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Pharmacological, Ethanobotany, Phytochemicals and Studies of Catharanthus Roseus (L.): A Review

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Abstract: ***Catharanthus roseus (L.) is traditional medicinal plants used as medicine since ancient times. It is well known Ayurveda plant. It has various medicinal properties for pharmacological such as antimicrobial, anticancer, antioxidant, antiulcer etc. Catharanthus roseus has phytochemicals such as vinblastine, vincolinine, vincristine, catharanthamine, vinacardine, leurocristine, raubasin raubasin, vinacardine, leurocristine, catharanthamine etc. Catharanthus roseus has alkaloids, saponin, flavonoids, and carbohydrates. Catharanthus roseus used to treat hypertension, gonorrhea, wasp string and menstrual cycle problem and there obtained compounds utilized in medicine preparations for commercially because it's anticancer properties. It is also used in herbal medicine in kidney, liver and cardiovascular diseases. The main purposes' of this review all valuable information explore of Catharanthus roseus like pharmacological, ethanobotany, phytochemical properties. Catharanthus roseus widely used as herbal anticancer drugs because well - known mechanism.***

Keywords: Pharmacological, Ethanobotany, Phytochemicals, Antihyperglycemic, Vinblastine, Vincolinine, Vincristine, Catharanthamine, Vinacardine, Leurocristine, Raubasin

1. Introduction

Catharanthus roseus is flowering plants. It has wide range of medicinal properties so explored commercially worldwide. It is cultivated mainly for its alkaloids, which are having anticancer properties (Jaleel et al., 2006). *Catharanthus roseus* produces more than 100 monoterpenoids indole alkaloids in different organs (Jordan et al., 1991). The leaves and stems are the sources of dimeric alkaloids, vinacristine and vinblastine that are indispensable cancer drugs, while roots have antihypertensive, ajmalicine and serpentine (Kulkarni et al., 1999). The therapeutic vegetation of South Asia is a significant wellspring of various pharmacologically significant mixtures that are generally consumed as home cures in restoring or treating different sorts of illnesses from normal cold to malignant growth (Patel, 2011). The antimicrobial activities of plant extracts may reside in a variety of different components, including aldehydes and phenolic (Lai and Roy, 2004). While some of these raw drugs are collected in smaller quantities by the local communities and folk healers for local uses, many other raw drugs are collected in larger quantities and traded in the market as the raw material for many herbal industries (Uniyal et al., 2006). The active principles of many drugs found in plants are secondary metabolites (Ghani, 1990 and Dobelis, 1993). . Fresh leaf juice of C. roseus has been reported to reduce blood glucose in normal and alloxan diabetic rabbits (Nammi et al., 2003). Leaves and twigs of Catharanthus roseus have been reported to have hypoglycemic activity in streptozotocin induced diabetic rats (Singh et al., 2001). *Catharanthus roseus* has secondary metabolites such as alkaloids, steroids, tannins, phenolic, flavonoids, steroids, resins, and fatty acids, which are capable of producing definite physiological action. The present review evaluates the antibacterial activity, antihyperglycemic activity, antihypertensive activity, cytotoxic activity, antitumor activity, antidiabetic activity, diabetic wound healing activity and phytochemical constituents of *Catharanthus roseus*. The highest diabetic wound healing activity was observed with ethanol extract is attributed due to the presence of alkaloids, tannins and tri - terpenoids. *Catharanthus roseu*s leaves extract treated animals have shown the hypotensive effects due to the presence of alkaloids and carbohydrates. It improves the blood supply to the brain, increases oxygen and glucose for the brain to use, helps prevent abnormal coagulation of blood, and it raises brain levels of the neurotransmitter serotonin (Hisiger et al., 2007).

