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A Brief Review on *Giant calotropis* Linn- Indian Traditional Medicine

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Vishakha G Patil[1*], Kajal S Chaudhari[2], Himanshu C Chaudhari[3]

[1, 2, 3]PSGVP Mandal's College of pharmacy, Shahada, Maharashtra, India 425409

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ABSTRACT

Calotropis gigantea (Giant Calotropis) It is a multipurpose plant belonging to the family (Asclepiadaceae) that has been known for centuries for its pharmacological importance. This plant can be found all over India. In Hindi, it is commonly referred to as arka. *Calotropis gigantea* is one such plant that has been endowed with the best natural resources and ancient knowledge for its wise use. The systematic position, vernacular names, vegetative characters, Ecology and distribution, Phytochemistry, and economic values of *Calotropis gigantea* are discussed in this review. It is a multipurpose plant that can be used for medicine and to treat a variety of diseases. *Calotropis gigantea* Linn is a well-known Healthful herb, also known as Milkweed, that has been used in the Unani, Ayurvedic, and Siddha systems of medicine for many years. It is currently being extensively researched for potential pharmacological applications. Several aspects of giant calotrope have been discussed in this review, including its general characteristics, current, and potential uses, and invasive tendencies. The objectives of this review are a) to compile the information available in the literature on Giant calotrope, to make it accessible for future research, b) to enlist together its potential applications being investigated in different fields.

INTRODUCTION

Calotropis gigantea is known as "Sweta Arka" in ancient Ayurvedic medicine, while *Calotropis procera* is known as "Raktha Arka A." Both are frequently similar in botanical aspects and have similar pharmacological effects. Plants, animals, and other natural objects have had a profound influence on human culture and civilization in many parts of the world, including India, from prehistoric times to the modern era. *Calotropis gigantea* (crown bloom) is a Calotropis species found in Cambodia, Indonesia, Malaysia, the Philippines, Thailand, Sri Lanka, India, China, Pakistan, Nepal, Booc in Somalia, and tropical Africa. This plant is home to a variety of bugs and butterflies. It serves as a host plant for the non-transient ruler butterflies of Hawaii. Calotropis, also known as Madar, has been used in the Unani, Ayurvedic, and Siddha systems of medicine for many years. Within the indigenous system of Ayurvedic medicine, all parts of this plant are used as medicine. Milkweed (or Crown flower weed) is another name for it. *Calotropis gigantea* is a latex-producing plant that produces latex after a tissue injury. This milkweed plant has gained popularity in recent years as a potential pesticide source against insect pests. Plant latex may contain Alkaloids, tannins, gum, sugars, starch, resins, and proteins. This plant was widely used by all segments of society, either directly as folk remedies or indirectly as pharmaceutical preparation of recent medicine. Indian medicinal plants describe the utilization of this plant within the treatment of several ailments including anorexia, asthma, cold, and cough. Roasted leaves are helpful in painful joints or swellings. *Calotropis gigantea* has been shown to have mosquito repellent properties against *Culex gelidus* and *Culex tritaeniorhynchus* mosquitos, both of which serve as vectors for Japanese encephalitis. Significant larvicidal, repellent and ovicidal activity was demonstrated by the Calotropis gigantea leaf aqueous extract. This review will go over the plant's Taxonomic rank, Vernacular names, Origin, Geographical and Morphological distribution, Propagation, and Planting in detail. Phytochemicals, medicinal properties, and other applications. [(1)-(2).]

SCIENTIFIC CLASSIFICATION:

Kingdom: Plantae

Division: Magnoliophyt

Class: Magnoliopsida

Order: Gentianales

Family: *Apocynaceae*

Genus: Calotropis

Species: C. gigantean

COMMON NAMES:

English: Bowstring hemp, calotrope, crown flower, crown Plant, gaint milkweed,

Hindi: Safed aak

Kannada: Ekka

Manipuri: Angkot

Tamil: Erukku

Telungu: Jilledi puvvu

Sanskrit: Svetarka

ORIGIN AND DISTRIBUTION:

Calotropis gigantea is native to continental Asia and South-East Asia, but it has been introduced as an ornamental near villages and temples, as well as a weed, to the Pacific Islands, Australia, Central and Northern South America, and Africa. It has been observed in Gabon, the Democratic Republic of the Congo, Sudan, Kenya, Tanzania, Angola, and Mozambique, as well as Seychelles and Mauritius. However, its distribution is unknown, and it is likely to exist in other countries as well. It is a native of India, China, and Malaysia, and it has been widely distributed throughout the world. Lower Bengal, Himalaya, Punjab, Assam, Madras, and South India are the most common locations in India. In the Himalayas, from Punjab to Assam, common inwaste land, roadsides, and railway embankments ascend to about 1000 m in the Himalayas from Punjab to Assam.[3]

Morphology:

