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A REVIEW ON WONDER PLANT *CATHARANTHUS ROSEUS*

M. G. Kuldeep *, K. H. Ahalyadevi, T. Balasubramanian and B. S. Suresha

Department of Phamacology, Bharathi College of Pharmacy, Bharathinagara, Mandya - 571422, Karnataka, India.

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Correspondence to Author:
M. G. Kuldeep

Department of Phamacology, Bharathi College of Pharmacy, Bharathinagara, Mandya - 571422, Karnataka, India.

E-mail: kuldeepmg2020@gmail.com

ABSTRACT: *Catharanthus roseus*, population known as *Vinca rosea*, is a significant medicinal plant from the Apocynaceae family, used to treat various life-threatening diseases. It is known by names such as bright eyes, cape periwinkle, pink periwinkle, and Madagascar periwinkle. The plant contains chemical compounds like carbohydrates, flavonoids, saponins, and alkaloids, including vinblastine, vincristine, vindoline, monoterpenes, sesquiterpenes, indole, and indoline glycosides. *Catharanthus roseus* is native to the Indian Ocean Island of Madagascar and was once considered an endangered species in the wild. However, it is now found in many tropical and subtropical regions worldwide, including the southern United States. The plant demonstrates various pharmacological activities, such as anticancer, antidiabetic, antimicrobial, antioxidant, memory enhancement, wound healing, hypotensive, antidiarrheal, antiulcer, and hypolipidemic effects. In this review article express taxonomy, synonym, vernacular names, distribution, ethnomedical uses, phytochemicals and pharmacological activities of *Catharanthus roseus*.

INTRODUCTION: Medicinal plants have been used extensively in traditional medicine throughout history. Ethnobotanical knowledge about these plants and their applications by indigenous communities is valuable for preserving cultural heritage, promoting biodiversity, enhancing community healthcare, and advancing drug development [1]. In medical practice, many herbal medicines are utilized, as herbal preparations have proven to be an effective tool for preventing and treating a wide range of diseases, backed by years of experience in their use [2].

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Natural resources, including herbal plants rich in a diverse array of phytochemicals, are regarded as promising traditional medicines for treating chronic and infectious diseases. They are considered safer and more effective alternatives with fewer side effects compared to synthetic drugs [3]. *Catharanthus roseus* Linn a perennial plant is commonly seen in tropical counties and are native to Madagascar and Southern Asia.

The flowers produced by these plants are planted for decorative purposes are of colours such as pink, purple and white Madagascar periwinkle is used traditionally for number of ailments such as high blood pressure, infection and diabetes mellitus. The stem produces a milky sap that serves as a source for over 70 indole alkaloids". Vincristine and vinblastine were isolated from this plant are well known anti-cancer drugs for Hodgkin's lymphoma and childhood leukemia respectivel.

FIG. 1: *CATHARANTHUS ROSEUS* PLANT

FIG. 2: *CATHARANTHUS ROSEUS* LEAVES

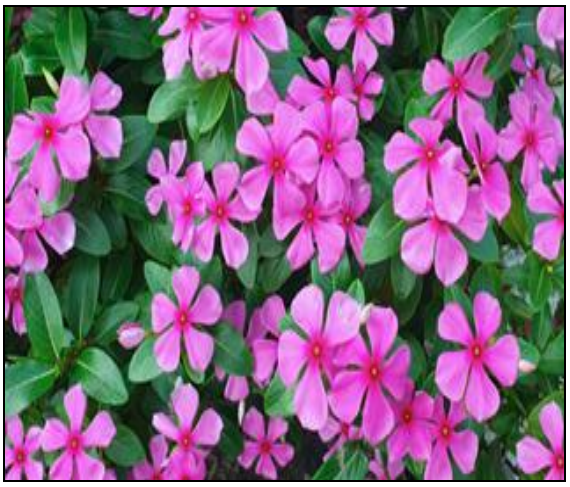

FIG. 3: *CATHARANTHUS ROSEUS* FLOWER

Plant Biography:

Taxonomical Classification [6]:

TABLE 1: TAXONOMICAL CLASSIFICATION OF *CATHARANTHUS ROSEUS*

Kingdom	Plantae
Division	Magnoliophyta
Class	Magnoliopsida
Order	Gentianales
Family	Apocynaceae
Genus	Catharanthus
Species	*Catharanthus roseus*

Synonyms [5]:

- *Vinca rosea* L.
- *Pervinca rosea* (L.) Gaterau
- *Lochnera rosea* (L.) Rchb. ex Spach
- *Ammocallis rosea* (L.)

