



## A Review on: Anti-Cancer Activity of Vinca (Catharanthus Roses)

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### ABSTRACT :

The strive of this assessment shows that Vinca rosea, many obviously grown vegetation round us which can be used for medicinal purposes. It has many known names like vinca Rosea, Madagascar periwinkle, vibrant eyes, Cape periwinkle, graveyard plant, old maid, crimson periwinkle, rose periwinkle myrtle. Ayurveda is the Indian conventional device of medication which focuses on the scientific capability of plant life. Catharanthus roseus is one plant recognized nicely in Ayurveda. It is known for its antitumour, anti-diabetic, anti-microbial, anti-oxidant and antimutagenic effects. It is an evergreen plant first originated from islands of Madagascar. The flowers can also range in color from red to pink and leaves are organized in opposite pairs. It produces nearly 130 alkaloids especially ajmalicine, vinceine, reserpine, vincristine, vinblastine and raubasin. Vincristine and vinblastine are used for the treatment of various types of cancer such as Hodgkin's disease, breast cancer, skin cancer and lymphoblastic leukemia. It has high medicinal values which need to be explored considerably. This review deals with anticancer activities and pharmacognostic study of Vinca plant.

**Key words:** vinca, vincristin, vinblastine

### Introduction :

Traditional medicine has always made use of medicinal herbs. Information on ethnobotanical properties of medicinal plants and how indigenous societies use them is helpful for drug discovery, biodiversity preservation, community health care, and the preservation of traditional traditions. A dicotyledonous angiosperm, Catharanthus roseus L. (G.) Don is an important medicinal plant that belongs to the Apocynaceae family. It produces the terpene indole alkaloids vinblastine and vincristine, which have the potential to treat a variety of malignancies. In 1910, Catharanthus roseus L. reported that an infusion of the leaves was used in Brazil to treat scurvy, control bleeding, relieve toothaches, and clean and heal chronic wounds. Related species have been employed in Europe to artificially reduce the flow of milk. It has been used to treat diabetic ulcers in the British West Indies, and it has recently been reported to be a potent oral hypoglycemic agent in the Philippines. Ajmalicine, one of the alkaloids extracted from this plant, has been reported to possess a transient depressant effect on arterial blood strain Periwinkle, or Catharanthus roseus (family Apocynaceae), often known as "Nayantara" or "Sadabahar." The word "catharanthus" comes from the Greek and means "natural flower."

### Taxonomy :

Kingdom : Plantae

Division: Magnoliophyta (Flowering plants)

Class : Magnoliopsida (Dicotyledons)

Order : Gentianales

Family : Apocynaceae

Genus : Catharanthus

Species : roseus

Botanical name: Vinca Rosea

Binomial name: Catharanthus roseus

**Scientific classification:**

1. Botanical Name(s): Vinca Rosea (Catharanthus roseus)
2. Family Name: Apocynaceae
3. Kingdom: Plantae
4. Division: Magnoliophyta (Flowering plants)
5. Class: Magnoliopsida (Dicotyledons)
6. Order: Gentianales
7. Family: Apocynaceae
8. Genus: Catharanthus
9. Species: C. roseus

## Vernacular names :

1. English: cayenne jasmine, old maid, periwinkle
2. Hindi: sada bahar, sadabahar
3. Kannada: batla hoo, bili kaasi kanigalu, ganeshana hoo, kempu kaasi kanigalu
4. Malayalam: banappuvu, nityakalyani, savanari, usamalari
5. Marathi: sadaphool, sadaphul, sadaphuli
6. Sanskrit: nityakalyani, rasna, sadampuspa, sadapushpi
7. Tamil: cutkattu malli, cutukattu malli, cutukattuppu
8. Telugu: billaganneru
9. Gujarati: Barmasi
10. Bengali: noyontara

**Fig1: vinca flower**

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## Principles of Cultivation:

Catharanthus roseus grows best in sunny, tropical climates with plenty of sunshine. It is commonly planted in sandy, fertile locations with plenty of shade. Up until the arrival of snow, the flower blooms throughout the summer. Vinca minor and Vinca major are evergreen plants that are clipped and veined. Normal moisture is necessary for the plant, but don't overwater it. The plant produces its seeds 12–16 weeks prior to the last frost.