Macroscopic features

Calotropis gigantea is a 1-5 m tall, erect, heavily branched Shrub. The roots are cylindrical, tortuous, and frequently branched, externally yellowish Grey white while internally ceramic

white, and measure approximately 90 cm in length and 2.5-10 cm in diameter. The root bark is short, curved, and rarely quilled. Pieces are 2-5 mm thick and 3-5 cm wide, with a distinct mucilaginous, bitter taste. The leaves are simple, opposite-decussate, sub sessile, and exstipulate; the blade is oblong obovate to broadly obovate, and measures 5-30 2.5-15.5 cm. Flowers are complete, bisexual, bracteate, actino-Morphic, pentamerous, hypogynous, and peduncu-Late; calyx has five sepals and lobes that are briefly united at the base; and the corolla is gamopetalous. Fruit is simple, fleshy, and inflated, ranging from subglobose to obliquely ovoid. The seed is approximately 6 5 mm in diameter, flat compressed, and covered in silky white. PappusFruit has two follicles, each ovoid and boat-shaped, inflated, 6.5–10 cm 3–5 cm, and many-seeded. Seeds are surrounded by an abundance of white coma, and seeds are 5–6 mm long ovoid with a 2–3 cm long coma at one end Suckering is also used to propagate the plants. As a result, crowns and roots form suckers, and broken stems can take root and regenerate. Pollination is accomplished by insects, most notably bees and butterflies. (4)

Microscopic features:

The root's transverse section reveals the presence of cork as the outermost layer, which is regularly arranged with 15-20 layers of rectangular cells with no intercellular space. The cells in the cortex region are densely packed with starch grains. These cells were made up of irregularly shaped parenchymatic cells with laticiferous tubes and a calcium oxalate rosette. 5 Transverse section of a leaf through the midrib reveals an upper and lower single-layered epidermis externally covered with thick striated cuticle and few epidermal cells on both surfaces of the leaf Elongated to form uniseriate 2-3 celled trichomes. The majority of the xylem is made up of vessels and tracheid. Central cells were irregular in shape, with laticifers and vascular bundles scattered throughout were also present in this area in varying degrees (5). The details are shown in fig.1.

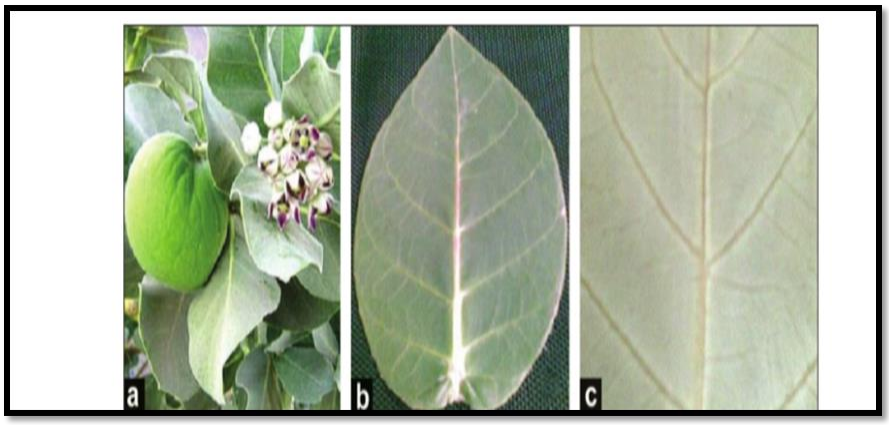
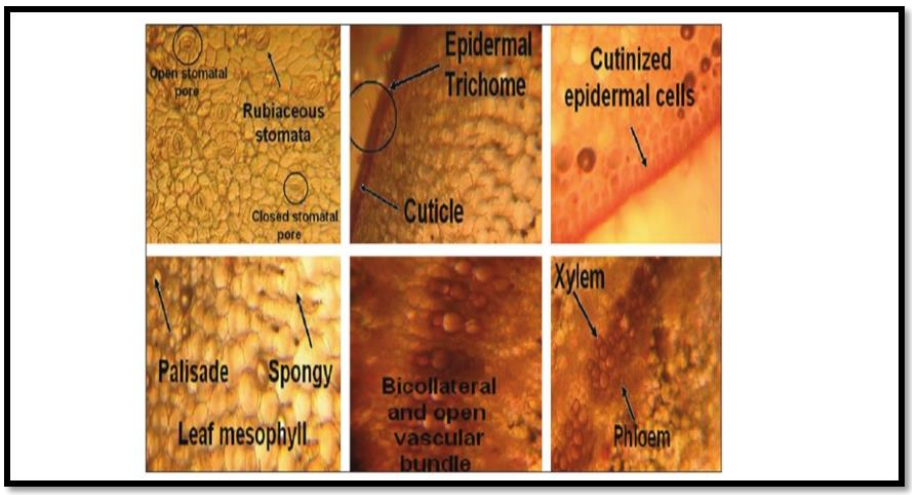


Fig1.morphology of Giant Calotropis

BOTANICAL DESCRIPTION:



Botanical description of Calotropis Includes following parts:

Bark & Branches: The bark is thick, rough, and corky, with a yellow-brown colour; the twigs are green and fleshy, with a tomentum covering (white fur-like hairs).

