A Review on Phytochemical Constituents and Medicinal Importance of *Catharanthus roseus*

ABSTRACT

In present times, large numbers of medicinal plants are available. ***Catharanthus roseus*** (periwinkle) is also an abundant source of medicinal properties. This legendary splendid plant provided the path for new research works. Scientists had discovered the constitution of phytochemicals and its pharmacological importance. It has prolific varieties having great aesthetic value. This evergreen herbaceous plant is mainly used for its antioxidant, anticancerous, wound healing and antimicrobial activity. Several alkaloids, flavonoids and phenol compounds are present in it. Two unique indole alkaloids are possessed by Madagascar periwinkle which are vinblastine and vincristine. *Catharanthus* is widely used as an ornamental plant and as well as for pharmacological purposes. Now a days, many research reports are coming out about its pharmacological properties. The presence of invaluable phytochemicals in these plants leads to the discovery of effective medicines to cure various diseases. The main agenda of this review paper is to deliver the pharmacological aspects of *Catharanthus rosea* plant and its present need. Here, a brief description is given about most of the phytochemicals identified in *Catharanthus roseus* and their medicinal importance that will be helpful for future research studies on this plant.

Keywords: *Catharanthus roseus*; Antioxidant; Anticancer; Anti helminthic; Phytochemicals; Medicinal

INTRODUCTION

Everybody needs healthy life. This can be acquired from our mother nature that provides solution to heal our wounds. Our traditional medicinal systems are focused on the Ayurveda. It is our ancient opus. *Catharanthus roseus* (*Vinca rosea*) is most important medicinal plant having ailment healing property. This evergreen plant is widespread in the world. Apart from this our ancient Acharya's like Charka, Sushruta in their opus well described unique features of several plants. This reveals how they are essential part in our culture. In the present scenario demand of medicinal plants is increasing. The products have global popularity (Tavhare & Nishteswar, 2014). The proper knowledge about a plants character and its usage leads to the discovery of new drugs which can be prepared from any part of the plant body. Such as root, leaves, stem, flower, bark and seed etc. In addition to this we can also make drugs from the secondary metabolites like resins, tannins, gums, alkaloids and latex etc. According to the modern science new drugs are developed with the help of our ancient knowledge. This made a wide impact in our society. Medicinal plants are most important part of our life (Mishra & Verma, 2017). Our ancient history reveals its necessity and uses in various fields. Various studies and ethno- botanical data provide the medicinal importance of several native and non-native plants. These ethno-botanical studies are also useful in conservation of indigenous culture, biodiversity, emergence of new drugs and health care of a wide population. One of the identified well known medicinal plant is *Vinca rosea (Catharanthus roseus*). *Vinca rosea* is a dicotyledons plant (angiosperm), which belongs to the family Apocynaceae. It is commonly called Madagascar periwinkle or rose periwinkle. This plant is a source of various drugs. The alkaloid named vinblastine and vincristine are produced by vinca rosea. It is a fast-growing ornamental and medicinal plant. It has antitumor, antimicrobial, antioxidant, antifungal and antimutagenic activity. Mainly it produces 130 alkaloids, few well-known names are ajmalcine, vinceine, reperine, vincristine, vinblastine and raubasin (Mishra & Verma, 2017). Vincristine and vinblastine are mainly

used in the treatment of cancers. The proper knowledge about the chemical constituent which present in the plant body, that pave the way for the emergence of new drugs. A successful drug developed by a series of steps. When a drug chemical composition got combine with the human body without any side effect, then it is successful.

History of *Vinca rosea*

The word *Catharanthus roseus* derived from the Greek language. In which *Catharanthus* means “pure flower” and *roseus* means “red or rose”. In the earlier Brazil, Europe and Philippines people used these related plant species to cure various diseases. In Brazil, it is used to control the hemorrhage and scurvy. The leaves extracts are used for this. It also performs as oral antidiabetic agent. This property is reported in Philippines. Currently, it is found to possess various natural base containing compounds that are effective in antibacterial activity (Aruna *et al.*, 2015).

