A Study on Potential Phytopharmaceuticals
Assets in Catharanthus Roseus L. (Alba)

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Abstract— Herbal medicinal plants are boon for human being as treatment of existing and new diseases are being developed either direct or indirect usage of plants. But availability of such plants and their properties also play an important role. Catharanthus roseus is a very important medicinal herb in this direction as availability and its property both are fortunate thing for humankind. This plant is used in treatment of several diseases like diabetes, cancer, high blood pressure, asthma, inflammation, dysentery, brain imbalance, angiogenesis, malaria and other diseases that occur due to potent micro organisms. Though it’s a native of Madagascar but it is found most parts of the world. It is also appreciated for its long flowering period throughout the year. Its roots, plant stems and flowers having active constituents to inhibit the growth of disease and other micro organism. Extracts from the dried or wet flowers and leaves of plants are applied as a paste on wounds in some rural communities. The substances vinblastine and vincristine extracted from the plant are used in the treatment of leukemia and Hodgkin's lymphoma. The fresh juice from the flowers of C. roseus is used to treat various skin problems e.g. dermatitis, eczema and acne. Therefore, the main active constituents present in this plant are alkaloids, flavonoids, steroids and phenolic acid. As C. roseus has mammoth potential to heal many syndrome due to its phytopharmaceuticals assets and it’s intact fractions i.e. root, leaf, stem and flower are drug complaint. Still further research is required to find main utility in healing of diseases arises due to deadly viruses.

Index Terms— Medicinal plants, Catharanthus roseus, Alkaloids, Anti-diabetic, Anti-oxidant, Anti-fungal, Antibacterial.

I. INTRODUCTION

Catharanthus roseus, commonly known as the Madagascar periwinkle, is a species of apocynaceae family and endemic to Madagascar. Other English names occasionally used include Vinca rosea, Lochnera rosea, Ammocallis rosea, Cape periwinkle, rose periwinkle, rosy periwinkle and "old-maid". Catharanthus is a genus of flowering plants in the dogbane family, Apocynaceae. Like genus Vinca, they are known commonly as periwinkles. There are eight known species. Out of eight, seven are endemic to Madagascar[1]. Though one, C. roseus, is widely naturalized around the world[2]. The eighth species, C. pusillus is native to India and Sri Lanka. The name catharanthus comes from the Greek for “pure flower” and roseus means red, rose, rosy. It rejoices in sun or rain, or the seaside, in good or indifferent soil and often grows wild. It is known as 'Sadabahar' meaning 'always in bloom' and is used for worship. These are perennial herbs (small shrub) with oppositely decussate or almost oppositely arranged leaves. Flowers are usually solitary in the leaf axis. Each has a calyx with five long, narrow lobes and a corolla with a tubular throat and five lobes. It grows to 20-80 cm high and blooms with pink, purple, or white flowers[3]. There are over 100 cultivars of C. roseus known [4].

The main active constituents in plants are phenolic acids, flavonoids and alkaloids. These active substances perform a number of protective functions in the human organism and are involved in important anti-oxidative, anti-allergic, antibiotic, hypoglycaemic and anti-carcinogen activities [5] [6] [7]. Catharanthus roseus is formerly known as Vinca rosea and main source of vinca alkaloids, now sometimes called catharanthus alkaloids. These are more than 130 alkaloids[8] including about 100 monoterpenoid indole alkaloids[9]. Vinblastine and vincristine are the dimers, formed by the coupling of Monoidole alkaloids such as catharanthine and vindoline[10] mainly present in aerial part of plants used to treat cancer. Vincristine and vinblastine require both aerial and root parts of a plant to be synthesized [11]. Catharanthus roseus as a source of valuable alkaloids resembling those from Rauwolphia species. Roots of Catharanthus have more ajmalicine (vasodilating) and serpentine (hypertensive) than even Rauwolphia serpentina. They also possess reserpine[12][13]. The alkaloids possess hypotensive, sedative and tranquillisating properties. The root bark contains the alkaloid Alstonine which has been used traditionally for its calming effect and its ability to reduce blood pressure. Yohimbine (Prococol) is an alkaloid with stimulant and aphrodisiac effects found naturally in Pausinystalia yohimbine[14]. C. roseus also shows the presence of this compound along with another flavonoid hirsutidin[15]. Prepare decoction of C. roseus leaves and drink early in the morning for 7 days its beneficial to diabetes patients.

Catharanthus roseus contains significant amounts of volatile and phenolic compounds including caffeoylquinic acids and flavonal glycosides which are known to antioxidant activity. It has a important role in the body defense system that is acts as a antioxidants against reactive oxygen species (ROS)[16]. Catharanthus

doi: 10.18178/ijlbpr.5.1.1-6
roseus also possess good antibacterial, antifungal, antioxidant, anti-diabetic and antiviral potential [13][17][18].