Leaves: Leaves are opposite-decussate, simple, ovate to obovate with 4-6 pairs of subopposite nerves prominent on the abaxial surface, an acute apex, sessile (almost decurrent) base pale green colour, and quite large which about 30×25cm.

Inflorescences: Inflorescences arise from the base of the leaves in pedunculate (c.7cm) cymes of 3-20.

Flowers: Flowers have five small triangular dirty white sepals, five thick ovate petals (c1cm x1cm) that are white at the base and purple at the tips, and five purple-tipped stamens that surround a white five-lobed stigma 11.

Fruits: Fruits consist of green, spongy ovoid fruits(follicles), up to 15cm long by 10cm wide They split open to release plumed, papery light brown seeds with a pappus of white filaments up to 6cmlong on one side. The main flowering period would be from March to October.

Root: The root occurs in the entire condition. The bark is separated from the wood 0.5-2.0 cm. in diameter bearing rootlets with diameter varying From 0.2 to 0.5 cm. externally whitish-grey in colour, wrinkled in the fresh condition, plenty of whitish latex exudes from cuts or wounds in the Bark. The fracture is incomplete.

Leaf: Simple, opposite, sub-sessile, slightly thick, fleshy, coriacious,10-15 cm. long and 4.5 to 6.5 cm. broad, broadly cuneate, obovate or obovate oblong, slightly cordate and auricled at base with tuff of short simple hairs on the upper side near place of the attachment to the petiole. The tender leaves are covered with ashy gray pubescence. Mature leaves are nearly smooth or even glabrous and pale green.

Flowers: Regular, bisexual, liliac or pale rose, purple or light greenish-yellow, with a faint odour They are arranged in simple or rarely compound cymose corymbs at the ends of laterally placed or interpetiolar peduncles arising from the nodes' alternate sides. An involucre of several small oblong pointed scaly caducous bracts surrounds each cluster. The flower buds are ovoid.

Calyx: Five lobes broadly ovate with small fleshy Teeth like glands within the base.

Corolla: Regular, gamopetalous, pale rose-purple or Liliac, subcordate to broadly sub-campanulate with A short tube and five broad ovate, lanceolate, Valvate, spreading lobes.

Stamens: Five, inserted at the base of the coro Filaments united to form a large stamina cold that are completely adnate to, but slightly shorter than the column. The appendages are leshy, lightly shorter than the column. The appendages are fleshy, pale in colour.

Root bark: The tap roots have prominent tops with rounded heads and the rest of the portion spirally curved. These tough roots are greyish white in colour and have sap exudations where the bark has been cut. The bark of the older roots has cracks in it. The bark is yellowish-grey on the outside and white on the inside. The outer cork portion is spongy and rough, whereas the inner bark portion is smooth and mucilaginous. The dried bark is bitter to taste, with prominent tops with rounded heads and the remainder spirally curved. These hard roots are greyish white in colour with sap exudations where the bark has been cut.

Fig 2. flowers of Giant Calotropis

Propagation and management:

The seeds freely float in the air and natural Regeneration is very common. Vegetative propagation Through stem and root cuttings is very useful in large Scale multiplication of the superior genotypes. Calotropis has been cultivated in South America and on the Caribbean Islands for the Production of fibers at a spacing of 1-1.5m. When Cultivated annual yields of up to 500kg/ha are Expected. A single harvest per season is preferable to a Double or triple harvest; a single harvest would result in A net saving of energy input both on the form and in the processing plant. It is well suited for intensive energy farming in arid or semi-arid regions where frost is not a limiting factor. [6]

In Thailand, a trial on plant spacing of Calotropis gigantea for medicinal purposes showed that a spacing of 0.5 m × 0.5 m gave higher plants, whereas at 2 m × 2 m plants were wider, although the number of main branches did not differ significantly.

The chief features:

- The plant grows very well in a variety of soils and different environmental conditions.
- It does not require cultivation practices.
- It is one of the few plants not consumed by Grazing animals.[7]
- It thrives on poor soils, particularly where Overgrazing has removed competition from Native grasses.
- Sometimes this plant is the only survivor in Some areas, where nothing else grows.
- It is drought tolerant and the pioneer Vegetation in desert soil.
- The presence of latex, extensively branched root System and thick leaves with waxy coverage Are the xerophytic adaptations.
- Hence, it is distributed in tropical and Subtropical area of the world and throughout India.[8]
- Plants grow to their standard height. Harvest fruit, seeds, or other products. Non-Destructive management systems.
- Cut to the ground repeatedly – resprouting vigorously. Non-destructive management systems maintain the soil organic carbon.[9]-[10]