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## Morphology :

Catharanthus roseus is an evergreen subherb or herbaceous

plant developing to at least one m. Fruit is a couple of

elongated follicles. The broad sleek green hairless with

a light midrib and a brief petiole approximately 1- 1.8 cm.

The flowers are white to dark pink with a dark red center,

with a basal tube about 2.5- 3 cm. long and a corolla about

2-5 cm. diameter with five petal like lobes.

- **HABIT-** A Perennial herb
- **STEM-** Erect, Cylindrical, Branched, Solid, Reddish Green, Glabrous
- **ROOT-** Tap root, rarely branched.
- **LEAF -** cauline, simple, opposite, decussate, petiolate, exstipulate, entire, mucronate apex, unicostate reticulate venation.
- **INFLORESCENCE-** cymose, flower arranged in axillary pairs.
- **FLOWER-** Pedicellate, bractate, hermaphrodite, actinomorphic, complete, pink, hypogynous
- **CALYX- 5,** polysepalous, glandular, green, inferior, quinqueangular aestivation.
- **COROLLA - 5,** gamopetalous, corolla tube, throat of corolla tube hairy forming a corona, contorted aestivation

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## What is cancer?

Cancer is the body's aberrant cells growing out of control. It's not always agreed upon that common plants, herbs, and foods can have anti-cancer properties. About 35,000 plant species have been examined by the National Cancer Institute (NCI) for possible anticancer properties. One individual will only see the benefits of chemotherapy, for every one who thinks that plants and herbs can delay or even eradicate cancer cells. Here is a list of the top 20 herbs and medicinal plants that have been the subject of scientific research with promising results in the battle against cancer, even though there is still more to be done in this field. This indicates that immunomodulators work by boosting your body's defenses against cancerous cells. Others have cytotoxic action, which means that while they do kill cancer cells, they also have the potential to kill healthy cells. For this reason, they should only be administered under a physician's or herbalist's supervision. The large term "anti-cancer" can be divided into three components.






- Anti-tumor – shown to be toxic to tumors in animal studies
- Cytotoxic – shown to fight tumors in laboratory cell cultures (in vitro)
- Anti-cancer – shown to fight tumors in humans

Cancer usually takes years to develop, so prevention is preferable to any treatment. Avoid all known Carcinogens such as tobacco, excessive alcohol, processed foods, and exposure to chemicals. Plant-based diet can help protect you from cancer as plants are rich in antioxidant and anti-inflammatory compounds, both of which are powerful cancer fighters. In essence, cancer is an unchecked cell division disorder. Numerous diverse methods exist in cells to limit cell reproduction, fix damage to DNA, and stop the growth of cancer. As a result, it is believed that cancer progresses via a series of stages, requiring the failure of several mechanisms before a cell reaches a critical mass and turns malignant. These variations facilitate their growth, division, and tumor formation. For example, cancer cells acquire the capacity to metastasize, or spread to other areas of the body, and to induce angiogenesis, or the formation of new blood vessels, which provides tumor cells with a supply of oxygen and nutrients.