Taxonomy: Systematic composition of *Catharanthus roseus*
Kingdom: Plantae
Order: Gentianales
Family: Apocynaceae
Genus: *Catharanthus*
Species: *roseus*
Botanical Name: *Vinca rosea*
Binomial Name: *Catharanthus roseus*

2. Methodology

All corresponding information about Catharanthus roseus was collected using Google Scholar and from various scientific databases including Springer, Science Direct, Plants journal of Medicinal plants studies, Research Gate PubMed Local dissertations and books were searched as well. The scientific literature, Springer, Science Direct and various offline and online resources were referred for writing this paper. The search was made using *Catharanthus roseus* Phytochemistry, Pharmacological properties and ethanobotany etc. An attempt was made to document the relevant literature between1990 - 2022. Along with this, the references of selected papers were also screened manually for supplementary information.

1) Pharmacological Properties

Catharanthus roseus contains 90 different alkaloids ones are the monomers like catharanthine and vindoline. Both derivative of vincamine widely used as medicine is known as ethyl - apovincaminate or vinpocetine. It is used in vasodilating, blood thinning, and memory - enhancing actions, antherosclerotic plaque s (Basker *et al*., 1995). Extracts of Vinca have significant anticancer activity against numerous cell types. The most abundant ones are the monomers like catharanthine and vindoline. Both are common anticancer drugs which are derived from this plant such as vincristine and vinblastine. Vincristine is used in the chemotherapeutic regimen for Hodgkin‟s lymphoma while vinblastine is used for childhood leukemia. Alkaloids are approved as antineoplastic agents to treat leukemia, hodghin's disease, malignant lymphomas, neuroblastoma, rhabdomyosarcoma, wilms‟ tumor, and other cancers (Brun *et al*., 1999).

2) Anticancer Potential

Catharanthus roseus has alkaloids are adequate for anticancer potential including vinblastine, vindoline, vindolicine, vincristine, vindolinine, vindolidine (Tiong *et al*., 2015; Tiong *et al*., 2013). All these alkaloids work by inhibiting the cell proliferation by changing its microtubular dynamics causing apoptosis (Cragg *et al*., 2005). Vinblastine is the first chemotherapy drug that was commercialized under the brand name Velban obtained from *Catharanthus roseus* used for the treatment of various cancers including Kaposi's sarcoma, testicular, breast, bladder and lymphomas cancer (Hodgkin's disease) (Han *et al*., 2008). Vinblastine in combination with β - blockersis used to treat angiosarcoma. It works by binding with β - tubulin which causes disruption in mitotic spindle resulting in cell division inhibition (Pasquier *et al*., 2016; Schläger *et al*., 2016). Vinblastine is also administered in combination with mitomycin and cisplatin to treat breast cancer patients. The main mode of action of vincristine and vinblastine is that they bind with tubulin which in turn prevents making spindles, thus showing effective anticancer activity by inhibiting cell division (Sertel *et al*., 2011) Vincristine in combination with other chemotherapy drugs was used to treat certain types of leukaemia including acute lymphoblastic and acute myeloid leukaemia (Kumar *et al*., 2013) Vincristine is a lifesaver drug as it even shows its effectiveness at the advanced stage of cancer like that of in rhabdomyosarcoma reported by (Isono *et al*., 2016)

3) Antidiabetic Activity

Catharanthus roseus are traditionally use in the treatment of diabetes in many regions of the world. Leaves juice are recommended for the treatment of diabetic patients. *Catharanthus roseus* leaves contains ethanolic extracts and recommended dosage is between 100 and 200 mg/kg body weight in the animal model (Al - Shaqha *et al*., 2015).

