

# An overview of *Catharanthus roseus* medicinal plant: botany, chemical contents and its uses

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**ABSTRACT:** : *Catharanthus roseus* is a tropical hardy plant grown as a pot ornamental plant for its rosy or white flowers. It is popularly known as Madagascar periwinkle. It is small in size perennial herbaceous evergreen plant that was native to the Madagascar island. The plant has very good tolerance against heat, grows one or two feet high, have glossy, dark green leaves (1-2 inches long) and flowers even in the hot weather. The blooms of the natural wild plants are pale pink with a purple "eye" in their centers, but horticulturists have developed varieties with colors ranging from white to pink to purple. With this approach, a review of the literature was conducted through an electronic consultation of two databases, Science Direct and Google Scholar. The plant has immense medicinal importance for its alkaloids. The need for the novel pharmaceutical products out from the plant has attained a great interest in the present research world due to the cost and the higher side effects that are associated with the chemically manufactured drugs. *Catharanthus roseus*, which is a potent medicinal plant many of the pharmacological actions. That is used to treat many of the fatal diseases. Alkaloids were the major phytochemical constituent of the above medicinal plant and have different types possessing various medicinal uses. Every part of *Catharanthus* like root, stem, bark and flower are rich sources of several bioactive compounds. We hope that future research will be done to release the next components in *Catharanthus roseus*.

**Key words:** Alkaloid, Chemical constituents, Vinblastine, Vincristine

## INTRODUCTION

*Catharanthus osseous* is one of the most important and most commonly used ornamental and medicinal plants of the family Apocynaceae. The plant originates in tropical regions such as southern India, Indonesia and Madagascar. So far, about 130 types of alkaloids have been extracted from *Catharanthus roseous* and this plant is one of the most important plant species with indole alkaloid of reserpine. The amount of these alkaloids in the *Catharanthus roseous* is very low and All parts of this plant, even the seeds, contain alkaloids. Both vinblastine and vincristine alkaloids are commercially extracted from large quantities of *Catharanthus roseous* that both have anti-tumor effects and that's why they are so important in the pharmaceutical industry. Experimental and clinical studies have examined the efficacy of using *Catharanthus roseous* in the recovery of Bronchitis, Angina, Leukemia, Nasal Bleeding, Hemorrhoids, Mental powers, Tonsillitis, Gingivitis, expansion of vascular ducts and Cancer, have proven. But we

should be careful in using this plant, because its raw consumption through the mouth is dangerous and can be hallucinatory. *Catharanthus roseus* is a valuable plant for chemotherapy with a set of Vinca alkaloids (including vincristine, ...) to treat a variety of cancers (Danaee, 2020). *Catharanthus osseous* is an herbaceous sub shrub also known as Madagascar periwinkle, *Vinca rosea*, or *Lchnera rosea* worldwide. It is cultivated mainly for its alkaloids, which are having anticancer activities (Abduljaleel and Panneerselvam, 2007). The flowers produced by these plants are planted for decorative purposes are of colours such as pink, purple and white Madagascar (Fig 1) periwinkle is used traditionally for number of ailments such as high blood pressure, infection and diabetes mellitus (Loh, 2008).

