



# A Review on Therapeutic Importance of Vinca Alkaloids

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## ABSTRACT:

Vinca Plant is small herb with lots of medicinal values. It contains various phytochemicals. The purpose of this paper is to understand more about the uses and both qualitative and quantitative analysis of phytochemicals in the six distinct solvent extracts of Vinca plant. To learn the structure and activity of different phytochemicals. Anti – diabetic activity mainly Vinblastine (VBL), vinorelbine (VRL), vincristine (VCR) and vindesine (VDS) used as anti-cancer drug chemotherapy agent in cancer treatment. Extract of plant has different activity like Bio-insecticidal Activity, Anti – diabetic activity, Antioxidative & growth inhibitory, Wound Healing Activity, Antifungal etc are discuss. Phytochemical analysis of vinca leaves and flower is done in 6 different solvent. There Qualitative and quantitative analysis of phytochemicals is performed to see the medicinal Value of extract.

**Keywords:** Vinca, Anti -diabetic activity, Antioxidative & growth inhibitory, Wound Healing Activity, Antifungal.

## 1. INTRODUCTION

Vinca plant is flower bearing shrub with lots of magical benefits for mankind. Vinca plant also known as periwinkle in english and sadafuli in marathi. It mainly founds in region Europe, northwest Africa and southwest Asia. Vinca belongs to Apocynaceae family.[1] Extract from vinca alkaloids contains abundant amount of secondary metabolites Steroids, Terpenoids Flavonoids, Phenolic Compounds Coumarins, Quinones, Alkaloids, Saponins, Anthraquinones, Carbohydrates, Tannins. Alkaloids are natural compound obtaining from plant containing nitrogen as heterocyclic compound. Many alkaloids are medicinally important that are used to treat various diseases including malaria, diabetics, cancer, cardiac dysfunction. There are 4 main types of alkaloids: Vinblastine (VBL), vinorelbine (VRL), vincristine (VCR) and vindesine (VDS). [2] Vinca also contains additional alkaloids as ajmalicine, serpentine, and lochnerine.[3] Nanoemulsions are submicron sized colloidal particulate systems that contain two immiscible liquids, such as water and oil, and are stabilised by an interfacial film made of an appropriate surfactant and co-surfactant to form one phase. They are also referred to as submicron emulsions, ultrafine emulsions, and

mini emulsions. Nanoemulsions have been employed with a variety of surfactants, some of which have different properties (ionic or non-ionic). [3]

Scientific classification	
Kingdom:	Plantae
Order:	Gentianales
Family:	Apocynaceae
Subfamily:	Rauvolfioideae
Genus:	<i>Vinca</i>
Synonyms:	Pervinca Mill, sadafuli

## 2. MACROSCOPICAL FEATURES OF VINCA PLANT

Vinca Plant is erect, pubescent herb, pubescent herb. It is having characteristic Odor. Leaves are Simple, petiolate, ovate or oblong, unicostate, reticulate, entire, brittle with acute apex, and glossy appearance with green color. Roots are pale grey branched tap- root. Shepe of Flowers is bracteate pedicellate, complete, hermaphrodite, 2-3cm in cymose axillary clusters color of them are violet pink - white or carmine-red coloured. Fruits contain follicles with several black seed.

Vinblastine and vincristine, two terpene indole alkaloids, are produced by the significant medicinal plant *Catharanthus roseus*. Cancer is treated using these alkaloids. Many different ailments have historically been treated with this herb. It is used as a traditional medicine to treat diabetes. Wasp stings are treated with a leaf extract. Hodgkin's disease is also treated with dried leaf extract.

To treat menorrhagia, the root extract is used orally.<sup>[2]</sup>

## 3. USES OF VINCA EXTRACT

### 3.1 ANTI-NEOPLASTIC AGENT

These are agent or drug substance that is used to treat cancer. They are also known as anticancer, chemotherapy, chemo, cytotoxic, or hazardous drugs. They can be liquids or in the form of tablets or capsule.

