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Diverse Pharmacological Potential of Ever-Green Plant Catharanthus roseus

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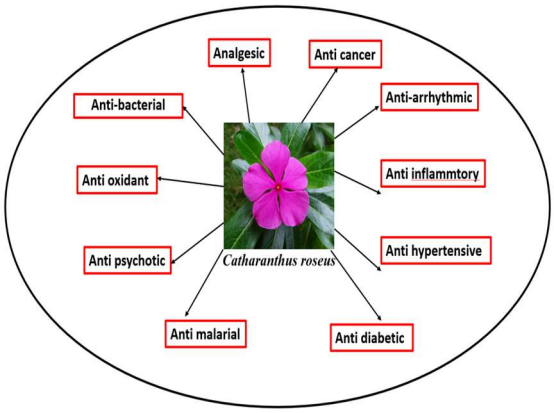
Graphical Abstract



Diverse pharmacological activities of Catharanthus roseus

A B S T R A C T

Catharanthus roseus is a plant that belongs to the family Apocynaceae which produces various secondary metabolites of high medicinal importance. These phytoconstituents are very essential for diverse medicinal uses. This paper covers different phytoconstituents in C. roseus for their various medicinal importances. The original home of this evergreen shrub was on the islands of Madagascar. Its antitumor, anti-diabetic, anti-microbial, anti-oxidant, and anti-mutagenic properties are well-known. Apocynaceae family shrubs with two perennial flowers are commonly referred to as Catharanthus roseus. Nearly the whole tropical nation grows it as an ornamental plant. Several more well-known phytochemicals were extracted from this therapeutic plant. It possesses a wide range of pharmacological qualities, including wound healing, anti-ulcer, antidiabetic, antioxidant, and memory enhancement and many more. C. roseus is used across the globe to treat various diseases and disorders. This plant is of high medicinal importance. The antibacterial, antihyperglycemic, cytotoxic, antitumor, and wound healing activities, among others, are assessed in this review.

Keywords: Catharanthus roseus, pharmacological activities, herbal drugs, diseas .

INTRODUCTION

Natural medicines derived from plants are now widely utilized in the treatment and prevention of a wide range of ailments in an effort to increase longevity, achieve favorable health outcomes, and lessen the side effects of chemotherapy. The phytocompounds or secondary metabolites found in herbal extracts have varying actions against different diseases, and each extract or compound has a unique mode of action. A significant evergreen herb belonging to the dogbane family Apocynaceae, Catharathus rosea (L.), also referred to as Vinca rosea, is commonly called "Nayantara" or "Sadabahar." There are two common cultivars of C. roseus, namely Rosea for pink flowers and Alba for white flowers, which are distinguished by their flower colors (Shaikh, and Patil. 2020; Singh, et al., 2018; Mishra, and Verma. 2017; Renjini, et al., 2017; Vutukuri, et al., 2017; Singh, et al., 2001). Because it is native to Madagascar, the plant is commonly referred to as Madagascar periwinkle. The following are some synonyms for the plant: "Old Maid," Rosy Periwinkle, Cape Periwinkle, Lochnera rosea, and Ammocallis rosea. In the past, C. roseus was used to treat a wide range of illnesses, including dyspepsia, indigestion, rheumatism, diabetes, cancer, menstruation problems, and hypertension. The plant has a wide range of pharmacological effects and is rich in bioactive chemicals. It has been reported that the plant is commonly grown for its anticancer alkaloids. Reported that C. roseus include more than 130 distinct types of alkaloids generally used in curing various types of cancer including breast cancer, lung cancer, melanomas due to the presence of vincristine and vinblastine (Lahare, et al., 2020; Lawal, et al., 2015; Falcão, et al., 2017; Aziz, et al., 2015; Auriola, et al., 1989; Blask and Cordell. 1990).

Seventy distinct kinds of chemical compounds, including ajmalicine, reserpine, and serpentine, are found in Catharanthus roseus leaves. The primary ingredients of C. roseus, which is used to treat diabetes, blood pressure, menstruation issues, asthma, constipation, and cancer, are alkaloids. Vincristine and vinblastine, two major terpene indole alkaloids that combat cancer, are synthesized by the plant. Significant amounts of volatile and phenolic chemicals, such as flavonal glycosides and caffeoylquinic acids, are found in C. roseus. These compounds function as antioxidants against reactive oxygen species and are crucial to the plant's defensive mechanism (Kumar, et al., 2022; Parihar, et al., 2022; Ukoha, et al., 2017; Punnen, et al., 2016; Patel, et al., 2011; Roepke, et al., 2010; Patil, and Ghosh. 2010; Pereira, et al., 2009).

