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Review Article

Therapeutic Applications and Diverse Uses of *Vinca rosea* in Treating Various Disease Conditions: A Comprehensive Review

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ABSTRACT

A medicinal plant called *Vinca rosea* has been used for centuries to cure a number of illnesses. Vincristine and vinblastine, two of its more than 70 alkaloids, have demonstrated considerable promise in the treatment of cancer, diabetes, and other disorders. This review article seeks to condense the most recent information on *V. rosea*'s applications and usage in the management of various illness situations. There is evidence to support the use of *V. rosea* and its alkaloids in the treatment of leukemia, lymphoma, and solid tumors due to the substantial research done on its anticancer qualities. The microtubule-inhibiting properties of vincristine and vinblastine are known to cause cell cycle arrest and death in cancer cells. These substances are now utilized to treat a variety of cancers in conjunction with other chemotherapeutic medicines. It has also demonstrated hypoglycemic characteristics, with studies indicating that it may increase insulin production, improve glucose absorption by cells, and prevent hepatic glycogen breakdown. These outcomes could help in the management of diabetes and its consequences. Enhancing memory and cognitive function as well as treating hypertension, are two possible advantages. Its vasodilator actions might result in increased blood flow and lowered blood pressure, while its capacity to boost oxygen delivery to the brain could enhance cognition and memory. It has shown a lot of promise in the treatment of numerous illness situations, including diabetes and cancer. Its effectiveness and safety in the treatment of these disorders need to be further investigated, as well as its potential use in treating additional medical conditions.

INTRODUCTION

The Apocynaceae family includes the tropical plant *Catharanthus*. There are eight species *Catharanthus roseus* is the most utilized due to its medicinal qualities. More than 130 distinct terpenoid indole alkaloids (TIAs), some of which have potent pharmacological effects, are produced by this plant. *C. roseus* is both aesthetically pleasing and therapeutic, with the ability to cure a variety of ailments. With the exception of *C. pusillus*, all but one of the species are unique to Madagascar (Van der *et al*., 2004). Due to its medicinal qualities, *Vinca rosea* has been utilized in Ayurvedic medicine for millennia. The plant includes alkaloids that have been demonstrated to have benefits against diabetes, hypertension, and cancer. *V. rosea*-based Ayurvedic formulations have been used to treat a variety of ailments, such as diabetes, hypertension, and cancer. The herb has also been utilized for its antioxidant, anti-inflammatory, and analgesic properties. Overall, *V.*

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rosea is still being studied for its potential use in both contemporary pharmacology and Ayurvedic medicine (Ortore *et al*., 2022).

The plant *V. rosea*, also known as *Kemunting Cina* in Malaysia, is utilized both as an attractive and therapeutic plant. The vinca alkaloids, which are the oldest type of indole alkaloids and are used to cure cancer, are produced by it in more than 70 distinct varieties (Brogan, 2010). Hodgkin's lymphoma and pediatric leukemia are treated with chemotherapy using the anti-neoplastic substances vincristine and vinblastin, which are both produced from the *V. rosea* plant (Figure 1). (Tropiclab, 2008). Peripheral neuropathy, hair loss, hyponatremia, and constipation are some of the negative effects of vinca alkaloids, which prevent cellular mitosis. Aside from non-small lung cancer, they are also used to treat diabetes, hypertension, and malaria. Antibacterial, antioxidant, anti-diarrheal, hypolipidemic, and wound-healing properties are also displayed by *V. rosea* (Johnson *et al*., 1963).

Classification of *V. rosea*

Catharanthus roseus, also called *V. rosea*, is a member of the huge flowering plant family Apocynaceae, which also contains trees, shrubs, and herbs (Table 1). It is a perennial plant that was once only found in tropical areas of Madagascar. *V. rosea*, which comes in two subspecies (*V. rosea* subsp. *rosea* and *V. rosea* subsp. *albus*), is a highly varied plant. While the latter has only white flowers, the former is distinguished by pink, purple, or white flowers. In ancient medical practices like Ayurveda and Chinese medicine, the *V. rosea* plant is valued for its therapeutic benefits (Missouri, 2024).

