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A discussion on *vinca* plant

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Abstract

Ayurveda is the Indian customary arrangement of medication which centers on the clinical capability of plants. *Catharanthus roseus* is one plant perceived well in Ayurveda. It is known for its antitumour, against diabetic, hostile to microbial, hostile to oxidant and against mutagenic impacts. It is an evergreen plant originally began from islands of Madagascar. The blossoms may fluctuate in shading from pink to purple and leaves are orchestrated in inverse sets. It delivers about 130 alkaloids predominantly ajmalicine, vinceine, reserpine, vincristine, vinblastine and raubasin. Vincristine and vinblastine are utilized for the therapy of different kinds of malignancy, for example, Hodgkin's sickness, bosom disease, skin disease and lymphoblastic leukemia. It is an imperiled species and should be preserved utilizing strategies like micropropagation. It has high therapeutic qualities which should be investigated widely.

Keywords: Alkaloids, *Catharanthus roseus*, vinblastine, vincristine, micropropagation

Introduction

Therapeutic plants have a long history of utilization in customary medication. Ethno-herbal data on therapeutic plants and their utilization by indigenous societies is valuable in the preservation of conventional societies, biodiversity, network medicinal services and medication advancement. *Catharanthus roseus* L. (G.) Don, is a significant therapeutic plant having a place with the Apocynaceae family; this plant is a dicotyledonous angiosperm and integrates two terpene indole alkaloids: vinblastine and vincristine that are utilized to battle disease [1]. Peckolt, in 1910, portrayed the utilization in Brazil of an implantation of the leaves to control discharge and scurvy, as a mouthwash for toothache, and for the mending and cleaning of interminable injuries. In Europe related species have been utilized for the restrictive concealment of the progression of milk. In the British West Indies it has been utilized to treat diabetic ulcer and in the Philippines has been accounted for similar to a successful oral hypoglycemic operator. All the more as of late, Chopra *et al.* have detailed that the complete alkaloids have a restricted antibacterial movement just as a huge and continued hypotensive activity. The hypoglycemic and antibacterial exercises have not been affirmed, albeit one of the alkaloids confined from this plant, ajmalicine, has been accounted for to have transient depressor activity on blood vessel pulse Periwinkle" or *Catharanthus roseus* (Family Apocynaceae), regularly known as "Nayantara" or "Sadabahar", the word *Catharanthus* gets from the Greek language signifying "unadulterated blossom." While, *roseus* implies red, rose or blushing [2].

Vinca alkaloids are a material of a class of natural mixes comprised of carbon, hydrogen, nitrogen and oxygen that is regularly gotten from plants is named alkaloid. In spite of the fact that, the name speaks to antacid like some don't show basic properties. Numerous alkaloids with having harmful qualities have physiological impacts excessively that make them helpful as medicines [3]. The most established gathering of the plant alkaloids bunches that used to treat disease are the *vinca alkaloids* [4].

Vinca alkaloids are gotten from the Madagascar periwinkle plant. They are normally happening or semi engineered nitrogenous bases extricated from the pink periwinkle plant *Catharanthus roseus* G. Don [5] [Figure 1]. *Vinca alkaloids* were discovered in the 1950's by Canadian researchers, Robert Noble and Charles Beer just because. Restorative uses of this plant lead to the observing of these mixes for their hypoglycemic movement, which is of little significance contrasted with their cytotoxic effects [6]. They have been utilized to treat diabetes, hypertension and the medications have even been utilized as disinfectants. By and by, the *vinca alkaloids* are so significant for being malignant growth warriors. There are four significant *vinca alkaloids* in clinical use: Vinblastine (VBL), vinorelbine (VRL), vincristine and vindesine (VDS), yet just VCR, VBL and VRL are endorsed for use in the United States [7]. From 2008, there is additionally another engineered *vinca* alkaloid, vinflunine that is presently affirmed in Europe for restorative treatment [8, 9].



Fig 1: The flowers of *Catharanthus roseus* G. Don. *Catharanthus roseus* (syn. *Vinca rosea*) an evergreen shrub, it grows to a height of 1 m with a spread of 1 m. The stem is short, erect and branching; the leaves are glossy green, oval, 5 cm long and opposite acuminate; the flowers are soft pink, tinged with red, 5 petal, open, tubular and 4 cm across, appearing in spring and autumn (three colors: pink, purple and white)

Scientific classification ^[10]:

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

Potentially Active Chemical Constituents

Specialists researching its therapeutic properties found that it contained a gathering of alkaloids that, however amazingly harmful, had expected utilizations in disease treatment. Plants can blend a wide assortment of synthetic aggravates that are utilized to perform significant natural capacities, and to protect against assault from predators, for example, creepy crawlies, parasites and herbivorous well evolved creatures. *C. roseus* force's starch, flavinoid, saponin and alkaloids. Alkaloids are the most possibly dynamic synthetic constituents of *Catharanthus roseus*. In excess of 400 alkaloids are available in the plant, which are utilized as pharmaceuticals, agrochemicals, flavor and aroma, fixings, food added substances and pesticides. The alkaloids like actineo plastidemic, Vinblastine, Vincristine, Vindesine, Vindeline Tabersonine and so on are primarily present in airborne parts though ajmalicine, vinceine, vincamine, raubasin, reserpine, catharanthine and so on are available in roots and basal stem. Rosindin is an anthocyanin color found in the bloom of *C. roseus* ^[11].