Disease and Pests: *Poecilocerus pictus*, a leafhopper, is a pest of Calotropis Gigantea plants. The oleander aphid (Aphis nerii) and the tiger butterfly (Danaus chrysippus) and monarch butterfly (Danaus plexippus) caterpillars feed on Calotropis spp., using cardenolides as a chemical defense mechanism. Meloidogyne incognita and Meloidogyne javanica are nematodes found on the roots of Calotropis gigantea in India, but the leaf extract kills them. Aphis nerii transmits a sap-transmissible mosaic disease of Calotropis Gigantea.[11]

FIG 3. Leaf spot infections of Calotropis gigantea by Passalora calotropidis. (A) Severe infections on the plants (B) yellowing of leaves due to infection (C) infection of stem (D) leaf spot on both surfaces of the leaf

In September 2011, a leaf spot epidemic of ak[Calotropis gigantea (L.) R. Br. Ex. Ait.], growing in Wasteland sites was observed in Lahore, Pakistan. A halo Chlorotic yellow tissue zone was also observed with Disease spots on leaves (Fig 3 A and D). As the disease Progressed, the leaf turned yellow followed by abscission (Fig 3 B). Disease spots had been observed on older Leaves and lower stem (Fig 3 C). A voucher specimen (IR00027) has been deposited in the First Fungal Culture Bank of Pakistan (FCBP), Institute of Plant Pathology, University of the Punjab, Lahore, Pakistan.

PRINCIPAL CONSTITUENTS OF CALOTROPIS GIGANTE:

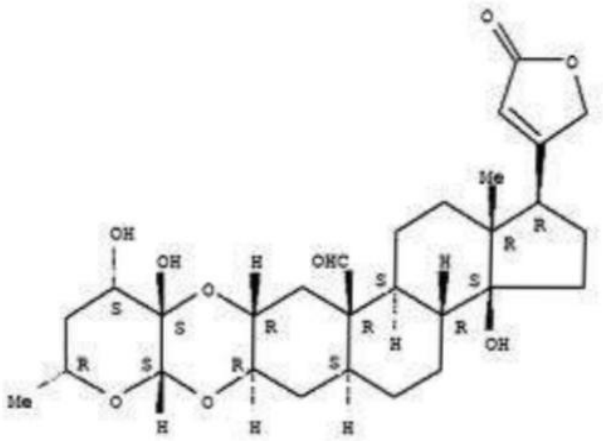


Fig.4 Calotropin

Allotropy, uscharin, calotoxin, and gigantin are all found in the latex of Calotropis gigantea. The resinol Protion is primarily composed of two new alcohols, and ß-Calotropeols in nearly

equal proportions, with minor amounts of ß-amyrin. A mixture of tetracyclic triterpenes, fatty acids, flavonoids, alkaloids, the proteolytic enzyme calotropain, and traces of sterols are also present. 5 Calotropis gigantea is used to treat a variety of ailments, including life-threatening diseases. To validate the traditional uses, researchers conducted various in vivo and in vitro pharmacological screenings. These studies have revealed that the plant has the potential to be developed as a natural resource-based curative agent.

Cardiac glycosides, oxypregnane-oligo Glycosides, and calotroposides A-G -Amyrin, two isomeric crystalline alcohols, giganteol, isogiganteol, and cardenolides are all found in root bark. Latex: Akundarin, latex contains 0.45 percent uscharin, 0.15 percent Calotoxin, 0.15 percent calactin, latex also contains -Calatropeol, -Calotropeol, -amyrin, and calcium Oxalate, and it also yields gigantin, a nitrogen and sulfur-containing fish and cardiac poison. Latex also has traces of glutathione and a proteolytic enzyme that is similar to papain. Leaves contain alkaloids, glycosides, and mudarine. Stembark contains -calotropeol, -Amyrin, and giganteol. Flower constituents include n-calatropeol, -calotropeol, amyrin, cardioactive glycosides, Mudarine, asclepin, bitter resins akundarin, and Calotropin.[12]

Phytochemistry of Calotropis:

Previous researchers discovered a plethora of phytochemical constituents in Calotropis gigantea's various parts, particularly its leaves. Usharin, gigantin, calcium oxalate, alpha and beta-calotropeol, beta-amyrin, fatty acids (both saturated and unsaturated), hydrocarbons, acetates, and benzoates There is also a mixture of tetracyclic triterpene compounds, terols, Giganteol, and giganteol. Cardenolide calotropin -amyrin, -amyrin, araxasterol, -sitosterol, -amyrin methylbutazone, -amyrin Acetate, taraxasteryl acetate, lupeol acetate B, gigantursenyl acetate A, gigantursenyl acetate B Flavonol glycosides, akundarol, uscharidin, calotropin, Frugoside, and calotroposides A to G are responsible for many of its activities. The following cardenolides are also mentioned in the literature: calactin, calotoxin, Calotropagenin, proceroside, syriogenine, uscharidin, Uscharin, uzarigenin, and voruscharib. Other compounds discovered include benzoylisolineolon and benzoyllineolone. Flavonoids, triterpenoids, alkaloids, steroids, glycosides, saponins, terpenes, enzymes, alcohol, resin, fatty acids and esters of calotropeols volatile long chain fatty acids, glycosides, and proteases Calotropis gigantea has been isolated from various parts of the plant. Calotropis laticifer fluid was discovered to have high proteolytic activity, containing the enzymes cysteine proteinase and aspartic proteinase. Because of the presence of these components, the plants are resistant

