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Review Article

**BIOLOGICAL ACTIVITIES AND MEDICINAL PROPERTIES OF MADAR
(*CALOTROPIS GIGANTEAN R.BR*)**
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ABSTRACT:

Calotropis gigantean, R.Br. is a shrub with clusters of flowers of white or lavender colour. They grow widely in Thailand, Singapore, China, Sri Lanka and Malay Islands. In India, the shrubs are very common and grow widely in compounds of temples and other waste lands. It is called as Madar. Large shrub or small tree up to 4-10 m tall, much-branched at base, stems erect, up to 20 cm in diameter; bark pale grey, longitudinally cracked; young shoots woolly hairy; latex in all parts. The White Madar plants are very slow growing but are fleshy in nature especially the leaves and stems. The flowers, bark with milky latex has high medicinal value. Hindus in India offer the flowers of Calotropis gigantea to Lord Ganesha. The flowers are said to cure all ailments and make you live healthy. This plant said to yield gutta-percha from the milky sap; a strong fibre from the bark; useful floss from the seeds; and a medicine from the root-bark. Calotropis gigantea is fast growing and flowers throughout the year, but especially during the hot season. It is primarily pollinated by bees, butterflies and wasps. Some reports indicate that C. gigantea affects germination and seedling vigour of agricultural crops. All parts of Calotropis gigantea are toxic due to the presence of several cardiac glycosides (cardenolides). The latex contains the cardenolides calotropin, calotoxin and uscharin (which has been patented to combat uncontrolled cell proliferation), as well as the proteinase calotropain. Calotropin is a quick-acting heart stimulant, and is known to be 15–20 times more poisonous than strychnine: minute amounts can cause death. In the cat, the cardiotonic actions of calotroposide, calotoxoside and uscharin are 83%, 76% and 58% of the action of ouabain, respectively

Key words: *Calotropis gigantean, R.Br. Diseases, Uses and properties.*

INTRODUCTION**Correspondent:**

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Botanical Name of madar is *Calotropis gigantean, R.Br.* It belongs to the family Apocynaceae, Subfamily: Asclepiadoideae,

chromosome number $2n = 22$. It is a large shrub of about 4 m. The leaves are thick, opposite decussate in arrangement and coated with white powder. Flowers are umbellate lateral cymes and white in colour. It is typical leaves and flowers, which are quite unique in structure.



Each flower consists of five pointed petals and a small, elegant "crown" rising from the centre, which holds the stamens. The plant has oval, light green leaves and milky stem. The flowers long lasting as a consequence they are used in various floral arrangements in Thailand. They were also supposed to be popular with the Hawaiian Queen Liliuokalani, who considered them as symbol of royalty and wore them strung into leis. In India, the plant is common in the compounds of temples and is known as Madar. While in Cambodia, they are used in funerals to decorate the urn or sarcophagus and the interior of the house holding the funeral. This plant plays host to a variety of insects and butterflies. *Calotropis* species are considered common weeds in some parts of the world. The flowers are fragrant and are often used in

making floral tassels in some mainland Southeast Asian cultures. Fibres of these plants are called madar . The plant is known as Arka in Ayurveda and was used in cases of coetaneous diseases, intestinal worms, cough, ascites, asthma, bronchitis, dyspepsia, paralysis, swellings, intermittent fevers, anorexia, inflammations and tumours. In large doses, *C. gigantea* R.Br. is known to act as a purgative and an emetic. *C. gigantea* R.Br. is a much larger coarser plant and it is widely spread in India. It is an erect, spreading and perennial bush, frequent in most tropical countries, in India being especially abundant in Bengal, Assam and South India. There are two species of Madar *C. gigantea* R.Br. and *C. Procera* (Aiton).

Common Names of *Calotropis gigantea* R.Br.

The common names include in hindi known as Madar, in Bengali Aakand, in Sanskrit is known 'Alark' and Mandar, in



Gujtati Aakdo, in Assamese Ushar or Ushaar etc. In Tamil, it is called as Erukku

and in Marathi, it is known as Rui and Aak.