<sup>[4]</sup> Vinca alkaloids obtained from leaves and stems of vinca plant have antitumour and anticancer properties.

<sup>[5]</sup>

### 3.2 BIO-INSECTICIDAL ACTIVITY

Crude extract of *Vinca rosea* is very effective Bio-insecticidal activity against gramme pod borer *Helicoverpa armigera* larvae was reported in Deshmukhe et al. (2010).<sup>[6]</sup>

### 3.3 ANTI – DIABETIC ACTIVITY

Vinca alkaloids are very good anti diabetic agent. As per study conducted in Alloxan-Induced Diabetic Rats high dose of alcoholic extracts of whole plant *Vinca rosea* exhibited significant antihyperglycemic activity. Also when ethanolic extract of vinca is introduced streptozotocin induced diabetic wistar rats result showed that there is good positive correlation between intracellular calcium and insulin release levels in those rats.<sup>[7]</sup>

### 3.4 ANTI-OXIDATIVE & GROWTH INHIBITORY

n-butanol extract of vinca have Cytotoxic it decreases Activity of *E. coli* & *S. lugdunensis*. Methanolic extract of vinca is Apoptotic which increase Apoptosis of cancer cells. Vinca root extract and its two subfractions saponinenriched (SE) and aqueous (AQ) fractions are antioxidative & growth inhibitory which decrease Growth of *E. coli*, *E. aerogenes*, and *S. lugdunensis* and fungi.<sup>[8]</sup> Ethanolic extract of vinca flower act as antimicrobial agent in topical wound in rats.<sup>[9]</sup>

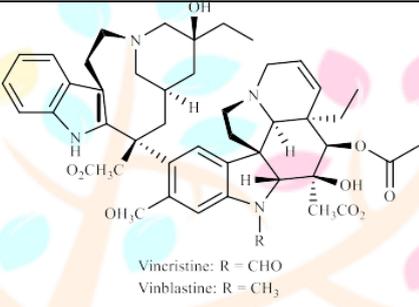
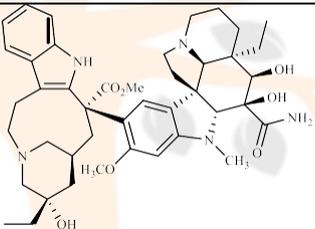
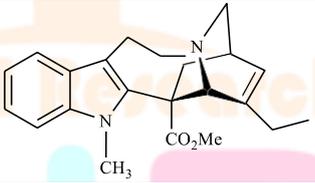
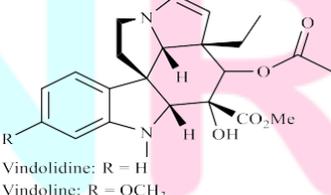
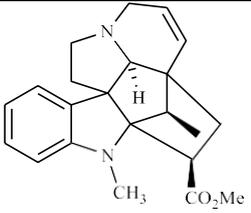
### 3.5 ANTIFUNGAL

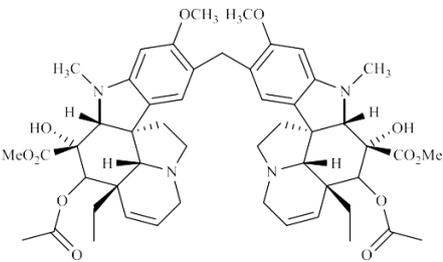
Extract of leaves of vinca plants has anti-fungal activity against *Aspergillus niger*, *Fusarium moniliforme*, *Aspergillus fumigatus* and *Candida albicans*. With the help of the paper disc diffusion technique antifungal efficacy of vinca plant is studied. For this experiment 3 media are used for extraction these are ethanol, acetone, and water. Ethanolic extract is more effective than acetic extract of vinca in terms of antifungal activity.<sup>[10]</sup>

