

# The Journal of Phytopharmacology

(Pharmacognosy and phytomedicine Research)

## Review Article

ISSN 2320-480X

JPHYTO 2021; 10(4): 277-280

July- August

Received: 05-05-2021

Accepted: 19-06-2021

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doi: [10.31254/phyto.2021.10411](https://doi.org/10.31254/phyto.2021.10411)

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## A mini review on *Calotropis procera* and tapping its phytochemical and pharmacological potential

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### ABSTRACT

*Calotropis procera* is considered as a medicinal plant belonging to the Asclepiadaceae family, surrounded throughout India and in other tropical areas. The common names of *C. procera* are Arka, Akanal, Madar, and Akanda. Based on the morphological characteristics, the leaves of *C. procera* is characterized as ovate, obovate, ovate-oblong or elliptical. The medicinal value or pharmacological properties of this plant are associated with its latex. *C. procera* leaves is said to be important antidote against snake bite, burning, rheumatism, mumps and bacterial infections. The phytochemical composition of leaf powder composed of cardenolides, steroids, tannins, glycosides, terpenoids, flavonoids, alkaloids and saponins. Phytochemical screening of bark also showed the presence of several secondary metabolites. Latex mainly contains calotropaine (cardiotoxic), a proteolytic enzyme and also contains a small percentage of nontoxic proteolytic enzyme, calotropin. The plant has several ecological importance including natural phytoremediation, improvement in soil quality. Mainly, *C. procera* has great importance throughout world for its great value.

**Keywords:** *Calotropis procera*, phytochemistry, enzymes, pharmacology, ethnobotany.

### INTRODUCTION

India being a tropical country has vast biodiversity and covered with several medicinal plants. *Calotropis procera* and *Calotropis gigantea*- these two species of *Calotropis* have been distributed throughout the world from ancient time. The purplish flowered *Calotropis procera* (also named *C. persica*) is seen more commonly, whereas whitish flowered *Calotropis gigantea* is rarely noticed [1]. *Calotropis procera* is surrounded throughout India and in other warm and dry places like Waziristan, Afghanistan, Egypt and tropical Africa. *Calotropis* species are also covered in Australia, many pacific islands, central and South America [2]. *Calotropis procera* was introduced probably as garden plants into Australia in the early 1900s. It became distributed in Katherine area and spread throughout roper river in the 1950s. In the northern region of Australia, this species is spread widely [2]. In 1938, botanists Hannah and Ephraim HaReuveni, authors of "The Squill and the Asphodal", discussed that Jeremiah's arar was the Sodom apple [3].

Physically the main difference between *C. procera* and *C. gigantea* are easily differentiated by the colour of their flowers. So, without having presence of flowers in plant, it is really hard to identify *Calotropis*. The both species can be differentiated from each other by evaluating the pH of crude latex of stem [4]. The colour of the milky sap of *Calotropis* is due to the presence of calcium oxalate crystals [1].

*Calotropis procera* is a species of flowering plants in the family of Asclepiadaceae. Worldwide, it has various socially accepted names such as swallowwort, dead sea apple, Sodom apple or milk weed. Whereas in India, the plant is popularly known as madar in Hindi, orka in Oriya, alarka in Sanskrit and akanda in Bengali. In Arkelavana (Ayurveda formulations), *C. procera* is commonly known as Aak. In traditional system of medicine, due to the medicinal value of *C. procera*, it is widely known [5]. *C. procera* reaches upto 6-8 feet (rarely to as much as 15 feet). The flower of this plant is mainly 5-20 cm long, 4-10 cm wide and basically borne in pairs. The plant and plant extracts of *Calotropis* have been utilized in modern pharmaceutical companies recently [6].

## PLANT TAXONOMY

**Table 1:** *Calotropis procera* plant taxonomical data

Rank	Description
<b>Kingdom</b>	Plantae- plants
<b>Subkingdom</b>	Tracheobionta– vascular plants
<b>Superdivision</b>	Spermatophyta– seed plants
<b>Division</b>	Magnoliophyta– flowering plants
<b>Class</b>	Magnoliopsida- dicotyledons
<b>Subclass</b>	Asteridae
<b>Order</b>	Gentianales
<b>Family</b>	Asclepiadaceae – Milkweed family
<b>Genus</b>	<i>Calotropis</i> R. Br. - calotropis

(The data is collected and assembled from <https://plants.usda.gov/core/profile?symbol=CAPR>)



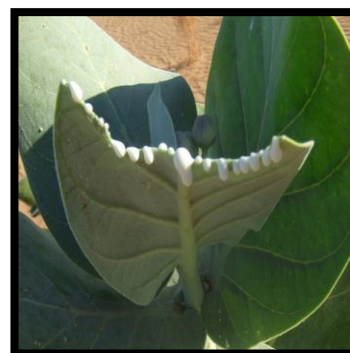
**Figure 1:** *Calotropis procera* plant



**Figure 2:** Leaf of *C. procera*



**Figure 3:** Latex of *C. procera*



**Figure 4:** Latex of *C. procera*

### Plant profile

- ✓ Habit is described as large shrub with much branched.
- ✓ The stem is herbaceous and the lower portion is woody. Upper portion is covered with woolly hairs. It contains milky juice.
- ✓ Leaves are mainly cauline and ramal, unicostate reticulate, hermaphrodit, pentamerous.
- ✓ Flowers are mainly medium sized with purplish color. Flowers do not have any fragrance. Calyx made of five sepals, polysepalous, quincuncial. Corolla made of five petals, gamopetalous. Stamens are mainly united with stigma to form gynostegium. Coronary outgrowth is present at the rear of every stamen.
- ✓ The fruits of this plant are an aggregate follicle type of fruits which is called as etaerio of follicles [7].

