MEDICINAL PROPERTIES OF CALOTRPOIS GIGANTEA

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Abstract:
*Calotropis gigantea* (Crown flower) commonly called as ‘Madar’ is a milkweed available in India, Bangladesh and Sri Lanka. The plant is belonging to Apocynaceae family which includes latex bearing plant. It is an important medicinal plant and widely used in Ayurveda for management of various health hazards. Current study is aimed at the identification of the phytoconstituents present in the plant. It was observed that the plant mainly contains phenolics, terpenoids and flavonoids. The plant also showed antimicrobial activities. The presence of flavonoids in the plant was further evaluated for photoprotective activity. It was observed that the methanolic extract of leaves show effective absorption of ultraviolet light at 200 nm to 400 nm by using UV visible spectrophotometer. This could be helpful for the formulation of anti UV dermatological applications.

Keywords: *Calotropis gigantea*, Anti UV, Flavonoids.

I. INTRODUCTION

Calotropis is a genus first described in 1810. They are flowering plants in the dogbane family, Apocynaceae. It is native to southern Asia and North Africa. The plant produces the latex so they are commonly known as milkweeds. The Botanical name of plant *Calotropis gigantea* is known by different names in English ‘Crown flower’, in Hindi ‘Arka’, in Sanskrit ‘Madar’, ‘Ganarupa’, ‘Vasuka’, ‘Svetapushp’ etc. In India it has other names ‘Ekka’ in Kannada, ‘Erukku’ in Tamil and Malayalam, ‘Jilledi Puvvu’ in Telugu, ‘Rui’ in Mrathi. In different parts of the world it is also known by different vernacular names like, French cotton, Alarka, Rooster tree, Widuri. The genus Calotropis is distributed in tropical and subtropical regions of Asia and Africa (The Wealth of India, 1959).

Classification:

- **Kingdom**  - Plantae
- **Division**  - Magnoliophyta
- **Class**  - Magnoliopsida
- **Order**  - Gentianales
- **Family**  - Apocynaceae
- **Sub-family**  - Asclepiadoideae
- **Genus**  - Calotropis
- **Species**  - *Calotropis gigantea*
Botanical description:

In Ayurvedic medicine the plant *Calotropis gigantea* is known as “SwetaArka”, it is erect, tall, large, much branched perennial shrub or small tree. *Calotropis gigantea* and *Calotropis procera* are the two common species in the genus Calotropis. *C. gigantea* grows to a height of 2.4 to 3.0 m while *C. procera* grows to about 0.91 m to 1.83 m. The leaves of these plants are sessile and sub-sessile, opposite, ovate, cordate at the base. The flowers of *C. procera* are about 3.8 to 5.1 cm in size, with umbellate lateral cymes and are colored white and are fragrant while the flowers of *Calotropis gigantea* are without any fragrance and are purple colored. The seeds are compressed, ovoid, with a tufted micropylar coma of long silky hair. *Calotropis gigantea* grows in dry uncultivated open waste land and even roadsides and railways, up to 1000 m altitude. It grows on a variety of soils and usually with a periodic dry period. Pollination is carried out by bees (Entomophily). The gynoecium is formed by the fusion of stigmas and androecium. The pollens are enclosed in pollinia. The pollinia are attached to an adhesive glandular disc at the stigmatic angle. When a bee lands on one of these, the disc adheres to its legs, and the pollinium is detached from the flower when the bee flies away. When the bee lands on other flower, the flower is pollinated by the adhering pollinium on the bee.

![Calotropis gigantea plant with flowers](image)

Figure 1: *Calotropis gigantea* plant with flowers

Cultural importance

The flowers of the plant *Calotropis gigantea* are offered to the Hindu Lord Shiva, Ganesha, and Hanuman traditionally.

Herbal significance

Herbal plants are important in our day-to-day life and health. They are being used from ancient times till the present day. *Calotropis gigantea* is also a plant of herbal importance.

*Calotropis gigantea* is known for its utilization in traditional medicinal system due to the various properties that cure a variety of diseases. Herbal medicines have less side effects and are easily available in nature. The molecular agents that prevent the oxidation of other molecules by stopping the transfer of electrons or hydrogen are known as the antioxidants. Antioxidants can protect the human body from free radicals and Reactive Oxygen Species. Oxidative damages caused by free radicals to living cells leads to the pathogenesis of many chronic diseases such as Parkinson’s, Alzheimer’s, cancers, aging, cardiovascular, atherosclerosis, cataract, inflammatory, and other degenerative ailments (Chaudiere and Ferrari-Iliou, 1999). Medicinal plants contain many antioxidants such as vitamins, carotenoids, flavonoids, polyphenols, saponins, enzymes and minerals.
Natural antioxidants are safer and also possess anti-viral, anti-inflammatory, anti-cancer, antimutagenic and anti-tumour properties. Phenols, flavonoids, alkaloids and tannins are the most commonly found polyphenolic compounds in plant extracts. The presence of many phytochemicals such as flavonoids, terpenoids, alkaloids, steroids, saponins, terpenes have been isolated in different parts of *C. gigantea* especially in the leaves.

It has different medicinal properties. Different parts of this plant have ability to cure various diseases and disorders like asthma, cold, epilepsy, fever, indigestion, leprosy, piles, skin diseases etc., and exhibiting activities that are anti-inflammatory, antihelmintic, anticancer and antitumor; as observed in various polyherbal preparations.

It is necessary to study various pharmacological actions and medicinal applications. So, in order to understand them, there is a need to scientifically evaluate them at molecular and biochemical level.

Calotropis occupies special importance in India because of its large industrial uses and economic values. Different parts of this plant are used for many purposes. The uses are-

- Biogas production
- To substitute for petroleum products
- Cleansing of water
- Energy plantation
- Fibers, fodder, latex or rubber, etc.