### 3.6 WOUND HEALING ACTIVITY

The extract of vinca flower helps to epithelialize wound faster and increased wound contraction and tensile strength topical management of wound healing.<sup>[11]</sup>

## 4. STRUCTURE OF COMPOUND

Bioactive	Plant part	Chemical structure	Ref
Vincristine <sup>12</sup>	Leaf, Stem, Root	 <p>Vincristine: R = CHO Vinblastine: R = CH<sub>3</sub></p>	<b>12</b>
Vinblastine	Leaf, Stem, Root		
Vindesine <sup>13</sup>	Leaf, Stem, Root		<b>13</b>
Catharanthine <sup>14</sup>	Leaf		<b>14</b>
Vindolidine <sup>14</sup>	Leaf	 <p>Vindolidine: R = H Vindoline: R = OCH<sub>3</sub></p>	<b>14</b>
Vindoline	Leaf, Stem, Root		
Vindolinine <sup>15</sup>	Leaf		<b>15</b>

Vindolicine <sup>14</sup>	Leaf		14
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## 5. QUALITATIVE ESTIMATION OF PHYTOCHEMICALS

Qualitative analysis of genus vinca alkaloids is considered for phytochemicals carbohydrates, phenols, tannins, flavonoids, saponins, glycosides, cardiac glycosides and alkaloids

### 5.1 TEST FOR CARBOHYDRATES

- Fehling's test: Equal volume of Fehling A and Fehling B reagents when mixed together with 2ml of it was added to crude extract and gently boiled. A brick red precipitate appeared at the lower side of the test tube implies the presence of reducing sugars.
- Benedict's test: Crude extract when mixed along 2ml of Benedict's Chemical reagent and boiled, a reddish-brown precipitate formation which indicated the presence of the carbohydrates.
- Iodine test: Crude extract once mixed with 2ml of iodine solution. A dark blue or purple coloration indicates the presence of the carbohydrate.

### 5.2 TEST FOR PHENOLS AND TANNINS:

Crude extracts once mixed with 2ml of 2% solution of FeCl<sub>3</sub>. A blue-green or black coloration formation shows the presence of phenols and tannins.

### 5.3 TEST FOR FLAVONOID ALKALINE CHEMICAL TEST:

Crude extracts once mixed with 2ml of 2% solution of NaOH. A dark yellow color was formed which turned colorless on addition of few drops of diluted acid which indicated the presence of flavonoids.

### 5.4 TEST FOR SAPONINS (FROTHING TEST):

Crude extracts were mixed with 5ml of distilled H<sub>2</sub>O in test tube and it was shaken vigorously. The formation of stable foam shows presence of saponin.

### 5.5 TEST FOR GLYCOSIDES LIEBERMANN'S TEST:

Crude extracts were mixed with every of 2ml of chloroform and 2ml of acetic acid. The mixture was cooled in ice. Carefully concentrated H<sub>2</sub>SO<sub>4</sub> was added. A colour change from violet to blue to green shows the presence of steroidal nucleus, i.e., glycone portion of glycoside.

### 5.5 SALKOWSKI'S TEST:

Crude extracts once with 2ml of chloroform. Then 2ml of concentrated sulphuric acid was added carefully and shaken gently. A reddish-brown color indicated the presence of steroidal ring, i.e., glycone portion of the glycoside.

### 5.6 KELLER-KILANI TEST (CARDIAC GLYCOSIDES):

Crude extracts were mixed with 2ml of glacial acetic acid containing 1-2 drops of 2% solution of FeCl<sub>3</sub>. The mixture was then poured into another test tube containing 2ml of concentrated H<sub>2</sub>SO<sub>4</sub>. A brown ring at the inter phase indicated the presence of cardiac glycoside. Test for Alkaloids: The crude extract of all the six

solvents was boiled in 10 ml methanol and filtered separately. 1% HCl was added followed by 6 drops of Dragendroff chemical reagent, and the brownish-red precipitate was taken as indicates for the presence of alkaloids.