Figure 1: *V. rosea* with two distinct colors

Synonyms of *V. rosea* (Allamset *et al*., 2020)

V. rosea is known by various names in different nations. Here are some of its synonyms that are widely preferred to called as under:

- Ammocallis rosea
- Cape periwinkle
- Catharanthus roseus
- Lochnera rosea
- Madagascar periwinkle
- Myrtle
- Old maid
- Ram-goat rose
- Rose periwinkle
- Vinca rosa

Vernacular Name of *V. rosea* (Allamset *et al*., 2020)

Here are some vernacular names of the *V. rosea* with different languages, as shown in the following Table 2:

Table 1: Biological classification of *V. rosea*

Kingdom	*Plantae*
Division	Magnoliophyta
Class	Magnoliopsida
Order	Gentianales
Family	Apocynaceae
Genus	Catharanthus
Species	Catharanthus roseus
Subspecies	*V. rosea* subsp. rosea, *V. rosea* subsp. albus

Table 2: Vernacular names of *V. rosea*

S. No.	*Vernacular Name*	*Languages*
1.	Sadabahar	Hindi
2.	Nayantara	Bengali
3.	Shavamna	Gujarati
4.	Nityakalyani	Kannada
5.	Baramasiya	Marathi
6.	Sadafuli	Nepali
7.	Ramacham	Malayalam
8.	Sadaabhaar	Urdu
9.	Nayantara, Manjal Neer	Tamil
10.	Billaganneru	Telugu
11.	Bougainvillea Rose	Filipino
12.	Sadabahar	Punjabi

Table 3: Brief description of *V. rosea*

S. No.	*Plant's Part*	*Description*
1.	Habit	A perennial herb
2.	Root	Tap root, rarely branched
3.	Stem	Erect, cylindrical, branched, solid, reddish green, glabrous
4.	Leaf	cauline, opposite, decussate, petiolate, whole, mucronate apex, unicstate reticulate veration.
5.	Flower	pedicellate, bractate, hermaphrodite, actinomorphic, complete pink, hypogynous
6.	Inflorescence	Cymose, flower arranged in axillary pairs
7.	Calyx	5, polysepalous, glandular, green, inferior, quincunical aestivate
8.	Corolla	5, gampetalous framing corolla tube, throat of corolla tube hairy forming a corona, contorted aestivate
9.	Androcium	5, free, epipetalous, alternate to petals, almost sessile, anthers dorsified , yellowish.
10.	Gynoecium	2 carpells, bicarpellary, syncarpous, carpel united above in the region of the style and stigma, ovaries free, nectar glands present, unilocular, marginal plaventation
11.	Fruit	A pair of elongated follicles

Description & Morphology of *V. rosea*

V. rosea, often known as Madagascar periwinkle or Sadabahar, is a tropical evergreen shrub that was formerly only found in Madagascar but is now grown extensively all over the world. The plant has gorgeous pink, purple, or white flowers that bloom all year round in warm areas in addition to glossy green foliage.[7] In addition to being a common aesthetic plant, *V. rosea* has long been utilized for its therapeutic benefits in the treatment of many illnesses like cancer, diabetes, and hypertension. The natural treatment for coughs, colds, and other respiratory conditions is also employed in conventional therapy. Even though *V. rosea* has a lot of advantages (Table 3), it should still be used carefully because it can be poisonous if consumed (Rosea, n.d.).

Numerous alkaloids found in the plant, such as vincristine and vinblastine, have been demonstrated to have antitumor effects and are frequently utilized in cancer therapy. Additionally, *V. rosea* has been shown to assist in controlling blood sugar levels, making it a possible diabetic therapy. In addition, the plant includes substances with antioxidant and anti-inflammatory characteristics that have been demonstrated, which may help lower the risk of chronic illnesses, including cancer and heart disease. To completely comprehend the possible advantages and disadvantages of utilizing *V. rosea* in the treatment of cancer and diabetes, additional study is nonetheless required (Evans, 2009).

Chemical Compositions

More than 100 alkaloids, including the well-known vincristine and vinblastine that are used to treat cancer, are found in *V. rosea*. In order to protect itself from herbivores and pests, the plant produces these alkaloids. Additionally, *V. rosea* includes a number of terpenoids, flavonoids, and phenolic acids, all of which have anti-inflammatory and antioxidant effects (Ambusta, 1992). The leaves, stems, and roots of the plant are all therapeutically useful in conventional medicine. Numerous studies have been conducted on the chemical makeup of *V. rosea*, and current research is still looking into the plant's potential medical benefits. It is crucial to remember that the plant can be harmful if ingested in big quantities and should only be used with a doctor's approval (Mishra *et al*., 2001).