Catharanthus roseus is a medicinal plant belonging to the family Apocynaceae which produces terpenoid indole alkaloids (TIAs) of high medicinal importance. The high added value of this plant is based on its enormous pharmaceutical interest, producing more than 130 TIAs, some of which exhibit strong pharmacological activities. Alkaloids that are isolated from C. roseus are found to be hypotensive, and sedative and possess tranquilizing and anti-cancerous properties (Almagro et al. 2015). Over the past three decades, the use of supplements and herbal medicinal products has increased tremendously with not less than 80% of the worldwide population relying on them for some part of primary healthcare. Where poisoning from medicinal plants has been reported, it usually has been due to misidentification of the plants in the form, in which they are incorrectly prepared, or sold and administered by inadequately trained personnel. The plants are effective by this property in various conditions including memory deficit and Alzheimer's, cancer, diabetes, atherosclerosis, cardiovascular diseases, and other diseases. The symptoms are addressed by synthetic drugs caused by specific diseases as understood by scientific pathology, however, herbal medicine is usually directed towards aiding the body's healing process. About 8% of hospital admissions are due to adverse or side effects of synthetic drugs in the United States of America. Approximately 100,000 people each year die due to these toxicities. This means that the number of killed people by drunken drivers in the U.S. is at least three times less than the number of people killed by pharmaceutical drugs. In addition, these substances have cardioprotective, anti-inflammatory, antibacterial, antithrombotic, antiallergic, and vasodilatory qualities. The plant exhibits strong antiviral, antifungal, antibacterial, antioxidant and other pharmacological properties (Kenda, et al., 2022; Chaturvedi, et

al., 2022; Fattepur, et al., 2018; Dai, et al., 2016; Kabubii, et al., 2015; Bhutkar, and Bhise. 2011; Koul, et al., 2013; Nayak, et al., 2007; Jacobs, et al., 2004; Chattopadhyay, et al., 1991). The ethanobotanical, phytoconstituent, and pharmacological features of C. rosea are the main topics of this review.

Figure 1. Catharanthus roseus plant.

Catharanthus roseus

Catharanthus roseus Linn (synonym: Vinca rosea; Madagascar periwinkle; Apocynaceae) (Figure 1) is a perennial plant commonly seen in tropical counties and is native to Madagascar and Southern Asia. The plant has spread all over tropical and subtropical parts of India and grows wild all over the plains and lower foothills in the Northern and Southern hills of India (Paarakh et al., 2019). C. roseus is an important plant. Traditionally, different parts of it are used in the treatments of various diseases (viz. diabetes, menstrual regulators, hypertension, cancer, and anti galactagogue, etc.), in several countries (Australia, Brazil, China, Cook Island, Dominica, England, Europe, France, French Guiana, India, Jamaica, Kenya, Mexico, Mozambique, North Vietnam, Pakistan, Peru, Philippines, South Africa, South Vietnam, Taiwan, Thailand, USA, Venda, Vietnam, West Indies etc.). Moreover, more than 130 alkaloids have been isolated from different parts; amongst which two important alkaloids (vinblastine and vincristine used in cancer treatment) present in very low concentrations. Keeping these views; researchers are continuously using different approaches to enhance the level of important alkaloids to meet the required demand (Aslam, et al.2010). It is known by different names in different languages, mentioned as follows (Paarakh, et al., 2019).

Taxonomy

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

Kingdom	Plantae
Subkingdom	Tracheobionta (vascular plants)
Division	Magnoliophyta
Class	Magnoliopsida
SubClass	Asteridae
Order	Gentianales
Family	Apocynaeean (Dog-bane family)
Subfamily	Plumeroideae
Tribe	Plumerieae
Subtribe	Alstonrieae
Genus	Catharanthus G.Don
Species	Catharanthus roseus

