

A REVIEW ON *Calotropis gigantea* (WARA): A MIRACLE PLANT

Lakshani A.A.R.P., De Silva N. N. and Dahanayake N.*

Department of Agricultural Biology, Faculty of Agriculture, University of Ruhuna,
Matara, Sri Lanka

*Corresponding Author: nilanthi@agbio.ruh.ac.lk (<https://orcid.org/0000-0001-5631-2423>)

Received: 29.11.2021; Accepted: 02.05.2022; Published: 18.07.2022

ABSTRACT

Calotropis gigantea (L.) R.Br. (Asclepiadaceae) is a perennial herb used as a traditional medicine. This is an important plant however, presently under the threat of extinction. While the entire plant is used for skin diseases, powdered root bark able to cure elephantiasis, dysentery and leprosy. The stem bark is important for gastrointestinal and respiratory track diseases including dysentery, spleen complaints, ringworm and pneumonia. The toothache, caries, leprosy, stings, syphilis, rheumatism and tumors were treated using latex of the plant. Powdered flowers have therapeutic value for coughs, colds, and asthma. The leaf extraction has potential to heal burns and relief headaches, rheumatic pains. Mosquito repellent efficacy of flower extracts was already published. In addition, because of the massive forest destruction, it has been included in the Red Data Book of IUCN. This paper will discuss the significance of this species and the medicinal value to convince the importance of conservation by reintroducing regenerated plants into their natural habitats

Keywords: *Calotropis gigantean*, Traditional Medicine, Red data book, Wara

INTRODUCTION

Calotropis gigantean 'Wara', is a drought-resistant and salt-tolerant plant belongs to the Apocynaceae family (Orwa *et al.*, 2009) that usually referred to as "Giant milkweed" and locally referred to as "wara" in Sri Lanka. It has several names in various nations and even in the same country it is called by different names. As an example; Arka in India, Remiga in Malaysia, Bidhuri in Indonesia, Kapal-kapal in Philippines, Po thuean in Thailand, B[oot]ng b[oot]ng in Vietnam, Faux arbre de soie in French. However, in English it is called as English Crown flower, giant Indian milkweed (Kumar *et al.*, 2013). *Calotropis* is native to Sri Lanka, Thailand, China, Cambodia, India, Malay Islands, Philippines, and Indonesia. Moreover, it is distributed within; Myanmar, Niger, Nigeria, Nepal, Oman, Pakistan, Senegal, Sudan and Saudi Arabia (Poonam & Punia, 2013).

The purpose of this review paper is to identify and introduce the properties of *C.gigantean*, as well as to summarize the health benefits in a broad sense. In some countries, this species has already been designated as an endangered species, and this paper will discuss the importance of the plant and also go through some uses of *C.gigantean*. Therefore this article is intended to be useful for both scientific and lay audiences.

Botanical Characters

The family of Apocynaceae mainly comprises of latex bearing plants with more than 280 genera and

2,000 species (Mushir *et al.*, 2016) that are fundamentally conveyed to the tropical and subtropical Africa and Asia. Apocynaceae are the placed in the Gentianales order under the Asteridae subclass (Rahman & Wilcock, 1991).

Kindom: Plante

Order: Gentianales

Family: Apocynaceae

Subfamily: Asclepiadaceae

Genus: *Calotropis*

Species: *Calotropis gigantea* (L.) W.T.Aiton

Morphological Characters

This grows up to 4-10 m like a large shrub or small tree. It has erect stems with 20 cm diameter consist with pale gray color barks and young woolly hairy shoots. Latex can be seen in all part of the plant (Plate: 01-A).

Thick leaves with opposite: decussate leaf arrangement but simple, not present petiole, Stipules are absent (Plate:01-B) Blade is widely ovate to oblong-obovate, 9.5-20 cm× 6-12.5 cm, apex is almost as acute type, and margins can be categorize under 'entire type' (Plate:01-C) Under the leaf, it's short-hairy (Gaur *et al.*, 2013, Singh *et al.*, 2014).

Axillary type inflorescence and umbellate - corymbose cyme up to 12.5 cm in diameter, 6-12 cm long peduncle and stout secondary branches up to 2 cm long. Bisexual Flowers with white, cream,

pale pink or purple in color; the pedicel is 2.5 - 4 cm long. Thickly hairs can be seen.