Vincristine

A naturally occurring alkaloid known as vincristine (Figure 2 A) is obtained from the leaves of the *V. rosea* plant. Leukaemia, lymphoma, and breast cancer are only a few of the cancers that are treated with this effective anticancer drug. Vincristine functions by limiting the development and halting the division of cancer cells, ultimately causing their demise.

Vincristine's method of action is based on its capacity to bind to tubulin, a protein required for the assembly of the microtubules that make up the cytoskeleton of cells. Vincristine kills cancer cells by preventing their division and growth by interfering with the synthesis of microtubules (Sarmah, 2021).

It is frequently taken intravenously and has a number of adverse effects, including constipation, hair loss, and peripheral neuropathy. Vincristine has been demonstrated to be a successful treatment for a variety of cancers despite these adverse effects and is frequently used in conjunction with other chemotherapy medications.

Vincristine has been shown to have immunosuppressive effects in addition to its anticancer capabilities, making it effective in the treatment of autoimmune illnesses, including lupus and rheumatoid arthritis. Additionally, it has been used to treat a few neurological problems, such as chronic pain and seizure disorders (McGuire *et al*., 1989).

Vinblastine

The leaves of the *V. rosea* plant contain vinblastine (Figure 2 B), a natural alkaloid. It is a strong cytotoxic chemical that has long been used in chemotherapy to treat a variety of

malignancies, including Hodgkin's disease, lymphoma, and breast cancer. Vinblastine stops the growth of microtubules, which are necessary for cell division and hence stops the spread of cancer cells. Additionally, it possesses anti-angiogenic qualities, which can stop the development of new blood vessels that feed tumors, slowing the growth of the tumors even more (Haque and Saba, 2010).

To boost its effectiveness and lower the risk of drug resistance, vinblastine is frequently combined with other chemotherapeutic drugs, such as cisplatin. Vinblastine is a powerful cancer treatment, but it can also cause serious side effects, including gastrointestinal issues, hair loss, and bone marrow suppression. As a result, it is only given out under the guidance of a trained healthcare practitioner (Gregory and Smith, 2000).

Vinblastine has been demonstrated to possess antiviral and immunosuppressive qualities in addition to its capacity to combat cancer. The possibility of using it to treat autoimmune conditions, including lupus and rheumatoid arthritis, is now being researched (Joel, 1996).

Quercetin

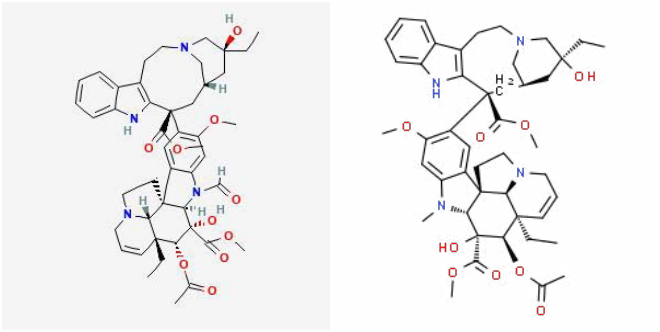
Several plant species, including *V. rosea*, contain the flavonoid component quercetin. It is known to provide a wide range of health advantages, including lowering the risk of heart disease, diabetes, and certain forms of cancer. It also has strong antioxidant and anti-inflammatory qualities (Ciorîță *et al.*, 2021). It also has antiviral characteristics, and researchers have looked at its potential to cure viral infections like COVID-19. It works by preventing viral replication and controlling the immune system. Quercetin has been demonstrated to boost cardiovascular health, prevent neurological disorders, and increase exercise performance. It is frequently sold as a nutritional supplement and may also be gotten from food sources such as berries, apples, and onions (Avanapu and Ahmad, 2013).

Kaempferol

V. rosea, a flowering plant, contains the flavonoid component kaempferol. Antioxidant, anti-inflammatory, and anticancer actions are only a few of its medicinal qualities. By causing cell cycle arrest and encouraging apoptosis, kaempferol has been shown to slow the development of cancer cells. Additionally, it strengthens the cardiovascular system and has neuroprotective properties. Kaempferol works by altering a number of cellular signaling pathways, including PI3K/Akt and MAPK. In addition, it has been demonstrated to stop the activity of enzymes linked to cancer growth and inflammation (Johnson *et al.*, 1963).