Botanical Description

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.

Feeding: As the flowering begins, apply standard liquid fertilizer every two weeks. Plants are not tolerant of excessive fertiliser.

Irrigation: They need regular moisture, but avoid overhead watering. It should be watered tolerably during the growing season, but it is relatively drought resistant once entrenched. They will regain after a good watering.

Fertilizing: The plants is not heavy breeders. If necessary, feed biweekly or once monthly with a fair amount liquid fertilizer. Too much fertilizing will produce abundant foliage instead of more blooms ^[12, 13, 14].

Geographical Distribution

Catharanthus roseus is originated from the Indian Ocean

Island of Madagascar. It was believed to be an endangered plant in the wild. However in many tropical and subtropical regions worldwide, including the Southern United states, it is now a common plant ^[15, 16].

Pharmacological Activities

Anticancer Activity

In clinical practice, the organization of *C. roseus* is done intravenously, after which they are in the long run used by the liver and discharged. Going bald, fringe neuropathy, obstruction and hyponatremia are the significant symptoms of this medications. To improve the remedial list, Semi-engineered Catharanthus alkaloids, for example, vinorelbine and vinflunine were created. Vinorelbine and vinflunine apply their antitumor impact by authoritative to tubulin. These alkaloids have development restraint influence some human tumors. Vinblastine is utilized tentatively for treatment of neoplasmas and is suggested for Hodgkin's sickness, chorio carcinoma. *C. roseus* was found to show the noteworthy anticancer movement against various cell types in vitro condition and particularly most prominent action was found against the multidrug safe tumor types. *Vinca alkaloids* likewise called as mitotic axle harms they restrain get together of the axle structures from microtubules, there by hindering mitosis in cell cycle. *Vinca alkaloids* subsequently effectively keep disease cells from partitioning. Distinctive *Vinca alkaloids* have their own special properties ^[17]. *Vinca alkaloids* square cells in mitosis since they are cell cycle explicit specialists. The *vinca alkaloids* tie explicitly to β -tubulin and obstruct its capacity to polymerize with α -tubulin into microtubules. Without a flawless mitotic axle, copied chromosomes can't adjust along the division plate and cell division is captured in metaphase. Cells obstructed in mitosis go through changes normal for apoptosis (Fig 2). They are additionally utilized for therapy of leukemias, lymphomas, and testicular disease (Retna *et al.*, 2013) ^[18].

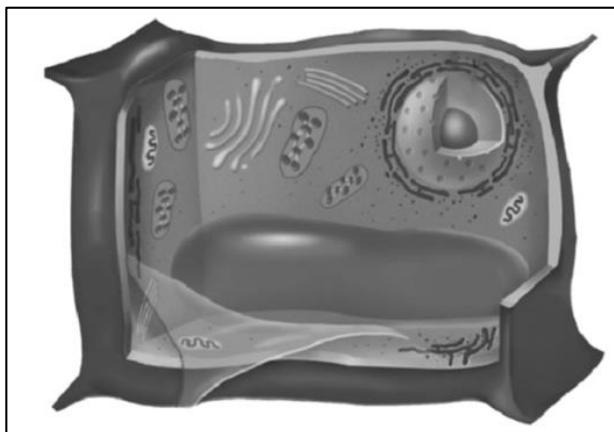


Fig 2: Possible pathways and mode of action of vincristine and vinblastine to act as anticancer

Antidiabetic Activity

Hypoglycemic action was found by utilizing the dichloromethane: methanol remove (1:1) of the leaves and twigs of *C. roseus* plant in streptozotocin incited diabetic rodent model at the portion of 500 mg/kg that has been controlled orally for 7 and 15 days. 48.6 and 57.6% hypoglycemic action was watched and further treatment for a time of 30 days has given total insurance against STZ challenge (75 mg/kg/i.p.). Catalysts exercises of glycogen synthase, glucose 6-phosphatedehydrogenase, succinate dehydrogenase and malate dehydrogenase were discovered to

be diminished in the liver of diabetic creatures which would be fundamentally improved after treatment with remove at portion 500 mg/kg p.o. for 7 days. Results showed the expanded utilization of glucose in treated rodents with the expanded degrees of lipid per oxidation. The ethanolic concentrates of the leaves and bloom of *C. roseus* uncovered that a portion subordinate diminishing of glucose is like the standard medication. Diminishing of glucose in practically identical to the standard medication glibenclamide. The Hypo glyceemic activity has been arosed because of the consequence of the expansion glucose use in the liver ^[19-20].