Catharanthus roseus is an evergreen herb that blooms year-round and is native to central Madagascar. Periwinkle has a long history dating back to 50 B.C. in the folk medicine literature of Europe, where it was recognized for its diuretic, hemorrhagic, and wound-healing properties. It was introduced to various regions around the world during the 18th century, including India by Portuguese mercenaries in Goa. Currently, it is cultivated in Europe, India, China, and America. Periwinkle has been used globally to treat different ailments such as coughs, sore throats, eye infections, lung infections, and even diabetes. Its use in treating diabetes is particularly notable due to its numerous alkaloids, some of which have been scientifically proven to lower blood sugar levels and blood pressure. Researchers have discovered many properties associated with C. roseus, but it was the identification of two key alkaloids, i.e., vinblastine and vincristine, which are used as sources for anticancer drugs, that made it highly valued among breeders, pharmacists, and genetic/genomic researchers. C. roseus is widely regarded as one of the most extensively studied medicinal plants. This herb is an erect, bushy, evergreen plant that continuously produces blooms. It mostly reproduces through self-pollination and has 16 chromosomes in its somatic cells. The understanding of its terpenoid indole alkaloid pathways is steadily increasing. Due to its relatively small genome size, low chromosome count, and self-compatibility, C. roseus has emerged as an excellent model plant for investigating transcriptomic, proteomic, and metabolomic aspects of plant secondary metabolism. It is an erect branched deciduous herb woody at the base. Some of its characteristics are as follows:

The branching starts from the base.

The leaves are short stalked leathery, petiole generally ovate, rarely oblong elliptic having oblong tips.

The leaf blade ranges from 2 to 4 inches.

The younger leaves are particularly very soft, and light green. Veins are prominent over the lower surface of the leaves.

The color of the upper surface of the leaves is deep green while of lower surface is much lighter in color.

The seeds are black in color and oblong in shape.

Stem and leaves contain white latex.

There are three variants in C. roseus i.e. rose purple-flowered, white-flowered, and white-flowered flowered with rose-purple spots in the center.

All the parts of the plant contain about 200 indole monoterpenoid alkaloids.

The plant is a self-pollinating species and carries 2n=16 chromosomes in the somatic cells.

The plant survives and flowers even in very hot weather and needs very little water to grow.

The way of propagation is through stem cutting or seeds.

Very commonly grown in tropical and subtropical areas.

The major chemical constituents of C.roseus are illustrated in Table 1.

Table 1. Chemical Constituents present in C. roseus.

S. No.	Plant Part	Chemical constituents
1	Leaf	Catharanthine, vindoline, vindolidine, vindolicine, vindolinine, ibogaine, yohimbine, raubasine, vinblastine, vincristine, leurosine, lochnerine
2	Stem	Leurosine, lochnerine, catharanthine, vindoline
3	Root	Ajmalacine, serpentine, catharanthine, vindoline, leurosine, lochnerine, reserpine, alstonine, tabersonine, horhammericine, lochnericine, echitovenine
4	Flower	Catharthine, vindoline, leurosine, lochnerine, tricin, flavones

More than130 alkaloids have been identified from extract of different plant parts of C. roseus. Alkaloids have a wide range of pharmacological activities including antimalarial, anticancer, anti-arrhythmic, analgesic, antibacterial, antihyperglycemic activities, etc. Because of their potent pharmacological effects, alkaloids are the basis for many drugs. Major being alkaloids from 0.74 to 0.82%; important being vincristine, vinblastine, catharanthamine, vincoline. Other alkaloids viz, deoxyvinblastine, leurosine, pleurosin, leurocristine, leurosidine, vincolinine, vinacardine, roseadine, vindolicine, rosicine, etc. are isolated. A wide range of alkaloids has been discovered from C. roseus. A major number of 130 alkaloids are from indole and dihydro-indole groups have been isolated and characterized from different plant organs.

Vinblastine

Vinblastine is a very important alkaloidal extracted from the leaf part of C. roseus. It is a widely used chemotherapy drug in many prescriptions for the treatment of various dangerous types. It is in line with Hodgkins's lymphoma, small cell destruction of the lung, bladder risk, cortical disease, melanoma, and testicular malformations.

Vincristine

Also known as Leuro-Cristine It is associated with atypical lymphocytic leukemia, atypical myeloid leukemia, Hodgkin infection, neuroblastoma, and small cell degradation of the lung.

Vindesine

It is a subordinate of vinblastine, a typically happening vinca alkaloid. Vindesine binds to and settles tubulin, thus barging in on tubulin polymerization and preventing the game plan of the mitotic shaft and cell division.

