

POTENTIAL MEDICINAL PROPERTIES OF *CALOTROPIS GIGANTEA* LINN: A REVIEW

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ABSTRACT

The aim of this present study is to evaluate the parameters of different part of *Calotropis gigantea*. *Calotropis gigantea* (L.) R. Br. belonging to the family *Apocynaceae*. It is a well known medicinal shrub commonly known as milkweed and also Madar in Hindi. It is a perennial herb with a long history of use in traditional medicines and has been used in Ayurveda, Unani, Siddha system of medicine for years. Mostly found in India, China and Malaysia on a large scale. *Calotropis gigantea* have unique properties and it is also one such plant used alone or with other medicinal drugs to treat common diseases. In Ayurvedic system of medicine it is widely used for healing various acute and chronic disease. The chemical constituents are, flavonoids, cardenolides, terpenes, pregnanes and non-protein amino acids. It also has used to treat various diseased conditions such as tumors, leprosy, ulcers, and piles. It also shows pharmacological activities like CNS activity, analgesic activity, pregnancy interceptive activity, procoagulant activity, antipyretic activity, anti-inflammatory activity, anti-diarrheal activity, free radical scavenging activity, antimicrobial activity, anti-tumor activity, antifungal activity, antitussive activity, and anti-feedant activity.

KEYWORDS: *Calotropis Gigantea*, Milk weed, CNS activity, Hepatoprotective activity, Anti-tussive activity.

INTRODUCTION

India being a tropical nation is favored with common assets and antiquated information for its judicious utilization.^[1] The medicinal plant is exploited as a extraordinary environmental and biological diversity compared with the rest of the world.^[2] Natural products are increasing their restoration in numerous allopathic drugs causing extreme side effects and toxic and harmful effects. In the developing countries World Health Organization (WHO) heavily encourage to increase the use of herbal drugs as an alternative medicinal practice.^[3] It is estimated that around 45% of flowering plants to have medicinal importance. India ranks 4th in Asian countries and 10th among the plant rich countries of the world.^[4] India is also called as the botanical garden of the world because it is the largest producer of medicinal herbs in the world.^[5] *Calotropis gigantea* plant is one of the valuable medicinal herbs in that botanical garden commonly known as arka.^[6] Traditionally, it is believed that, when this herb is used for observation and clocking including the basic principles, they produce highly therapeutic effects.^[7] In Sanskrit, arka means

“radiance of the Sun” which signifies its advantage and ability to treat many diseases. *Calotropis* is distinguished in two types such as *Calotropis gigantea* and *Calotropis procera*. *Calotropis gigantea* is known as “Sweta arka” (white flowered) and *Calotropis procera* as “Rakta arka” (purple flowered).^[8] Both of them are often similar in their botanical aspects and also have similar pharmacological effects. Among the two varieties, Rakta arka (*Calotropis procera*) is more toxic and is assumed even more poisonous than cobra venom.^[9-10]

MYTHOLOGICAL SIGNIFICANCE

Calotropis gigantea, a crown bloom having a lovely purple colored, somewhat scented blossom with sweet and pleasant scent. In India, it is stated that arka is white flower with bluish color similar to Shiva's color. It is offered to Lord Shiva. Another name for arka is Lord Surya as described in Hindu epic Suryashotra. It is said that When God were doing ritual pooja for Lord surya some milk spilled on the earth. From that spilled milk a plant has been invented i.e arka.^[11-12]



Fig. 1: *Calotropis gigantea*.

Origin and Geographical Distribution

Calotropis gigantea is local to Asia and South-East Asia and has been presented within the Pacific Islands,

Australia, Central and northern South America and Africa as a decorative herb.^[13]

Taxonomical Hierarchy^[14-16]

Kingdom	:	Plantae
Order	:	Gentianales
Family	:	Apocynaceae
Subfamily	:	Asclepiadoideae
Genus	:	Calotropis
Species	:	Calotropis gigantea

Vernacular Names^[17-19]

English	:	Madar, Giant Milk-weed, Roostertree, Mudar plant
Sanskrit	:	Alarka, Rajaarka, Shvetarka, Asuka, Madaar, Bhasvanmuula, Dinesh, Prabhakar
Unani	:	Madaar, Aak
Siddha	:	Erukku
French	:	Calotrope, Pomme de Sodome
German	:	WahreMudarpflanzer, Gomeiner
Italian	:	Calotropo
Bengali	:	Aaknad
Telugu	:	Jilledu, Mandaram
Punjabi	:	Ak
Arab	:	Ushar
Persian	:	Kharak