Vernacular Names [7]:

TABLE 2: VERNACULAR NAMES OF *CATHARANTHUS ROSEUS*

Sl. no.	Languages	Vernacular names
1	English	Cayenne jasmine, old maid, periwinkle
2	Hindi	Sadabahar
3	Kannada	Kempukassi Kanigalu, batlahoo, bilikaasikanigalu, ganeshanahoo
4	Malayalam	Banappuvu, Nityakalyani, savanari, usamalari
5	Marathi	Sadaphool, sadaphul, sadaphuli
6	Sanskrit	nityakalyani, rasna, sadampuspa, sadapushpi
7	Tamil	cutkattumalli, cutukattumalli, cutukattuppu
8	Telugu	billaganneru
9	Gujarati	Barmasi
10	Bengali	noyontara

Phytoconstituents [9, 10, 11, 12, 13, 14]:

TABLE 3: PHYTOCONSTITUENTS OF *CATHARANTHUS ROSEUS*

Phytochemicals	Plant parts	Isolated compounds
Alkaloids	Leaf	Catharanthine,Vindoline,Vindolidine,Vindolicine,Vindolinine,ibogaine, yohimbine, raubasine, Vinblastine, Vincristine, Leurosine, Lochnerine, β-carboline, apparicine, akuammicine, iochrovicine, pericyclivine, cavincine, rosicine, tabersonine, perivine, Iochneridine, serpentine, rosamine, fluorocarpamine, N -oxide, sitsirikine, vincoline, vincarodine, deacetoxy, tabersonine, 19- acetoxy-11- hydroxy, cathovaline, strictosidine, bannucine, 4'-anhydro-, catharanthamine, roseadine, vincathicine, catharicine, catharine, carosine, vinamidine, vincristine, neoleurocristine, leurosinone, neoleurosidine, N b-oxide, vindolicine, cathindine, cavincidine, perosine, rovindine, vinaphamine, vinaspine, vincamicine
	Stem	Leurosine, Lochnerine, Catharanthine, Vindoline
	Root	Ajmalacine, Serpentine, Catharanthine, Vindoline, Leurosine, Lochnerine, Reserpine, Alstonine, Tabersonine, Horhammericine, Lochnericine, echitovenine, ammocalline, akuammicine, cavincine, venalstonine, perivine, serpentine, tetrahydroalstonine, yohimbine, vinosidine, strictosidine, ammorosine, cathalanceine, cathindine, cavincidine, maandrosine, perosine
	Flower	Catharanthine, Vindoline, Leurosine, Lochnerine, Tricin (Flavones), apparicine, perivine, coronaridine, tetrahydroalstonine, tabersonine,11-methoxy, mitraphylline, catharicine, carosine
	Seeds	Vingramine, Methylvingramine, tabersonine, strictosidine, vinsedicine
	shoots	Catharanthine, cyclolochnerine, 21-hydroxy, serpentine, tetrahydroalstonine, sitsirikine, horhammericine, 11-methoxy, strictosidine lactam. vinblastine,3',4'-anhydro-, catharine
Phenols	Leaves	Kaempferol-3-O-(2,6-di-Orhamnosyl-galactoside)-7-Ohexoside, Kaempferol-3-O-(2,6-diO-rhamnosyl-galactoside), Quercetin-3-O-(2,6-di-O-rhamnosylgalactoside), Chlorogenic acid, 3-Ocaffeoylquinic acid, 4-Ocaffeoylquinic acid 5-Ocaffeoylquinic acid, Quercetin trisaccharides, 3-O-caffeoylquinic acid, kaempferol-3-O-(2,6-di-O-rhamnosyl-galactoside)-7-O-hexoside,4-O-caffeoylquinic acid, 5-O-caffeoylquinic acid, Quercetin-3-O-(2,6-di-O-rhamnosyl-galactoside), Kaempferol-3-O-(2,6-di-O-rhamnosyl-galactoside)
