

## CATHARANTHUS ROSEUS: CHEMICAL CONSTITUENTS AND PHARMACOLOGICAL ACTIVITIES- A REVIEW

Rupali Jaiswal\*, Asheesh Kumar Singh, Navneet Kumar Verma, Prem Chand Mall, Vikas Yadav

Department of Pharmacy, Buddha Institute of Pharmacy, GIDA, Gorakhpur, U.P. India-273209.

\*Corresponding Author: Rupali Jaiswal

Department of Pharmacy, Buddha Institute of Pharmacy, GIDA, Gorakhpur, U.P. India-273209.

Article Received on 05/11/2019

Article Revised on 26/11/2019

Article Accepted on 16/12/2019

### ABSTRACT

Medicinal plants were the potent source of various novel pharmaceutical products that shows ect causing potent pharmacological effect on the human beings. Instead of using the side effects causing chemical drugs, the ancient medicine could be explored to identify the novel drug formulations that are more effective with lesser side effects and also cheaper cost. Though, many of the traditional drugs were used without understanding the basic mechanism, their effect could be proved further with the help of the present technology and tools. The active compound that is responsible for the pharmacological effect could be found very easily and also commercialized as a drug product itself with proper approval from the respective organizations. *Catharanthus roseus* is one of the 21000 important medicinal plants found. It is used for the cure of a number of diseases such as diabetes, sore mouth, mouth ulcers, and leukemia. It produces about 130 alkaloids such as reserpine, vinceine, raubasin and ajmalicine. Anti-leukemic activity is shown by vinblastine and vincristine. Different parts of this plant produce different amounts of alkaloids, out of which root bark produces the maximum i.e. nearly 1.79%. There are a number of reports supporting its anti-microbial activity against *Staphylococcus albusi*, *Bacillus megatarium*, *Shigella*, *Pseudomonas*, etc. Its anti-oxidant and anti-mutagenic effects have also been reported. Further studies need to be done to explore its anti-tumour effects.

**KEYWORDS:** *Catharanthus roseus*, vinblastine, vincristine, anti-cancer property.

### INTRODUCTION

Medicinal plants have a long history of usage in traditional medicine. Ethno-botanical information on medicinal plants and their usage by indigenous cultures is useful in the conservation of traditional cultures, biodiversity, community health care and drug development. *Catharanthus roseus* L. (G.) Don, is an important medicinal plant belonging to the Apocynaceae family; this plant is a dicotyledonous angiosperm and synthesizes two terpene indole alkaloids: vinblastine and vincristine that are used to fight cancer.<sup>[1]</sup> Peckolt, in 1910, described the use in Brazil of an infusion of the leaves to control hemorrhage and scurvy, as a mouthwash for toothache, and for the healing and cleaning of chronic wounds. In Europe related species have been used for the proprietary suppression of the flow of milk. In the British West Indies it has been used to treat diabetic ulcer and in the Philippines has been reported as being an effective oral hypoglycemic agent. More recently, Chopra *et al.* have reported that the total alkaloids possess a limited antibacterial activity as well as a significant and sustained hypotensive action. The hypoglycemic and antibacterial activities have not been confirmed, although one of the alkaloids isolated from

this plant, ajmalicine, has been reported to possess transient depressor action on arterial blood pressure Periwinkle” or *Catharanthus roseus* (Family Apocynaceae), commonly known as “Nayantara” or “Sadabahar”, the word *Catharanthus* derives from the Greek language meaning "pure flower." While, *roseus* means red, rose or rosy.<sup>[2]</sup>

**Scientific classification:**<sup>[3]</sup>

**Botanical Name(s):** *Vinca Rosea (Catharanthus roseus)*  
**Family Name:** Apocynaceae  
**Kingdom:** Plantae  
**Division:** Magnoliophyta (Flowering plants)  
**Class:** Magnoliopsida (Dicotyledons)  
**Order:** Gentianales  
**Family:** Apocynaceae  
**Genus:** *Catharanthus*  
**Species:** *C. roseus*

**Vernacular names:**

**English:** cayenne jasmine, old maid, periwinkle  
**Hindi:** sada bahar, sadabahar  
**Kannada:** batla hoo, bili kaasi kanigalu, ganeshana hoo, kempu kaasi kanigalu

<b>Malayalam:</b>	banappuvu, nityakalyani, savanari, usamalari	<b>Tamil:</b>	cutkattu malli, cutukattu malli, cutukattuppu
<b>Marathi:</b>	sadaphool, sadaphul, sadaphuli	<b>Telugu:</b>	billaganneru
<b>Sanskrit:</b>	nityakalyani, rasna, sadampuspa, sadapushpi	<b>Gujarati:</b>	Barmasi
		<b>Bengali:</b>	noyontara