Geographical Distribution

Vinca rosea is distributed in Island country of India that is Madagascar. It is very common in rainforest and semi-arid regions. In addition to this found in Southern United States. Worldwide it is used for ornamental and medical purpose (Aruna *et al*., 2015).

Scientific Position of *Vinca rosea*

Kingdom: Plantae

Division: Magnoliophyta (Angiosperm)

Class: Magnoliopsida

Super order: Asternae

Order: Gentianales

Family: Apocynaceae

Genus: *Catharanthus*

Species*: C. roseus* (Aruna et.al.,)

Morphological Characters

Catharanthus roseus is an evergreen and herbaceous plant (Figure No. 1). Commonly has oval shaped leaves which are green in color. The petiole is short with broad and green midrib. The flowers are in different colors varying from pink, white to red etc. A pair of follicles is present as a fruit (Paarakh *et al*., 2019).

PHYTOCHEMICALS COMPOSITION OF VINCA ROSEA

Catharanthus roseous is rich in many alkaloids (Table 1) and phenolic compounds (Table 2). These are obtained from different plant parts such as leaf, stem, root, seeds, petal and even in some cases whole plant is used (El-Sayed & Cordell, 1981; Tikhomiroff *et al*., 2002; Ferreres *et al*.,2008; Pereira *et al*.,2009; Mu *et al*.,2012; Wang *et al*., 2013; Wang *et al*., 2016; Kumar et., 2018).

MEDICINAL IMPORTANCE OF *VINCA ROSEA*

Anticancer Activity

Some studies revealed that *Vinca rosea* has anticancer activity. This activity is due to the presence of 'vincristine and vinblastine'. These alkaloids are present in leaf and stem of the plant. Vinblastine is used for the treatment of carcinoma and Vincristine is used for leukemia. Clinically some reports showed that chemical methanol which is isolated from the plant body has anti-cancerous activity (Jordan *et al*.,1998).

Antioxidant Activity

Some ethanol compounds are found in the plant body, mainly located in the roots. These are responsible for the antioxidant activity. Mostly rose and white flowered plant possess ethanol compounds (Zheng&Wang,2001).

Antidiabetic Activity

The ethanol compounds are also responsible for antidiabetic activity. This also helps to reduce the blood sugar level in human body. In addition to this, it also made impact on hypoglycemic effect (Chattopadhyay *et al*.,1991; Wang *et al*.,2004).

Wound Healing Property

Wound healing property of this plant is due to presence of ethanol in extract. This also shows significant decrease in epithelization period (Nayak *et al*., 2007). Apart from this the component hydroxyproline found in it also have the wound healing property (Singh *et al*.,2014).

Antidiarrheal Activity

The combined use of ethanol extract obtained from the *Catharanthus roseus* and castor oil helps to control the diarrhea in human. It was experimented on the wister rats and good results were obtained. The ethanol extract significantly reduces the number and weight of wet fecal matter and comparatively reduces its severity (Hassan *et al*.,2011).

Anti-helminthic Activity

Helminthes causing diseases are more common in cattle and humans. Some experimental reports reveal the anti-helminthic property of *Catharanthus roseus*. For the experiment *Pheretima posthuma* was taken as model. Through several experimental studies 250 mg/ml concentration of ethanol extract is effective in helminthic disease (Agarwal *et al*.,2011).

Hypotensive Activity

The extract obtained from the leaves (hydro alcoholic or dichloromethane-methanol) caused significant changes in the hypotensive property (Pillay *et al*.,1959).

Alzheimer's disease

The compound vinpocetine has remarkable action on Alzheimer's disease. Scientific studies reported that vinpocetine will improve our memory and brain functions. The required amount of vinpocetine for the treatment is 60mg/d for stroke and dementia (Sekhar, 1996).