Origin and Geographic distribution

Calotropis gigantea R.Br. is native to continental Asia and South-East Asia and has been introduced in the Pacific Islands, Australia, Central and northern South America and Africa as an ornamental near villages and temples and as a weed. In Africa it is recorded from Gabon, DR Congo, Sudan, Kenya, Tanzania, Angola and Mozambique, as well as from Seychelles and Mauritius. However, its distribution is incompletely known, and it probably occurs in other countries.

General Description

Large shrub or small tree up to 4-10 m tall, much-branched at base, stems erect, up to 20 cm in diameter; bark pale gray, longitudinally cracked; young shoots woolly hairy; latex in all parts. Leaves opposite, decussate, simple and entire, sessile; stipules absent; blade broadly ovate to oblong-obovate, 9.5–20 cm × 6–12.5 cm, base cordate with semi-amplexicaul lobes, apex almost acute, short-hairy beneath. Inflorescence is an axillary, umbellate to almost corymbose cyme up to 12.5 cm in diameter, peduncle 6–12 cm long, stout, secondary branches up to 2 cm long.

Flowers bisexual, regular, 5-merous, white, cream, lilac or purple; pedicel 2.5–4 cm long, densely woolly hairy; calyx lobes broadly ovate, 4–6 mm × 2–3 mm; corolla 2.5–4 cm in diameter, lobes broadly triangular, 10–15 mm × 5–8 mm; corona with 5 narrow, fleshy scales, laterally compressed, 6–11 mm long, adnate to and shorter than the staminal column, forming an upturned horn with 2 rounded auricles on either side, cream or lilac to purple, with a dense longitudinal dorsal row of short white hairs; ovary superior, 2-celled, gynostegium up to 1 cm long, stigma head star-shaped. Fruit is a pair of follicles, each follicle ovoid, boat-shaped, inflated, 6.5–10 cm × 3–5 cm, many-seeded. Seeds ovoid, 5–6 mm long, with 2–3 cm long



coma at one end.

Propagation and planting

Calotropis gigantea R.Br. can be propagated by seed or stem cuttings. The seeds are dispersed by wind and water. It can also be multiplied by tissue culture methods such as cell suspension cultures. India has varied agro climatic zones which have wide range of temperature, humidity,

rainfall and soil conditions. Growth and productivity of plant depends upon a large number of nutritional and environmental factors. This is more important in respect to laticiferous plants whose growth is influenced significantly by soil composition. As a member of the milkweed family, the giant milk weed is sometimes planted to attract monarch butterflies. It is occasionally found in nurseries, but deserves wider use. The giant milkweed grows best in full sun. It does not do well in wet soils as this promotes root rot. Once established it requires only minimal care. The growth might be quite straggly if not regularly attended to. Shrubs can be pinched back to encourage a thicker canopy. If a small tree is the objective, lightly prune the tree after it has attained 3 to 4 feet of clear trunk. Frequent pruning is required thereafter to develop a full, bushy crown. In summer the plant might become semi deciduous. It is a frequent bloomer unaffected by drought.

Growth and development

Calotropis gigantea R.Br. is fast growing and flowers throughout the year, but especially during the hot season. It is primarily pollinated by bees, butterflies and wasps. Some reports indicate that *C. gigantea* R.Br. affects germination and seedling vigour of agricultural crops.

However, the extracts failed to produce any detrimental effects on weeds.

Phytochemistry of Calotropis

The previous workers have reported many phytochemical constituents in the various parts of *Calotropis gigantea* R.Br. especially in the leaves. Usharin, gigantol, calcium oxalate, alpha and beta-calotropol, beta-amyrin., fatty acids (both saturated and unsaturated), hydrocarbons, acetates and the benzoates, a mixture of tetracyclic triterpene compounds, terols, giganteol and gigantol are also found to be present [10,11,12], Cardenolide calotropin [8], α -amyrin, β -amyrin, taraxasterol, β -sitosterol, α -amyrin methylbutazone, β -amyrin methylbutazone, α -amyrin acetate, β -amyrin acetate, taraxasteryl acetate, lupeol acetate B, gigantursenyl acetate A, gigantursenyl acetate B [5,15 flavonol glycoside, akundarol, uscharidin, calotropin, frugoside, calotroposides A to G [4] are responsible for many of its activities. The following cardenolides are also described in the literature: calactin, calotoxin, calotropagenin, proceroside, syriogenine, uscharidin, uscharin, uzarigenin and voruscharin [2,16,9]. Other compounds found are benzoylisolineolone and benzoyllineolone [3]. Flavonoids [4], triterpenoids [13], alkaloids, steroids, glycosides, saponins, terpenes, enzymes, alcohol, resin, fatty acids and esters of