4) Antimirobial Activity

The antimicrobial activity of the *Catharanthus roseus* extract against various microorganisms. Crude extract from different parts of the plant was assessed for antimicrobial

activity against Fusarium moniliform, Escherichia coli, Aspergillus fumigatus, Candida albicans and Bacillus fusiformis. Ethanolic extract of the stems, flowers, roots and leaves was evaluated as an antibacterial agent against various bacteria. Flower extract (200 µg/mL) obtained from the *Catharanthus roseus* has antimicrobial activity against Staphylococcus aureus, Enterobacter agglomerans, Beta - hemolytic streptococci and Pseudomonas aeruginosa (Patil *et al*., 2010). Silver and zinc oxide (Gupta *et al*., 2018). Nanoparticles of *Catharanthus roseus* leaves were an effective antimicrobial agent against activity against *Escherichia Coli* and Grampositive bacteria like Pseudomonas fluorescens.

5) Anti - Ulcer Property:

Vincamine and Vindoline alkaloids of the plant showed antiulcer property. The plant leaves proved for anti - ulcer activity against experimentally induced gastric damage in rats.

6) Hypotensive Property:

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. It was reported that resistant hypertension could be treated using vincristine by the method of chemical sympathetic denervation. To prove this study vincristine was injected in Landrace swine animal models using catheters. Following twenty - eight days, the histopathological sample report revealed that the injured nerve was lower in the vincristine treated group as compared to the placebo group (Stefanadis *et al*., 2013).

7) Anti Diarrheal Property:

The anti - diarrheal activity of the plant's ethanolic leaf extract was tested in the Wistar rats with castor oil as experimental diarrhea inducing agent. Catharanthus roseus showed a dose dependent inhibition of the castor oil - induced diarrhea.

8) Wound Healing Property:

Catharanthus roseus flower displayed a significant decrease in time for the wound healing in comparison to control. (Pereira *et al*., 2006). The same experiment was also conducted using ethanolic extract of leaves of *Catharanthus roseus* also showed significant wound healing activity in comparison to control (Nayak *et al*., 2007)

9) Hypolipidimic Effect:

Significant anti atherosclerotic activity was observed in a study as suggested by reduction in the serum levels of total cholesterol, triglycerides, LDL - c, VLDL - c and histology of aorta, liver and kidney with the leaf juice of Catharanthus roseus (Linn.) G. Don.

10) 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 were observed.

3. Conclusion and Future Perspective

The morphology, traditional usage, pharmacological uses, and Phytochemistry of *Catharanthus roseus* have been described in this review, taking into account the published literature. The use of *Catharanthus roseus* for diabetes and cancer treatment is now commonly acknowledged in the scientific age. Apart from this, extensive research has been done on the chemical components of *Catharanthus roseus* and its pharmacological use. New biological roles and their mechanisms, as well as toxicity studies, are being discovered as a result of the growing number of studies aimed at discovering new chemical compounds from *Catharanthus roseus*. Keeping in mind that future research will need to address a number of important challenges. In the first place, *Catharanthus roseus* was traditionally used for the treatment of various disorders like ulcers, memory loss, malaria, stomach problems, menorrhagia and tooth problems but very few modern kinds of researches are available to support these uses. There is further need to investigate these topics as the increase in the number of evidence confirms that natural medicines possess great potential for the treatment of various disorders with low toxicity values. The research on the effect of *Catharanthus roseus* extract on the central nervous system is very limited to support its clinical trials. Though *Catharanthus roseus* is still in use as a cure for various disorders in some parts of the world so to verify its effect there is a need for further investigation. The majority of studies on *Catharanthus roseus* focus only on the plant's leaves and blooms. We have yet to fully investigate seeds, stems, fruits, and roots. Because leaves and flowers have diverse chemical compositions, research on these sections of the plant should also be done on other portions to determine its efficacy. This gives us a wide range of study topics to investigate in the *Catharanthus roseus* plant since it efficiently directs clinical medicine and lays a solid basis for the plant's future growth. In conclusion, additional pharmacological and chemical researches on *Catharanthus roseus* will assist elucidate its toxicity, therapeutic effectiveness, and quality control based on the bioactive compounds present in it. Besides, this review might be useful for future researchers to get a hand on the current status of the study of *Catharanthus roseus* and would give a direction for future research.

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