WORLD JOURNAL OF PHARMACEUTICAL RESEARCH
Coden USA: WJPRAP Impact Factor 8.63
Volume 15, Issue 21, 1455-1463. Review Article ISSN 2277–7105

A REVIEW ON MEDICINAL VALUE OF *CATHARANTHUS ROSEUS*

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Article Received on 05 Oct. 2026,
Article Revised on 25 Oct. 2026,
Article Published on 01 Nov. 2026

https://doi.org/10.5281/zenodo.23910634

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How to cite this Article: Khushi Singh Chauhan*, Jyoti Singh, Anish Kumar, Ramesh Singh. (2026). A Review on Medicinal value of Catharanthus Roseus. World Journal of Pharmaceutical Research, 15(21), 1455–1463.
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ABSTRACT

Vinca is also known as Catharanthus roseus(C. roseus), is a well-known medicinal plant from the apocynaceae family, native to various region including asia, Africa, Australia, north and south America, and southern Europe. Renowned for its rich phytochemical composition, C. roseus contains bioactive compounds such as flavonoids, phenolics, vinblastine, and terpenoids, which contribute to its diverse therapeutic properties, including anticancer, hypolipidemic, anthelmintic, antimicrobial, antiulcer, neuroprotective, wound-healing, antioxidant and hypoglycemic activities. This paper summarizes the most recent methods for preparing dried material, extracting bioactive components from this plant, and isolating them. Natural products significantly impact the pharmaceutical and agricultural industries, especially as “eco -friendly” alternatives to synthetic fungicides. The identified bioactive compounds in Gas chromatography-mass spectrometry analysis also have the way for developing pharmaceutical biosynthesis pathway, enlightening future research and development in these industries.

KEYWORDS: Catharanthus roseus, GC-MS analysis, vinblastine, vincritine, Anticancer activity, Indole alkaloid.

INTRODUCTION

Herbal plants are plants whose leaves, roots, flowers, seed or bark are used for medicinal or aromatic purposes. These plants synthesize natural chemical compounds called secondary metabolites (such as alkaloids, tannins, and Flavonoids) that triggers physiological benefits in the human body. Herbal remedies rich in diverse Phytoconstituent have been invaluable

since ancient times foe preventing and treating diseases, including cancer and remain integral to global healthcare. Herbal plants, known for their safety and efficacy offer a natural alternative to synthetic drugs, with minimal side effect.

Vinca rosea is a significant medicinal plant that is a member of the apocynaceae family. Vinca is also known by the synonym sadabahar, ratanjot, sadfuli and catharanthus rosea C.roseus exhibits a wide range of medicinal properties including vasodilation, anti-allergic, anti-inflammatory, antimicrobial, antidiabetic, antithrombotic, cardioprotective, antioxidant, antifungal and antiviral activities. Vincristine and vinblastine were isolate from this plant are well known anti-cancer drugs for hodgkin's lymphoma and childhood leukemia respectively. It is a dicotyledonous angiosperm with two terpene alkaloid.

PLANT PROFILE



Vinca Plant.

Vinca is a herbaceous plant or an evergreen subshrub growing to 32 in 80 cm high. It has glistening, dark green and flower all summer long. The flower of the naturally appear pale pink with purple ''eye'' in their centers. Stem is green, often permeate with purple or red.

Leaves: Oval leaves (1-2 in long) decussate, lamina variable, elliptic, obovate or narrowly obviate.

Flowers: 4-5 cm, classy, white or pink, with a purple, red, pale yellow or white centre follicle 1.2-3.8 × 0.2-0.3 cm, susceptible on the axial side. Seeds 1-2 mm, are numerous and grooved on one side.

Flowering period: Throughout the year in equatorial condition, and from spring to late autumn, in warm.

Temperature: Normal room temperature is suitable at all times and temperature is not less than 10^0C(50^0F).

A vinca having a unpleasant flavor and the smell is characteristic. Gardeners choose vinca because it is relative drought-tolerate and perform well in dry and hot location exposed to full sun. It also have some pharmacological vinca minor used for treatment of disorder's mostly related to skin and hair. It is effective in treating skin condition like acne, pimple and painful lumps on the skin.



Various Types of Vinca.