### 5.7 PHLOBATANNINS:

The deposition of a red precipitate denoted the presence of phlobatannins when crude extract of all the six solvent of plant material was dissolved in 10 ml of aqueous extract and few drops of 1% HCl were added in the boiling tube.

### 5.8 ANTHRAQUINONES:

All the six solvent extracts of leaves were boiled in 10% HCl for 5 minutes separately and the filtrate was allowed to cool. An equal volume of  $\text{CHCl}_3$  with few drops of 10%  $\text{NH}_3$  was added to the 2ml filtrate. The formation of rose-pink colour indicates the presence of anthraquinones.

## 6. QUANTITATIVE ESTIMATION OF PHYTOCHEMICALS:

Phytochemicals were determined quantitatively for alkaloids, flavonoids, tannins, saponins and total phenols.

The *Catharanthus roseus* leaves and flowers were extracted using six solvents: chloroform, petroleum ether, ethanol, methanol, hexane, and distilled water. Each solvent was individually soaked with 10g of the powdered sample for 12 hours. After that, filter paper was used to separate the extracts. The extracts were then concentrated to equal 50 ml, or 14 of the initial extracts.

Using the Folin-Ciocalteu technique, the total quantity of phenolics in leaf and flower extracts was calculated. The total phenol content in the extract was expressed as mg of gallic acid equivalent per gramme of extract using the range of concentrations (20–200 g) as a benchmark.

Additionally, numerous aliquots of 0.1 to 1.0 ml of plant extract were made in methanol, and 0.5 ml of every sample was added to test tubes along with 2.5 ml of a 10-fold diluted Folin-Ciocalteu reagent and 2 ml of 7.5% sodium carbonate. The mixture was set at stand at room temperature for 30 minutes. In an alkaline medium, phenols react with phosphomolybdic acid in the Folin-Ciocalteu reagent to produce a blue-colored complex. At 760 nm, the absorbance of the produced solutions was measured in comparison to a reagent blank. A standard calibration curve was prepared by plotting absorbance against concentration and it was found to be linear over this concentration range. By graphing absorbance against concentration, a standard calibration curve was created, and it was discovered that it was linear across this concentration range.

For the purpose of determining flavonoids, the aluminium chloride colorimetric technique was employed. Separate mixtures of 1.5 ml of methanol, 0.1 ml of 10% aluminium chloride, 0.1 ml of 1 M potassium acetate, and 2.8 ml of distilled water were made for each solvent extract (0.5 ml of 1:10 gm ml<sup>-1</sup>). After 30 minutes at room temperature, the reaction mixture's absorbance at 418 nm was determined. Total flavonoids were represented as Quercetin Equivalent (QE) equivalents in mg per gm sample, and the calibration curve of quercetin equivalent (QE) (200-1000 g) was used to compute the percentage of total flavonoids.

Qualitative phytochemical analysis of leaves of Vinca (**Table- 1**)

Tests		Extracts used					
		Chloroform	Petroleum ether	Ethanol	Methanol	Hexane	Distilled water
<b>Carbohydrates</b>	Fehling's test	+	+	+	+	-	-
	Benedict's test	+	-	+	+	+	+
	Iodine test	-	+	+	+	+	+
<b>Phenols and Tannins</b>	Ferric chloride test	-	+	+	+	+	-
<b>Falavonoids test</b>	Alkaline reagent test	-	+	+	+	+	+
<b>Saponin test</b>	Froth Foam test	-	-	+	+	+	+
<b>Glycosides</b>	Liebermann's test	+	-	+	+	-	+
	Salkowski test	-	-	+	+	+	+
	Killer- Killani test	+	-	+	+	-	-
<b>Phenolic compounds</b>		+	+	+	+	-	-
<b>Steroids</b>		+	+	+	+	-	-
<b>Tests for some other phytochemicals</b>	Phlobatannin	+	+	+	+	+	+
	Terpinoid	+	+	+	+	+	+
	Diterpinoid	+	+	+	+	+	+
	Emodins	+	-	+	+	+	+
	Antraquinones	+	+	+	+	+	+
	Carotenoids	+	+	+	+	+	+
	Anthocyanin	+	+	+	+	+	+
	Coumarin	+	+	+	+	+	+
	Phytosterol	+	+	-	-	+	+
	Fatty acids	+	+	+	+	+	+
	Proteins	+	+	+	+	+	+
	<b>Amino acids</b>	+	+	+	+	+	+