	Stem	3-O-caffeoylquinic acid, 4-Ocaffeoylquinic acid 5-O-caffeoylquinic acid, Syringetin glycosides Quercetin trisaccharides, Quercetin3-O-(2,6-di-O-rhamnosylgalactoside) , Kaempferol-3-O-(2,6- di-O-rhamnosyl-galactoside), Isorhamnetin-3-O-(2,6-di-Orhamnosyl galactoside), Quercetin-3-O-(2,6-di-O-rhamnosyl-galactoside)
	Flower (Petals)	4-O-(2,6-di-O-rhamnosylgalactoside) Malvidin 3-O-(6-O-pcoumaroyl), Kaempferol-3-O-(2,6-di-Orhamnosyl-galactoside) Petunidin 3-O-(6-Op-coumaroyl), Quercetin-3-O-(2,6-di-O-rhamnosylgalactoside), Malvidin 3- Oglucosides, Kaempferol-3-O-(2,6- di-O-rhamnosyl-glucoside), Isorhamnetin-3-O-(6-O-rhamnosylglucoside), Kaempferol-3-O-(6-Orhamnosyl-galactoside), Kaempferol3-O-(6-O-rhamnosyl-glucoside), Hirsutidin 3-Oglucosides, Hirsutidin 3-O-(6-Op-coumaroyl), Isorhamnetin-3-O-(6-O-rhamnosyl-galactoside)
	Seed	Kaempferol-3-O-(2,6-di-Orhamnosyl-galactoside)-7-Ohexoside, Quercetin-3-O-(2,6-di-Orhamnosyl-galactoside), Isorhamnetin-3-O-(2,6-di-Orhamnosyl-glucoside), Kaempferol3-O-(2,6-di-O-rhamnosylgalactoside), Kaempferol-3-O-(2,6 di-O-rhamnosyl-glucoside), Kaempferol-3-O-(6-O-rhamnosylgalactoside), Isorhamnetin-3-O-(6- O-rhamnosyl-glucoside)
	Whole plant	Vanillic acid, Gallic acid, Hydroxytyrosol, Ferulic acid
Others	Leaves	Carbohydrates, saponins, tannins, flavonoid, steroids, triterpenoids, loganic acid
	Stem	Carbohydrates, steroids, tannin
	Flower	Steroids, tannin, saponins, carbohydrate.
	Root	Saponins, carbohydrate, triterpenoid, tannins, ajmalicine, steroids
	Whole part	Catharanthine, vindoline, vincristine, mono terpenoids, glycoside, flavonoids, vinblastin.

Traditional Uses:

Leaves: leaves are taken orally for menorrhagia, diabetes, hypertension, Cancer, pregnant woman to combat primary inertia in childbirth, Hodgkin's disease, rheumatism, smoked as a euphoriant, wasp sting, stomach cramps, anti-cancer, vomitive, indigestion and dyspepsia [11, 15, 16].

Root Bark: The root bark is taken orally as a febrifuge for menorrhagia, by pregnant women to

induce abortion, for venereal diseases, intestinal parasitism, anti-cancer effects, dysentery, as a purgative, vermifuge, depurative, hemostatic, and for toothache relief [16].

Aerial Parts: These are used as menstrual regulators and are a part of Vietnamese traditional medicine [16].

Ovules: The ovules are used in the treatment of diabetes [16].

Whole Plant: The whole plant is used for managing diabetes mellitus, acting as an anti-galactagogue, cholagogue, anti-cancer agent, and for treating stomach problems, heart disease, leishmaniasis, liver disease, bleeding, hypertension, insomnia, sore throats, chest ailments, and laryngitis [11, 15, 16].

Flower: The flowers are used as an eye wash for infants, as well as to treat asthma, tuberculosis, and flatulence [11, 15].

