

Catharanthus Roseus Chemical Constituents And Pharmacological Properties: 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. The genus Catharanthus consists of eight species of which seven are native to Madagascar and one, C. pusillus, to India. Catharanthus roseus, Madagascar periwinkle is one of the few pharmacological plants that have a long history of therapeutic voyage from Mesopotamian folklore of 2600 BCE till today playing a considerable role as herbal and traditional medicine of various diseases. The Catharanthus (or Vinca) alkaloids comprise a group of about 130 terpenoidindole alkaloids. Vinblastine is now marketed for more than 40 years as an anticancer drug and became a true lead compound for drug development. Due to the pharmaceutical importance and the low content in the plant of vinblastine and the related alkaloid vincristine, Catharanthus roseus became one of the beststudied medicinal plants. Consequently it developed as a model system for biotechnological studies on plant secondary metabolism.*

Drying of Catharanthus roseus leaves offer easy utilization of its powder for medicinal purposes but is challenging due to temperature sensitivity of its bioactive constituents. In this work, C. roseus leaves were subjected to three economic drying techniques: solar, tray (40, 50, 60°C) and, microwave (450, 600, 900 W) to identify the best drying condition for retention of bioactives of C. roseus leaves. Semi-empirical models that best defined the drying conditions were identified. Results revealed lowest moisture content (~1.2% d.b.), drying time (4–8 min) and activation energy (36.92 kJ/mol) with high moisture diffusivity (~10–9 m²/s) for microwave drying. For retention of bioactives, solar drying in natural convection mode performed well and may serve as a low-cost drying strategy. However, leaves dried at 600 W microwave power showed higher antioxidants (152 mg TE/g), phenols (11.28 mg GAE/g), and flavonoids (59.69 mg/QE g) and is recommended for drying of C. roseus leaves.

Keywords: Species, alkaloids, vincristine, vinblastine, Catharanthus roseus

I. INTRODUCTION

Medicinal plants have a long history of use in conventional medication. Ethno-local data on helpful plants and their use by neighbourhood social orders is significant in the protection of standard social orders, biodiversity, network clinical thought and medication improvement. *C. roseus* (Periwinkle Madagascar), alkaloids, vinblastine, vincristine, anticancer agent Periwinkle Madagascar L. (G.) Don is a large speckled medicinal plant of the Apocynaceae family. These vascular spermatozoa are binary vascular spermatozoa that combine two indole-terpene alkaloids, vinblastine and vincristine, which are used to stop harmful vibrations (Ajaib et al. 2010). In 1910, Pecourt described the use of leaves, mouthwash for toothache, and continuous dental decay treatment and irrigation to combat childbirth and scurvy in Brazil. In Europe, related species are used as masks to restrict milk production. It has been used to treat diabetic ulcers in the British West Indies and has been recognized as an excellent teacher of oral hypoglycemia in the Philippines. Recently Chopra et al. Absolute alkaloids reported the development of internal and persistent hypotension, as well as a limited increase in antimicrobial activity. *Catharanthus roseus* (Madagascar periwinkle) is commonly known as Nayantara or Sadabahar



Fig.1& 2 periwinkle flower.



Fig 3 Sadabahar powder

CHEMICAL CONSTITUENTS:

Vincristine, also known as Leuro-Cristine and sold under the brand name Oncovin, is a chemotherapy drug used to treat a variety of malignancies. It is associated with atypical lymphocytic leukemia, atypical myeloid leukemia, Hodgkin infection, neuroblastoma, and small cell degradation of the lung (Fig. 2) (Hejaz et al., 2006).

Vinblastine (VBL), sold under the Welban brand name, is a widely used chemotherapy drug in many prescriptions for the treatment of various dangerous types. It is in line with Hodgkins lymphoma, small cell destruction of the lung, bladder risk, cortical disease, melanoma, and testicular malformations (Fig.3) (Ravina et al., 2011)

Vindesine is a made subordinate of vinblastine, a typically happening vinca alkaloid. Vindesine binds to and settles tubulin, thusly barging in on tubulin polymerization and preventing the game plan of the mitotic shaft and cell division; treated cells can't go through mitosis and are caught in metaphase. This expert similarly upsets macromolecular blend (Fig. 4) (Mondal et al., 2019).