to phytopathogens and insects, particularly in the leaves where latex circulates freely. The plant's milky latex is high in lupeol, calotropin, calotoxin, and the latex protein Uscharidin. Sharma and Sharma et al., screened the major phytochemicals in Calotropis flower, bud, and root, including alkaloids, carbohydrates, glycosides, phenolic compounds/tannins, proteins and amino acids, flavonoids, saponins, sterols, acid compounds, and resins. Cardenolides from latex and leaves, 9, 10 triterpenoids, 10 anthocyanins from flowers 11, and hydrocarbons have all been studied phytochemically in the plants. Cardiac glycosides were discovered in the leaves and latex of Calotropis gigantea; various glycosides were isolated and studied. A "mudarine" active principle was isolated from C. Gigantean leaves Aside from this, a yellow bitter acid and Resin were discovered. Calotropogenjn, calotropin, uscharin, and calotoxin were identified as cardiac glycosides. Calactin There are three cardenolide glycosjdgs. Coroglaucigenn, which contains fish and the cardiac poison gigantin.Latex also contains traces of glutathione and a proteolytic enzyme similar to calotropeol, amyrin, cardioactive glycosides, mudarine, asclepin, bitter resins papain.: Leaves alkaloids, glycosides, mudarine. Stembark: β-calotropeol, β-amyrin, giganteol. Flower: nα-calatropeol, β-akundarin[13]

Phytochemical studies on Calotropis have yielded a variety of compounds including Cardenolide, Triterpinoids, alkaloids, resins, anthocyanins, and proteolytic enzymes in latex, flavonoids, tannins, Sterol,saponins, and cardiac glycosides. Terpenes, multiflorenol, and cyclisadol are found in flowers.

Leaves:

The leaves contain mainly the Amyrin,amyrin acetate, ß-sitosterol, urosolic acid,Cardenolides, calotropin, calotropagenin.[14]

Latex:

The latex contains caoutchouc,Calotropin,calotoxin 0.15%, calactin 0.15%,Uscharin0.45%, trypsin, voruscharin, uzarigenin,syriogenin And proceroside[17]

Flower: Flavonoids, queretin-3-ratinoside, sterol, calactin, calotoxin, calotropagenin, calotropin, polysaccharides with D-arabinose, glucose, glucosamine, and L-rhamnose are all found in the flower. Flowers contain the enzymes 3-proteinase and calotropain as well (protease). Other chemical constituents of C. gigantea flowers include lupeol, uscharin, proceroside, proceragenin (cardenolide), syriogenin, taraxast-20(30)-en-3-(4-methyl-3-

pentenoate), 3-thiazoline cardenolide, gigantin, giganteol, isogiganteol, uscharidin,Uzarigeninvoruscharin a-calotropeol, 3- epimoretenol, alactuceryl acetate an a-lactuceryl Isovalerate

Bark:

Root bark of Calotropis contains Triterpenes, a new norditerpenyl ester, named Calotropterpenyl ester, and two unknown Pentacyclic triterpinoids, namely Calotropursenyl acetate and calotropfriedelenyl Acetate, akundarol isovalerate, mundarol isovalerate And quercetin -3- rutinoside. (15)

Root:

Cardiac glycosides, oxypregnane-oligo Glycosides, and calotroposides A-G -Amyrin, two isomeric crystalline alcohols, giganteol, isogiganteol, and cardenolides are all found in root bark. Latex: Akundarin, latex contains 0.45 percent uscharin, 0.15 percent Calotoxin, 0.15 percent calactin, latex also contains -Calatropeol, -Calotropeol, -amyrin, and calcium Oxalate, and it also yields nitrogen and sulphur. Giantin, a cardiac poison-containing fish. Latex also has traces of glutathione and a proteolytic enzyme that is similar to papain. Leaves contain alkaloids, glycosides, and mudarine. Stembark contains -calotropeol, -Amyrin, and giganteol. Flower constituents include n-calatropeol, -calotropeol, amyrin, cardioactive glycosides, Mudarine, asclepin, bitter resins akundarin, and Calotropin.(16)