Ethnopharmacology

The plant has historically been used to treat a wide assortment of diseases (Figure 2). It was used as a folk remedy for diabetes in Europe for centuries. In India, juice from the leaves was used to treat wasp stings. In

Hawaii, the plant was boiled to make a poultice to stop bleeding. In China, it was used as an astringent, diuretic, and cough remedy. Traditional uses of C.roseus in various countries are represented in Table 2.

Figure 2. Different parts of C. roseus are used in traditional systems of medicine for treating various diseases (Arora et al., 2009).

Table 2. Traditional medicinal uses of C. roseus in various countries (Farnsworth. 1961; Farnsworth. 1961; Virmani et al., 1978; Morrison & West. 1982; Morrison & West. 1982; Johns et al., 1990; Virmani et al., 1978; Virmani et al., 1978; Yang et al.,1987; Siege.1976).

Country	Medicinal uses
Australia	Hot water extract from dried leaves is taken orally for menorrhagia, diabetes, and extract of root bark are taken orally as a febrifuge.
Brazil	The hot water extract of the dried entire plant is taken orally by humans for diabetes mellitus.
China	Hot water extract of the aerial parts is taken orally as a menstrual regulator.
England	Hot water extract of the dried entire plant is taken orally for the curing of diabetes.
Europe	Decoction of dried leaves is taken orally for diabetes mellitus.
France	Hot water extract of the entire plant is taken as an antigalactagogue.
India	The hot water extract of the dried entire plant is taken orally by humans for cancer. Hot water extract of dried leaves is taken orally to Hodgkin's disease. The root extract is taken orally for menorrhagia.
Jamaica	Hot water extract from dried leaves is taken orally for diabetes
Kenya	Hot water extract from dried leaves is taken orally for diabetes
Mexico	Infusion of the whole plant is taken orally for stomach problems.
North Vietnam	Hot water extract of the aerial parts is taken orally as a menstrual regulator.
Pakistan	Hot water extract of dried ovules is taken orally for diabetes.
Peru	Hot water extract of the dried entire plant is taken orally by human adults for cancers, heart disease, and leishmaniasis.
Philippines	Hot water extract of root is taken orally by pregnant women to cause an abortion.
South Africa	Hot water extract of dried leaves is taken orally for menorrhagia and diabetes.

South Vietnam	Hot water extract of the entire plant is taken orally by human adults as an antigalactagogue.
Taiwan	Decoction of the dried entire plant is used orally by human adults to treat diabetes mellitus and liver disease.
Thailand	Hot water extract of the dried entire plant is taken orally for diabetes
America	Hot water extract of leaves is smoked as a euphoriant

Pharmacological Activities of Catharanthus Roseus:

Catharanthus roseus consists of the following pharmacological activities anti-oxidant, anti-microbial, anti-ulcer, anti-helminthic, hypolipidemic, diarrhea-alleviating, anti-diabetic, memory-improving, hypotensive, wound-healing, and hypolipidemic effects (Ali et al., 2021; Abd Wahab, et al., 2020; Agarwal, et al., 2011; Aslam, et al., 2009).