II. Materials and Methods

Collection and identification of plant material:

The plant *Calotropis gigantea* was collected from a wasteland near Walchand College of Arts and Science, Solapur district of Maharashtra, India, in July 2018. Sample was identified the by using standard description data. Botanical identification was confirmed at the department of Botany at Walchand College of Arts and Science, Solapur.

Antimicrobial activity

1. The leaves of plants were washed to remove the dust particles. Mid-ridge of leaves are removed and cut it into small pieces.
2. 5 gram of leaves were crushed in mortal and pestal by addition of 5ml solvents i.e. distilled water and ethanol. The extract obtained was filtered.
3. The suspension of test organisms (*Pseudomonas aeruginosa, E.coli, Klebsiella spp., Bacillus subtilis, Staphylococcus aureus, Salmonella spp.*) was spread on different sterile nutrient agar plates.
4. The wells were made by using gel punch. The extract was added in the wells.
5. The plates were incubated at 37°C for 24 hrs.
6. The plates were observed for zone of inhibition.

Phytochemical Activity

1. The plant leaves and flowers were crushed in various solvents such as of ethanol, methanol and distilled water. The plant extract is filtered.
2. The filtrate is used for testing of phytochemical activity such as alkaloids, phenols, steroids, flavonoids, and saponins.
a) Alkaloids

500 µl leaf extract was treated with 5 ml of aqueous 1% HCl on boiling water bath for 20 minutes then this solution centrifuged for 10 minute at 3000 rpm after centrifugation. 1 ml of supernatant was taken and then the Wagner’s reagent (2 gm of Iodine and 6 gm of KI dissolved in 100 ml of water) was added.

b) Flavonoids

500 µl leaf extract was heated at 80°C to 90°C with 10 ml of ethyl acetate in water bath for 3 min. Filter the sample. 4 ml filtrate was taken with 1 ml dilute ammonia solution and few drops of concentrated H₂SO₄.

c) Phenol

500 µl leaf extract was taken in 2 ml of distilled water. Boiled it on water bath (100°C) for 1 min and filter the solution. In filtrate add 10% ferric solution was added.

d) Saponin

500 µl of leaf extract was boiled in 5 ml of distilled water, filter the sample. 2.5 ml filtrate was added in 1.5 ml of distilled water and shake vigorously.

e) Terpenoids

2 ml of leaf extract was treated with 1 ml of 2,4 dinitrophenyl hydrazine (DNP) dissolved in 100 ml of 2 M HCl.

f) Anthraquinone

500 µl leaf extract was shaken with 10 ml of benzene and filtered. In filtrate 5 ml of 10% ammonia solution was added and mixed.

g) Tannins :

500 µl leaf extract was boiled with 10 ml of distilled water and filtered. In filtrate 1 M FeCl₃ was added.

Anti UV activity :

1) The plant leaves were dried and powder was obtained.

2) The 0.5 g of leaves powder was added into the 10 ml various solvents. [Methanol, Water, Water:methanol (2:5)] The mixture was allowed to react overnight then filtered.

3) The UV absorbance spectrum of the extract was observed in the range of 200 nm to 400 nm using UV-Visible spectrophotometer.

III. Results

Antimicrobial activity

<table>
<thead>
<tr>
<th>Test organism</th>
<th>D/W extract</th>
<th>Ethanolic extract</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pseudomonas aeruginosa</em></td>
<td>Sensitive</td>
<td>Sensitive</td>
</tr>
<tr>
<td><em>E.coli</em></td>
<td>Sensitive</td>
<td>Sensitive</td>
</tr>
<tr>
<td><em>Klebsiella spp.</em></td>
<td>Resistant</td>
<td>Resistant</td>
</tr>
<tr>
<td><em>Bacillus subtilis</em></td>
<td>Sensitive</td>
<td>Sensitive</td>
</tr>
<tr>
<td><em>Staphylococcus aeruginosa</em></td>
<td>Sensitive</td>
<td>Sensitive</td>
</tr>
<tr>
<td><em>Salmonella spp.</em></td>
<td>Resistant</td>
<td>Resistant</td>
</tr>
</tbody>
</table>
Phytochemical Activity

<table>
<thead>
<tr>
<th>Components</th>
<th>Leaf (D/W)</th>
<th>Leaf (Methanol)</th>
<th>Flower (D/W)</th>
<th>Flower (Methanol)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flavonoids</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Alkaloids</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Phenol</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Anthroquinone</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Saponins</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Tannins</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Terpenoids</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

(‘+’ indicates presence, ‘-’ indicates absence)

Anti UV activity

![Absorbance for methanolic extract](image)

![Absorbance of Aqueous extract](image)
IV. Discussion

The aqueous and ethanolic extract of leaves of *C. gigantea* show effective toxicity against *Pseudomonas aeruginosa, E.coli, Bacillus subtilis, Staphylococcus aureus*. This indicates that the plant extracts can be used for the formulation of medicines used for treatment of diseases.

The results of phytochemicals indicate that in *C. gigantea* leaf extract contains significant amount of flavonoid, alkaloids, anthraquinone and in flower extract contain significant amount of terpenoids, alkaloids. These are the components are mainly found in leaves and flower. These are the coloured pigments are found in leaves and flowers of *C. gigantea*. It protects the photosensitive substance in leaves and flowers reveal a key role in defence mechanism of plant.

Absorption of UV radiations is main characteristics for identification of flavonoid in plant. All the extracts of leaves of *C. gigantea* showed moderate absorption of UV light at 290 nm to 350 nm. The maximum absorption was observed at range of 360 nm to 400 nm. The ability of plant extract to efficiently absorb UV light can be utilized for the formulation of various dermatological applications.

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REFERENCES


