upper soil to dry slightly before watering again.

Feeding / Fertilization

- Not a heavy feeder.
- Use balanced liquid fertilizer every 2 weeks during flowering.
- Excess fertilization results in excessive foliage and reduced flower production.

Optimal nutrient balance encourages both flower formation and healthy green leaves.

GEOGRAPHICAL DISTRIBUTION:

Catharanthus roseus is native to the Madagascar region of the Indian Ocean, but over centuries it has naturalized across:

- India
- Sri Lanka
- Southeast Asia
- Africa
- The Caribbean
- South America
- Australia

Due to its adaptability and medicinal value, it is widely cultivated in tropical and subtropical regions worldwide.

CHEMICAL CONSTITUENTS OF VINCA ROSEA

(a) **Vinblastine:-** Vinblastin, beneath the marketed brand Velban amongst others, is the most commonly used combined with different medications. This area unit treat various variety of cancer includes non-small cell respiratory organ. cancer. Hodgkin's malignant neoplastic disease, bladder cancer, brain cancer, seminoma and malignant melanoma. It's administered by injection into a vein⁽⁸⁾

(b) **Vincristin:-** Vincristin is also called leuro-cris-tine and under marketed brand name is Oncovin among other, in chemotherapy. It should be used in the treatment of different types of cancer. These include acute lymphocytic leukemia, acute myeloid leukemia, Hodgkin's disease, neuroblastoma, and small cell lung cancer amongst other. It is administered by intravenously. These are also used as an immunosuppressant (Vincristine Sulphate).^(8,9)

(c)

(d) **Vindesine:-** Vindesine is employed in therapy. Vindesine is that the opposing mitotic genus. Vinca organic compound. It should be employ-ed in the treatment of varied form of cancer including or beneath the malignant neoplastic. disease, multiple skin cancer. Lymphoma, carci-noma and carcinoma. It is ad-ministrated by the blood vessel,^(8,9)

(e) **Tabersonine:-** Tabersonine is that the terpenes of indole alkaloid that are found within the medicative plant of genus inca rosea. These are hydroxylated at the sixteen position by the enzyme tabersonine 16-hydroxylase (T16H) was form 16-hydroxytabersonine. It is Ist inter-medi-ate resulting in type the vindoline one in all the 2 precursors are needed for vinblastine bio-synthesis,^(8,9)

(f) **Vinpocetine:-** These area unit the chemical syn-thetically derivative of the Vinca organic compound vincamine. These area unit the extr-acted from the leaves of Vinca minor (lesser periwinkle) or the seeds of voacanganafricon. Vinpocetin supplement was illegal for the sale in New Zealand, Australia and Canada as a result of its probably harmful nootropic characteristics. The major constituents in different part of C roseus has been explained in the table no. 1

MAJOR CONSTITUENTS IN DIFFERENT PART OF CATHARANTHUS ROSEUS

Part of Plant	Constituent
Leaf	Vindoline, vinblastine, vincristine, alkaloids, carbohydrate, saponins, tannins, flavonoid, steroids, triterpenoid, loganic acid.
Stem	Carbohydrate, steroids, tarmin, alkaloids.
Flower	Steroids, tannin, saponins, alkaloids, carbohydrate
Root	Saponins, carbohydrate, alkaloids, triterpenoid, alkaloids, tannins, ajmalicine, steroids.
Whole Part	Catharanthine, vindoline, vincristine, mono terpenoids, flavonoids, vinblastine.

PHARMACOLOGICAL ACTIVITIES

ANTICANCER ACTIVITY:

In clinical practice, the organization of C. roseus is done intravenously, after which they are in the long run used by the liver and discharged. Going bald, fringe neuropathy. obstruction and hyponatremia are the significant symptoms of this medications. To improve the remedial list, Semi-engineered Catharanthus alkaloids, for example, vinorelbine and vinflunine were created. Vinorelbine and vinflunine apply their antitumor impact by authoritative to tubulin. These alkaloids have development restraint influence some human tumors. Vinblastine is utilized tentatively for treatment of neoplasmas and is suggested for Hodgkin's sickness, chorio carcinoma. C. roseus was found to show the noteworthy anticancer movement against various cell types in vitro condition and particularly most prominent action

was found against the multidrug resistant tumor types. Vinca alkaloids likewise called as mitotic spindle poisons, they restrain get together of the spindle structures from microtubules, thereby hindering mitosis in cell cycle. Vinca alkaloids subsequently effectively keep disease cells from partitioning. Distinctive Vinca alkaloids have their own special properties⁽¹¹⁾, Vinca alkaloids square cells in mitosis since they are cell cycle specific specialists. The vinca alkaloids bind explicitly to α -tubulin and obstruct its capacity to polymerize with β -tubulin into microtubules. Without a flawless mitotic spindle, copied chromosomes can't adjust along the division plate and cell division is captured in metaphase. Cells obstructed in mitosis go through changes normal for apoptosis (Fig 2). They are additionally utilized for therapy of leukemias, lymphomas, and testicular disease