calotropeols [14], volatile long chain fatty acids, glycosides and proteases [7] have been isolated from the various parts of the plant *Calotropis gigantea* R.Br..

Calotropin is a quick-acting heart stimulant, and is known to be 15–20 times more poisonous than strychnine: minute amounts can cause death. In the cat, the cardiotoxic actions of calotroposide, calotoxoside and uscharin are 83%, 76% and 58% of the action of ouabain, respectively. The lethal dose for calotropin is 0.12 mg/kg. Calotropone, as well as other isolated cardenolides, display inhibitory effects towards various cell lines of human origin.

Calotropis gigantea R.Br. is also known to cause allergic contact dermatitis, and the latex causes kerato-conjunctivitis. The cheese making capacity of the latex was studied as well as the effect of various parameters on the coagulating activity of the latex. The pH of the latex was 6.0. Coagulating activity of latex stored at 28°C was impaired within 24 hours, whereas latex stored at 4°C showed high stability. The optimum coagulation temperature and time for the latex were 80°C and 5 minutes, respectively. The optimum concentration of the latex for milk coagulation was 1.5%. As the temperature rose, the coagulating activity increased. Yields were lower when coagulation time was longer. The protein,

fat, and lactose contents of the cheese were 20%, 14.5% and 2.5%, respectively (Jiofack Tafokou, R.B., 2010).

Adulterations and substitutes

In Africa, lemon juice is sometimes used as a substitute for the latex as a coagulant for making soft white cheese. In Asia *Calotropis gigantea* R.Br. is used as a substitute for ipecacuanha (*Carapichea ipecacuanha* (Brot.) L.Andersson), from tropical America, as an effective cure for amoebic dysentery, but it has a stronger tendency to produce vomiting and depression.

Diseases and pests

The leaf hopper *Poecilocerus pictus* is a pest of *Calotropis gigantea* R.Br. plants. The oleander aphid (*Aphis nerii*) and the caterpillars of the tiger butterfly (*Danaus chrysippus*) and of the monarch butterfly (*Danaus plexippus*) feed on *Calotropis* spp., using the cardenolides as a chemical defence mechanism. The nematodes *Meloidogyne incognita* and *Meloidogyne javanica* are found on the roots of *Calotropis gigantea* in India, although the leaf extract kills them. A sap-transmissible mosaic disease of *Calotropis gigantea* is transmitted by *Aphis nerii*.

Primary Medicinal Uses

The whole plant is used for skin diseases, boils and sores and as a tonic and purgative in small doses, and as an emetic in larger doses. The powdered root bark is used to cure dysentery, elephantiasis, and leprosy. The stem bark is diaphoretic and expectorant, and is used for dysentery, spleen complaints, convulsions, lumbago, scabies, ringworm, pneumonia, and to induce labour. The latex is used on stings, toothache, caries, ringworm, leprosy, syphilis, rheumatism and tumours, and also as an antiseptic, vermifuge, emetic and purgative, as well as for poisoning arrows. The powdered flowers are given for coughs, colds and asthma. The crushed and warmed leaves are applied on burns, headaches and rheumatic pains, and as a tincture for intermittent fever.