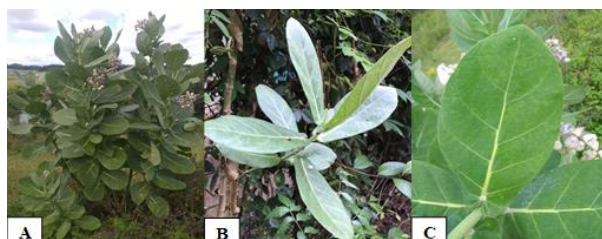


Plate 01: Morphological features of plant and leaf



Plate 02: Morphological features of Inflorescence and flower

Widely ovate calyx lobes and 4-6 mm 2-3 mm ; diameter of corolla is 2.5-4 cm. triangular shape broad lobes and 10-15 mm × 5-8 mm; 5 narrow corona; fleshy scales; laterally compressed, 6-11 mm in long but shorter than the stamina column; forming an upturned horn with two rounded auricles on either side, cream or sometimes lilac to purple in color, superior ovary , two celled, gynostegium up to 1 cm long, stigma head is star in shaped (Plate 02). (Gaur *et al.*, 2013, Singh *et al.*, 2014).



Plate 03: Morphological features of fruit

Insects like monarch, butterflies pollinate flowers. Progeny with genetic differences from their parents (chromosome number $2n = 22$). (Payal *et al.*,

2015). Each follicle is ovoid and a fruit is a couple of follicles; boat-shaped; inflated; simplistic; fleshy, and seeded. Seeds are 6.5-10 cm × 3-5 cm. ovoid shaped seeds, 5-6 mm in long, small, flat, and have a coma on one end (Plate 03) (Gaur *et al.*, 2013, Singh *et al.*, 2014).

Ecology of plant

Calotropis gigantea thrive in tropical and subtropical countries and grows at an altitude of up to 900 meters. It grows well with 300-400 mm downpour fall and mainly in sandy soils with great drainage. However, it can tolerate a variety of soil conditions including poor soils, especially where native grasses have been overgrazed. (Kumar *et al.*, 2013). Moreover, it will not thrive in wet soils without adequate drainage, as roots will affect to the root rot disease. *Calotropis gigantea*, also known as giant milk weed, is a type of weed and Full sun is ideal for growing weed. It blooms through the year and drought is not a limiting factor (Gaur *et al.*, 2013). Sri Lanka is an island surrounded by sea water. *Calotropis gigantea* is an ideal plant for beach side cultivation since this is a sun loving plant and having high salt tolerant potential

Propagation

Because the seeds are freely released into the air, regeneration occurs naturally and is very common. Conventionally *C. gigantea* propagated through seed or stem cuttings. Vegetative propagation of stem and root cuttings can be used to produce superior genotypes on a large scale (Kumar *et al.*, 2013). However, then seeds are distributed by water and wind (Gaur *et al.* 2013). Once established it requires only minimal care and do not necessarily require any specific cultivation techniques.

Medicinal properties

“Wara” has potential as a traditional medicine plant with a long history and can be used for many diseases. Root and leaf extracts were showed their therapeutic activities against cancers, syphilis, leprosy, abdominal tumors, and tuberculosis and heal the skin diseases, piles, wounds and insect bites. Roots (highly poisonous) are applied as an acute treatment to snakebites and specially, root bark is used as a treatment for dysentery, purgative, diaphoretic, emetic. Flowers are used for asthma (Motaleb *et al.*, 2011, Verma, 2014). White flower of *C. gigantea* is used to treat diabetes in the past (Manivannan *et al.*, 2017). Cold-related symptoms such as dropsy, rheumatism, and chest pain are treated with a poultice of warmed leaves. The twigs

are used for the preparation of diuretics, stomach tonic, and anti-diarrhoeotics and for treatment for the asthma. Also used to treat colic, headaches, lice, toothaches, ulcers, and swellings. (Motaleb *et al.*, 2011, Verma, 2014).

According to some researches, leaf extracts has a large number of bioactive secondary molecules such as alkaloids; tannins; saponin; flavonoids; and glycoside. The presence of these molecules indicated that it might be useful for medicinal purposes (Singh *et al.*, 2014). Moreover, *C. gigantea* leaves have traditionally been treated for stomach ulcers; syphilis; leprosy; types of skin diseases; insect bites; and diseases of elephants, according to Habib & Karim, (2009).

Latex has a strong purgative and caustic effect. For guinea worm blisters, ringworm, and scorpion stings, this is an effective treatment (Mann, 1997). Cholera and indigestion are also treated with the leaf and root –bark (Misra *et al.*, 1993). In India, this plant is used to treat skin conditions such as hypertrophic scars. Ash which has made by using gun powder from *C. gigantea* latex is used in treating dizziness, tooth aches, baldness, hair fall, intermittent fevers, rheumatoid/joints swellings and paralysis. Commercial products as eye tonic, pungent latex extracted from the leaf and flowers of *C. procera* is used (Vohra, 2004).