Biological Aspects

Habitat	Xerophytic adaptation (mesophyte).
Habit	Shrub
Stem	Aerial, erect, cylindrical, solid, herbaceous, glabrous with milky latex.
Leaf	Ramel or Cauline, opposite decussate, subsessile, simple, exstipulate, ovate to Elliptical, entire, acute, glaucous, reticulate uncostate, coriaceous.
Inflorescence	Extra axillary, umbelate (or) dichasial cyme.
Flower In General	Pedicellate, bracteate, ebracteolate (or) bracteolate, complete, bisexual, actinomorphic, cyclic, hypogynous, pentamerous, dichlamydeous and heterochlamydeous.
Flower In Detail	5 Sepals, polysepalous, ascendingly imbricate, 5 petals, polypetalous, valvate, 5, epipetalous or gynandrous, exerted stamens, introrse, dithecous anther. Basifixed in asclepiadoideae behind the stamens the extensions of corolla are present called coronary corolla. The two anther lobes of adjacent stamens fuses to form a lambda shaped structure called translator mechanism. Androecium fuses with gynoecium to form gynostegium.

Gynoecium : 2 carpels, bicarpellary, sub-apocarpous, bilocular, superior, marginal placentation, terminal, fuses with pentagonal disc

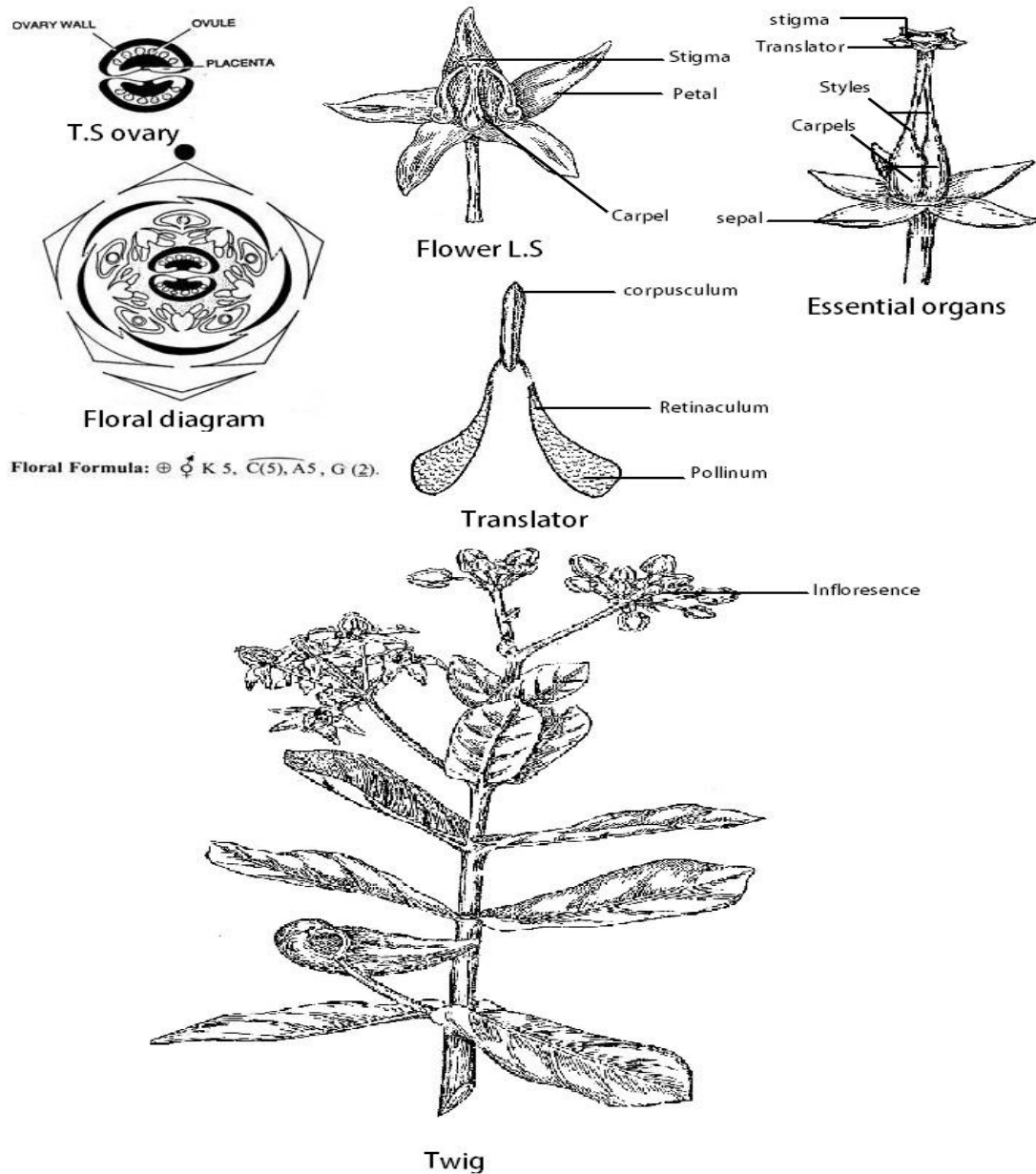


Fig. 2: Ovary T.S, Floral structure, Essential organs of *Calotropis*.

MORPHOLOGY

Calotropis Gigantea is a tall shrub reaching about 2.4-3 m long; furrowed; branches stout, terete, bark yellowish white, covered more or less especially the younger ones with fine appressed cottony pubescence. Leaves 10-20 by 3.8-10cm, sessile, or nearly so, abovate-oblong or elliptic-oblong, thick, acute, glaucous-green, clothed beneath and more or less above with fine cottony tomentum, cordate, sometimes amplexicaul, base narrow. Flowers are purplish or white, inodorous, 3.5-5cm. diameter, in umbellate lateral cymes; peduncles from between the petioles, 5.9 cm. long, dilated at the base; pedicels much higher than the flowers, covered with cotton wool; buds ovoid. Calyx are divided to the base;