Hypolipidemic Activity

Leaf extract of *Vinca rosea* has significant capacity of hypolipidemic and inhibit biomarkers of it. It was proved that it inhibits the cholesterol, triglycerides, kidney and liver serum levels (Yogesh, 2011).

CONCLUSION

Our nature is the source of wide variety of medicinal plants. Traditionally we have got a lot of knowledge regarding the importance of medicinal plants. Most of the plants are rich source of phytochemicals and pharmaceutical product. Phytochemicals includes alkaloids, flavonoids, vinblastine, vincristine, ajmalicine, reserpine etc. These compounds have several medicinal properties such as antimicrobial, anthelminthic, antioxidant, antiulcer and hypolipidemic activities etc. Now a day, researchers are continuously working on the medicinal plants for finding new pharmacological properties. In this present scenario, demand of medicinal plant products has increased and its cost is affordable. These have fewer side effects as compared to other medicines. Several government or non-government organizations are supporting to conduct research on plants. In *Vinca rosea* each plant part is useful. Extract obtained from root, stem, leaves and flowers has a lot of medicinal properties

and phytochemical constituents. The main agenda of this review is to deliver the pharmacological aspects of *Vinca rosea* plant and its present need. Here, a brief description is given about most of the phytochemicals identified in ***Catharanthus roseus*** and their medicinal importance this review will help for future research studies on this plant.

Table 1*:* **Alkaloid Composition in *Catharanthus roseus*.**

Alkaloid	**Plant Parts**	**References**
Vincristine	Leaf, stem, root	(Kumar *et al*.,2018)
Vinblastine	Leaf, stem, root	(Kumar *et al*.,2018)
Vinpocetine	Leaf, stem, root	(Kumar *et al*.,2018)
Reserpine	Leaf, stem, root	(Kumar *et al*.,2018)
Ajmalicine	Leaf, stem, root	(Kumar *et al*.,2018)
Ajmaline	Leaf, stem, root	(Kumar *et al*.,2018)
Yohimbine	Leaf, stem, root	(Kumar *et al*.,2018)
Vindesine	Leaf, stem, root	(Kumar *et al*.,2018)
Serpentine	Leaf, stem, root	(Kumar *et al*.,2018)
Catharanthine	Leaf	(Tikhomiroff *et al*.,2002; Mu *et al*.,2012)
Vindolidine	Leaf	(Tiong *et al*.,2013)
Vindoline	Leaf, stem, root	(Tiong *et al*.,2013)
Vindolicine	Leaf	(Tiong *et al*.,2013)

Vindolinine	Leaf	(Tiong *et al*.,2013)
Catharoseumine	Whole plant	(Wang *et al*.,2012)
Tabersonine	Hairy root	(Wang *et al*.,2013)
Tryptamine	Hairy root	(Wang *et al*.,2013)
Catharanthamine	Leaf	(El-Sayed&Cordell, 1981)
14',15'-Didehydrocyclovinblastine	Whole plant	(Wang *et al*.,2012)
17-Deacetoxycyclovinblastine	Whole plant	(Wang *et al*.,2012)
Cycloleurosine	Whole plant	(Wang *et al*.,2012)
17-Deacetoxyvinamidine	Whole plant	(Wang *et al*.,2012)
Vinamidine	Whole plant	(Wang *et al*.,2012)
Leurosine	Whole plant	(Wang *et al*.,2012)
Leurosidine	Whole plant	(Wang *et al*.,2012)
Catharine	Whole plant	(Wang *et al*.,2012)
Cathachunine	Whole plant	(Wang *et al*.,2016)

Table 2. **Phenolic Compounds Identified in *Vinca rosea***

Phenolic compounds	**Plant parts**	**References**
3-O-caffeoylquinic acid Kaempferol-3-O-(2,6-di-O-rhamnsoyl-galactoside)-7-O-hexoside.	Leaf	(Ferreres *et al*.,2008; Pereira *et al*.,2009) (Ferreres *et al*.,2008; Pereira *et*