II. TAXONOMY

A. Description

Catharanthus roseus is a long-lived (perennial) sub-shrub or herb, usually erect, 30-100 cm high and at least somewhat woody at the base, sometimes sprawling. White latex is present.

Stems are cylindrical (terete), longitudinally ridged or narrowly winged, green or dark red, pubescent at least when young. Leaves opposite, borne on short petioles, 2.5-9.0 cm long, usually elliptical to obovate (egg-shaped in outline but with the narrower end at the base), green with paler veins. The leaf tip is rounded to acute with a tiny point extending from the midrib. Stems and leaves usually with hairs (pubescent), sometimes hairless.

![Figure 1: 1, flowering twig; 2, flower; 3, base and top of corolla tube in longitudinal section; 4, fruit; 5, seed. (Source: PROSEA)](image)

Flowers borne in leaf axils; either singly or paired on very short stalks (pedicels). Sepals 5, 2-6 mm long, narrow, usually with hairs (pubescent). Corolla with a long narrow tube and lobes that spread perpendicular to the tube and almost flat.; corolla tube greenish, usually at least 2.2 cm long, with the inside of the mouth often dark pink or sometimes yellow, pubescent inside the throat with rings of stiff hairs below the mouth and anthers; corolla lobes 5, pink to white or pinkish purple, 1.0-2.8 cm long, obovate. Anthers 5, attached to the inside of the corolla tube in the upper portion and concealed within it.

The fruit is a follicle, 2.0-4.7 cm long, with numerous small black seeds.

B. Classification

<table>
<thead>
<tr>
<th>Kingdom</th>
<th>Plantae</th>
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<tbody>
<tr>
<td>Phylum</td>
<td>Magnoliopsida</td>
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<tr>
<td>Class</td>
<td>Annonidae</td>
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<tr>
<td>Order</td>
<td>Gentianales</td>
</tr>
<tr>
<td>Family</td>
<td>Apocynaceae</td>
</tr>
<tr>
<td>Genus</td>
<td>Catharanthus</td>
</tr>
<tr>
<td>Species</td>
<td>roseus</td>
</tr>
</tbody>
</table>

| Botanical Name | Catharanthus roseus |

C. Vernacular names

<table>
<thead>
<tr>
<th>Common name</th>
<th>Periwinkle, Vinca</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hindi</td>
<td>Sadabahar</td>
</tr>
<tr>
<td>Malayalam</td>
<td>ShayamNaari, Usamalari</td>
</tr>
<tr>
<td>Marathi</td>
<td>Sadaphuli</td>
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<tr>
<td>Bengali</td>
<td>Nayantara</td>
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<tr>
<td>Oriya</td>
<td>Visayan</td>
</tr>
<tr>
<td>Punjabi</td>
<td>Ratanjot</td>
</tr>
<tr>
<td>Sanskrit</td>
<td>Nityakalyani</td>
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<tr>
<td>Tamil</td>
<td>Sudukattumalikai</td>
</tr>
<tr>
<td>Telugu</td>
<td>Billaganneru.</td>
</tr>
<tr>
<td>Kannada</td>
<td>Kempukesi, Kanigali</td>
</tr>
<tr>
<td>European</td>
<td>Vinca branca</td>
</tr>
<tr>
<td>Spanish</td>
<td>Vinca rosada</td>
</tr>
</tbody>
</table>

There are two major cultivars of Catharanthus roseus L., which are distinguishable on the basis of their flower colors, namely ‘rosea’ (Pink) and ‘alba’ (White) shown in Fig. 2, are commonly found in India.

![Figure 2: Major cultivars of Catharanthus roseus](image)

(a) rosea  
(b) alba

III. PROPERTIES

A. Alkaloids

Catharanthus roseus has been found to contain as many as 130 constituents with an indole or dihydroindole structure. The principal component is vindoline (up to
0.5%); other compounds are serpentine, catharanthine, ajmalicine, akuammicine, lochnerine, lochnercine and tetrahydroalstonine. Alkaloids present in various part of Catharanthus roseus are summarized below:

- **Leaf** - Catharanthin, Vindoline, Vindolidine, Vindolicine, Vindolinine, ibogaine, yohimbine, raubasine, Vinblastine, Vincristine, Leurosine, Lochnerine.
- **Stem** - Leurosine, Lochnerine, Catharanthine, Vindoline.
- **Root** - Ajmalacine, Serpentine, Catharanthine, Vindoline, Leurosine, Lochnerine, Reserpine, Alstonine, Tabersonine, Horhammericine, Lochnericine, echitovenine [19].
- **Flower** - Catharanthine, Vindoline, Leurosine, Lochnerine, Tricin (Flavones).
- **Seeds** - Vingramine, Methylvingramine [20].