Pharmacological Actions:

Hypotensive and Hypolipidemic Effects: The leaves extract of *Catharanthus roseus* was studied for its hypotensive and hypolipidemic effects in adrenaline-induced hypertensive rats (AIHR) and compared with Atenolol in a crossover design. The pharmacologically active components responsible for the hypotensive effects were isolated from the plant using a bioassay-guided purification method, and their structures were proposed through spectroscopic techniques. Both the *Catharanthus roseus* leaf extract and the commercial drug Atenolol were administered *via* the intraperitoneal (i.p.) route for one week. Various biochemical parameters, including heart weight, blood glucose levels, serum cholesterol levels, serum triglyceride levels, and body weight, along with their interrelationships, were measured. The *Catharanthus roseus* leaf extract was injected daily at a dose of 30 mg per 155 ± 15 g of body weight during the treatment period. The dosage of Atenolol was determined based on its pharmacokinetic properties. A clinically effective plasma concentration of Atenolol as a hypotensive drug was achieved after administering 0.1 mg per 155 ± 15 g of body weight. Significant changes in cardiovascular parameters were observed following treatment with *Catharanthus roseus* leaf extract. Animals treated with the extract showed noticeable hypotensive effects, similar to those observed with Atenolol [17].

Anthelminthic Activity: *Catharanthus roseus* has traditionally been used as an anthelminthic agent. The anthelminthic properties of *Catharanthus roseus* were evaluated using *Pheretima posthuma* as an experimental model, with Piperazine citrate as the standard reference. The ethanolic extract at a concentration of 250 mg/ml demonstrated significant anthelminthic activity, with a death time of 46.33 minutes, while the standard drug at 50 mg/ml showed a death time of 40.67 minutes [18].

CNS Depression Activity: In experimental animal models, the central nervous system (CNS) depressing effects of *C. roseus* leaves were assessed using locomotor activity and pentobarbitone-induced sleeping time. The extracts were prepared through sequential fractionation using petroleum ether, chloroform, and ethanol. Significant, dose-dependent CNS depressive effects were observed with oral administration of petroleum ether extracts at doses of 200 and 400 mg/kg. Diazepam at 4 mg/kg was used as the reference standard. A dose of 100 mg/kg did not produce any noticeable effect in the animals. Qualitative chemical analysis of the petroleum ether extract revealed the presence of steroids, tannins, flavonoids, glycosides, alkaloids, and phenolic compounds. The extract was particularly high in steroids, phenols, and flavonoids, which are known to contain compounds sensitive to CNS depressive effects in preclinical studies. The observed CNS depressing properties of *C. roseus* leaves may be attributed to the presence of steroids, glycosides, and phenolic compounds [19].

Anti-Parasitic Activity: Adults of the hematophagous fly *Hippobosca maculata* Leach (Diptera: Hippoboscidae) and the sheep-biting louse *Bovicolaovis* Schrank (Phthiraptera: Trichodectidae) were treated with titanium dioxide nanoparticles (TiO2 NPs) synthesized from an aqueous extract of *Catharanthus roseus* leaves. Adulticidal activity was observed in the aqueous *C. roseus* leaf extract, TiO2 solution, and the synthesized TiO2 NPs at various concentrations over a 24 hour period. The aqueous crude leaf extract of *C. roseus* showed the highest

parasiticidal activity against *H. maculata* and *B. ovis*, with LD50 values of 36.17 mg/L and 30.35 mg/L, respectively, and r^2 values of 0.948 and 0.908. The most effective concentration was a 5 mM TiO2 solution, which had LD50 values of 33.40 mg/L and 34.74 mg/L against *H. maculata* and *B. ovis* (r^2 = 0.786 and 0.873, respectively). The highest activity was observed with the synthesized TiO2 NPs, which exhibited LD50 values of 7.09 mg/L and 6.56 mg/L for *H. maculata* and *B. ovis*, with r^2 values of 0.8 [20].

Anti-diabetic Activity: The leaves of *Catharanthus roseus* being widely used in various regions, including India, for the treatment of diabetes mellitus. The extract of *C. roseus* helps lower blood glucose levels by inhibiting glucose-6-phosphate dehydrogenase.