**ANTICANCER HERBLE DRUGS:**

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| <p><b>Vinca</b><br/>Family: Apocynaceae<br/>Biological Name : <i>Catharanthus roseus</i></p>                     |     |
| <p><b>Burdock Root</b><br/>Family: Asteraceae<br/>Biological Name:<br/><i>Arctium lappa</i></p>                  |     |
| <p><b>Grapes</b><br/>Family: Vitaceae<br/>Biological Name: <i>Vitis</i><br/><i>vinifera</i> L.</p>               |   |
| <p><b>Ginger Root</b><br/>Family:<br/>Zingiberaceae<br/>Biological Name:<br/><i>Zingiber officinale</i></p>      |  |
| <p><b>Goldenseal Root</b><br/>Family:<br/>Ranunculaceae<br/>Biological Name:<br/><i>Hydrastis canadensis</i></p> |   |

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|---|---|
| <p><b>Aloe Vera</b></p> <p>Family:<br/>Asphodelaceae</p> <p>Biological Name:<br/>Aloe Vera<br/>(L.) Burm.f.</p> |  A photograph of a young Aloe Vera plant with thick, green, pointed leaves growing from a central base.   |
| <p><b>Clove</b></p> <p>Family:<br/>Myrtaceae</p> <p>Biological Name: Eugenia<br/>aromaticum</p>                 |  A photograph of a pile of dried cloves, which are small, dark brown, and have a characteristic two-pronged shape.                                      |
| <p><b>Licorice Sticks</b></p> <p>Family:<br/>Fabaceae</p> <p>Biological Name:<br/>Glycyrrhiza glabra</p>        |  A photograph of several dried licorice sticks, which are long, thin, and have a dark brown, slightly textured surface.                                |
| <p><b>Turmeric Root</b></p> <p>Family:<br/>Zingiberaceae</p> <p>Biological Name:<br/>Curcuma longa</p>          |  A photograph showing fresh turmeric roots (rhizomes) and a small wooden bowl filled with bright orange turmeric powder, garnished with a green herb. |
| <p><b>Red Clover</b></p> <p>Family:<br/>Fabaceae</p> <p>Biological Name:<br/>Trifolium pratense</p>             |  A photograph of two vibrant purple-red clover flowers in a field of green grass and other yellow flowers.  |

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| <p><b>Bloodroot Flower</b></p> <p>Family:<br/>Papaveraceae</p> <p>Biological Name:<br/><i>Sanguinaria canadensis</i></p> |    |
| <p><b>Artemisia Annua</b></p> <p>Family:<br/>Asteraceae</p> <p>Biological Name:<br/><i>Artemisia annua</i></p>           |    |
| <p><b>Barberry</b></p> <p>Family:<br/>Berberidaceae</p> <p>Biological Name: <i>Berberis</i></p>                          |   |
| <p><b>Tea</b></p> <p>Family:<br/>Theaceae</p> <p>Biological Name:<br/><i>Camellia sinensis</i></p>                       |  |
| <p><b>Onions</b></p> <p>Family:<br/>Amaryllidaceae</p> <p>Biological Name: <i>Allium</i><br/><i>cepa</i></p>             |  |



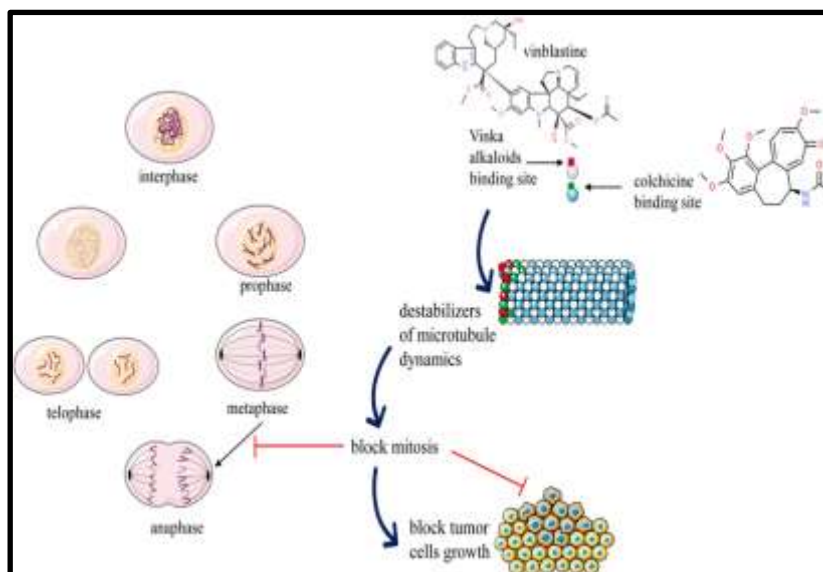
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| <p><b>Dandelion-Flower</b></p> <p>Family: Asteraceae</p> <p>Biological Name:</p> <p>Taraxacum<br/>officinale</p>                 |  |
| <p><b>Foxglove-Flower</b></p> <p>Family: Plantaginaceae</p> <p>Biological Name: Digitalis<br/>purpurea (Common<br/>foxglove)</p> |  |