The physiologically important and antineoplastic alkaloids, vincristine and vinblastine (Fig. 2), are mainly present in the leaves and antihypertensive alkaloids are found in roots such as ajmalicine, serpentine, and reserpine (2 ref). Vincristine and vinblastine alkaloids are used in the treatment of various types of lymphoma and leukemia (3,4 ref). These Catharanthus alkaloids are also used for the treatment of both malignant and non-malignant diseases and in platelet and platelet associated disorders.

![Figure 3. Structure formulae of vincristine (a) and vinblastine (b) in Catharanthus roseus L.](image)

**IV. USES**

A decoction of all parts of Catharanthus roseus is well known as an oral hypoglycaemic agent. The decoction is also taken to treat diabetes.

**B. Traditional**

In traditional medicine, Catharanthus roseus has been used to treat a variety of ailments in Madagascar as well as in other parts of the world where the plant has naturalized. Folk Remedies and Traditional Uses of Catharanthus roseus are summarized below:

- In India, the juice from the leaves is used to treat wasp sting with [21]
- In Hawai‘i extract of boiled plant is used to arrest bleeding[21]
- In Cuba and Jamaica- Flower extract is used for eye wash in infants[21]
- In Africa- Leaves are used for menorrhagia and rheumatism. (Dobelis, 1997; Walts, 2004)[21]
- In Philippines-Decocction of leaves is used in diabetes and decoction of young leaves is used in stomach cramps, root decoction is used for intestinal parasitism. Infusion of leaves is used for treating menorrhagia. Crude leaf extracts and root has anti cancer activity. Roots used for dysentery[22].
- In Madagascar- The bitter and astringent leaves are used as vomitive, roots used as purgative, vermicidal, depurative, hemostatic and toothache remedies[22].
- In Mauritius- The juice of leaves is used for indigestion and dyspepsia[22].
- In West Indies and Nigeria- The plant is used in diabetes[22].
- In Bahamas- Decocction of flower is used in asthma, tuberculosis and fluatulance[22].
- In Malaysia- The plant is used in diabetes, hypertension, insomnia and cancer[22].
- In America- Gargle of plant is used to ease soarthroats, chest ailments and laryngitis[22].

**C. Modern**

Whilst researching the anti-diabetic properties of the plant in the 1950s, scientists discovered the presence of several highly toxic alkaloids in its tissues. These alkaloids are now used in the treatment of a number of different types of cancer, with one derived compound, called vincristine, having been credited with raising the survival rate in childhood leukaemia from less than 10% in 1960 to over 90% today. Brief summary of Catharanthus roseus’s therapeutic properties are presented in Table I.

**TABLE I. THERAPEUTIC PROPERTIES CATHARANTHUS ROSEUS**

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Therapeutic Properties</th>
<th>Plant parts and methods used</th>
<th>Doses</th>
<th>Organism</th>
<th>References</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Anti-diabetic activity</td>
<td>Dichloromethane: methanol extract (1:1) of leaves and twigs</td>
<td>500mg/kg</td>
<td>streptozotocin (STZ) induced diabetic rat model.</td>
<td>23,24,25</td>
</tr>
<tr>
<td>2.</td>
<td>Anti-oxidant activity</td>
<td>Methanolic leaf extract, Dichloromethane extract (DE), Ethanolic extracts of the roots</td>
<td>12.5and 25.0 µ g/mL</td>
<td>β-TC6 cells</td>
<td>6,26</td>
</tr>
<tr>
<td>3.</td>
<td>Hypolipidemic Activity</td>
<td>Leaf juice of Catharanthus roseus, Aqueous extract of leaves.</td>
<td>-</td>
<td>Guinea Pigs, Alloxan induced diabetic rats.</td>
<td>22,27</td>
</tr>
</tbody>
</table>
Table II

<table>
<thead>
<tr>
<th>Type of use</th>
<th>Symptoms</th>
<th>Plant part used and method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqueous Extracts from Catharanthus roseus leaf, stem, root, flower</td>
<td>Insulin resistance (Gita Bisl et al., 2013)</td>
<td>Aqueous Extracts from Catharanthus roseus leaf</td>
</tr>
</tbody>
</table>

VI. CONCLUSION AND FUTURE WORK

The leaf juice or water decoction of Catharanthus roseus L. (Apocynaceae) is used as a folk medicine for the treatment of diabetes all over the world. In continuation to this its other parts like root, stem & flower have active components like alkaloid, flavonoids, steroids and phenolic acids which effectively make it in usage as antimicrobial, anti diabetic, anti-syndrome, anti-oxidant. The above study reveals that Catharanthus roseus has a potential Phytopharmaceuticals assets and further more research is required to find out its actual responsible component, so that its main utility can be used in healing of diseases arises due to deadly.

REFERENCES