Rutin

A flavonoid glycoside called rutin is frequently present in many plants, including *V. rosea*. Its anti-inflammatory and antioxidant qualities have been employed in conventional medicine. Additionally, rutin has been investigated for its ability to boost circulation, lower blood pressure, and defend against cardiovascular disease (Cid-Ortega and Monroy-Rivera, 2018).



(A) (B)

Figure 2: Chemical Structure of Vincristine (A) & Vinblastine (B)[17,18]

Rutin's capacity to function as an antioxidant, which aids in the elimination of free radicals and the defense of cells against oxidative damage, is one of its primary methods of action. In addition to having anti-inflammatory properties, rutin has been demonstrated to block the activity of enzymes linked to inflammation.

Rutin's capacity to stop the development of cancer cells and trigger apoptosis, or programmed cell death, has led researchers to believe that it may play a part in the prevention and treatment of cancer. Overall, greater investigation is required to completely comprehend the mechanisms of action of rutin and its potential therapeutic uses (Chua, 2013).

Ajmalicine

Ajmalicine, commonly referred to as reserpine methyl ether, is a natural alkaloid that may be found in the leaves of *V. rosea*, a plant native to Madagascar. It has been used as a traditional treatment for a number of illnesses, such as diabetes, cancer, and hypertension.

Ajmalicine is largely utilized as an antihypertensive drug in contemporary medicine. It operates by stifling the sympathetic nervous system's activity, which controls the constriction and relaxation of blood vessels to manage blood pressure. Ajmalicine lowers blood pressure by lowering sympathetic nervous system activity, which causes blood vessels to expand (Nisar *et al.*, 2016).

Research on ajmalicine's possible anticancer properties has focused on the treatment of leukemia and lymphoma. Microtubule creation, which is essential for cell division and proliferation, is assumed to be interfered with in order for it to function. Overall, ajmalicine is a significant natural substance with several medicinal uses (Almagro *et al.*, 2015).

Serpentine

An alkaloid called serpentine is often obtained from the *V. rosea* plant. Due to its calming, antispasmodic,

and antihypertensive qualities, this substance has been utilized in conventional medicine. Serpentine's capacity to prevent the growth of cancer cells by interfering with DNA synthesis and mitosis has also been proven to have potential anticancer effects (Pham *et al*., 2020).

Vincristine and vinblastine are examples of serpentine derivatives that have been created and utilized in contemporary medicine to treat a variety of cancers, including leukemia, lymphoma, and breast cancer. These medications impede the development of the mitotic spindle, which is essential for cell division, by attaching to tubulin, a protein involved in cell division. As a result, cancer cells are unable to divide and grow, which causes them to die (Muthu *et al*., 2006).

Organic substances generated by plants, known as secondary metabolites, are not directly engaged in their major metabolic activities. Instead, these substances are crucial for interactions with other species as well as the plant's defense against herbivores and diseases. The plant *V. rosea* is widely recognized for producing a number of significant secondary metabolites, such as alkaloids like vincristine, vinblastine, and ajmalicine. While ajmalicine has been used to treat hypertension, it has been utilized to treat a variety of cancers.

Several flavonoids, including as quercetin, kaempferol, and apigenin, which have antioxidant and anti-inflammatory properties, are produced by the plant. *V. rosea*'s secondary metabolites have significant pharmacological effects, and their potential medical applications have been the focus of substantial investigation (Schutz *et al*., 2011).

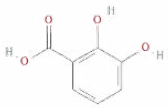
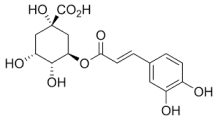
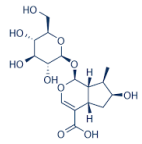
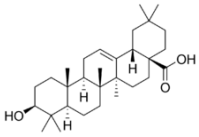
Pharmacological Properties

V. rosea is an important medicinal plant due to its wide range of pharmacological effects. There are many alkaloids in the plant, and studies have shown that they have anti-inflammatory, antitumor, and antimicrobial properties. These substances function by preventing cell proliferation, interfering with DNA synthesis, and lowering inflammatory responses in the body. Additionally, *V. rosea* contains phenolic acids, terpenoids, and flavonoids, all of which have antioxidant characteristics and can help shield the body from oxidative stress (Table 4). (Gomaa *et al*., 2019). The plant is being researched for its possible utility in treating a number of medical illnesses, including cancer, diabetes, and Alzheimer's disease. It has also been discovered to have neuroprotective and cardioprotective benefits. To completely comprehend *V. rosea*'s pharmacological characteristics and its advantages and disadvantages, additional study is nonetheless required (Table 5). (Rowinsky and Donehower, 1995).