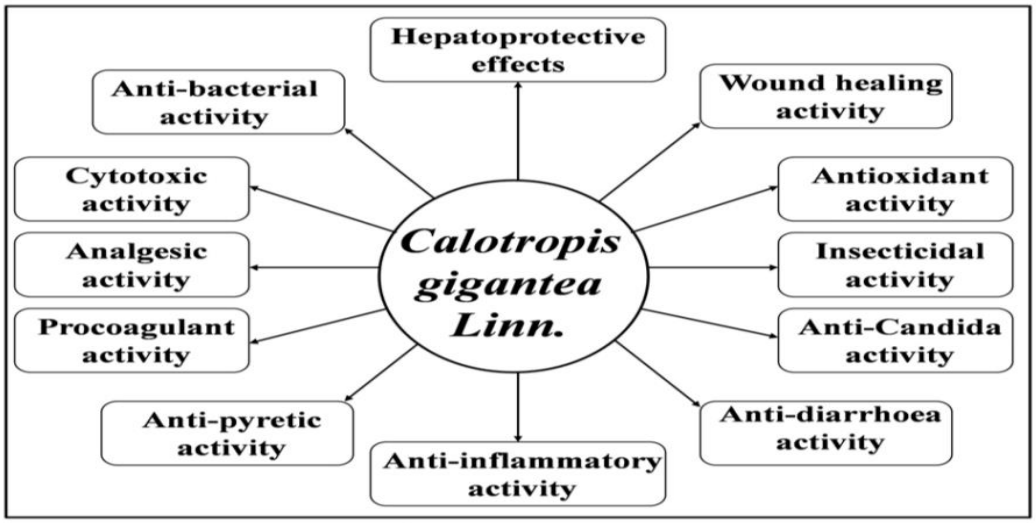
Chemical constituent	Plant part	Chemical nature
19-Nor- and 18,20-Epoxy-cardenolides	Leaves	Cardenolides
15beta-hydroxycardenolides	Leaves	Cardenolides
16alpha-hydroxycalactinic acid methyl ester	Leaves	Cardenolides
Isorhamnetin-3-*O*-rutinoside	Arial parts	Flavonol
Isorhamnetin-3-*O*-Glucopyranoside	Arial parts	Flavonol
Taraxasteryl acetate	Arial parts	Flavonol
Calotropain-F1 and	Latex	Proteinases
Calotropain-FII	Latex	Proteinases
3′-methylbutanoates of α-amyrin	Latex	triterpene esters
ψ-taraxasterol	Latex	triterpene esters
Calotropins DI	Latex	Proteinases
Calotropins DII	Latex	Proteinases
Di-(2-ethylhexyl) Phthalate	Flowers	Triterpenoids
Anhydrosophoradiol-3-acetate	Flowers	Triterpenoids
Calotropone	Roots	Cardiac glycoside
Calotropises juiterpenol	Roots	Terpene
Calotropisesterterpenol	Roots	Terpene
Calotropbenzofuranone	Roots	Aromatic product
Coroglaucigenin	Roots	Cardenolides
Frugoside	Roots	Cardenolides
Stigmasterol	Root bark	Sterols
β-sitosterol	Root bark	Sterols
Giganticine	Root bark	Nonprotein amino acid

PHARMACOLOGICAL ACTIVITY:

Therapeutic effect:

Anthelmintic, alexipharmic, cures leprosy, Leucoderma, ulcers, tumours, piles, diseases of the Spleen, liver, and abdomen; the juice is Anthelmintic and cures leprosy, Leucoderma, tumors, ascites, and diseases of the abdomen. The leaves are used to treat paralyzed parts, painful joints, and swellings, as well as to heal wounds. The tincture of the leaves is used as an antiperiodic in the treatment of intermittent fevers 3, 4. Inflammations, tumours, rat bites, and ascites are all helped by this remedy. The milk is bitter, warming, and purgative; it also acts as a laxative and cures piles. The root bark is diaphoretic and can be used to treat asthma and syphilis. The flower has sweet, bitter, antihelmintic, analgesic, astringent, and curative properties. The roots are said to have anti-pyretic and cytotoxic properties. antibacterial activity Insecticidal, wound healing, CNS activity, and pregnancy interfering properties.[18]

The plant's latex is said to have purgative properties, procoagulant activity, wound healing activity, and antimicrobial activity. Stem cells have been shown to have hepatoprotective properties. The current review focuses on an overview of C. gigantea's medicinal properties and biomolecules, as well as its prospects. Further scientific research will be conducted to develop effective therapeutic compounds.[19]



Antimicrobial activity:

C. gigantea leaf extracts in aqueous, methanol, ethanol, and petroleum ether were found to have anti-Candida activity against clinical isolates of Candida albicans, C. parapsilosis, C. tropicalis, and C. krusei. The aqueous extract of leaves of C. gigantea was reported to possess

antibacterial activity Against Staphylococcus aureus, Escherichia coli, Bacillus cereus, Pseudomonas aeruginosa, Micrococcus luteus and Klebsela pneumonia. The aqueous extract of the latex of C. gigantea was Reported to exhibit a significant inhibitory effect on S. aureus, B. cereus, E. coli and C. krusei. Antifungal activity of C. gigantea was reported against plant pathogenic fungi like Fusarium Mangiferae, which poses a significant threat to mango cultivation. Alam et al. (2008) investigated the antibacterial activity of methanol extracts of C. gigantea root bark and its petroleum ether, chloroform, and ethyl acetate fractions. Methanol extract and its chloroform fraction both inhibited Sarcina lutea, B. Megaterium, and P. aeruginosa. The petroleum ether fraction was active against B. Subtilis and Shigella sonnei, while the ethyl acetate fraction was active against P. Aeruginosa and E. coli.[20-21]