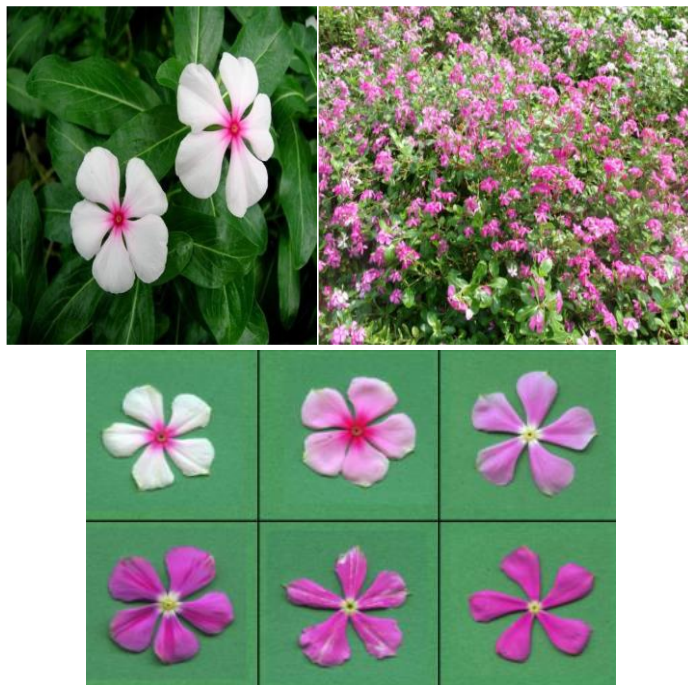


Fig 1- *Catharanthus roseus*

Stem produces a milky sap which is a source for more than 70 indole alkaloids. Vincristine and vinblastine were isolated from this plant are well known anti cancer drugs for Hodgkin's lymphoma and childhood leukemia respectively (Fig 2- Fig 3). The mechanism of action being binding to tubulin thus inhibit the metaphase of cellular mitosis. Hair loss, peripheral neuropathy, constipation and hyponatremia are the major side effects of this drugs (Loh, 2008).

### 1.1. Scientific classification

Kingdom: Plantae  
Division: Magnoliophyta (Flowering plants)  
Class: Magnoliopsida (Dicotyledons)  
Order: Gentianales  
Family: Apocynaceae  
Genus: *Catharanthus*  
Species: *roseus* (Farnsworth, 1961).

### 1. 2. Origin and distribution

Native of Madagascar. Abundantly naturalised in many regions. Particularly in arid coastal locations. Grown commercially for its medicinal uses in Australia, Africa, India and southern

Europe. Cultivated as an ornamental plant almost throughout the tropical and subtropical world (Mohammad et al., 2009).

## 2. Potentially Active Chemical Constituents

Researchers investigating its medicinal properties discovered that it contained a group of alkaloids that, though extremely toxic, had potential uses in cancer treatment. Plants have the ability to synthesize a wide variety of chemical compounds that are used to perform important biological functions, and to defend against attack from predators such as insects, fungi and herbivorous mammals. *C. roseus* posse's carbohydrate, flavinoid, saponin and alkaloids. Alkaloids are the most potentially active chemical constituents of *Catharanthus roseus*. More than 400 alkaloids are present in the plant, which are used as pharmaceuticals, agrochemicals, flavor and fragrance, ingredients, food additives and pesticides. The alkaloids like actineo plastidemic, Vinblastin, Vincristine, Vindesine, Vindeline Tabersonine etc. are mainly present in aerial parts whereas ajmalicine, vinceine, vineamine, raubasin, reserpine, catharanthine etc are present in roots and basal stem. Rosindin is an anthocyanin pigment found in the flower of *C. roseus*. (Prajakta, and Patil, 2010).

### 2.1. Types of alkaloids

A wide range of alkaloids has been discovered from *C. roseus*. More than 130 alkaloids of the indole and the dihydro-indole groups have been isolated and characterized from different plant organs (van der Heijden *et al.* 2004).

#### 2.1.1. Vinblastine

Vinblastin is very important alkaloid extracted from leaf part of *C. roseus* (Fig 2). Previously the cost of extraction and purification of vinblastin was very high but now after the advancement of various biotechnological approaches, new protocols for rapid production have been developed. Vinblastin is mainly used for treatment of Hodgkin's disease, lymphocytic lymphoma, histiocytic lymphoma, advanced testicular cancer, advanced breast cancer, Kaposi's sarcoma (Jordan et al 1992).