Analgesic Activity

V. rosea has long been used as an analgesic to lessen pain. The plant includes a number of alkaloids, including vincristine and vinblastine, which have been shown to have pain-relieving properties. These alkaloids function by attaching to opioid receptors in the brain and spinal cord, which lessens the transmission of pain signals (Sain, 2018). *V. rosea* has been proven to be useful in treating neuropathic pain, such as that brought on by diabetes, and it also lessens post-operative pain. To completely comprehend *V. rosea*'s analgesic effects and discover the best doses for pain management, additional study is necessary. It is crucial to remember that *V. rosea* can be harmful if ingested in big doses and should only be used under the supervision of a healthcare provider (Edrah *et al*., 2019).

Table 4: Chemical composition of *V. rosea* with specific biological activities (Schutz *et al*., 2011)

Secondary Metabolites	*Chemical Structure*	*Bioactivity*	*Reference*
2,3-dihydroxybenzoic acid		Antifungal	Moreno *et al*., 1994
Chlorogenic acid		Antifungal	Mohsen. 2008
Loganic acid		Antifungal	Huang *et al*., 2012
Oleanolic acid		Antimicrobial, anti-inflammatory, anti-tumor	Huang *et al*., 2012

Antipyretic Activity

The antipyretic (fever-reducing) qualities of *V. rosea* have been employed historically. According to recent research, the plant has bioactive substances that can lower fever by preventing the creation of prostaglandins, which are in charge of raising body temperature. In one investigation, it was shown that a *V. rosea* extract greatly reduced fever in rats (Aziz *et al*., 2014). To completely comprehend the mechanism of action and possible efficacy of *V. rosea* as an antipyretic, additional study is necessary. It is crucial to remember that fever is a normal immunological reaction and that, in some circumstances, such as during infections, it could be required for the body to fight off microorganisms. As a result, *V. rosea* shouldn't be used to treat fever without first consulting a medical expert (Octaviana *et al*., 2015).

Anti-inflammatory Activity

Numerous inflammatory disorders, including asthma, rheumatism, and arthritis, have historically been treated

using *V. rosea* in many different cultures. Numerous anti-inflammatory substances, including as alkaloids, flavonoids, and phenolic acids, have been found in the plant, according to studies. These substances function by preventing the synthesis of inflammatory mediators such as prostaglandins, leukotrienes, and cytokines, which lowers inflammation and discomfort (Ramaiah and Sravani, 2018). Animal models of arthritis and asthma have shown *V. rosea* to have anti-inflammatory properties, and it has also been proven to be successful in lowering inflammation in human cell cultures. However, more investigation is required to completely comprehend the mode of action and possible therapeutic uses of *V. rosea* in the management of inflammatory disorders (Lahare *et al*., 2020).

Antioxidant Activity

The antioxidant-rich components of *V. rosea* include a number of flavonoids, alkaloids, and phenolic acids. These substances have been demonstrated to scavenge free radicals, unstable chemicals that may harm cells through oxidative stress and have a role in the onset of chronic illnesses, including cancer, diabetes, and heart disease. Research is now being done to determine whether *V. rosea*'s potential advantages in lowering oxidative stress and inflammation outweigh its extensive studies on its antioxidant activity. However, it's crucial to remember that even though *V. rosea* could have antioxidant characteristics, it shouldn't be used in place of medical care and should only be taken with a doctor's approval (Johnson *et al*., 1963).