Analgesic activity:

An alcoholic extract of C. gigantea flowers was found to have analgesic activity in chemical and thermal models in mice. The hot plate method and the acetic acid-induced writhing test were used to evaluate analgesic activity. An oral dose of ethanolic extract of C. gigantea flower resulted in a significant reduction in the number of writhings and a delay in paw licking time. The CNS activity (analgesic activity) of an alcoholic extract of peeled roots of C. gigantea was tested in albino rats. Both Eddy's hot plate method and acetic acid-induced writhings produced analgesic effects. The oral doses of the extract (250 and 500 mg/kg body weight) were significantly delayed. The time spent licking the paws and the number of writhings was significantly reduced.[22]

Wound healing activity:

Wound healing activity of C. gigantea root bark extract was tested in Wistar albino rats. Rats were topically treated with extract formulated in ointment for excision wound healing models, and extract was given orally (100, 200, and 400 mg/kg dose) for incision wound healing models. The findings show that extract treatment accelerates wound healing in rats. The wound healing activity of 12 C. gigantea crude latex was tested in albino rats using excision and incision wound models. C. gigantea latex was active at a dose of 200 mg/kg/day. Significant wound healing activity was observed in treated animals, which demonstrated an 83.42 percent reduction in wound area when compared to controls, which demonstrated a 76.22 percent reduction. When compared to controls, wounds treated with extract epithelize faster.[23]

Cytotoxic activity:

Cardenolide glycosides derived from the root of C. gigantea are cytotoxic to a variety of human and mouse cell lines. Calotropin, frugoside, and 4'–O—D-Glucopyransylfrugoside were discovered to be the active principles. Compounds 1 and 2 isolated from C. Gigantea roots were found to inhibit chronic myelogenous leukaemia K562 and human gastric cancer SGC-7901 cell lines. The crude ethyl acetate extract of C. gigantea flower has been shown to inhibit Ehrlich's ascites carcinomain mice. The extract (50, 100, and 200 mg/kg body weight) administered intraperitoneally significantly reduces viable tumour cells and body weight gain caused by the tumour burden, resulting in a longer survival time. The extract also restores hematological and biochemical parameters (glucose, cholesterol, triglyceride, blood urea, ALP, SGPT, and SGOT) that were altered during tumour progression at a dose of 200 mg/kg body weight.[24]

Anti-diarrhoeal activity:

The anti-diarrheal activity of a hydroalcoholic (50:50) extract of C. gigantea aerial part against a castor oil-induced diarrhoea model in rats was investigated. At doses of 200 and 400 mg/kg body weight, the extract significantly reduced faecal output and frequency of droppings (intraperitoneal dose). The extract also inhibited the weight and volume of intestinal content significantly.[25]

Anti-pyretic activity:

The anti-pyretic activity of the water:ethanol (50:50) extract of C. Gigantea roots. Anti-pyretic activity was studied by using yeast and TAB (Typhoid) vaccine-Induced pyrexia in Albino Swiss rats and rabbits. At the dose of 200 and 400 mg/kg body weight (intraperitoneal injection) extract significantly reduced the fever and body temperature was normalized. [26]

Insecticidal activity:

Methanol extracts of C. gigantea root bark, as well as chloroform and petroleum ether fractions, were tested for residual film toxicity, fumigant toxicity, and repellent effect against several insters of Tribolium castaneum larvae and adults. Methanol extract was the most effective insecticide against T. castaneum, followed by the petroleum ether fraction and the chloroform fraction. There was no evidence of fumigant toxicity in any of the samples.[27]

Anti-inflammatory:

C. gigantea ethanol extract was found to have anti-inflammatory activity against carrageenan. Wistar albino rats developed paw edoema as a result of this treatment. The administration of 400mg/kg of C. gigantea orally Significant anti-inflammatory activity was discovered, which was greater than that of 100mg/kg Ibuprofen.[28]

Antioxidant activity:

C. gigantea leaves have been shown to have antioxidant activity. The hydroalcoholic extract of C. gigantea leaves was tested for DPPH radical scavenging activity, reducing power activity, and nitric oxide scavenging activity. At 400g/ml concentration, the extract had the highest DPPH radical scavenging activity (85.17 percent). At a concentration of 100g/ml, the extract demonstrated 54.55 percent nitric oxide scavenging activity. The extract's reducing power was found to increase as the concentration of the extract increased. [29]

Pregnancy interceptive properties:

Several organic solvents derived from C. gigantea roots have been shown to have pregnancy-interrupting activity in rats. At a dose of 100 mg/kg, the extract had 100 percent pregnancy interceptive activity. When administered in the Days 1-5 and 1-7 postcoitum schedules, the extract also demonstrated 100 percent efficacy at a dose of 12.5 mg/kg.