Sepals is 6 by 4mm, acute, ovate, cottony. Corolla is 2 cm. long or more, Lobes is 1.3-1.6cm long, sub acute, deltoid-ovate, revolute and twisted in age; lobes of the corolla is 1.3cm. long by 5 mm. Broad in the middle, shorter than the column, the back much curved towards the column above the obtuse spur, the apex rounded (not bifid) with 2 obtuse auricles just below it, pubescent on the slightly thickened margin. Follicles is 9-10 cm. long, thick, broad, fleshy, green, ventricose. Seed is about 6 by 5 mm, numerous, broadly ovate, narrowly margined, flattened, minutely tomentose, brown, coma 2.5-3.2 cm long.^[20]

Chemical Constituents

Chemical examination of this plant has appeared the presence of saponins, terpenoids, flavonoids, cardiac glycosides, steroids. Cardenolide calotropin, 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, flavonol glycoside, akundarol, uscharidin, calotropin, frugoside calotroposides A to G are responsible for many of its activities. Cardenolides are also Explained in the literature: calactin, calotoxin, calotropagenin, proceroside, syriogenine, uscharidin, uscharin, uzarigenin, and voruscharin. Flavonoids, triterpenoids, alkaloids, steroids, glycosides, saponins, terpenes, enzymes, alcohol, resin, fatty acids and esters of calotropeols, volatile long chain fatty acids, glycosides and proteases have been separated from the various parts of the plant *Calotropis gigantea*.^[21-31]

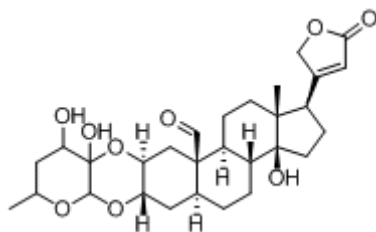


Fig. 3: Structure of Calotropin.

Pharmacological Activity^[32-33]

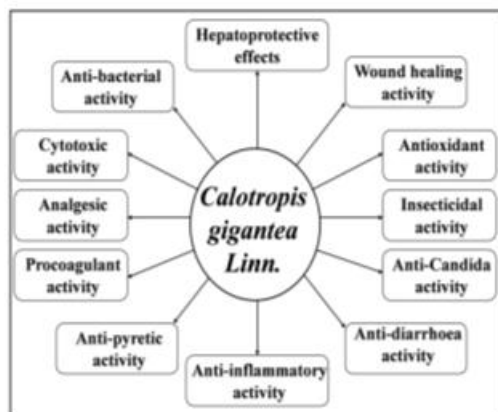


Fig. 4: Potential Medicinal properties of *Calotropis Gigantea* Linn.