Tabersonine is a monoterpenoidindole alkaloid with cytotoxic development. It has a section as an antineoplastic subject matter expert and a metabolite. It is an alkaloid ester, a monoterpenoidindole alkaloid, a methyl ester and a characteristic heteropentacyclic compound. It is a structure base of a tabersoninium

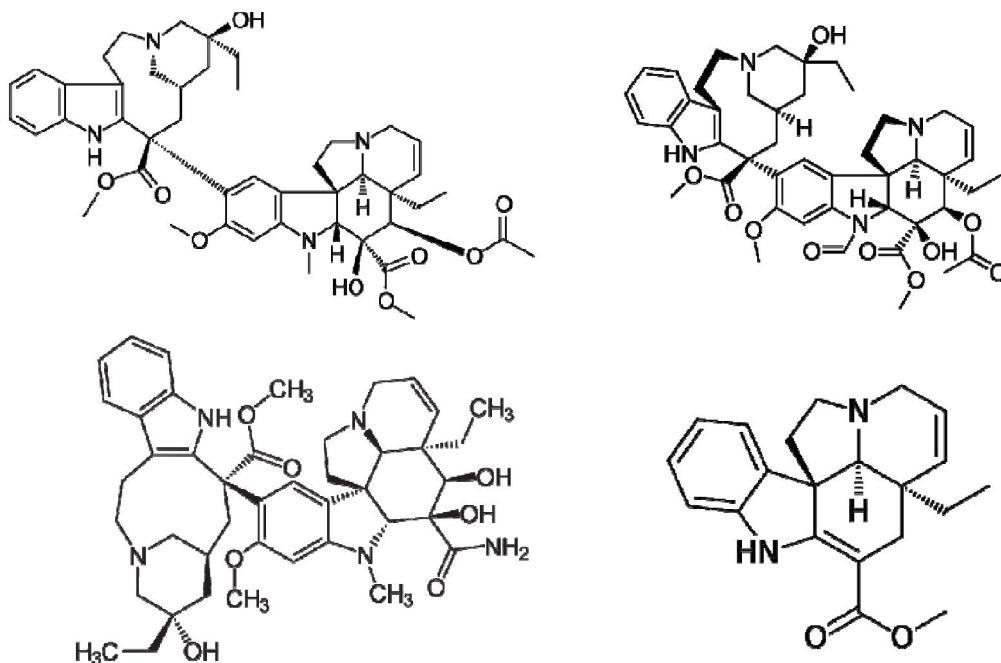


Fig.4 Chemical constituents of catharanthusroseus

SCIENTIFIC CLASSIFICATION:

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

MORPHOLOGY OF SADABAHAR CATHARANTHUS ROSEUS

commonly known as Sadabahar is a lengthy (perennial) sub-shrub plant that is normally erect, 30-100 cm tall, and rigid at the base, occasionally spreading. A white latex is present in it (Henderson, L.; 2001) [15]. Stems are tubular (terete), lengthwise ridged or broadly winged, dark green crimson in colour, and pubescent when in juvenile state. Leaves are alternate, borne on short pedicels, 2.5-9.0 cm in length, elliptic to ovate (egg-shaped in design but smaller at the base), greenish with whiter veins, and borne on short pedicels. With a little point protruding from the rhizome, the leaf tip is rounded to sharp (Henderson, L.; 2002) [16]. Hairy leaves and stems are common, yet bald stems and leaves do exist. Flowers are borne singly or in pairs on very short stalks on the leaf axils (pedicels). Sepals are 5 to 6 mm long, thin, and usually hairy (pubescent). Corolla tube greenish, generally at least 2.2 cm long, with both the interior of the mouth frequently dark pink or yellow, glandular within the neck with rings of stiff hairs beneath the mouth and anthers; corolla lobes 5, pinkish to white or pinkish purple, 1.0-2.8 centimetres long, obovate. Anthers 5, hooked to the inner of the upper portion of the corolla tube and hidden within it (J N Mishra et al., 2017, S Siti et al., 2019) [18, 40]. The fruit is a spind

EXTRACTION:

MATERIAL AND METHOD:

Collection of plant material Matured leaves of catharanthusroseus (L) were collected from the campus of the police head coter, Tal.DistrictAhmednagar. White and Pink Catharanthusroseus (L) collected plant material.