Table 5: Pharmacological properties of *V. rosea* with its benefits

S. No.	*Pharmacological properties*	*Benefits*
1.	Anticancer	Inhibition of microtubule formation Cell cycle arrest Induction of apoptosis
2.	Hypoglycemic	Stimulation of insulin secretion Enhancement of glucose uptake by cells Inhibition of glycogen breakdown in the liver
3.	Antihypertensive	Vasodilation Reduction in blood pressure
4.	Analgesic	Relief of pain
5.	Anti-inflammatory	Reduction in inflammation
6.	Antioxidant	Protection against oxidative stress
7.	Neuroprotective	Protection of nerve cells Prevention of neurodegeneration
8.	Antimicrobial	Inhibition of microbial growth
9.	Antiulcer	Reduction in ulcer formation
10.	Antidepressant	Improvement in mood Reduction in depressive symptoms
11.	Anticancer	Inhibition of microtubule formation Cell cycle arrest Induction of apoptosis

Therapeutic Uses of *V. rosea*

Modern studies have validated the therapeutic potential of *V. rosea*, which has been historically utilized for its medicinal benefits. The herb has been used to treat a number of illnesses, including cancer, diabetes, and hypertension (Table 6) (Nayak and Pereira, 2006). Several forms of cancer have been successfully treated with chemotherapy using its alkaloids, vincristine and vinblastine. Additionally discovered to have anti-inflammatory and antioxidant effects, *V. rosea* may be used to treat chronic illnesses. *V. rosea* can also be used to treat bronchitis, coughs, and menstruation issues. *V. rosea* should only be taken under the supervision of a skilled healthcare expert since it can be harmful if ingested in big doses (Babulova *et al*., 2003).

Cancer

Historically, *V. rosea* has been used to cure cancer because of its cytotoxic qualities. The two primary alkaloids found in it, vincristine and vinblastine, have been used in chemotherapy for a number of cancers, including Hodgkin's disease, leukemia, and breast cancer (Sain, 2018). In addition, *V. rosea* extracts have been shown to exhibit anti-angiogenic and apoptotic properties, which means they can slow the development of blood vessels that feed tumors and cause cancer cells to undergo programmed cell death. *V. rosea*'s therapeutic potential in the treatment of cancer is still being investigated despite the need for additional study to completely understand the mechanisms of action and potential adverse effects (Pillay *et al*., 1959).

Diabetes

Due to its ability to reduce blood sugar levels, *V. rosea* has long been utilized in the treatment of diabetes. Alkaloids in

Table 6: Different therapeutic uses of *V. rosea* in various disease conditions

Diseases	*Advantages*	*Dosage forms*
Cancer	Inhibits microtubule formation, leading to cell cycle arrest and apoptosis in cancer cells. Used in the treatment of leukemia, lymphoma, and solid tumors.	The injectable solution, oral tablets, capsules
Diabetes	May stimulate insulin secretion by pancreatic beta cells, enhance glucose uptake by cells, and inhibit glycogen breakdown in the liver, leading to a decrease in blood glucose levels.	Oral tablets, capsules, teas
Hypertension	May act as a vasodilator, widening blood vessels and improving blood flow.	Oral tablets, capsules, teas
Memory & Cognitive Function	May improve memory and cognitive function by enhancing blood flow and oxygen supply to the brain.	Oral tablets, capsules

the plant, including vincristine and vinblastine, have been proven to promote the release of insulin from pancreatic cells and boost cellular absorption of glucose. In addition, *V. rosea* includes substances that might enhance insulin sensitivity and lessen insulin resistance, both of which are important risk factors for the onset of diabetes. *V. rosea* has promise as a natural medicine for controlling blood sugar levels in diabetics, yet further research is required to properly grasp its potential therapeutic advantages in the treatment of diabetes. On the other hand, it must only be used with a doctor's approval (Pillay *et al*., 1959).

Hypertension

Traditional medicine has utilized *V. rosea* to treat hypertension and high blood pressure. Alkaloids found in the plant, such as vincamine and ajmalicine, have been demonstrated to have vasodilatory effects, which means they can dilate blood vessels and lower blood pressure. These substances also have antiplatelet action, which can lessen the risk of cardiovascular illnesses by assisting in the prevention of blood clot formation. To fully comprehend the potential advantages of employing *V. rosea* in the treatment of hypertension and to establish the ideal dosage and administration, additional study is necessary. It is crucial to get medical advice before taking *V. rosea*, as with any medication for hypertension (Fernández *et al*., 2012).

