



Catharanthus Roseus: Medicinal Plants

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ABSTRACT:

Ayurveda, originating from India, is a traditional medicinal system focusing on plant-based treatments. *Catharanthus roseus*, a well-recognized plant in Ayurveda, is renowned for its diverse medicinal effects, including anti-tumor, anti-diabetic, anti-microbial, antioxidant, and anti-mutagenic properties. This evergreen plant, native to Madagascar, displays flowers ranging from pink to purple, with leaves arranged in opposite pairs. With the production of around 130 alkaloids such as ajmalcine, vinceine, reserpine, vincristine, vinblastine, and raubasine, it plays a significant role in medicinal applications. Notably, the alkaloids vincristine and vinblastine find use in treating various cancers like Hodgkin's disease, breast cancer, skin cancer, and lymphoblastic leukemia. As an endangered species, conservation efforts, including techniques like micropropagation, are imperative to protect and explore the extensive medicinal values of *Catharanthus roseus*.

Keywords: *Catharanthus roseus*, Alkaloids, vincristine Pharmacological activities, Anti-cancer activity



INTRODUCTION:

Vinca rosea, commonly called Madagascar periwinkle, is a herbaceous subshrub grown primarily for its alkaloids, renowned for their anticancer properties¹. Belonging to the Apocynaceae family, this plant synthesizes more than 100 monoterpenoids indole alkaloids (TIA) in various organs, constituting its valuable medicinal components². The active compounds in *Vinca* comprise alkaloids and tannins, emphasizing its pharmaceutical significance. The leaves and stems of *Vinca rosea* serve as vital sources for dimeric alkaloids, specifically vincristine and vinblastine, essential in cancer treatment. Meanwhile, the roots contain ajmalcine and serpentine, recognized for their antihypertensive properties³. Traditionally, in various parts of the world, including India, the West Indies, and Nigeria, the leaves are traditionally used to address diabetes⁴. *Vinca rosea* leaves are rich in 150 beneficial alkaloids and other pharmacologically active compounds. Laboratory findings highlight significant antihyperglycemic and hypotensive effects in extracts obtained from the leaves, whether using a hydroalcoholic or dichloromethane-methanol method⁵. Furthermore, studies indicate that the fresh leaf juice of *C. roseus* can effectively reduce blood glucose levels in both normal and alloxan diabetic rabbits⁶. Leaves and twigs of *Catharanthus roseus*, also recognized as *Vinca rosea*, exhibit hypoglycemic activity in streptozotocin-induced diabetic rats⁷. This plant, belonging to the Apocyanaceae family and native to the Caribbean basin, has a historical application in treating various diseases. With over 400 alkaloids, some of which are sanctioned as antineoplastic agents, it is employed in the treatment of leukemia, Hodgkin's disease, malignant lymphomas, neuroblastoma, Wilms' tumor, and other cancers⁸.

The extraction of antimicrobial agents from medicinal plants provides a rich and diverse pool of potent drugs, as emphasized by Srivastava et al.. The historical roots of using these plants for treating human diseases can be traced back to prehistoric times. Notably, in developing countries, medicinal plants serve as the exclusive source of medicines for 80% of the world's population, highlighting their crucial role⁹.

Various parts of medicinal plants, such as leaves, roots, stems, flowers, fruits, and twigs, are utilized for extraction as raw drugs. Local communities and folk healers often gather some of these raw drugs in smaller quantities for local purposes. In contrast, numerous other raw

drugs are collected on a larger scale and traded in the market, serving as the raw material for various herbal industries. Traditional medicinal plants contain a broad spectrum of substances with the potential to address chronic infectious diseases. Clinical microbiologists show significant interest in examining the antimicrobial activities and phytochemicals of medicinal plants as potential candidates for new therapeutics. Many drugs derived from plants consist of secondary metabolites, a point emphasized by Ghani (1990) and Dobelis¹⁰. The presence of aldehydes and phenolics is among the factors contributing to the antimicrobial efficacy of plant extracts¹¹. The therapeutic effects of plant materials typically arise from the intricate combinations of secondary products found in the plant. These secondary metabolites, including alkaloids, steroids, tannins, phenolics, flavonoids, resins, and fatty acids, exhibit specific physiological actions. As human pathogens develop resistance to commonly used antibiotics, there is a growing necessity to explore alternative sources, such as plants, for novel antimicrobial substances. The assessment of medicinal plants for both antimicrobial activities and phytochemicals holds significant importance in identifying potential new therapeutic drugs.



PLANT PROFILE;

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 with a 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: Oval leaves (1-2in long) decussate, petiolate; lamina variable, elliptic, obovate or narrowly obviate; apex mucronate.

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. Climate, soil and propagation

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

Soil: Full sun and well-drained soil is preferred.