Cleaning and Dry of Plant Material The Collected plant material under washed under tap water and to remove soil and unwanted dust particles. The leaves were placed in an oven at 45°C for one day remove water and grounded into powder form. The dried plant material was grind in mixed and sieved it with the help of sieve. This powder kept in air tight polythene bags and used for further extraction.

Preparations of Extract Weight 3 gm. of powdered plant sample and dissolve it in 30 ml of different solvent (aqueous, Methanol, Ethanol) and cover with aluminium foil. Leaves the solution for 24 hours tab room temperature 24- 27°C. It filtrate with what man No 1 filter paper and collected the filtrate. This filtrate is further used for the phytochemical screening.

IDENTIFICATION TEST:

Test for alkaloids

To 1 ml extract added 1ml of Mayer's reagent and few drop of iodine solution. Formation of yellow colour precipitate indicate the presence of alkaloids.

Test for Terpenoids

To 1 ml crude extract add 1 ml of concentrated H₂SO₄and heated for 2 min. A gryeyishcolour indicates the presence of terpenoids.

Test for Phenol and Tannin

To 1 ml of crude extract added 1 ml of Fecl₃. A blue green or black colour indicates presence of tannin.

Test for reducing Sugar

To 1ml of extract added 1 ml of Fehling's B solution. Formation of red colour indicates the presence of sugar.

Test for Saponins

To ml of extract Added 2 ml of distilled water, shaken well and formation of 1 cm layer of foam indicates presence of saponins.

Test for Flavonoids

Take 1 ml of extract and treat with 3- 5 drops of 20 % NaOH solution observe for the formation of intense yellow colour, which become colourless on Addition of 0.5 ml dilute HCl indicates the presence of flavonoids.

Test for Quinines

To 1 ml of extract added 1 ml of 1% NaOH and mixed well. Appearance of blue green or red indicates presence of Quinines.

Test for Protein

To 1 ml of extract added few drops of mercuric chloride formation of yellow colour indicates the presence of Protein.

Test for Steroids

To 1 ml of extract mixed with 1 ml of Chloroform and concentrated H₂SO₄ side wise. A red colour presence at lower chloroform layer indicates presence of Steroids.

PHARMACOLOGICAL ACTIVITY

Anticancer:

C.roseus produces Vinca alkaloids which are well known for their anti-cancer properties. Some of the alkaloids are vinblastine, vincristine, vinorelbineandvindesine. Anti-cancer drugs derived from C.Roseus act us inhibitors of tubulin by binding to α/β - tubulin. This prevents its association in to microtubules which provide cells with both the structure and flexibility they need to divide and replicate. 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. Vinca alkaloids, also known as mitotic spindle poisons, prevent the formation of spindle structures from microtubules, which prevents mitosis in the cell cycle. Vinca alkaloids hence successfully prevent cancer cells from dividing. Different Vinca alkaloids have their

own unique properties. For many years scientists have involved in the process to synthesize new derivatives of vinblastine and vincristine. Modification in vindoline skeleton or catharanthine moiety produced a number of new selective, less toxic antitumor agents. Vinblastine is used experimentally for the treatment of neoplasms and is recommended for Hodgkin's disease and choriocarcinoma. Vincristine another alkaloid is used for leukemia in children. In vitro tests using various concentrations of *Catharanthus roseus* methanolic crude extracts revealed strong anticancer activity against a wide range of cell types, with multidrug resistant tumour types showing the greatest anticancer activity. Vinblastine is sold as Velban and Vincristine as oncovin. That is microtubules are the building block of protein and is vital to the proper functioning of the mitotic spindle in mitosis i.e., cell division. Vinca alkaloids known as mitotic spindle poisons as they inhibit further assembly of the spindle forms from microtubules, thereby inhibiting mitosis in cell cycle.