Neurological disorders

Since ancient times, *V. rosea* has been used in traditional medicine to treat a number of neurological conditions, such as epilepsy, Parkinson's disease, and Alzheimer's disease. The plant includes a variety of alkaloids and flavonoids, which have been shown to have neuroprotective and neuroregenerative qualities (Kruczynski and Hill, 2001). It has been investigated if the alkaloid vinpocetine, which comes from the *V. rosea* plant, may be used to treat memory problems and cognitive deficits. Antioxidant and anti-inflammatory qualities of the plant may also help lower the risk of neurological illnesses. Even though additional study is required to properly understand *V. rosea*'s therapeutic potential in treating neurological diseases, the plant's lengthy history of usage in traditional medicine suggests that it would be a worthwhile area to investigate (Braguer *et al*., 2008).

Mechanism of Actions

Numerous alkaloids found in Catharanthus roseus have powerful anticancer, antihypertensive, antidiabetic, and antimalarial effects. Vinca alkaloids, such as vincristine and vinblastine, function by attaching to tubulin, a protein that creates microtubules in cells, which prevents cell division and causes cell death. Vinca alkaloids block the production of mitotic spindles during cancer therapy, stopping cancer cells from proliferating and dividing. Additionally, because to their distinct mode of action, vinca alkaloids have shown promise in the treatment of diabetes, malaria, and hypertension, among other disorders (Ngan *et al*., 2000).

Role in inhibition of proliferation of cancer cell

The fast and uncontrolled division and expansion of abnormal cells in the body, which can result in tumor formation and the spread of cancer to other regions of the body, is referred to as cancer cell proliferation. This process is frequently fueled by genetic abnormalities and changes to cell signaling pathways, which can give cancer cells an advantage over healthy cells by allowing them to bypass normal biological systems that control cell growth and division. As cancer cells multiply and build up, they can obstruct normal organ function and eventually cause a number of grave health issues (Furuse *et al*., 1992).

Alkaloids like vincristine and vinblastine are found in the therapeutic plant Madagascar periwinkle. It has been demonstrated that these alkaloids prevent cancer cells from proliferating. Vinca alkaloids affect cancer cells by preventing microtubule dynamics, which are necessary for cell proliferation. The microtubule structure becomes unstable as a result of their binding to the beta-tubulin component of microtubules, which prevents their polymerization. As a result, the mitotic spindle becomes damaged, the cell cycle is arrested at the metaphase stage, and apoptosis, or programmed cell death, occurs. A significant class of chemotherapeutic medicines, vinca alkaloids, have demonstrated effectiveness against a number of cancer forms, including lymphoma, leukemia, and breast cancer (Bennouna *et al*., 2008).

Cell cycle arrest and, ultimately, apoptosis (cell death) in cancer cells are caused by the alkaloids that are derived from the *V. rosea*. Microtubules are required for cell division and inhibition of their development has been demonstrated to be harmful. Numerous malignancies, including leukemia, lymphoma, and solid tumors, have been treated using vinca alkaloids. However, there are also potentially harmful adverse effects linked with their usage, including bone marrow suppression and peripheral neuropathy. So, the usage of *V. rosea* and its derivatives for the treatment of cancer should only be done so under a doctor's supervision (Singh *et al*., 2001).

Role in regulating blood sugar levels

The concentration of glucose in the blood is referred to as blood sugar level, and it is strictly controlled by the hormones glucagon and insulin in the body. When blood sugar levels rise, the pancreas releases insulin to assist in bringing glucose into cells for use as fuel or storage. When blood sugar levels fall, on the other hand, glucagon is produced to encourage the liver to release glucose that has been stored in the body. Poor nutrition, inactivity, insulin resistance, and certain medical diseases like diabetes are some of the factors that can lead to increased or uncontrolled blood sugar levels (Joel, 1996).

Alkaloids that have been investigated for their possible involvement in controlling blood sugar levels include vincristine and vinblastine. Although the precise mechanism of action is still unclear, it is thought that these alkaloids may increase the amount of insulin secreted by pancreatic beta cells and the amount of glucose taken up by cells, which would lower blood glucose levels. These substances may also prevent the liver's storage form of glucose, glycogen, from being broken down, which would further lower blood sugar levels. To completely understand the specific processes by which *V. rosea* exerts its possible hypoglycemic effects, additional study is necessary (Toso *et al*., 1993).

By enhancing glucose absorption by cells, inhibiting glycogen breakdown in the liver, and stimulating insulin release by pancreatic beta cells, these alkaloids may lower blood glucose levels. To validate these modes of action and establish the proper dosage and duration of *V. rosea* usage, more study is required. Overall, *V. rosea* appears promising as a natural hypoglycemic agent, but due to potential adverse effects and drug interactions, it should be taken with caution and under medical supervision (Vacca *et al*., 1999).