Light: Bright light, included three or four hours of direct sunlight daily, is essential for good flowering.

Temperature: Normal room temperatures is suitable at all times. It cannot tolerate temperatures less than 10°C (50°F).

Watering: Water the potting mixture plentifully, but do not allow the pot to stand in water.

Irrigation: They need regular moisture, but avoid overhead¹²⁻¹⁴.

PLANT DISTRIBUTION ;

In its natural habitat, this plant is classified as endangered, primarily due to habitat destruction caused by slash-and-burn agriculture. Despite this threat, it is extensively cultivated and has become naturalized in subtropical and tropical regions globally. This evergreen sub-shrub or herbaceous plant typically reaches a height of about 1 meter and boasts white to dark pink.



Fig. CATHARANTHUS ROSEUS

Scientific classification:

Botanical Name(s) : *Vinca rosea* (*Catharanthus roseus*) Family : Apocynaceae

Kingdom : Plantae Family :

Apocynaceae Genus :

Catharanthus Species

: *roseus*

Synonyms : Cayenne jasmine, sadabahar, nityakalyani, sadaphool, rasna, sadampuspa, Barmasi, noyontara, periwinkle¹⁵.

Morphology

- Permanent herbaceous plant (*Catharanthus roseus*) up to 1 m high.
- The leaves are oblong, 1-3-3 cm long handle and 2.5-9.0 cm. long.
- It is inverted green, with a yellow center in the middle, and the stem is about 1 ~ 1.8cm.
- You have been in the opposing group for a long time.
- White to pale pink flowers with pale red spots have a basal thread with 5 pointed petals.
- The natural element consists of several hair follicles 3mm wide and 2-4 cm wide long (Bennouna et al.,2008)¹⁶.

Geographical distribution ;

- *Catharanthus roseus* is originally located in the Indian Ocean region near Madagascar.
- Initially identified as an endangered wild plant, its decline was attributed to logging and the destruction of radiation farms. However, it is now prevalent in numerous tropical and subtropical regions globally, including the southern United States¹⁷.



PHARMACOLOGICAL ACTIVITIES ;

- **ANTIOXIDANT ENZYME ACTIVITIES :**

The counter oxidant limit of the ethanolic concentrate of the foundations of the two blends of

C. roseus explicitly *rosea* (pink fledgling) and *alba* (white sprout) was gotten by utilizing distinctive approach of investigate, for example, Hydroxyl fan rummaging movement, uperoxide reformist glancing through action, DPPH revolutionary searching turn of events and nitric oxide fan limitation strategy. The outcome acquired displayed that the ethanolic concentrate of the foundations of Periwinkle groupings has shown the extraordinary searching influence in the whole test in a middle subordinate way yet *C. roseus* was found to have more cell support improvement than that of *C. alba* (AlbaBhutkar et al., 2011)18.

- **ANTI HYPERGLYCEMIC EFFECT :**

The Sadabahar leaves possess anti-diabetic activity as the leaves extract has been proven to decrease blood glucose levels on a dose dependent basis in many studies as compared to the standard drug (glibenclamide). The anti-diabetic effect is due to the alkaloids packed in the leaves which increases insulin production; cells of pancreas are repaired and side by side glucose usage in the liver is enhanced.

The anti-hyperglycemic activity of the leaves is due to their action on liver as the leaves increase the utilization of glucose in the liver. The alkaloid present in the leaves which possess anti-diabetic effect is named as vinculin which has been isolated from the leaves of the plant and is studied pharmacologically and is marketed for use in diabetes treatment19-21.

- **ANTI- CANCER ACTIVITY :**

There are two alkaloids namely vincristine and vinblastine that are found to be there in the leaves of Sadabahar, and the anti-cancer action of the leaves is due to the presence of these two alkaloids only. Out of which, vincristine is effectual and is used in the treatment of leukemia in the children and is sold with the name of oncovin in the market. Whereas vinblastine is used for neoplasms and specified for Hodgkin disease and is available with the name of velban.

Vinblastine is probably used to treat oncology and is recommended for Hodgkin's infection, placental cancer. Vincristine is another alkaloid used to treat childhood Leukemia. The apparent level of abrupt concentrations of methanol in Catalan has shown tremendous progress in the fight against cancer, with the most severe activity against multiple cell types, particularly multiple types of multidrug-resistant tumors. Volban Vinblastine or Vincristine is marketed as Oncovin22.

- **ANTHELMINTHIC ACTIVITY :**

Helminthes contaminations are the consistent ailment, affecting people and dairy cows. *Catharanthus roseus* was discovered to be utilized from the standard time span as an adversary of helminthic topic master. The counter helminthic property of *C. roseus* has been overviewed by utilizing *Pheretimaphostuma* as an exploratory model and with Piperazine citrate as the standard reference. The ethanolic concentrate of the centralization of 250 mg/ml was found to show the epic enemy of helminthic advancement23.