Mechanism of Action

1. Microtubules Inhibition

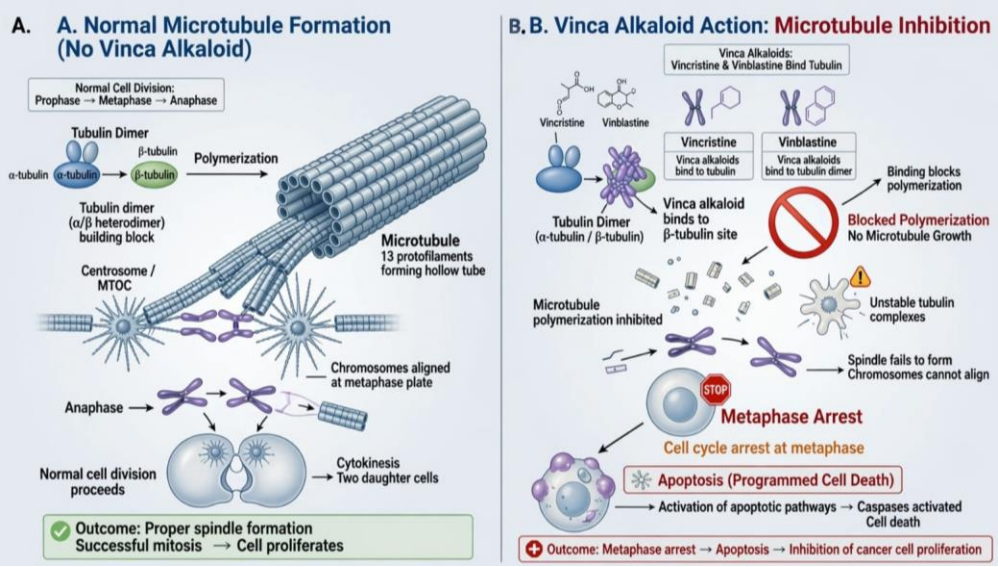
The activity of many of the drugs currently in use in cancer chemotherapy can probably be ascribed to inhibition of nucleic acid synthesis, but mechanisms of action differ widely.

Natural product which have exhibited antitumor activity span a very wide range of structural types. Yet there is no common features to explain their biological activity, some compound are mitotic inhibitor.

Natural product Vinca alkaloids, such as vincristine, vinblastine, and vinorelbine, target tubulin, a globular protein that is essential for forming microtubules. Microtubules are dynamic structures made from tubulin dimers, which are involved in various cellular processes. One of their critical roles is in cell division, specifically during mitosis, where they form the mitotic spindle—a structure that separates chromosomes into the daughter cells.

Tubulin Structure: Tubulin exists in two forms, alpha and beta, which combine to form heterodimers. These heterodimers polymerize into long, linear chains that make up microtubules. The microtubules are continuously undergoing polymerization (growth) and depolymerization (shrinking), which is crucial for their dynamic role in cellular functions, including mitosis.

Vinca Alkaloids' Action: Vinca alkaloids bind to the β-tubulin subunit of the tubulin dimers. This binding prevents polymerization, effectively disrupting the dynamic assembly of microtubules. Because microtubules cannot form or maintain their structure, the cell loses its ability to create functional microtubule network.



2. Prevention of Mitotic Spindle Formation

The mitotic spindle is a structure composed of microtubules that is essential for the separation of chromatids during mitosis. Microtubules grow out from structures called centrosomes (or

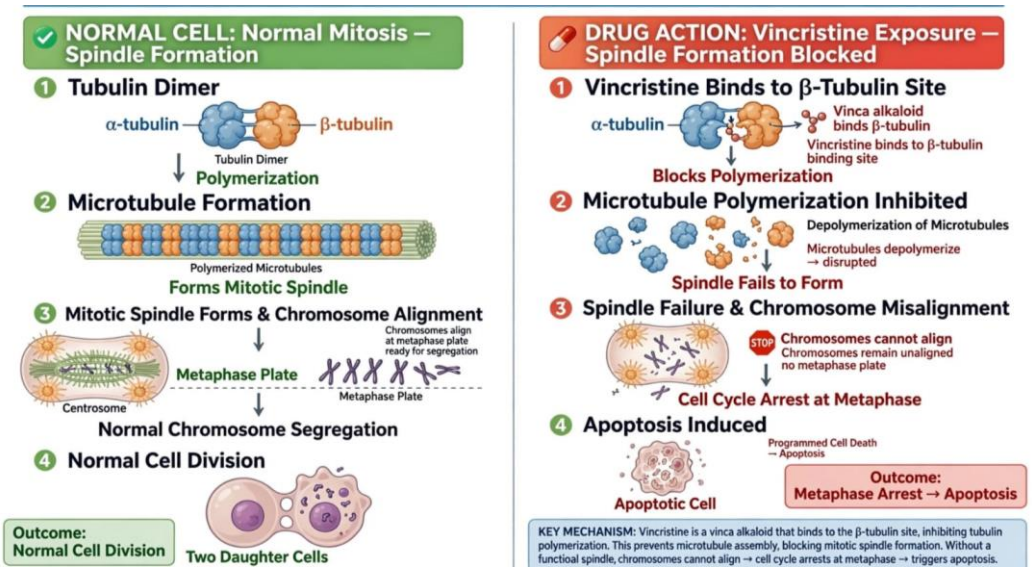
spindle poles) and attach to kinetochores on chromosomes. These microtubules help align the chromosomes at the metaphase plate and then pull them apart during anaphase.