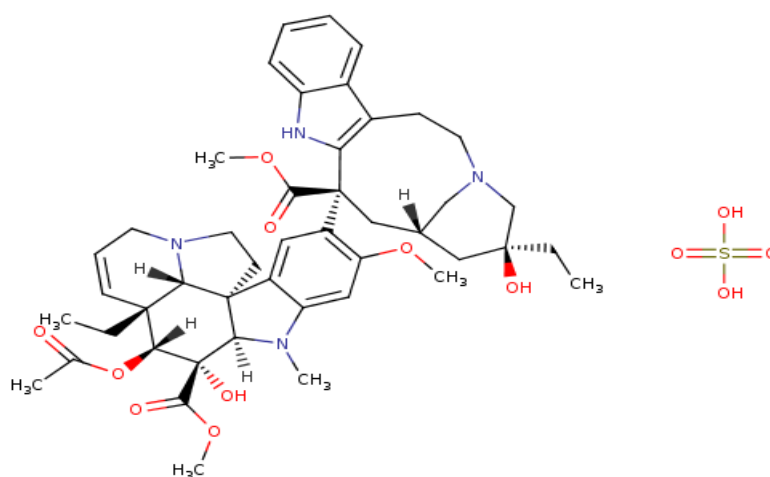


**Fig. 1:** *Catharanthus roseus* (copied from google.com).

#### 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*.<sup>[4]</sup>



**Fig. 2:** Vinblastin.

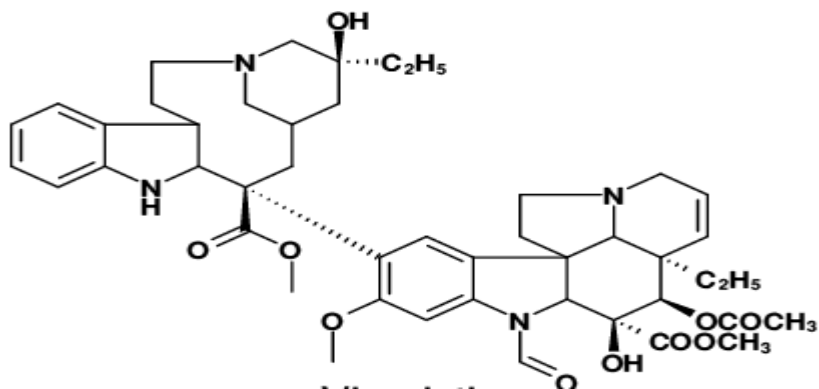


Fig. 3: Vincristine.

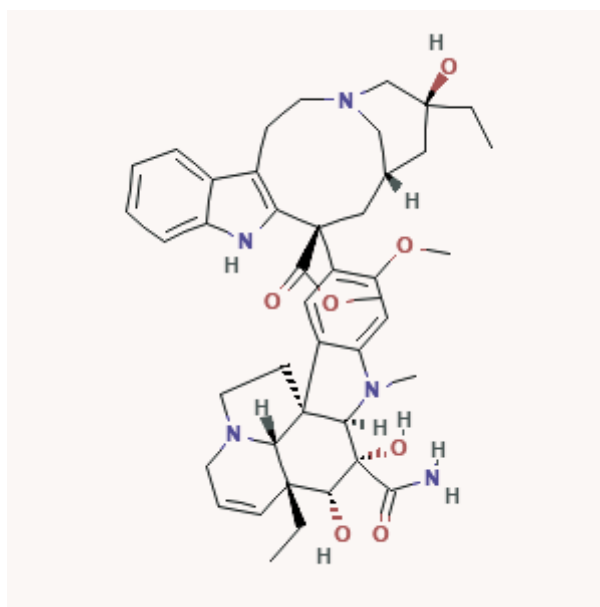


Fig. 4: Vindesine.

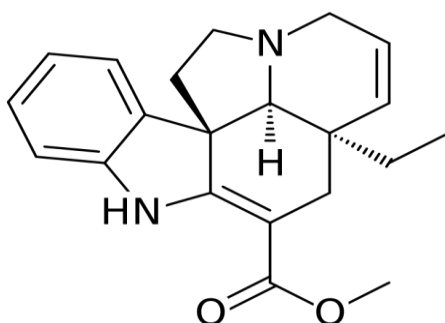


Fig. 5: Tabersonine.