Remedy for poisonous snake bites: If bitten by poisonous snakes, few leaves of the plant are plucked and chewed. Alternatively, the roots of the plant are crushed and the juice is applied over the bitten area. Source:-
www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Fever: Juice is extracted from *Calotropis gigantea* R.Br. leaves and mixed with equal quantity of honey. When consumed, it cures fever. The body temperature

comes down immediately. Source:-
www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Intestinal Worms: Juice is extracted from the leaves and mixed with honey and consumed. The worms in the intestines get killed. Source:-
www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Stomach ulcers: The leaves of *Calotropis gigantea* R.Br. are dried and powdered. They can be applied externally over the stomach to heal ulcers. Source:-
www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Rheumatic disorders: The plants of *Calotropis gigantea* have latex in them. This latex can be taken and applied over the infected area. This could be used in swellings or rat bitten areas or other disorder infected area. The latex can also be applied over the dental area for any tooth related problems. Source:-
www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Purgative: White Madar acts as a strong purgative. It cleans the unwanted waste contained in the stomach and makes stomach clean. Source:-
www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Stomach Disorders: Erukku is also very effective in curing various stomach disorders. The herb boosts the functions of the various organs in the body. They have the ability to expel the unwanted waste from the body very effectively. They are also very effective in curing dysentery.

Source:-

www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Nerve disorders: The latex from the plant is taken and applied over the body to cure nerve disorders. The herb impacts a calm nature to the mind.

Source:-
www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Asthma: The flowers of the herb Erukku or White Madar have high medicinal value in treating asthma.

Source:-
www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Rejuvenative: The herb increases the blood circulation in the body. It increases the energy levels. It keeps the mind calm, energizes the nerves and provides youthful feeling.

Source:-
www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Abortion: The herb has been used for inducing abortions in India. The leaves of the plant were inserted into the cervix so

that it causes labour pains and induces abortion.

Source:-

www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Skin Disorders: The oil extracted from the herb is used to treat skin problems like eczema, ringworm, etc. It also cures the bites caused due to insects or scorpions.

Source:-

www.ayurvedicnaturalhomeremedies.com/calotropis-gigantea Jun 9, 2013.

Additional Uses

In Indonesia and Thailand, however, the floss is said to be made into thread, sometimes combined with cotton fibre.

Calotropis gigantea R.Br. has also been tested for use in the paper pulp fabrication, and as a source of methane, through anaerobic fermentation for bio fuel production, although its potential is limited due to its invasive properties. *Calotropis gigantea R.Br.* is sometimes used as fuel wood, but it is of poor quality. In Indo-China, charcoal from the wood was used in gun powder and fireworks. The leaves can be used for mulching, green manuring of rice fields and for binding sandy soil. In Vietnam, *Calotropis gigantea R.Br.* is planted as a hedge plant. A fermented mixture of the latex and salt is used to remove the hair from goat skins for production of 'nari leather' and of sheep

skins to make leather which is used for book-binding. The gynostegium is used by the Chinese in Indonesia in sweetmeats. In India, Thailand, the Philippines and Hawaii the long-lasting flowers of *Calotropis gigantea* R.Br. are used in various floral arrangements in temples and in rosaries. It is also widely planted as an ornamental.

Precautions

- The medicine should be consumed only in small quantities. If taken in excess, it induces vomiting.
- Pregnant women should not consume this, since it induces abortion.

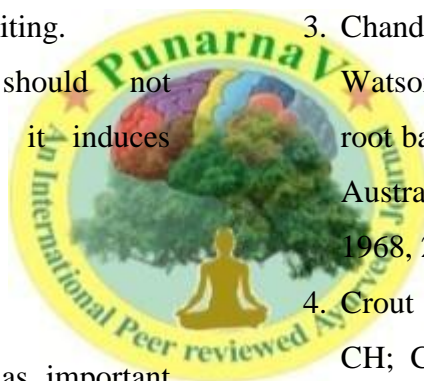
CONCLUSION

Calotropis gigantea R.Br. has important uses in traditional medicine, although it is very poisonous, due to the presence of cardiac glycosides. This toxicity will strongly limit its potential use in local medicine. Also, the patenting of the cardenolide uscharine has not led to its use as a medicine. Extracts of *Calotropis gigantea* R.Br. however, display a range of interesting pharmacological activities, e.g. anti-ulcer, anti-inflammatory, analgesic, antipyretic, anticonvulsant, antiarthritic, anxiolytic and sedative activity in various

experimental models with rats, which merit further research.

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