Side effects & Precautions

Although the *V. rosea* plant and the alkaloids vincristine and vinblastine may have medical uses, they can also have serious negative consequences. *V. rosea* frequently causes nausea, vomiting, diarrhea, and hair loss as adverse effects. Furthermore, these substances have the potential to have harmful side effects such as immunological suppression, bone marrow suppression, and peripheral neuropathy. *V. rosea* should only be used under a doctor's supervision, and patients using it should be regularly watched for indications of these negative effects. To balance possible advantages with potential hazards, dosage and usage time should be carefully chosen (Klement *et al*., 2000).

Nausea

Along with its alkaloid's vincristine and vinblastine, *V. rosea* frequently causes nausea. Chemoreceptor trigger zone (CTZ) activation in the brain, which results in sensations of nausea and vomiting, is considered to be the reason. With the help of antiemetic drugs and dietary modifications, nausea can be a bothersome condition for people receiving *V. rosea* cancer therapy. Patients should talk to their doctor about any nausea sensations they have because this side effect may require adjusting their medication's dose or schedule (Wang *et al*., 1999).

Hair loss

Alopecia, sometimes known as hair loss, is a side effect of *V. rosea* and its alkaloids. Although the exact cause of this side effect is unknown, it is thought to be related to how the medications affect quickly dividing cells, such as hair follicles. For patients receiving Vinca alkaloids for cancer therapy, hair loss can be a major worry because it can negatively affect their quality of life. Patients should be made aware of the possibility of hair loss and provided with assistance in managing this adverse effect (Daniel *et al*., 2014).

Vomiting

Common adverse effects of *V. rosea* and its alkaloids include nausea and vomiting. Antiemetic drugs may be necessary to treat these adverse effects due to their potential severity. The chemoreceptor trigger zone (CTZ) in the brain is hypothesized to be stimulated when *V. rosea* causes vomiting. The CTZ is in charge of finding toxins and other harmful compounds in the blood and causing vomiting to get rid of them. Patients who take *V. rosea* need to be constantly watched for these side effects and may need to change their treatment plan or get supportive care to manage symptoms (Chattopadhyay *et al*., 1991).

Precautions during Pregnancy

Pregnant women should abstain from using *V. rosea* and its alkaloids unless the advantages outweigh the hazards to the fetus. These substances may damage the developing fetus and result in birth abnormalities and miscarriage because it has been demonstrated that they may cross the placenta (Singh *et al*., 2001). Use reliable contraception if you're a woman of reproductive age using *V. rosea* or its derivatives to prevent getting pregnant. *V. rosea* medication should be stopped right once and other therapies should be looked into if pregnancy is discovered while taking *V. rosea*. Before taking any drugs or dietary supplements, pregnant women should speak with their doctor to safeguard the wellbeing of both the mother and the growing fetus (Ghosh and Suryawanshi, 2001).

Since ancient times, *V. rosea* has been utilized as a medicine. It includes a number of alkaloids, including vinblastine and vincristine, which are used to treat a variety of ailments, including cancer. However, caution should be exercised when utilizing *V. rosea* due to the possibility of adverse consequences (Moudi *et al*., 2013).

It's critical to utilize medications according to the authorized dosage and with a doctor's supervision to avoid negative effects. Constipation, nausea, vomiting, and other negative effects may result from using *V. rosea* excessively or for an extended period of time. To avoid drug interactions, it's also crucial to let your doctor know if you're taking any other prescription drugs or dietary supplements (Hoff *et al*., 1998).

Conclusion

V. rosea, which contains various alkaloids, has demonstrated considerable promise in the treatment of several illness conditions, including diabetes and cancer. With data supporting their use as anticancer and hypoglycemic medicines, *V. rosea* and its derivatives' mechanisms of

action have been thoroughly researched. However, it should only be used under medical supervision since its alkaloids might have serious negative effects. Despite its potential advantages, further study is required to validate its efficacy and safety in the treatment of certain illnesses. Future studies may also concentrate on the discovery of fresh substances or dosage forms as well as the investigation of their possible applications in different illness states. In the treatment of diabetes and cancer, *V. rosea* has shown a lot of promise, and more research into this plant may result in the development of novel treatments and better patient results.

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