## PHARMACOLOGICAL ACTIVITIES

### Anti cancer activity

The anticancer alkaloids Vinblastine and Vincristine are derived from stem and leaf of *Catharanthus roseus*. These alkaloids have growth inhibition effect to some human tumors. Vinblastine is used experimentally for treatment of neoplasmas and is recommended for Hodgkins disease, chorio carcinoma. Vincristine another alkaloids is used for leukemia in children. Different percentage of the methanolic crude extracts of

*Catharanthus* was found to show the significant anticancer activity against numerous cell types in the *in vitro* condition and especially greatest activity was found against the multidrug resistant tumor types. Vinblastine is sold as Velban or Vincristine as oncovin.<sup>[5,6]</sup>

### Anti diabetic activity

The ethanolic extracts of the leaves and flower of *C. roseus* showed a dose dependent lowering of blood sugar in comparable to the standard drug. Lowering of blood

sugar in comparable to the standard drug glibenclamide. The Hypo glyceemic effect has appeared due to the result of the increase glucose utilization in the liver. The aqueous extract was found to lower the blood glucose of about 20% in diabetic rats when compared to that of the dichloromethane and methanol extracts which lowered the blood glucose level to 49-58%. The hypoglycemic effect has appeared due to the result of the increased glucose utilization in the liver. the hypoglycemic activity of alkaloids isolated from *C. roseus* have been studied pharmacologically and a remedy derived from the plant has been marketed under the proprietary name Vinculin as a treatment for diabetes.<sup>[7-9]</sup>

#### Anti microbial activity

Crude extracts from different parts of the plant was tested for anti bacterial activity. Extract from leaves showed significantly higher efficacy. The anti bacterial activity of the leaf extract of the plant was checked against micro organism like *Pseudomonas aeruginosa* NCIM2036, *Salmonella typhimurium* NCIM2501, *Staphylococcus aureus* NCIM5021 and was found that the extracts could be used as the prophylactic agent in the treatment of many of the disease.<sup>[10]</sup>

#### Anti oxidant property

The anti oxidant potential of the ethanolic extract of the roots of the two varieties of *C. roseus* namely rosea (pink flower) and alba (white flower) was obtained by using different system of assay such as Hydroxyl radical-scavenging activity, uperoxide radical-scavenging activity, DPPH radical- scavenging activity and nitric oxide radical inhibition method. The result obtained proved that the ethanolic extract of the roots of Periwinkle varieties has exhibited the satisfactory scavenging effect in the entire assay in a concentration dependent manner but *C. roseus* was found to possess more antioxidant activity than that of *C. alba*.<sup>[11]</sup>

#### Anti helminthic activity

Helminthes infections are the chronic illness, affecting human beings and cattle. *Catharanthus roseus* was found to be used from the traditional period as an anti helminthic agent. The anti helminthic property of *C. roseus* has been evaluated by using *Pherithema postuma* as an experimental model and with Piperazine citrate as the standard reference. The ethanolic extract of the concentration of 250 mg/ml was found to show the significant anti helminthic activity.<sup>[12]</sup>

#### Anti ulcer property

Vincamine and Vindoline alkaloids of the plant showed anti ulcer property. The alkaloid vincamine, present in the plant leaves shows cerebrovasodilatory and neuroprotective activity. The plant leaves proved for anti-ulcer activity against experimentally induced gastric damage in rats.<sup>[13]</sup>

#### Hypotensive property

Extract of leaves of the plant made significant change in hypotensive. The leaves have been known to contain 150 useful alkaloids among other pharmacologically active compounds. Significant antihyperglycemic and hypotensive activity of the leaf extracts (hydroalcoholic or dichloromethane-methanol) have been reported in laboratory animals.<sup>[14]</sup>

#### Anti diarrheal property

The anti diarrheal activity of the plant ethanolic leaf extracts as tested in the wistar rats with castor oil as a experimental diarrhea inducing agent in addition to the pretreatment of the extract. The anti diarrheal effect of ethanolic extracts *C. roseus* showed the dose dependant inhibition of the castor oil induced diarrhea.<sup>[15]</sup>

#### Wound healing property

Rats treated with 100 mg /kg/day of the *Catharanthus roseus* ethanol extract had high rate of wound contraction significantly decreased epithelization period, significant increase in dry weight and hydroxyproline content of the granulation tissue when compared with the controls. Wound contraction together with increased tensile strength and hydroxyproline content support the use of *C. roseus* in the management of wound healing.<sup>[16]</sup>