### LITERATURE REVIEW

#### • Phytochemical components:

Leaf powder of *Calotropis procera* showed that the leaves contained several natural chemical constituents including cardenolides, steroids, tannins, glycosides, phenols, terpenoids, sugars, flavonoids, alkaloids and saponins [5, 8, 9]. The leaves are consisting of a bitter component (mudarine) and various glycosides, calotropin, uscharin, calotoxin and calactin. A steroidal ketone (procsterol) was also isolated from the undried flower of *C. procera*. The fresh leaves produced volatile organic compounds [10]. Phytochemical screening of stem bark showed the presence of various secondary metabolites such as polyphenols, triterpene glycosides, flavonoids, coumarins [11]. The latex of *C. procera* is also contained nontoxic proteolytic enzyme, calotropin (2-3%) and a bacteriolytic agent is isolated from milky sap [12]. It also contained calactin, calotropagenin, calotoxin, syriogenin, tetraxasterol, uscharin, lupeol. The latex also has cystein peptidase, procerain and procerain B [13]. Bioactive compound like chitinase isoform isolated from the latex is more cytotoxic to tumour cell lines and capable to reduce inflammation by NO mechanism [14].

#### • Medicinal uses

- ✓ The useful product of the plant is bark, leaves and the milky juice i.e., latex. Basically, the latex is cardiotoxic with active ingredient calotropaine, a proteolytic enzyme. The *Calotropis* has several uses from the ancient time to till date. Activity of tobacco mosaic virus can be inhibited by the latex of *Calotropis procera* (effectivity 80%) [11].
- ✓ For the treatment and cure of leprosy and elephantiasis, *Calotropis* bark powder infusion is used. *Calotropis* leaves have a role in the treatment against jaundice [3].

- ✓ The bark which has been kept for more than a year should not be used. Parts of *Calotropis* is used widely for its various therapeutic interventions. The root bark is used as emetic, flower as digestive and a tonic is used against asthma. For the stimulation of cattle lactation, bark and wood have been used. For the treatments in snakebite, roots are used from ancient time. The milky sap is used as a rubefacient and it is also strongly acting as purgative [1].
- ✓ Traditional Indian medicinal system supports *Calotropis* for its therapeutic status against leprosy, ulcers, tumours, piles, liver and abdomen. The plant has toxic properties which cause some unwanted problems including iridocyclitis, dermatitis and sometimes milky sap acts like a poison. The aqueous flower extract of *C. procera* has been shown to possess as analgesic, fever alleviator and inflammation suppressing agent [15, 16].
- ✓ Decoction of the aerial parts of plant shows neuromuscular blocking activity [17].
- ✓ The ethanolic extraction of the different plant parts specially flower and bud extracts have been reported to possess as an antimalarial agent [18].
- ✓ The chloroform extract of seeds exhibits antimicrobial activity. The biological activity of *C. procera* is well established and some organic extracts are derived from the aerial parts [19].
- ✓ Osmotin purified from latex of *Calotropis procera* has antifungal properties on some fungal species [20].

#### • Economic importance

*Calotropis* has potential economic value globally. Several everyday necessities products are made from various parts of this plant. *Calotropis* stem and seed coat used in producing fine, white, durable, flexible and high-quality fibre for industrial uses. It is also used in manufacturing of ropes, carpets, fishing nets, bow stings, sewing threads [21, 22, 23].

Inner bark fibres produce binding material and due to its high fibre, fibre gene CpTIp1, isolated from wild plant and processed into cotton variety NIAB-846 [21].

The white, strong silky floss from fruit is used in mattresses and pillow as well as in making shawls [23, 24]. The seed oil is used for soap, paint and making varnish. The flower is used for floral decoration in Thailand [22].

#### • Ecological importance

*Calotropis procera* has various ecological roles: natural phytoremediation, improves the quality of soil, rehabilitates abandoned and exhausted lands [26].

### CONCLUSION

In the present scenario, traditional system of knowledge in our country is fast eroding, therefore, there is an urgent need to inventory and record all ethno-botanical information among diverse communities. A vast database of traditional plant used for various purposes could be easier for upcoming generation to find out more about plants. Since ages, medicinal plants are used in various diseases and lots of people were engaged to find out the importance of those medicinal herbs. Especially, people living in villages have been using this medicinal plant as natural remedies. This ethno-medico-botanical

study on *C. procera* has revealed various medicinal uses of this plant throughout world. The latex or milky sap present on *C. procera* is shown to have beneficial as well as toxic effects on human. The presence of biologically active phytochemical and mineral content in *C. procera* suggested mechanism of action in different human tissues. Mostly, they show their action on cell membranes through G-protein coupled receptors. This species has very much economic potential as a source of carbon. It has also antioxidant properties, antibacterial activities, anti-fertility activities. The plant is also greatly known due to its economic and ecological values.

#### Funding

The authors received no financial support for the research, authorship, and/or publication of this article.

#### Conflict of Interest

The authors declare no conflict of interest, financial or otherwise.

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#### HOW TO CITE THIS ARTICLE

Kundu S. A mini review on *Calotropis procera* and tapping its phytochemical and pharmacological potential. *J Phytopharmacol* 2021; 10(4):277-280. doi: [10.31254/phyto.2021.10411](https://doi.org/10.31254/phyto.2021.10411)

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