Alcoholic extracts of *Vinca roseus* have demonstrated anti-hyperglycemic effects without altering body weight and have shown improvement in the condition of diabetes mellitus, as well as regeneration of beta cells. *C. roseus* influences insulin action in tissues, insulin release, glucose uptake, and these factors are crucial in understanding its anti-diabetic activity. It improves glycemic control by enhancing insulin sensitivity in the liver and muscles, while also decreasing HDL cholesterol and increasing total cholesterol in diabetic individuals. A higher dose (500 mg/kg) of the methanol whole plant extract proved more effective than a lower dose (300 mg/kg) after 14 days of treatment, and it was also more effective than the standard drug, glibenclamide (5 mg/kg) [21].

Anti-Cancer Activity: Vinblastine and vincristine, two potent anti-cancer alkaloids, are found in the leaves and stems of *Catharanthus roseus*. These compounds inhibit the growth of tumors in specific individuals.

Vinblastine is commonly used in the treatment of neoplasms such as choriocarcinoma and Hodgkin's disease, while vincristine is primarily used to treat pediatric leukemia. Various portions of the methanolic crude extracts of *Catharanthus* have shown notable anti-cancer activity against a range of cell types in *in-vitro* studies [22].

Anti-diarrheal Activity: The *in-vivo* anti-diarrheal effect of *C. roseus* ethanolic leaf extract was evaluated in Wistar rats, using castor oil as an experimental agent to induce diarrhea, along with pre-treatment with the extract. Loperamide and atropine sulfate served as standard drugs for comparison. The ethanolic extract of *C. roseus* demonstrated a dose-dependent inhibition of castor oil-induced diarrhea at doses of 200 and 500 mg/kg. The extract significantly reduced both the number and weight of wet fecal pellets, with the treated groups showing less severe diarrhea compared to the control rats. Additionally, doses of 200 and 500 mg/kg of the extract effectively inhibited castor oil-induced diarrhea and reduced gastrointestinal propulsion of a charcoal meal. These results support the traditional use of *C. roseus* in the treatment and management of diarrhea [23].

Analgesic Activity: *V. rosea* has traditionally been used as an analgesic to alleviate pain. The plant contains several alkaloids, including vincristine and vinblastine, which have demonstrated pain-relieving properties. These alkaloids work by binding to opioid receptors in the brain and spinal cord, reducing the transmission of pain signals. *V. rosea* has been found effective in treating neuropathic pain, such as that caused by diabetes, and in alleviating post-operative pain. However, further research is needed to fully understand its analgesic effects and determine the optimal doses for pain management. It is important to note that *V. rosea* can be toxic if taken in large doses and should only be used under the guidance of a healthcare professional [25].

Memory Enhancement Activity: Vinpocetine has been reported to have several actions that could potentially be beneficial in Alzheimer's disease (AD). However, the only study examining this agent in a well-defined cohort of AD patients found no significant benefit. A meta-analysis of earlier studies involving vinpocetine in poorly defined dementia populations concluded that there is insufficient evidence to support its clinical use at present. Vinpocetine has been well tolerated at doses up to 60 mg/day in clinical trials involving dementia and stroke, with no major adverse events reported [24].

Antipyretic Activity: The antipyretic (fever-reducing) properties of *V. rosea* have been used

traditionally. Recent studies suggest that the plant contains bioactive compounds that can reduce fever by inhibiting the production of prostaglandins, which are responsible for raising body temperature. In one study, *V. rosea* extract was found to significantly reduce fever in rats. However, further research is needed to fully understand the mechanism of action and potential effectiveness of *V. rosea* as an antipyretic. It is important to remember that fever is a natural immune response, and in some cases, such as during infections, it may be necessary for the body to fight off pathogens. Therefore, *V. rosea* should not be used to treat fever without consulting a healthcare professional [25].

CONCLUSION: This review highlights the remarkable therapeutic potential, pharmacological properties, and diverse bioactive compounds found in *Catharanthus roseus* (Linn), emphasizing its importance for human health. It stresses the need for continued research and clinical studies, urging researchers and industry professionals to explore its potential applications in the nutraceutical and pharmaceutical sectors.

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CONFLICT OF INTEREST: Nil

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