4-O-caffeoylquinic acid 5-O-caffeoylquinic acid		*al*.,2009) (Ferreres *et al*.,2008; Pereira *et al*.,2009) (Ferreres *et al*.,2008; Pereira *et al*.,2009)
5-O-caffeoylquinic acid Quercetin-3-O-(2,6-di-O-rhamnosyl-galactoside)	Stem	(Ferreres *et al*.,2008) (Ferreres *et al*.,2008; Pereira *et al*.,2009)
Kaempferol-3-O-(2,6-di-O-rhamnosyl-galactoside)	petal	(Ferreres *et al*.,2008; Pereira *et al*.,2009)
Quercetin-3-O-(2,6-di-rhamnosyl-galactoside)	seeds	(Pereira *et al*.,2009)

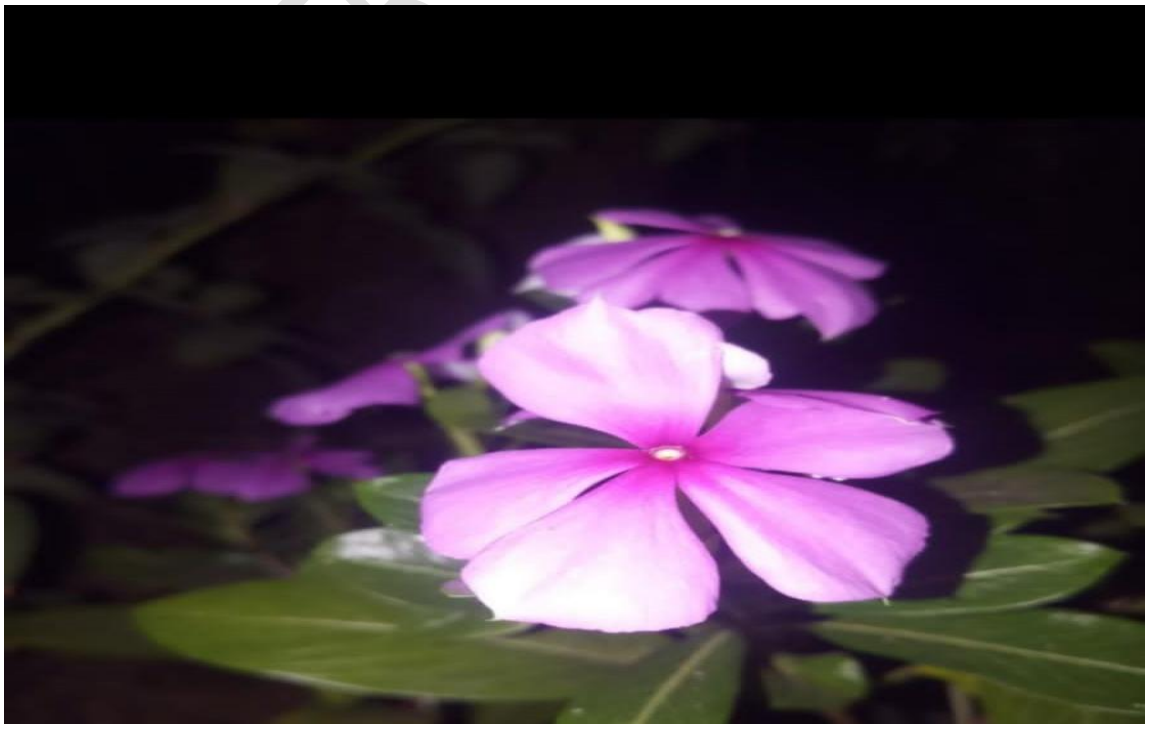

Figure 1: ***Catharanthus roseus*** *(Picture courtesy by Author)*

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