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A brief study on *Catharanthus Roseus*: A review

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Abstract
Ayurveda is the Indian traditional system of medicine which focuses on the medical potential of plants. Catharanthus roseus is one plant recognized well in Ayurveda. It is known for its antitumour, anti-diabetic, anti-microbial, anti-oxidant and anti-mutagenic effects. It is an evergreen plant first originated from islands of Madagascar. The flowers may vary in colour from pink to purple and leaves are arranged in opposite pairs. It produces nearly 130 alkaloids mainly ajmalcine, vinceine, resperine, 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 is an endangered species and need to be conserved using techniques like micropropagation. It has high medicinal values which need to be explored extensively.

Keywords: alkaloids, catharanthus roseus, vinblastine, vincristine, anti-cancer

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 [1]. 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 [2].

Scientific classification [3]:

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

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

Morphology
Catharanthus roseus is an evergreen subherb or herbaceous plant growing to 1 m. tall. The leaves are oval to oblong, 2.5-9.0 cm. long and 1- 3.5 cm. broad glossy green hairless with a pale midrib and a short petiole about 1- 1.8 cm. long and they are arranged in the opposite pairs. 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. The fruit is a pair of follicles about 2-4 cm. long and 3 mm broad.

Geographical Distribution

Catharanthus roseus is native to the Indian Ocean Island of Madagascar. In the wild, it is found to be an endangered plant and the main cause of their decline is the habitat destruction by the slash and burn agriculture however, it is now common in many tropical and subtropical regions worldwide, including the Southern United states.

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 plastidemeric, Vinblastine, 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* [4].

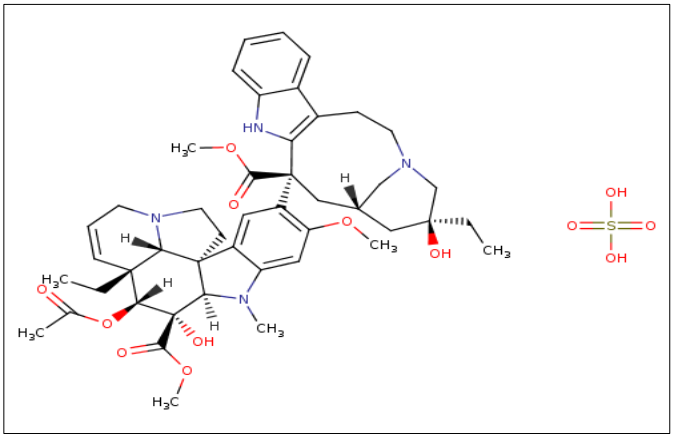

Fig 2: Vinblastin

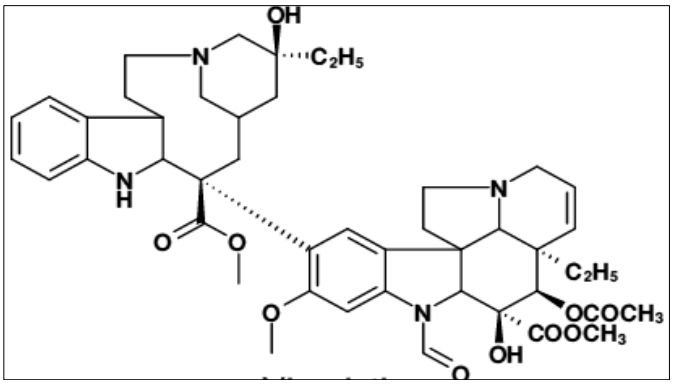

Fig 3: Vincrestine

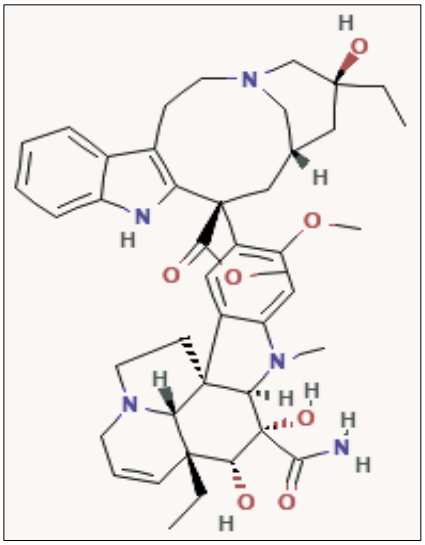

Fig 4: Vindesine

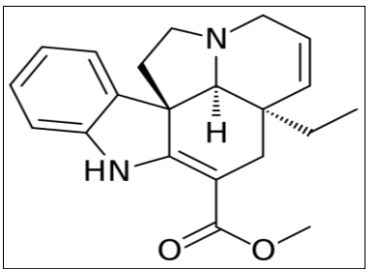

Fig 5: Tabersonine

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 [5, 6].

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 glycemic 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 propritery name Vinculin as a treatment for diabetes [7-9].

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 microorganism like *Pseudomonas aeruginosa* NCIM2036, *Salmonella typhimuruim* 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 [10].

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* [11].

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 *Pheretima posthuma* 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 [12].

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 [13].

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 [14].

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 [15].

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 [16].

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 [17].

Memory enhancement activity

Vinpocetine has been reported to have a variety of actions that would hypothetically be beneficial in Alzheimer's disease (AD). The only study investigating this agent in a well-defined cohort of AD patients found no benefit. Meta-analysis of older studies of vinpocetine in poorly-defined dementia populations concluded that there is insufficient evidence to support its clinical use at this time. Vinpocetine has been well tolerated at doses up to 60 mg/d in clinical trials of dementia and stroke, and no significant adverse events [18].

Conclusion

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 ajmalcine. 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.

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