Anti-diarrhoeal activity

The hydroalcoholic (50:50) extract of aerial part of *Calotropis gigantea* shows anti-diarrhoeal effect which was studied against castor oil-induced-diarrhoea model in rats. The gastrointestinal travel rate was expressed as the percentage of the longest distance travelled by the charcoal divided by the total length of the small intestine. After examining the castor oil induced diarrhoea model in rats in which castor oil facilitates the weight and volume of intestinal content by enteropooling method.

Antipyretic activity

The roots of *Calotropis gigantea* have been used in eczema, leprosy, syphilis, ulceration, elephantiasis and cough in the Indian pharmaceutical system of traditional medicine. The TAB (Typhoid) vaccine-induced pyrexia in rats and rabbits. In both yeast-induced and TAB vaccine-induced fever, the fever was all together decreased and the body temperature was normalized by 200 and 400 mg/kg dose administered intraperitoneally.

CNS activity

The albino rats was tested orally with the alcoholic extract of peeled root of *calotropis giganteae* (Asclepiadaceae) R.Br at the dose level of 250 and 500 mg/kg body wt for CNS activity. In Eddy's hot plate method and acetic acid induced writhings it was observed that it shows prominent analgesic effect. The numbers of writhings were greatly reduced and paw licking time was delayed. As there was a delay in the onset of pentylenetetrazole induced convulsions as well as decrease in its severity by significant anticonvulsion activity. The extract treated rats spent more time in the open arm of EPM showing its antianxiety activity.

Analgesic activity

The alcoholic extract of the flowers of *Calotropis gigantea* was given orally and taken for its analgesic activity in chemical and thermal models in mice. In the test of acetic acid induced writhing, at the doses of 250 and 500 mg/kg an inhibition of 20.97% and 43.0% in the number of writhes was observed, respectively. In the hot plate method the paw licking time observed delayed. The analgesic effect was observed after 30 min of dose administration which reached its maximum after 90 min.

Anti-inflammatory activity

The evaluation of anti-inflammatory activity was done using carrageenin-induced kaolin induced rat paw oedema for acute and cotton pellet granuloma, adjuvant-induced arthritis model for chronic inflammation. Antipyretic activity was evaluated out using yeast induced pyresis method. For analgesic activity Phenylquinone--induced writhing method in mice was used. Test compound shows variable anti-inflammatory activity and peak activity of the test compounds were reached at 2hours. Alkaloid fraction posses comparatively increased initial anti-inflammatory activity. The residual anti-inflammatory activity of alkaloid fraction of *Calotropis gigantea* suggests either a greater malic enzyme of a filarial worm *Setariadigitata*: some properties and effects of drugs and herbal extracts.

Hepatoprotective activity

Methanolic extract of *Calotropis gigantea* plant leaf shows a good hepatoprotective activity in dose dependant manner against CCl₄ induced hepatotoxicity in rats.

Antitussive activity

Leaf extract from *calotropis giganteae* plant showed antitussive activity due to presence of alkaloids and glycosides.

USES

Asthma, Abortifacient, Anti-cancer, Anthelmintic, CNS activity, Epilepsy, Eczema Expectorant, Fever, Leprosy, Migraine. Finally the result of these things useful of ethanolextract of *Calotropis gigantean*. The plant is purgative, anthelmintic, alexipharmic, cures leprosy, leucoderma, ulcers, tumors, piles, diseases of the spleen, the liver, and the abdomen; the juice is anthelmintic and leucoderma, tumors, ascites, diseases of the abdomen. The leaves are applied to paralyzed parts, painful joints, swellings; heal wounds. The tincture from the leaves used as antiperiodic in cases of intermittent fevers.^[35-37]

Inflammations, tumors, rat-bite, good in ascites. The milk is bitter, heating, purgative; Laxative; cures piles. The root bark is diaphoretic; cures asthma and syphilis. The flower is sweet, bitter, anthelmintic, analgesic, astringent.

CONCLUSION

In recent years, ethnomedicinal studies received much attention as this brings to light the numerous little known and unknown medicinal virtues especially of plant origin. Pharmacological screenings of *C. gigantea* revealed its medicinal potential and represents as a valuable medicinal plant with several medicinal properties. As the pharmacologists are looking forward to develop new drugs from natural sources, development of modern drugs from *Calotropis gigantea* can be emphasized for the control of various diseases. A systemic research and development work should be undertaken for the conservation of *C. gigantea* and development of products for their better economic and therapeutic utilization.

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