During mitosis, the chromosome separate with the assistance of these microtubules, and after cell division, the microtubules are transformed back to tubulin. These drugs inhibit DNA synthesis and replication via the the enzyme topoisomerase II.

Disruption of Spindle Formation: When vinca alkaloids bind to tubulin and prevent the assembly of microtubules, the mitotic spindle fails to form properly. This leads to a failure in chromosome alignment at the metaphase plate and an inability to segregate the chromosomes during anaphase. Without functional microtubules, the spindle cannot exert the forces needed to pull the chromosomes apart.

Metaphase Arrest: The inability to complete spindle formation causes cells to become arrested in metaphase, the stage of mitosis where chromosomes are aligned at the metaphase plate but cannot be separated. This mitotic arrest prevents the cell from progressing into anaphase, halting cell division.

Cell Death: Because cell division is halted, the affected cells eventually undergo apoptosis (programmed cell death), particularly if the arrest is prolonged. This is especially effective in cancer cells, which typically divide rapidly, making them more susceptible to disruption of mitosis.



PHARMACOLOGICAL ACTION

I. Anti-Microbial activity: It has antibacterial properties, with extracts from its leaves, stem, flower and roots effectively combating a variety of bacteria, fungi and malaria-causing parasites. It has antibacterial activity against pathogen like P. aeruginosa and staphylococcus aureus.

II. Anti-oxidant property: It protect the body from harmful free radicals generated during oxidation, which can lead to neurological issues and cancer. Vinca contain phytoconstituents like tannins, phenolic and flavonoids, which contribute to its strong antioxidant activity.

III. Anti-diabetic activity: Its works as an antihyperglycemic by stimulating insulin secretion, regenerating damaged pancreatic cells, and slowing sugar absorption. Vinca contains bioactive alkaloid and tannins that help lower blood glucose levels and improves lipid profiles.

IV. Anti-thrombotic activity: Vinca alkaloids and their derivatives exert antithrombotic activity primarily by inhibiting platelet aggregation, suppressing thromboxane synthesis, and reducing blood viscosity.

V. Anti-viral activity: Vinca exhibits antiviral activity primarily by disrupting the host cell's microtubule network and inhibiting viral replication machinery.

VI. Anti-allergic activity: It contains naturally occurring flavonoids and phenols that act as natural antihistamines and anti-inflammatory agents. It works by stabilizing mast cells and directly inhibiting inflammatory pathways.

VII. Vasodilation: Vinca alkaloid act as vasodilator primarily by relaxing the smooth muscles in blood vessel walls, particularly in the brain.

VIII. Cardioprotective: Vinca having derivatives like vinpocetine and indole alkaloids like vincamine act as cardioprotective agents by improving microcirculation, reducing vascular inflammation, and preventing pathological changes in the heart.

IX. Anti-fungal property: Vinca extract work as an fungal by disrupting fungal cell division and degrading cell membrane.

X. Anti-ulcer property: Vincamine and vindoline alkaloid of the plant showed anti-ulcer property. The vincamine are present in the leaves of vinca plant shows cerebrovaso dilatory and neuroprotective property.

USES

- Vinca is used to extract vincristine, vinblastine and vincristine sulphate is an nantineoplastic agent which may act by arresting mitosis at the metaphase it is given intravenously in the treatment of the acute leukemia of children.
- Vinca also exhibits hypotensive and anti-diabetic action.
- Vinca is used to treat Hodgkin disease because it contain vinblastin as a chemical constituent.
- Vinca is used to Reduced high blood pressure.
- Vinca is used to Improve skin health like treat acne, pimple and having anti-inflammatory effect.
- Vinca is used to control blood sugar and stimulate insulin production.

CONCLUSION

Here we conclude that vinca possesses both anticancer and anti-tumor capabilities. Phytochemical analysis revealed the presence of key constituents, including alkaloid, phenols, flavonoids and glycosides which contribute to its medicinal properties. The vinca alkaloids have cytotoxic effects that can arrest the division of cells and cause cell death.

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