- **ANTI- MICROBIAL ACTIVITY :**

Balaabirami et al. (2012) conducted an original study investigating the in vitro antimicrobial and antifungal activity of *Catharanthus roseus* leaf extracts against significant pathogenic organisms. The antimicrobial efficacy of the extract, particularly the ethanolic fractions, surpassed that of other tested fractions and organisms. The research identified the presence of secondary metabolites, such as alkaloids, in *Catharanthus roseus* leaves. It highlighted the potential use of leaf extract in treating infections caused by fungi like *Aspergillus* spp. The findings suggest that *Catharanthus roseus*, in alignment with its traditional use in treating microbial infections, could be explored for developing new and effective antibiotics.

The old maid leaves possess anti-microbial outcome against various microorganisms such as *Salmonella typhimurium*, *Pseudomonas aeruginosa* and *Staphylococcus aureus*, etc. The leaves can be used in long-term wounds cleaning and to treat numerous diseases24.

- **ANTI- ULCER ACTIVITY:**

It's interesting that Vincamine and Vindoline alkaloids in plants exhibit anti-ulcer properties through anti-inflammatory actions, with Vincamine specifically dilating blood vessels to

protect them from light. The resistance of plant leaves to lesion progression suggests potential benefits against rodent malnutrition25.

- **HYPOTENSIVE ACTIVITY:**

The concentrated leaves of the plant have demonstrated significant advancements in hypotensive effects. These leaves are recognized for harboring 150 beneficial alkaloids along with other pharmacologically notable compounds. Notably, the essential antihyperglycemic and hypotensive properties of leaf extracts, whether hydroalcoholic or dichloromethane- methanol, have been investigated in laboratory animals, as documented by Pillay et al. in 195926.

- **ANTI- DIARRHEAL ACTIVITY:**

It's noteworthy that the ethanolic leaf extracts of *C. roseus* demonstrated a dose-dependent inhibition of castor oil-induced diarrhoea in Wister rats. This suggests potential anti-diarrheal properties associated with the extract's pre-treatment in the experimental setting27 .

- **HYPOLIPIDEMIC ACTIVITY:**

It sounds like the hypolipidemic effect observed in the study may be attributed to the antioxidant impact of flavonoids and vinpocetine-like compounds found in the leaf juice of *Catharanthus roseus*. This effect is suggested to lead to a significant reduction in serum levels of total cholesterol, triglycerides, LDL-c, and VLDLc, as well as positive changes in the histology of the aorta, liver, and kidney²⁸.

- **WOUND RECOVERY ACTIVITY:**

The administration of *Catharanthus roseus* ethanol extract at 100 mg/kg/day to rodents resulted in accelerated wound healing, evidenced by a shortened epithelization period, a significant increase in dry weight, and hydroxyproline content in the granulation tissue compared to the control group. These findings, including enhanced tensile strength and hydroxyproline content, support the potential use of *C. roseus* in wound healing²⁹.

- **MEMORY ENHANCEMENT ACTIVITY:**

While vinpocetine has been suggested to have potential benefits for Alzheimer's disease (AD) due to its various actions, a study in a well-defined cohort of AD patients found no benefit.

Meta-analysis of older studies in poorly-defined dementia populations concluded that there is currently insufficient evidence to support the clinical use of vinpocetine for memory enhancement. However, it's worth noting that vinpocetine has been generally well-tolerated at doses up to 60 mg/d in clinical trials for dementia and stroke, with no significant adverse events reported³⁰.

Anticipated nutrients ;

- Experts studying beneficial properties have found a social affinity for alkaloids. Alkaloids are harmful, but they must be used to treat diseases.
- Plants can reach normal levels and control the various activators used to protect themselves from attack by tracers such as insects, pests and herbivores. worth Rose starch, flavonoids, saponins, alkaloids. Alkaloids are the most surprising substances in Madagascar periwinkle production.
- Plants are rich in 400 alkaloids used in cooking, pesticides, flavorings, ornaments, food additives and pesticides.
- Alkaloids such as actinio plast dammer, vinblastine, vincristine, bindidin and bindalintabersin.
- Rosindin is an anthocyanin found in blue skin.

Vinblastine , sold under the Welban brand name, is a widely used chemotherapy drug in many prescriptions for the treatment of various dangerous types. It is in line with Hodgkins lymphoma, small cell destruction of the lung, bladder risk, cortical disease, melanoma, and testicular malformations³¹.

Vincristine, also known as Leuro-Cristine and sold under the brand name Oncovin, is a chemotherapy drug used to treat a variety of malignancies. It is associated with atypical lymphocytic leukemia, atypical myeloid leukemia, Hodgkin infection, neuroblastoma, and small cell degradation of the lung³².