Some studies proven wound healing activity using the *Calotropis gigantia* latex and incision wound model, while latex has reported significant wound healing activity comparable to the standard FSC (Framycetin sulfate cream) for wounds (Nalwaya *et al.*, 2009). According to Saratha *et al.*, (2011), wild plant latex of *C. gigantea* contains lupeol which is a strong bioactive and widely used as an anti-inflammatory agent.

According to some research, the compounds found in the ethanol extracts of *C. gigantea* has antimicrobial, analgesic, wound healing, cytotoxic, anti-diarrheal, insecticidal, anti - oxidant, anti-inflammatory, anti-carcinogenic, anti-nociceptive properties, as well as hepato-protective properties. Therefore *C. gigantea* is an excellent antimicrobial agent. These findings will undoubtedly have a significant impact on drug and therapeutic research (Pattnaik *et al.*, 2016, Bairagi *et al.*, 2018).

In siddha medicine *C. gigantea* leaves utilized for various treatments. Venomous snake bites, periodic fever diseases, vatha diseases, intestinal worms, and ulcers are all can be treated with this plant. *C. gigantea* roots can be crushed and rubbed firmly on the snake bite area. Dental problems, rodent bites, swelling conditions, gonococcal type arthritis, and other rheumatic complaints are all treated with this

plant's latex. Bronchial type asthma can be treated with flowers of this plant (Kumar *et al.*, 2011).

Mosquito repellent activity

C. gigantea flower extracts had a large repellent efficacy against to the *C. quinquefasciatus* vector. Furthermore, *C. gigantea* flower extract can be used as an alternative to traditional insecticides for mosquito control. Moreover, toxicological tests of flower extracts have shown that it is not irritate human skin and that it is safe to use. In the preparation of mosquito repellents, t *C. gigantea* flower can be used alone or in combination with other mosquito repellent plants. Besides, it has a potential to control mosquito breeding in an integrated disease vector. This is a safe mosquito repellent that is both user-friendly and cost-effective (Dhivya *et al.*, 2013).

Industrial uses

Fibers of *Calotropis gigantea* use as a raw material for make carpets, ropes, fishing nets, and sewing thread with the high durability. Seed floss is good for stuffing purposes. The fishing-nets and twine are used Stem-bark yield fiber. The inner bark fiber is crucial for the fabric. (Payal *et al.*, 2015). 'Nari' leather is prepared by removing hair from goat skin by fermented mixture of *calotropis* and salt, and of sheep skins to make leather that is commonly used for bookbinding. (Singh *et al.*, 1996). In addition, *C. gigantea* is marketed as a houseplant and garden plant in different countries due to its ornamental potential as a butterfly attractor (Al Sulaibi *et al.*, 2020).

C. gigantea has also been investigated for use in the production of paper pulp and as a source of methane in anaerobic fermentation (Schmelzer and Gurib-Fakim 2008). Leaves can be used as mulching material, and the charcoal obtained from the wood was used in gun powder and fireworks. The gynostegium of the *C. gigantea* flower is used to make sweetmeats in China and Indonesia. In Vietnam, this plant is also used as a hedge plant. (Gaur *et al.*, 2013).

CONCLUSIONS

Calotropis gigantea is an important medicinal plant in Sri Lanka that has to be conserved since it is already in the Red data book of IUCN. The plant has high potential to use as a medicinal source and produce user friendly mosquito repellent. Hence, it is important to protect the plant as a native Sri Lankan species with diverse applications.