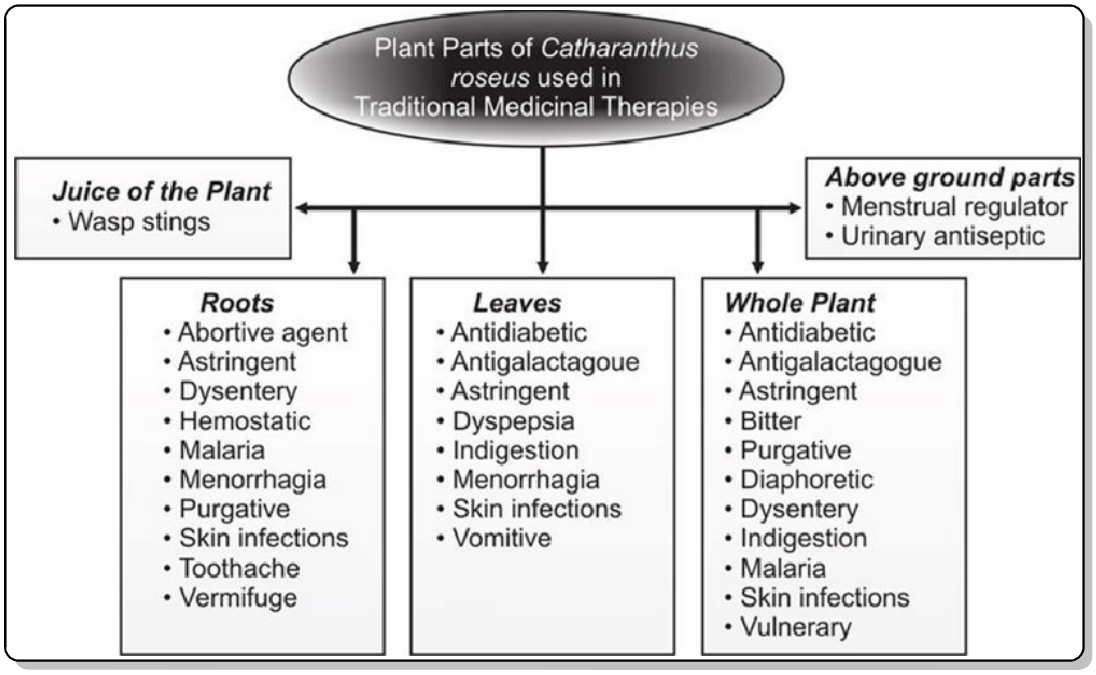


Figure 2. Different parts of C. roseus used in traditional systems of medicine for treating various diseases (Arora et al., 2009).

Antimicrobial activity

The different parts of the Catharanthus roseus plant were extracted and reported for antimicrobial activity.

Antibacterial activity

Antibacterial activity was carried out for various extracts of Catharanthus roseus leaves which have demonstrated significant action against various human pathogens. Studies have shown that extracts from

different parts of the plant particularly leaves, exhibit antimicrobial activity against both Gram-positive and Gram-negative bacteria. A combination of extracts from different C. roseus varieties may have synergistic or additive effects. C. roseus can be a valuable source for developing new antibacterial drugs, especially against pathogens that have developed resistance to common antibiotics (Ramya et al., 2008; Yadav et al., 2018).

Antidiabetic activity

The study of antidiabetic activity was reported with various extracts on different parts of the C. roseus plant.

Anti-cancer activity

Catharanthus roseus is known for its anti-tumor effects that produce nearly 130 alkaloids mainly ajmalicine, 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. Constituents like catharanthine, cathachunine, vinorelbine, and vinflunine also have high application as anticancer agents based on many in vitro and in vivo studies (Taher et al., 2019).

Antioxidant property

The antioxidant property was noted in different parts of the Catharanthus roseus plant for various extracts. Various studies have shown that ethanolic root extracts of C. roseus demonstrate concentration-dependent radical scavenging activity, with the pink-flowered variety (rosea) showing higher antioxidant potential than the white-flowered variety (alba). Antioxidant properties suggest that C. roseus could potentially be used for anti-aging purposes (Budianto, 2021).

Table 3. Medicinal Importance of Various Alkaloid Constitute Found in C. Roseus.

Alkaloid name	Medicinal importances	References
Ajmaline	Anticancer activity Anti-arrhythmic properties Antioxidant properties Cardiovascular health	Almagro et al., 2015
Akuammidine	Antimalarial Analgesic properties Antihypertensive	Fetse et al., 2014
Alpha Tabersonine	Antidiabetic Antihypertensive Anti-cancer	Dhyani et al., 2022
Conolidine	1.Anti-inflammatory and analgesic	Qu et al., 2018
Cryptolepine	Antimalarial Anti-cancer properties	Amissah et al., 2022
Dihydrocorynantheine	1. Anti-cancer properties	

Dihydrovincine	1. Cerebral blood flow enhancement	Levac et al., 2022
Dihydrotabersonine	Anticancer properties Anti-hypertensive effects	Williams et al., 2019
Eburnamine	1. Anti-inflammatory	Kellner et al., 2015
Geissoschizinemethyl ether	Antihypertensive properties Antioxidant activity	Scott and Lee, 1975
Ibogaine	Anti additive Psycho-spiritual effects	Odyuo et al., 2018
Isoreserpine	Antipsychotic and sedative effects Antihypertensive	Nisar et al., 2016
Isovincoside	1. Chemotherapeutics alkaloid precursor	Behzadi et al., 2022
Reserpine	1. Antihypertensive properties	Besseau et al., 2013
Serpentine	1.Antihypertensive properties	Guirimand et al., 2011
vindoline	1.Anti-cancer	Keglevich et al., 2020
Vinblastine and vincristine	1.Anti-cancer properties	Dhyani et al., 2022