### Anti-cancer activity of vinca:

Wilson et al. state that the extremely active mitotic spindle microtubule is one of the most successful anticancer therapeutic targets. It was previously believed that the primary mechanism of action of vinca alkaloids and paclitaxel, which are microtubule-targeted medications, was altering the mass of cellular microtubules. Tubulin is the target of an increasing number of structurally distinct peptides and depsipeptides that have been found in a range of organisms. Since tubulin is the subunit protein of microtubules, the majority of substances are extremely hazardous to mammalian cells. The end result of these drugs is the same, despite their differences in how they affect tubulin binding sites and microtubules. Microtubule disruption results in cell cycle arrest during the G2/M phase and apoptotic cell death.

Alkaloids that are generally anti-cancer and have anti-tumor properties come from the leaves and stems of the plant. Tumor-inhibiting alkaloids. The tumor known as choriocarcinoma is treated with vinblastine in cases of Hodgkin's disease. Vincristine is used to treat childhood leukemia. Vinblastin is available as Vincristin or Velban tablets. Vinorelbine, vinflunine, and semi-synthetic Catharanthus alkaloids were produced to improve the healing index. Vincristine is used to treat childhood leukemia. Vinorelbine and vinflunine bind to tubulin to produce their anticancer effects. The alkaloids, also known as mitotic spindle poisons, prevent microtubules from entering their metaphase, which prevents the cell cycle of mitosis. Thus, vinca alkaloids aid in stopping the cancer from proliferating. tubulin spiral filament development. Four vinca alkaloids were also shown to decrease tubulin binding properties and cellular absorption. Subsequently, the anti-angiogenic effects for anticancer activities in murine tumor models were found.

Research has shown that giving vinblastine or colchicine intraperitoneally to B6D2F1 mice with advanced subcutaneous colon 38 tumors dramatically inhibited the tumors' growth. Hemorrhagic necrosis also gradually appeared within 8 hours of treatment. In a panel of human tumor xenografts, vinflunine shown better in vivo experimental anticancer efficacy than vinorelbine. Vinflunine is a newly discovered Vinca alkaloid that was produced by superacidic chemistry from vinorelbine.



**Fig 2: Mechanism of action**

As having a different mechanism of action from vinorelbine in preclinical tumour models. Vinblastine has varied effects on polymerization and dynamics at opposing microtubule ends.

Vinca alkaloids, cause tubulin to form ordered paracrystals and indeterminate spirals that compete with the development of microtubules. The discovery that the Vinorelbine (VLB) group of alkaloids are known as "spindle poisons" due to their ability to obstruct tubulin's ability to polymerize, which is a protein necessary for the formation of the microtubule system, which is crucial for nerve conduction, as well as the mitotic spindle, which manifests during cell division. Synthetic derivatives were prepared wherein Anhydrovinblastine Nb -oxide 4 was subjected to the modified Polonovski reaction and found that the resulting reaction medium produced 5'-nor anhydrovinblastine after hydrolysis.,the resulting compounds showed anticancer activity.