#### Hypolipidimic effect

In study, significant anti atherosclerotic activity as suggested by reduction in the serum levels of total cholesterol, triglycerides, LDL-c, VLDLc and histology of aorta, liver and kidney with the leaf juice of *Catharanthus roseus* (Linn.) G. Donn. could have resulted from the antioxidant effect of flavonoid, and probably, vinpocetine like compound present in leaf juice of *Catharanthus roseus* (Linn.) G. Donn.<sup>[17]</sup>

#### CONCLUSION

*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. The plant has immense medicinal importance for its alkaloids. All parts of the plant including leaf, root, shoot and stem contains more than 200 alkaloids, which are used for therapeutic purposes against several diseases. The most important alkaloids vinblastine and vincristine are derived from leaves and they exhibits anti-cancer and anti-diabetic property. Another alkaloid rubacine derived from roots is used as hypotensive and anti-arrhythmic agent. In the present review more information on this magical plant will be provided.

## REFERENCES

1. M. Ajaib, Z.U.D. Khan, N. Khan, M. Wahab. Ethnobotanical studies on useful shrubs of District Kotli, Azad Jammu & Kashmir, Pakistan. *Pak J Bot*, 2010; 42: 1407–1415.
2. Dr. Hemamalini Balaji, Versatile. Therapeutic effects of *Vinca rosea* Linn. *International Journal of Pharmaceutical Science and Health Care*, 2014; 1(4): 59-76.
3. Erdogru. Antibacterial activities of some plant extract used in folk medicine. *Pharm. Biol.*, 2002; 40: 269-273.
4. Bennouna J, Delord JP, Campone M, Nguyen L. Vinflunine. A new microtubule inhibitor agent. *Clin Cancer Res.*, 2008; 14: 1625-32.
5. Banskota AH. Antiproliferative activity of Vietnamese medicinal plants. *Biological Pharmaceutical Bulletin*, 2002; 25(6): 753- 60.
6. Wang S, Zheng Z, Weng Y. Angiogenesis and anti-angiogenesis activity of Chinese medicinal herbal extracts. *Life Science*, 2004; 74(20): 2467-78.
7. Chattopadhyay RR, Sarkar SK, Ganguli S. Hypoglycemic and antihyperglycemic effect of leaves of *Vinca rosea* Linn. *Indian Journal of Physiology and Pharmacology*, 1991; 35: 145-51.
8. Singh SN, Vats P, Suri S. Effect of an antidiabetic extract of *Catharanthus roseus* on enzymic activities in streptozotocin induced diabetic rats. *Journal of Ethnopharmacology*, 2001; 76: 269-77.
9. Chattopadhyay RR. A comparative evaluation of some blood sugar lowering agents of plant origin. *Journal of Ethnopharmacology*, 1994; 67: 367–72.
10. Prajakta J. Patil, Jai S. Ghosh. Antimicrobial Activity of *Catharanthus roseus* – A Detailed Study. *British Journal of Pharmacology and Toxicology*, 2010; 1(1): 40-44.
11. Alba Bhutkar MA, Bhise SB. Comparative Studies on Antioxidant Properties of *Catharanthus Rosea* and *Catharanthus*. *International Journal of Pharmaceutical Techniques*, 2011; 3(3): 1551-1556.
12. Swati Agarwal, Simi Jacob, Nikkita Chettri, Saloni Bisoyi, Ayesha Tazeen, Vedamurthy AB, Krishna V, Joy Hoskeri H. Evaluation of In-vitro Anthelmintic Activity of *Catharanthus roseus* Extract. *International Journal of Pharmaceutical Sciences and Drug Research*, 2011; 3(3): 211-213.
13. Babulova A, Machova J, Nosalova V. Protective action of vinpocetine against experimentally induced gastric damage in rats. *Arzneimittel forschung*, 2003; 43: 981-985.
14. P. P. Pillay, C. P. M. Nair, and T. N. Santi Kumari. *Lochnera rosea* as a potential source of hypotensive and other remedies. *Bulletin of Research Institute of the University of Kerala*, 1959; 1: 51–54.
15. Mithun Singh Rajput, Veena Nair, Akansha Chauhan. Evaluation of Antidiarrheal Activity of Aerial Parts of *Vinca major* in Experimental Animals. *Middle-East Journal of Scientific Research*. 2011; 7(5): 784-788.
16. Nayak BS, Anderson M and Pereira LMP. Evaluation of wound-healing potential of *Catharanthus roseus* leaf extract in rats. *Fitoterapia*, 2007; 78: 540-544.
17. Yogesh Patel et al. Evaluation of hypolipidemic activity of leaf juice of *Catharanthus roseus* (Linn.). *Acta Poloniae Pharmaceutica - Drug Research*, 2011; 68(6): 927-935.