Catharanthus roseus (C. roseus) is an important medicinal plant distributed in many countries. It has attracted increasing attention due to it being shown to possess a range of phytochemicals with various biological activities such as antioxidant, antibacterial, antifungal, antidiabetic, and anticancer properties (Pham, et al.2020). Traditionally, the plant has been used for relieving muscle pain, depression of the central nervous system, and wasps stings. It is used in cases of nose bleeds, bleeding gums, mouth ulcers, and sore throats. It has also been used internally for the treatment of the loss of memory, hypertension, and depression (Gajalakshmi et al 2013). The rootbark contains the alkaloid alstonine which has been used traditionally for its calming drug namely vincristine and vinblastine are produced from C. roseus. Drug discovery is substantially benefited by ethno-pharmacological approaches and based upon their traditional uses.

Table 4. List of the major acknowledged alkaloids in the C. roseus.

ALKALOIDS	
Class-Corynanthean	
Tetrahydroalstonine	Alstonine

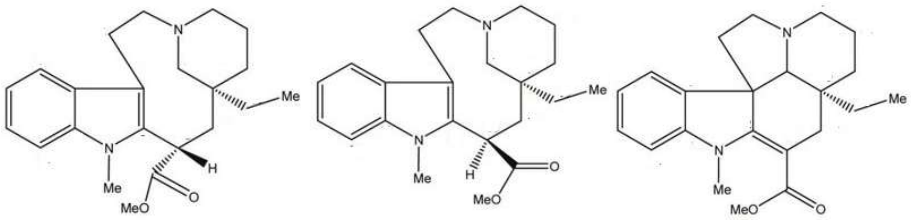
Akuammine	Sitsirikine
19,20-cis-16-(R)-isositsirikine	Yohimbine
19,20-trans-16-(R)-isositsirikine	Dihydrositsirikine
19,20-trans-16-(S)-isositsirikine	Perimivine
Akuammiline	Serpentine
7-Hydroxyindolenineajmalicine	Cathenamine
Pseudoindoxylajmalicine	Ajmalicine
10-hydroxyldeacetylakuammiline	19-epiajmalicine
Mitraphylline	3-epiajmalicine
Anthirine	Akuammigine
Pericyclivine	O-deacetylakuammiline
Pleiocarpamine	Perivine
Cavincine	21-hydroxycyclolochnerine
Lochnerine	Cavincidine
Cathindine	Perosine
Class - Bisindole	
3’,4’-anhydrovinblastine	Rovindine
Vingramine	Vinaphamine
4’-deoxyvinblastine	Vinaspine
Vinosidine	Vincamicine
N-desmethyl-vinblastine	Leurosivine
Methylvingramine	Nb-oxideneoleurosidine
Catharanthamine	17-deacetoxyleurosine
Leurosine	4-deacetoxyvinblastine

Roseadine	Deacetylvinblastine
Vincathicine	Vinsedine
Roseamine	Leurosinine
Vinblastine	Vindorosine
20’-epi-vinblastine	Nb’-oxide-Leurosine
Catharicine	Vinamidine
5’-oxoleurosine	Vincristine
Carosine	Nb-oxide-leurosidine
Vindolicine	14’-hydroxyvinblastine
Leurosinone	15’-hydroxyvinblastine
Neoleurosidine	Neoleurocristine
Catharine	
Class - Plumeran	
Tabersonine	Bannucine
Venalstonine	Vindoline
Cathovaline	19-Acetoxy-11-hydroxytabersonine
Vindolidine	19-hydroxytabersonine
Lochnericine	Deacetylvindoline
Minovincine	Rosicine
Vincoline	19-(S)-epimisiline
Vindolinine	Hörhammericine
Deacetoxyvindoline	11-methoxytabersonine
16-Hydroxytabersonine	11-methoxyhörhammericine
O-deacetylvindolidine	Minovincinine