REFERENCES

- Al Sulaibi, M.A., Thiemann, C. and Thiemann, T., 2020. Chemical constituents and uses of *Calotropis procera* and *Calotropis gigantea*—A Review (Part I—The plants as material and energy resources). *Open Chemistry Journal*, 7(1), pp.1–15.
- Bairagi, S.M., Ghule, P. and Gilhotra, R., 2018. Pharmacology of Natural Products: A recent approach on *Calotropis gigantea* and *Calotropis procera*. *Ars Pharmaceutica (Internet)*, 59(1), pp.37-44.
- Dhivya, R. and Manimegalai, K., 2013. Mosquito repellent activity of *Calotropis gigantea* (Apocynaceae) flower extracts against the filarial vector *Culex quinquefasciatus*. *Hygeia: Journal for Drugs and Medicines*, 5(2), pp.56–62.
- Gaur, L.B., Bornare, S.S., Chavan, A.S., Mukh, R., Singh, S.P., Gaur, S.C. and Sudhir, K., 2013. Biological Activities and Medicinal Properties of Madar (*Calotropis gigantea* R. Br) An International Peer Reviewed Ayurved Journal, 1 pp.11-19
- Habib, M.R. and Karim, M.R., 2009. Antimicrobial and cytotoxic activity of di-(2-ethylhexyl) phthalate and anhydrosophoradiol-3-acetate isolated from *Calotropis gigantea* (Linn.) flower. *Mycobiology*, 37(1), pp.31-36.
- Kumar, G., Karthik, L. and Rao, K.V.B., 2011. A review on pharmacological and phytochemical profile of *Calotropis gigantea* Linn. *Pharmacologyonline*, 1, pp.1-8
- Kumar, P.S., Suresh, E. and Kalavathy, S., 2013. Review on a potential herb *Calotropis gigantea* (L.) R. Br. *Scholars Academic Journal of Pharmacy*, 2(2), pp.135-143.
- Manivannan, R. and Shopna, R., 2017. Antidiabetic activity of *Calotropis gigantea* white flower extracts in alloxan induced diabetic rats. *Journal of Drug Delivery and Therapeutics*, 7(3), pp.106-111.
- Mann, A., Abalaka, M.E. and Garba, S.A., 1997. The antimicrobial activity of the leaf extracts of *Calotropis procera*. *Biomedical letters*, 55(219/220), pp.205-210.
- Misra, M.K., Mohanty, M.K. and Das, P.K., 1993. Studies on the method—ethnobotany of *Calotropis gigantea* and *C. procera*. *Ancient science of life*, 13(1-2), pp.40.
- Motaleb, M. A. (2011). Selected medicinal plants of chittagong hill tracts. IUCN Bangladesh.
- Mushir, A., Jahan, N. and Ahmed, A., 2016. A review on phytochemical and biological properties of *Calotropis gigantea* (Linn.) R. Br. *Discovery Phytomedicine*, 3(3), pp.15.
- Nalwaya, N., Pokharna, G., Deb, L. and Jain, N.K., 2009. Wound healing activity of latex of *Calotropis gigantea*. *International journal of pharmacy and pharmaceutical sciences*, 1(1), pp.176-181.
- Orwa, C., Mutua, A., Kindt, R., Jamnadass, R. and Simons, A., 2009. Agroforestry Database: a tree reference and selection guide. Version 4. *Agroforestry Database: a tree reference and selection guide. Version 4*.
- Pattnaik, P.K., Kar, D., Chhatoi, H., Shahbazi, S., Ghosh, G. and Kuanar, A., 2017. Chemometric profile & antimicrobial activities of leaf extract of *Calotropis procera* and *Calotropis gigantea*. *Natural product research*, 31(16), pp.1954-1957.
- Payal, C., Sharma, R.A. (2015). An Overview on Giant Milkweed (*Calotropis procera* (Ait.) Ait. f.). *Journal of Plant Sciences. Special Issue: Medicinal Plants*. 3(1), pp. 19-24.
- Poonam & Punia, G. 2013, "A Review on Varieties Of Arka - *Calotropis Procera* (Aiton) Dryand. And *Calotropis gigantea* (L.) Dryand", *Global Journal of Research on Medicinal Plants & Indigenous Medicine*. 2(5), pp. 392-400.
- Rahman, M.A. and Wilcock, C.C., 1991. A taxonomic revision of *Calotropis* (Asclepiadaceae). *Nordic Journal of Botany*, 11(3), pp.301-308.
- Saratha, V., Pillai, S.I. and Subramanian, S., 2011. Isolation and characterization of lupeol, a triterpenoid from *Calotropis gigantea* latex. *Int. J. Pharm. Sci. Rev. Res*, 10(2), pp.54-57.
- Schmelzer, G.H. and Gurib-Fakim, A., 2008. *Medicinal plants* 2 (Vol. 11). Prota.
- Singh, N., Gupta, P., Patel, A.V. and Pathak, A.K., 2014. *Calotropis gigantea*: A Review on its phytochemical & pharmacological profile. *Int. J. of Pharmacognosy*, 1, pp.1-8.
- Singh, S., Singh, S., Mishra, R.M. and Shrivastava, M.P., 2014. Preliminary phytochemical screening of *Calotropis gigantea* leaf. *International Journal of Scientific and Research Publications*, 4(2), pp.1-3.
- Singh, U., Wadhwani, A. M., & Johri, B. M. (1996). *Dictionary of economic plants in India*. Indian Council of Agricultural Research.
- Verma, V.N., 2014. The chemical study of *Calotropis*. *International Letters of Chemistry, Physics and Astronomy*, 1, pp.74-90.
- Vohra, R. (2004) *Calotropis* the medicinal weed. Online medicinal book store, India, 2004. Yoganarasimhan SN (2000) Medicinal plants of India.