**Qualitative phytochemical analysis of flowers of Vinca (Table- 2)**

Tests		Extracts used					
		Chloroform	Petroleum ether	Ethanol	Methanol	Hexane	Distilled water
<b>Carbohydrates</b>	Fehling's test	-	-	-	-	-	+
	Benedict's test	+	+	+	+	+	+
	Iodine test	+	-	-	-	+	-
<b>Phenols and Tannins</b>	Ferric chloride test	+	-	+	+	+	-
<b>Flavonoids test</b>	Alkaline reagent test	-	-	-	-	-	-
<b>Saponin test</b>	Froth Foam test	-	-	+	+	+	+
<b>Glycosides</b>	Libermann's test	-	-	-	-	-	-
	Salkowski test	+	+	+	+	+	+
	Keller- Killani test	+	+	+	+	+	+
<b>Phenolic compounds</b>		+	-	+	+	+	+
<b>Steroids</b>		+	+	+	+	+	+
<b>Tests for some other phytochemicals</b>	Phlobatannin	+	+	+	+	+	+
	Terpinoid	+	+	+	+	+	+
	Diterpinoid	+	+	+	+	+	+
	Emodins	+	-	+	+	+	+
	Anthraquinones	+	+	+	+	+	+
	Carotenoids	+	+	+	+	+	+
	Anthocyanin	+	+	+	+	+	+
	Coumarin	+	+	+	+	+	+
	Phytosterol	+	+	-	-	+	+
	Fatty acids	+	+	+	+	+	+
	Proteins	+	+	+	+	+	+
	<b>Amino acids</b>	+	+	+	+	+	+

**Quantitative estimation of phytochemicals in leaves and flowers of Vinca (amount in mg/gm) (Table- 3)**

Phytochemicals	Leaves	Flowers
<b>Alkaloids</b>	23.75±0.27	<b>21.35±0.43</b>
<b>Flavonoids</b>	47.65±0.45	<b>37.75±0.32</b>
<b>Phenols</b>	26.85±0.35	<b>22.67±0.21</b>
<b>Saponins</b>	19.65±0.31	<b>19.75±0.32</b>
<b>Tannins</b>	<b>17.35±0.21</b>	<b>17.45±0.31</b>

This shows that Vinca's leaves and flowers are rich in phytochemicals such as alkaloids, flavonoids, phenolic, saponins, and tannin. Alkaloids, flavonoids, and phenols were found in somewhat larger concentrations in the leaves of Catharanthus roseus than in the flowers.[16]

## 7. CONCLUSION

The Aqueous extract shows that it contains carbohydrate by Fehling's test positive. Only the floral extracts in chloroform and hexane demonstrated a positive Iodine test for carbohydrates (Table- 2). Only extracts made with chloroform, ethanol, methanol, and hexane contained phenols and tannins; petroleum ether and aqueous extracts did not.

All extracts with the exception of petroleum ether contained phenolic components. All six floral solvent extracts tested positive for steroids. Phlobatannin, terpenoids, diterpenoids, anthraquinones, carotenoids, anthocyanins, coumarin, fatty acids, proteins, and amino acids were among the phytochemicals found in all six solvent extracts. Except for petroleum ether extract of flowers, emodins were found in every sample.

Most of the activities like antifungal, Insecticidal wound healing are seen in the alcoholic and ether extract this extract contain most of the phytochemicals stated above.

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