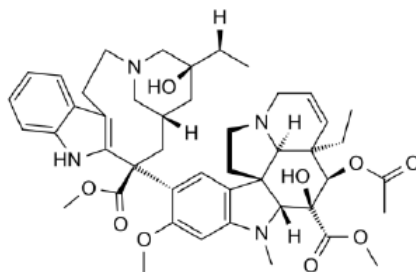


Fig 2- Chemical Structure of Vinblastin

#### 2.1.2. Vincristine

Vincristine (Fig 3) formally known as leurocristine, sometimes abbreviated "VCR", is a alkaloid extracted from *Catharanthus roseus* (Madagascar periwinkle). It is normally used in cancer chemotherapy. The chemical structure of vinblastine and vincristine are very similar, but their effects are not the same. Vinblastine is used to treat specific types of cancer, such as Hodgkin's disease, and Vincristine is used in the treatment of acute lymphoblastic leukemia (Jordan et al 1992).

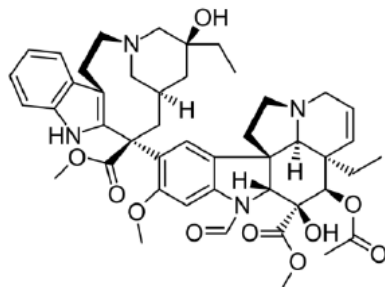


Fig 3- Chemical Structure of Vincristine

### 3. Medicinal uses of *Catharanthus roseus* in different countries of the world

In folklore, *Catharanthus Roseus* herb has been used to treat rheumatism, skin-lifting, treat less and painful urination, menstrual disorders, high blood pressure, sweating, blood thinning and poor digestion problems in many countries (Fig 4).

**Bahamas:** Flour decoction is used to treat asthma, flatulence and tuberculosis.

**Brazil:** The leaves of the plant were used to cure scurvy, bleeding, also possess wound healing and cleaning function and as a mouthwash for toothaches.

**China and North Vietnam:** As a menstrual regulator, the aerial portions' hot water extract is taken.

**Cook-Island:** Dried leaf decoction administered to treat diabetes, cancer and hypertension.

**Cuba and Jamaica:** In infants, flowers extract as a preparation for eye wash.

**Dominica:** To help pregnant Lady ingesting warm water extract of the leaves to overcome primary lethargy during childbirth.

**England, Europe, Jamaica, Kenya, Thailand, and West Indies:** The hot water boiled leaves and whole plant extracts are used to treat diabetes when administered.

**France and South Vietnam:** Warm water extract of whole plant have anti-galactagogue properties.

**French Guiana:** Hot water whole plant extract is administered as cholagogue.

**Hawaii:** To stop bleeding, a boiled plant extract is used.

**Taiwan:** Decoction of the dried whole plant cures diabetes mellitus and liver disease.

**Pakistan:** Dried ovule's warm water extract is utilized for the treatment of diabetes as oral preparation.

**Malaysia:** Diabetes, insomnia, hypertension and cancer are all treated with this plant.

**Mauritius:** To get relief from indigestion and dyspepsia, juice of its leaves is beneficial

**Mexico:** For stomach problems, a whole plant infusion is administered.

**Peru:** Human used dried whole plant extract to treat cancer, leishmaniasis and heart disease.

**Philippines:** Pregnant women take root decoction to induce abortion in general; people also use it in dysentery and intestinal parasitism while to treat diabetes and stomach cramps, people taken leaf decoction. Menorrhagia is treated with an infusion made from the leaves.

**South Africa:** Dried leaves extract is used to treat for rheumatism, diabetes and menorrhagia. *C. roseus* dried root decoction is used against urogenital infections and gonorrhoea.

**Venda:** For venereal disease, root extract is very helping in oral dosing.

**Vietnam:** In Vietnamese traditional medicine, dried aerial part's extract is listed in the Vietnamese pharmacopoeia and used as a drug.

**Zimbabwe:** This plant used for stomach ache in the Mutirikwi region.

**Australia:** For menorrhagia, rheumatism and diabetes, extracting dry leaves in hot water is administered, while a root bark extract is given internally as a febrifuge.

**USA:** Gargle of *C. roseus* to treat laryngitis, sore throats, chest pain, and sore throats.

**Madagascar:** To induce vomiting, leaves are utilized while roots act as toothache cure, purgative, homeostatic, vermifuge and depurative (Chaturvedi et al., 2022).