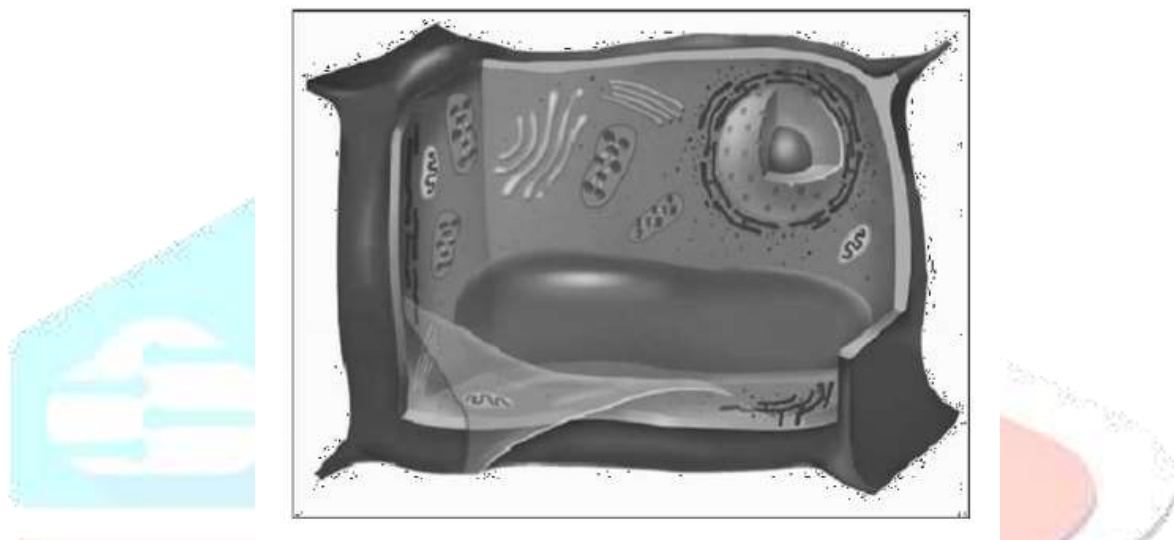


Fig 2: Possible pathway and mode of action of vincristine and vinblastine to act as anticancer

ANTI-OXIDANT PROPERTIES: The anti-oxidant potential of the ethanolic extract of the roots of two varieties as *C. roseus* (pink flower) and *Alba* (white flower) was obtained through different system of assay. The obtained extract of the roots of *Vinca rosea* varieties has exhibited satisfactory scavenging effect in entir-ed assay in concentration department manner but it found to possess more antioxidant activity than white flower (*Alba*),⁽⁸⁾

ANTIMICROBIAL ACTIVITY: *Vinca rosea* is an important medicinal plant for novel pharmaceuticals since most of the bacterial pathogens are developing resis-tant against several antimicrobial drugs. These plants have proved to importance natural resources for effe-ettive chemotherapeutic agent. The extract which ob-tained from different part of the plant show antibacterial activity against many microorganism such as *Pseudomonas aeruginosa*, *Salmonella typhimur ium*, *Staphylococcus aureus*. In the treatment of several bacterial diseases these extract also used as a prophy-lactic agent, ⁽¹²⁾

ANTI-DIABETIC ACTIVITY: The ethanolic extract which obtained from leaves and flower of the *Vinca rosea* show a dose dependent lowering of blood sugar level in comparable to standard drug. Lowering of the blood sugar in comparison to the standard drug gli-benclamide. The hypoglycemia effect has approv-ed due to result of increasing glucose utilized in liver. ⁽⁸⁾

ANTI-HELMINTHIC PROPERTY: The anti-helminthic are a group of antiparasitic drugs that are expel parasitic worms. Helminthic infection can leads to chronic ill-ness, ethanolic extract show the significant anti-helminthic activity, It affects human being and cattles. Vinca rosea was found to be used from the traditionally period as an anti-helminthic agent. ^{(13,}