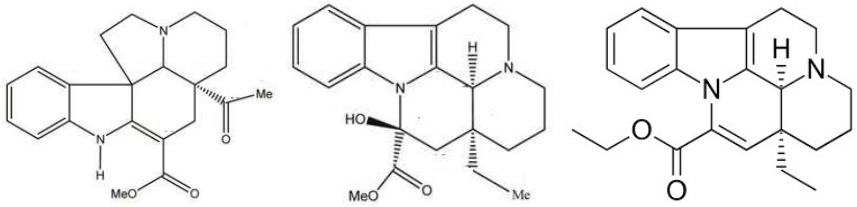
19-hydroxy-11methoxytabersonine	Nb-oxidevindolinine
19-epivindolinine	19-epi-N-oxidevindolinine
Class - Strychnan	
Lochneridine	Lochnerinine
Preakuammicine	Xylosyloxyakuammicine
Akuammicine	12-hydroxyakuammicine
Vinervine	
Class-Aspidospermatan	
Apparicine	Tubotaiwine
Class – Vallesiachotaman	
Strictosidine lactam	Vallesiachotamine
Isovallesiachotamine	
Class - Ibogan	
Coronaridine	Catharanthine
Vincadifformine	
Class - Eburnan	Class - Vincosan
Vincarodine	Strictosidine
Unknown Structure	
Ammorosine	Lochnerivine
Cathalanceine	Lochrovicine
Ammocalline	Vincolidine
Rosamine	Lochrovidine
Lochrovidine	Perividine
Maandrosine	Lochrovine

Vinsedicine	
Miscellaneous	
N-oxidefluorocarpamine	β-carboline
Nb-acetyltryptamine	N, N-dimethyltryptamine

Natural resources including herbal plants, which contain a large variety of phytochemicals promising as traditional medicine to treat chronic and infectious diseases, have been considered safe and effective alternatives with fewer side effects compared to synthetic agents. Amongst the plethora of medicinal plants identified, Catharanthus roseus has been widely used to treat various diseases in many countries. The hot water extract of the dried plant has been taken orally as a complementary and alternative therapy for various types of cancers, heart disease, and leishmaniasis. The people of Tamil Nadu, India mix the powder of C. roseus whole plant with cow's milk, which is taken orally to treat diabetes (Sun et al., 2018). C. roseus root is dried, ground, and decocted for curing urogenital infections, gonorrhea, and stomach aches. More scientific evidence has proved the potential health benefits of individual phytochemicals extracted from this plant.

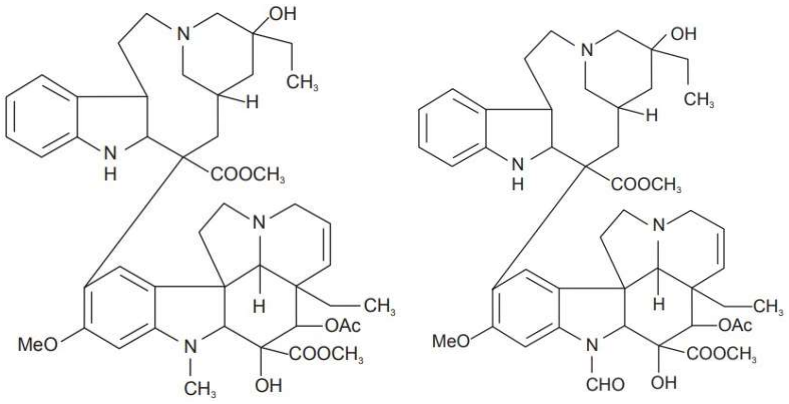


Vincaminorine Vincaminoreine Minovine

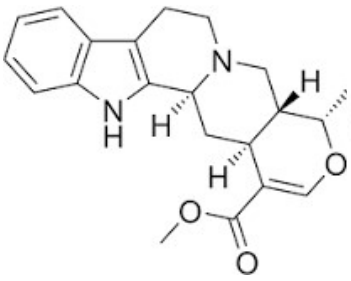


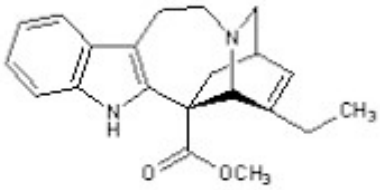
Minovincine Vincamine Vinpocetine

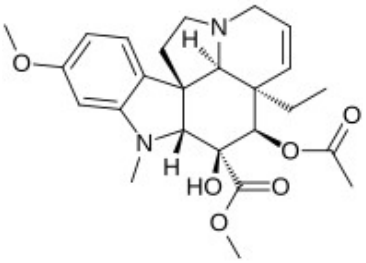
Figure 3. Structures of alkaloids isolated from the aerial parts of C. roseus.