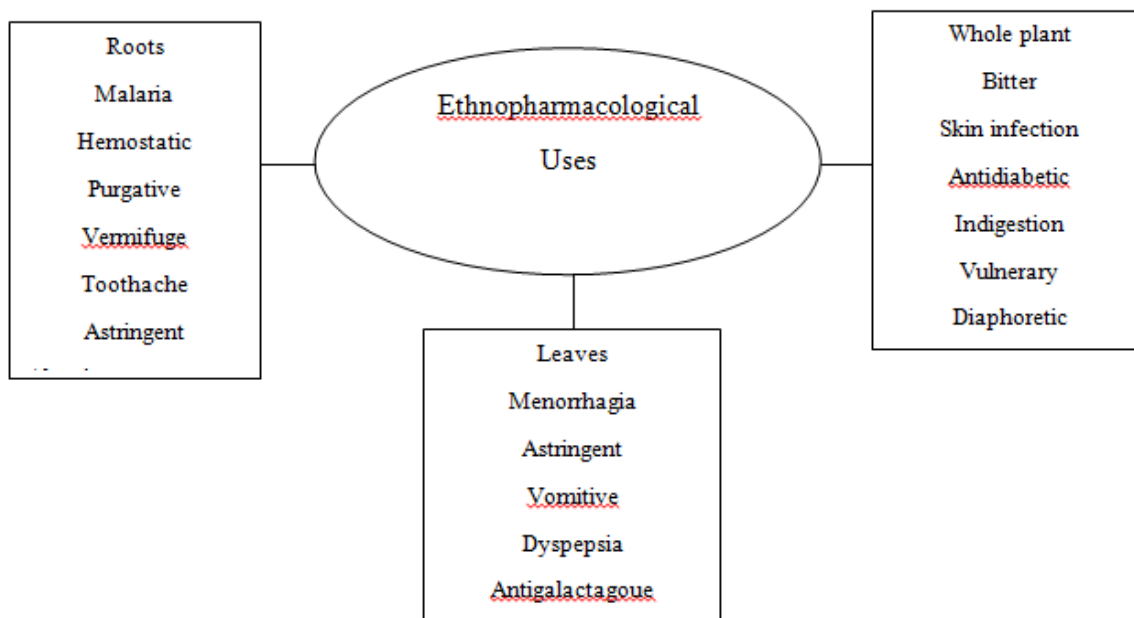


Fig 4- Ethnopharmacological Uses

#### 4. Economic market of *Catharanthus roseus*

Bisindole alkaloids such as vincristine, vinblastin, vinorelbine and vindesine have been gain clinical approval from the US Food and Drug Administration as a chemotherapeutic purpose, other pharmacological and pharmaceutical uses. These compounds are more costly and in high price around the world. Due to their very low concentrations (about 0.0005% of dry weight) in the aerial portion of the plant, these chemicals are expensive (Kaushik et al., 2017). The global market was thought to be worth 150–300 million in US dollars in 2005 (Prabha Lahare et al., 2020).

#### 5- CONCLUSION

Medicinal plant is the most exclusive source of life saving drugs for majority of the world's population. They continue to be an important therapeutic aid for alleviating the ailments of human kinds. The search for defence mechanism, longevity and remedies to relieve pain and discomfort drove early man to explore these immediate natural surroundings. It led to the use of plants, animal products and minerals etc., and the development of a variety of therapeutic agents. Today, there is a renewal interest in traditional medicine and an increasing demand for more drugs from plant sources because green medicine is safe and more dependable then costly synthetic drug, many of which have adverse side effects. *Catharanthus roseus* was investigated from the ancient time for their phytochemical components and their therapeutic effect. The plant contains enormous phytochemical constituents of various medicinal applications. *Catharanthus roseus* is used for the treatment of various diseases like diabetes, and tumors in all over the world from the last several decades. Every part of *Catharanthus* like root, stem, bark and flower are rich sources of several bioactive compounds. Hope this review will serve the purpose of aiding in future Research work to unleash the futher components present in *Catharanthus roseus*.

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