Antimicrobial Activity

C. roseus has been found to be a significant restorative plant for the making of the novel pharmaceuticals as the greater part of the bacterial microorganisms were improving obstruction against a considerable lot of the accessible enemy of microbial medications. Plants have been supported to be important regular assets for the dynamic chemotherapeutic operators and recommend a wide range of activity with the more prominent accentuation on the preventive activity ^[21]. It is exhibited that freak leaf extricates had great antibacterial potential against *S. aureus*, *S. citreus*, and *E. coli* and *P. aeruginosa* microscopic organisms while *B. subtilis* was notinfluenced. The vacillation in antibacterial movement among freak and control plant leaves may be expected to the genomic changes, stirred by the mutagen correspondingly affecting the combination and level of bio-dynamic mixes like vincristine, Vinblastine, vindoline in tissue, which may be commitment for antibacterial property of periwinkle leaves as additionally detailed before ^[22].

Antioxidant Activity

The antioxidant activity of *C. roseus* was assured by DPPH assays at distinct concentrations (200, 400, 600, 800 and 1000 μ g). Among the five concentrations tested, 800 μ g shows the apex antioxidant activity ^[23, 24].

Anti Diarrheal Activity

The *in vivo* anti diarrheal activity of *C. roseus* ethanolic leaf separate was tried in the Wistar rodents with castor oil as a test the runs initiating specialist notwithstanding the pretreatment of the concentrate. Loperamide and atropine sulfate were utilized as the standard medications. The counter diarrheal impact of ethanolic concentrate of *C. roseus* indicated the portion subordinate restraint of the castor oil actuated the runs at the dosages of 200 and 500 mg/kg. The concentrates essentially decreased the number and weight of wet fecal pellets with remove treated gatherings indicating lower diarrheal seriousness than control rodents incited the runs in Wistar rodents. A further dosages of 200 and 500 mg/kg of the concentrate hindered castor oil incited loose bowels just as repressed gastrointestinal drive of charcoal dinner. This information confirms the conventional utilization of *C. roseus* in the treatment and the executives of the runs ^[25, 26].

Anthelmintic Activity

Helminthes contaminations causes constant infections in individuals and steers. The assessment of anthelmintic property of *C. roseus* was completed by utilizing *Pherithema posthuma* as an exploratory model and with Piperazine citrate as the standard reference. Critical anthelmintic action was seen in the ethanolic separate in the convergence of 250 mg/ml with death season of 46.33 min and the standard medication at 50 mg/ml was found to show the passing season of 40.67 min This examination bears help to the ethnomedical

cases of *C. roseus* as an anthelmintic plant [27].

Hypotensive Activity

Extract obtained from the leaves of the *C. roseus* plant made significant change in hypotensive property. Remarkable antihyperglycemic and hypotensive activity of the leaf extracts (hydroalcoholic or dichloromethane-methanol) have been outlined in laboratory animals [28].

Wound Healing Property

The injury recuperating property was done utilizing 100 mg/kg/day of *C. roseus* ethanol extricate in rodents. High pace of wound withdrawal was seen which critical lessening in epithelization period, checked increment in dry weight and hydroxyproline substance of the granulation tissue as contrasted and the controls. Wound compression along with expanded elasticity and hydroxyproline content gives proof to the utilization of *C. roseus* in the administration of wound mending [29].

Hypolipidemic Activity

The leaf juice of *C. roseus* proved Significant anti atherosclerotic as observed by decline in the serum levels of total cholesterol, triglycerides, LDL-c, VLDL c as well as the histology of aorta, liver and kidney [30].

Alzheimer's Disease

Vinpocetine has been reported to have a variety of actions to improve brain function and memory, particularly beneficial in the case of Alzheimer's disease. Vinpocetine when subjected to a well-tolerated dose up to 60 mg/d in clinical trials of dementia and stroke proved no significant adverse events [31].

Other Activities

Vinpocetine is contra-indicated with any blood thinning agents such as warfarin, aspirin as well as some dietary supplements like ginkgo, vitamin E and garlic [32].

Memory Enhancement Activity

Vinpocetine has been accounted for to have an assortment of activities that would speculatively be valuable in Alzheimer's disease (AD). The main examination researching this operator in an all around characterized associate of AD patients found no advantage. Meta-examination of more established investigations of vinpocetine in ineffectively characterized dementia populaces reasoned that there is deficient proof to help its clinical use as of now. Vinpocetine has been all around endured at dosages up to 60 mg/d in clinical preliminaries of dementia and stroke, and no critical unfriendly occasions [33].

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 [34].

Conclusion

Catharanthus roseus is one of the 21000 significant therapeutic plants found. It is utilized for the fix of various infections, for example, diabetes, sore mouth, mouth ulcers, and leukemia. It produces around 130 alkaloids, for example, reserpine, vinceine, raubasin and ajmalcine. Against leukemic movement is appeared by vinblastine and vincristine. Various

pieces of this plant produce various measures of alkaloids, out of which root bark delivers the greatest for example almost 1.79%. There are various reports supporting its enemy of microbial action against *Staphylococcus albusi*, *Bacillus megatarium*, *Shigella*, *Pseudomonas*, and so on. Its enemy of oxidant and against mutagenic impacts have additionally been accounted for. Further examinations should be done to investigate its enemy of tumor impacts.

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