WOUND HEALING ACTIVITY: Wound healing is a process of repair that injury to the skin and other soft tissue. Describe that the ethanolic extract of Vinca rosea have wound healing property mostly when treated to wounded rats and its property was due to increase tensile strength and hydroxyproline content present in the granulation tissue. It is supported the use of plant extract in the management of wound healing. The juice of Vinca rosea leaves was reported that it is more effective to reduce total cholesterol, LDL-C, VLDL in serum levels, triglycerides and histology of liver arota, kidney and it show atherosclerotic acti-vity. The methanol leaf extract of Vinca rosea show wound healing activity in streptozotocin induction diabetic mice at a con-centration of 200 and 400 mg/kg. ^(15,16)

ANTI-MALARIAL ACTIVITY: Chloroform extract of Vinca rosea roots at a dose 400 mg/kg was taken orally with water extract at dose 4.42 gm/kg to chicken produce weak activity on Plasmodium gallinaceum.

ALZHEIMER'S DISEASE: Vinca rosea contain Vinpoce-tine alkaloids which have a variety of actions to improve brain function and memory, generally beneficial in the case of Alzheimer's disease. Vinpocetine when subjected to a well-tolerated dose up to 60 mg/day in clinical trials of dementia and stroke proved no importance adverse events

FUTURE PROSPECTIVE

1. Enhanced Alkaloid Production:

This will lead to the focus on increasing the yield of major alkaloids like vinblastine, vincristine, and vinorelbine through plant tissue cultures, bioreactors, and genetic engineering.

2. Metabolic Engineering & Gene Editing:

With modern tools such as CRISPR and pathway modification, increasing biosynthesis of valuable compounds could become more feasible and sustainable.

3. Development of New Drug Derivatives:

Eventually, scientists are developing new semi-synthetic Vinca derivatives with more advanced anticancer efficiency and less adverse effects than available chemotherapeutic agents.

4. Neuroprotective Research Expansion:

Vinpocetine, a compound derived from Vinca, is likely to have a greater role in the future management of conditions such as

Alzheimer's disease, dementia, and memory disorders open completely new medical perspectives.

5. Anti-microbial Drug Development:

Since resistance to antibiotics is on the rise, Vinca extracts could be one of the future sources for developing new antibacterial and antifungal medicines.

6. Advanced Cultivation Techniques:

Further studies may center on soil, climate, and cultivation conditions for the optimization of the growth of plants and better concentration of alkaloids for commercial production.

7. Green Pharmaceutical Manufacturing:

Some research may be directed towards reducing environmental impact and developing green extraction methods for the Vinca alkaloids.

8. Exploring New Medical Uses:

Further pharmaceutical research may provide more therapeutic functions, such as anti-inflammatory, cardiovascular, and metabolic benefits.

9. Integration into modern herbal medicine:

Vinca-based formulations may be an integral part of any future herbal therapeutics and nutraceutical industries.

10. Global Commercialization & Market Growth:

With the increasing demand for natural plant-based drugs, Vinca may become an economically important crop for pharmaceutical industries, increasing economic value globally.

CONCLUSION:

Vinca, or *Catharanthus roseus*, is a plant of exceptional medicinal value and finds an important place in traditional as well as modern herbal medicine. The rich phytochemical profile—more so the presence of potent indole alkaloids such as vinblastine, vincristine, vinorelbine, vindesine, and vinpocetine—places this plant as a very promising natural source against cancer, diabetes, infections, inflammation, and neurological disorders. It exhibits varied pharmacological activities, which include anticancer, antioxidant, antimicrobial, anti-diabetic, anti-helminthic, wound healing, and even potential benefits in Alzheimer's disease. This wide range of therapeutic actions underlines the remarkable medicinal versatility of Vinca and justifies its global use in pharmaceutical research and drug development.

Overall, Vinca stands out as one of the best examples of how a humble ornamental plant could be harboring extraordinary medicinal properties. The successful applications of Vinca molecules in modern chemotherapy and neuroprotective formulation prove that natural products keep playing crucial roles in advanced healthcare. Further studies on its alkaloids, biosynthesis pathways, and better cultivation methods may lead to the discovery of even more safe and effective drug molecules. Thus, Vinca remains an indispensable plant for both traditional systems of healing and further medicinal innovation.

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