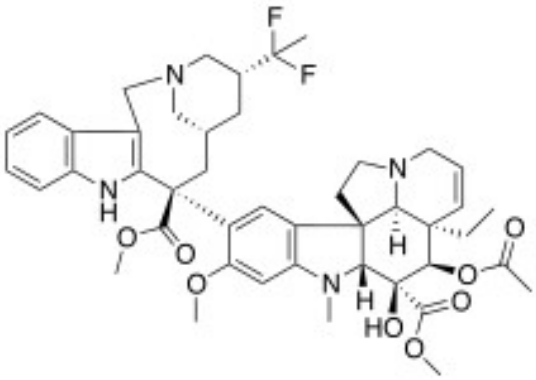
Vinblastin Vincristine

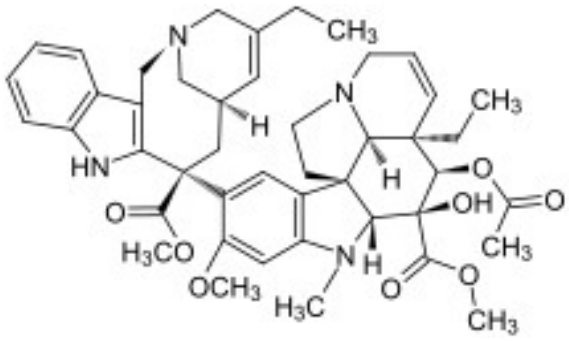






Ajmalcine Catharanthine Vindoline





Vinflunine Vinorelbine

Figure 4. Chemical Structure of main bioactive alkaloids from C. roseus.

Vinblastine and vincristine from C. roseus, and their synthetic analogues, have been used in combination with other cancer chemotherapeutic drugs for treating advanced testicular cancer, and breast and lung cancers. A range of alkaloids (nitrogen-containing organic compounds other than amino acids, peptides, purines and derivatives, amino sugars, and antibiotics) have been found in C. roseus. Alkaloids are broadly classified as heterocyclic or non-heterocyclic, depending on the chemical structure. Heterocyclic alkaloids are those that contain the nitrogen atom in the ring system, the size of which leads to further subclassification as pyrrole, pyrrolizidine, pyridine, piperidine, quinoline, isoquinoline, norlupinane or indole alkaloids. Non-heterocyclic alkaloids, which are also sometimes called proto-alkaloids or biological amines, are less commonly found in nature. These molecules have a nitrogen atom, which is not a part of any ring system such as ephedrine, cathinone, and colchicine (Almagro et al, 2015).

CONCLUSION

Catharanthus roseus is a highly reputed plant but no significant work has been conducted on diverse pharmacological effects. Phytochemical constituents of C. roseus leaves are alkaloids, tannins and phenols, Steroids, carbohydrates, flavonoids, glycosides, etc. The preliminary phytochemical screening is one of the initial and necessary steps to find out the nature of phytoconstituents present in the extract of the plant, which further leads to the isolation of active compounds. Preliminary phytochemical analysis in this study revealed the presence of alkaloids, flavonoids, and carbohydrates in the chloroform leaves extract of C. roseus but flavonoids, phenolic compounds, and tannins are present in the methanolic leaves extract of C. roseus. Over the past decades, herbal medicine has attracted interest from the psychiatry research community for its better compliance and lower side effects. C. roseus was commonly used in traditional medicine. However, further neurochemical studies will be necessary to clarify its mechanism of action and to characterize the active

principle. C. roseus is of high medicinal importance and is used around the entire globe for its various benefits. People from different regions use C. roseus for its different pharmacological benefits. C. roseus is a significant medicinal herb that helps treat human illnesses. Since ancient times, Catharanthus roseus has been studied for its alkaloids and potential medicinal benefits. Numerous phytochemical components found in the plants have a wide range of potential medical uses. Additionally, the plant has many other qualities, including anti-oxidant, anti-microbial, antidiabetic, antihelminthic, antidiarrheal, biopesticidal, and phytoremediation. It therefore has a great deal of therapeutic promise that requires more research.

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Conflict Of Interest

The authors declare no conflict of interest, financial or otherwise.

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