Anti-Helminthic activity: Infections with helminthes are a chronic condition that can affect both humans and livestock. It was discovered that *Catharanthus roseus* has been utilised as an anti-helminthic since traditional times. The anti-helminthic ability of *C. roseus* has been assessed using Piperazine citrate as the standard reference and *Pheretima posthuma* as an experimental model. It was discovered that the 250 mg/ml ethanolic extract has substantial anti-helminthic efficacy.

Hypotensive activity: The plant's leaf extract had a substantial impact in lowering blood pressure. There are 150 valuable alkaloids known to exist in the leaves, in addition to other pharmacologically potent substances. The leaf extracts (hydroalcoholic or dichloromethane-methanol) have been shown to have significant hypotensive and antihyperglycemic effects in laboratory animals

Anti-diabetic activity:

Blood sugar lowering is comparable to the common medication glibenclamide. The increased hepatic glucose utilisation has led to the appearance of the hypoglycemic impact. In comparison to the dichloromethane and methanol extracts, which reduced blood glucose levels in diabetic rats by 49–58% and 20%, respectively, respectively, the aqueous extract was found to lower blood glucose by roughly 20% enhanced hepatic glucose utilisation has led to the appearance of the hypoglycemic impact. 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. Alcoholic whole plant extracts at high dose (500 mg/kg) exhibited significant antihyperglycemic activity without acute toxicity. The extract effectively reverses the changes in the blood sugar level and the beta-cell population. The exact phytoconstituents responsible for the anti-diabetic effect are not known yet

Anti-Oxidant Activity:

The results showed that the ethanolic extract of periwinkle types' roots had a sufficient scavenging effect throughout the entire assay in a concentration-dependent manner, however *C. roseus* was discovered to have higher antioxidant activity than *C. alba*. Significant levels of volatile and phenolic substances, such as caffeoylquinic acids and flavonol glycosides, which are known to have antioxidant action, are found in *Catharanthus roseus*. It has an important role in the body's defense system that acts as antioxidants against reactive oxygen species (ROS), which are harmful by forming such products through normal cell aerobic respiration. Reactive oxygen species are the harmful byproducts created in our body in normal aerobic respiration and other metabolic activities. Antioxidants are found to be effective against these harmful free radicals. Vindolicine, present in the plant showed the highest antioxidant potential in ORAC and DPPH assays and it also alleviated H₂O₂-induced oxidative damage in β -TC6 cells at 12.5 μ g/mL and 25.0 μ g/mL

II. CONCLUSION

In conclusion, ***Catharanthus roseus*** (Madagascar periwinkle) stands out as a significant medicinal plant with a rich history in traditional and modern medicine. Its two key alkaloids, vinblastine and vincristine, have been extensively studied for their potent anticancer properties, making this plant invaluable in oncology. Beyond its anticancer applications, ***C. roseus*** exhibits a wide array of pharmacological activities, including antimicrobial, anti-diabetic, and anti-inflammatory effects, supporting its traditional uses in various cultures. The growing interest in natural products for drug development highlights the importance of preserving this plant and its habitats. Ethnobotanical knowledge combined with scientific research can lead to the discovery of new therapeutic agents and enhance the understanding of its mechanisms of action. Future studies should focus on exploring the full spectrum of its chemical

constituents and their interactions, as well as sustainable cultivation practices to ensure the availability of this remarkable species. By integrating traditional knowledge with contemporary scientific inquiry, we can unlock the potential of **Catharanthus roseus** for the advancement of health care and the development of novel pharmacological therapies..

III. ACKNOWLEDGEMENT

We would like to acknowledge and give my warmest thanks to Ms. Prachi. N. Padwal. who made the work possible. Her guidance and advice carried me through all the stages of writing my paper. We would also like to thank you our institute who gave us this opportunity to do this review paper .

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