Further it was discovered that *Vinca rosea* Linn's anticancer principles have an experimental basis for clinical examination. The structure-activity correlations of dimeric Catharanthus alkaloids have been the subject of diligent effort. Vinorelbine, synthesized by C' ring contraction of anhydrovinblastine, is currently sold all over the world thanks to Fahy J et al. tireless efforts to discover novel chemistry that allowed the semi synthesis of derivatives changed in the velbanamine "upper" end of the molecule. The pharmacology, physicochemical factors, naturally occurring bisindole alkaloids from *Catharanthus*, modifications of the upper half (velbanamineportion) of bisindole alkaloids, modifications of the lower half (vindoline portion) of bisindole alkaloids, multiple modifications: 4'-epideoxyvincristine, and new concepts in medicinal chemistry of bisindole alkaloids are all discovered by him. Further the successful molecular constructions included additional three-membered rings into the 14,15-position of the vindoline component of the dimer alkaloid by the Simmons-Smith reaction. This led to the synthesis of cyclopropanated vinblastine and its derivatives. In the presence of diethylzinc, reactions with iodoform and bromoform, respectively, were used to produce halogenated 14,15-cyclopropanovindoline.

Alkaloid Vinorelbine (VLB) caused C-mitosis *in vivo* in both the normal rat bone marrow and the cells of the L1210 ascites tumour. Post-metaphase completely vanished as a result of the afflicted cells being halted in metaphase. Stages of the prophase were unaffected. Tryptophan or glutamic acid treatment can change how VLB affects the production of metaphase arrest. It was further discovered the Vinorelbine effect on cells expanding in tissue culture. J-96 and LLC-He1 cells treated with VLB experience metaphase arrest and characteristic C-mitotic chromosomal alterations. Acute lymphoblastic leukaemia (ALL), malignant lymphoma, and neuroblastoma are only a few of the cancers that are frequently treated using done work on Vincristine (VCR), an alkaloid derived from *vinca*.

Further it was noted reported and discovered that the anti-cancer medications taxol, vincristine, and cisplatin clinically induce severe sensory neuropathy in addition to autonomic neuropathy. Although experimental sensory neuropathies brought on by these anti-cancer medications have been discovered to be prevented by nerve growth factor (NGF) administration, and to state that information about autonomic neuropathy is sparse.

## **Vinca also shows activities :**

### **Antimicrobial activity of vinca-**

Raw extracts from different parts of the plant were tested for antibacterial activity. Extraction of leaves showed very high efficiency. The anti-bacterial activity of the leaf of the plant was tested against a microorganism such as *Pseudomonas aeruginosa* NCIM2036, *Salmonella typhimurium* NCIM2501, *Staphylococcus aureus* NCIM5021 and found that the extract could be used as a prophylactic agent in the treatment of many diseases.



**Antioxidant Property :**

The anti-oxidant power of ethanolic extract from the roots of the two types of *C. roseus* i.e., rosea (pink flower) and alba (white flower) are obtained using a different test system such as Hydroxyl radical-scavenging activity, superoxide radical - extraction function, DPPH-radical-scavenging activity and nitric oxide radical inhibition method. The results obtained confirmed that ethanolic extract from the roots of the Periwinkle species showed a satisfactory search effect throughout the assay in a concentrated but C-dependent manner. roseus was found to have more antioxidant activity than that of *C. alba*.

**Conclusion:**

Vinca has been shown to possess life-saving qualities in the majority of cancer patients. It possesses both anticancer and anti-tumor capabilities. The half Vinca synthetic derivatives have a long history of use in the anticancer properties, and the raw extract additionally has the ability to fight cancer.

It also falls under the group of cytotoxic drugs that the FDA has approved, including vinblastine, vincristine, and vinorelbine. Moreover, additional medications used to treat cancer include vinflunine, as urothelial second-line transitional carcinoma in the works. Thus, the whole review and literature come to an end. That vinca has the potential to be an anticancer ethnopharmacological representative.

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