Vindesine is a made subordinate of vinblastine, a typically happening vinca alkaloid. Vindesine binds to and settles tubulin, thusly barging in on tubulin polymerization and preventing the game plan of the mitotic shaft and cell division; treated cells can't go through mitosis and are caught in metaphase. This expert similarly upsets macromolecular blend³³.

Tabersonine is a monoterpenoid indole alkaloid with cytotoxic development. It has a section as an antineoplastic subject matter expert and a metabolite. It is an alkaloid ester, a monoterpenoid indole alkaloid, a methyl ester and a characteristic heteropentacyclic compound. It is a structure base of a tabersoninium³⁴.

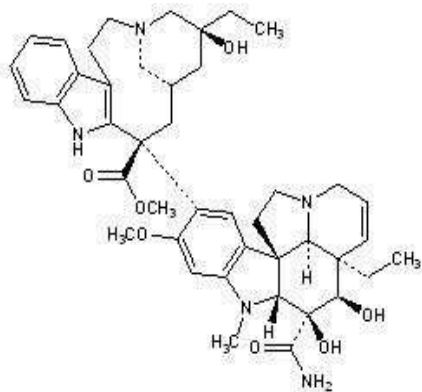
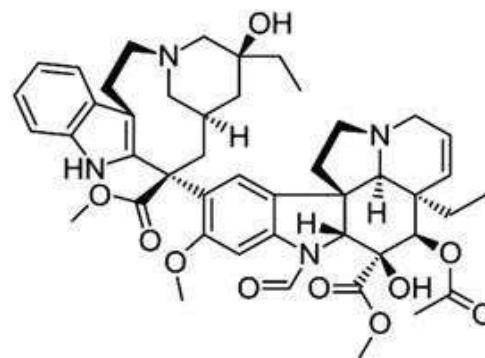


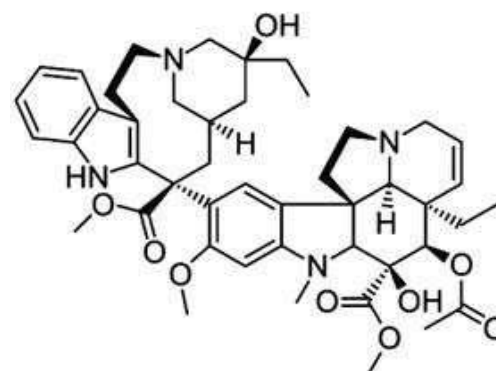
Fig. Vindesine



A. Vincristine



Fig. Tabersonine



B. Vinblastine



CONCLUSION;

The exploration of medicinal plants for novel pharmaceutical products presents an opportunity to discover effective drugs with fewer side effects and lower costs compared to chemical drugs. Advancements in technology allow for a better understanding of traditional medicines, identifying active compounds and obtaining necessary approvals for commercialization. *Catharanthus roseus*, with its diverse alkaloids, demonstrates medicinal potential against various diseases like diabetes, mouth ulcers, and leukemia. Its anti-leukemic activity through vinblastine and vincristine, along with antimicrobial, antioxidant, and anti-mutagenic effects, highlights the need for further research to explore its potential anti-tumor effects.

Identifying the remarkable compound responsible for pharmacological effects allows for its recognition as a therapeutic product with proper approvals. *Catharanthus roseus*, among 21,000 medicinal plants. Different plant parts yield varying alkaloid amounts, with root bark being the highest at 1.79%. Reports indicate its efficacy against various microorganisms, and further studies are essential to assess its potential as a tumor.

FUTURE PERSPECTIVE ;

Catharanthus roseus, or Madagascar periwinkle, has garnered attention due to its rich alkaloid content, particularly vincristine and vinblastine. These compounds exhibit potent anti-cancer properties and are crucial components in the treatment of various cancers, such as leukemia and Hodgkin's lymphoma. Vincristine and vinblastine interfere with cell division, making them valuable in chemotherapy regimens.

Looking forward, the future perspective involves exploring additional medicinal benefits beyond cancer treatment. Research indicates potential anti-diabetic properties, as the plant may influence glucose metabolism. Additionally, its hypotensive effects suggest a role in managing hypertension. Efforts to harness these medicinal qualities are accompanied by advancements in cultivation and biotechnology. Sustainable farming practices and optimized cultivation techniques aim to ensure a stable supply of *Catharanthus roseus*. Biotechnological approaches, including genetic engineering and metabolic pathway manipulation, may enhance alkaloid production and create strains with improved medicinal attributes.

In summary, the future outlook for *Catharanthus roseus* involves continued exploration of its diverse medicinal properties, advancements in cultivation methods to ensure a sustainable supply, and biotechnological interventions to optimize its therapeutic potential.

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