Procoagulant Activity:

Many proteins in the crude latex extract were highly basic and exhibited strong proteolytic activity. In a dose-dependent manner, the crude extract hydrolyzes casein, human fibrinogen, and crude fibrin clot. IAA completely inhibited the hydrolyzing activity, indicating that they are members of the cysteine protease superfamily. Alpha, Beta, and Gamma subunits of fibrinogen are hydrolyzed by crude extract. Alpha was the preferred subunit to be hydrolyzed out of all the subunits. Alpha, Beta, and Gamma subunits of fibrinogen are hydrolyzed by crude extract. The Alpha subunit was the most resistant to hydrolysis, followed by Beta, and the Gamma subunit is highly resistant and only hydrolyzed at higher protein concentrations or after a longer incubation time. When compared to trypsin and papain, crude extract hydrolysis crude fibrin clots strongly. Pharmacologically, the crude extract is hemorrhagic, causing skin hemorrhage at >75 microns, reducing the coagulation time of citrated plasma from 150 to 47 seconds, and promoting blood coagulation.[30]

Antifungal Activity:

Extracts from sixteen plants were tested for antifungal activity against Ceratocystis paradoxa, which causes soft rot in pineapples. The most effective was Xanthium Strumarium, followed by Allium sativum. The extracts Meriandra bengalensis, Mentha piperita, Curcuma longa, Phlogacanthus Thyrsiflorus, Toona ciliata, Vitex negundo, Azadirachta indica, Eupatorium Birmanicum, Ocimum sanctum, and Leucas Aspera were the most effective against C. paradoxa. Fungitoxicity was found in extracts of Cassia tora, Gynura Cusimba, Calotropis gigantea, and Ocimum Canum.

Hepatoprotective Activity:

In a dose of 100 mg, methanolic extract of C. gigantea leaf has good hepatoprotective activity. In a dependent manner, rats were protected against CCl4-induced hepatotoxicity.

Antitussive Activity:

Because of the presence of alkaloids and glycosides, leaf extract demonstrated antitussive activity.

Free Radical Scavenging Activity:

The free radical scavenging activity of ethanolic extracts of the leaves and latex of Calotropis procera and Calotropis Gingantea (Asciepadiacea) was tested using 1,1 Diphenyl Picryl hydrazyl radicals. C. procera and C. gigeantea latex extracts (10 Mg/ml) had the greatest capacity to scavenge DPPH radicals, whereas leaf extract had moderate free radical scavenging activity.[31]

Vasodilation Effect:

The effect of Calotropis gigantea latex in The cardiac output of the green frog R hexadactyla increased significantly. Evidence suggests that the primary action of latex on the cardiovascular system involves changes in cation (Ca, Na) permeability, resulting in the activation of Ca channels in the heart muscle and an increase in coronary flow. As a result, the latex's pharmacologic actions are most likely due to its dilation property.

Antivenom Activity:

Calotropis gigantea plant extract was tested for its antivenom activity against Vipera russelli snake venom. The lyophilized snake venom of Vipera Russelli was dissolved in Saline, and the necessary concentrations were prepared. As the reference serum, lyophilized polyvalent snake venom antiserum was used. The methanolic extract of Calotropis Gigantea was tested for its ability to neutralise various venom actions such as lethality, necrotizing activity, edoema formation, and hemorrhagic activity. The current study confirms the anti-snake venom activity of C. gigantean1 alcoholic extract.[32]

Hepatoprotective Activity:

Ethanolic extract (50%) of stems of Calotropis gigantea R. Br. (Asclepiadaceae) were studied for hepatoprotective activity in male Wistar rats with liver damage induced by carbon tetrachloride, 2 mL kg-1 twice a week. The antioxidant activity of C. gigantea extract was compared to that of the standard drug silymarin. Several biochemical parameters were measured, including aspartate aminotransferase (AST), alanine aminotransferase (ALT), glutathione (GSH), lipid peroxide (LPO), superoxide dismutase (SOD), glutathione peroxidase (GPx), and catalase (CAT).[33]

Hair growing activity:

Calotropis gigantea was combined with Hibiscus rosa sinensis (HRSF) and polyherbal formulation (HCF) to reveal the effect on hair growth initiation and pro-Motion in albino rats. The findings and observations from the study were compared to Minoxidil. Calotropis Gigantea showed potential hair growth activity, but it was less than other treatments.

Hypoglycemic activity:

The hypoglycemic activity of chloroform extracts of Calotropis gigantea leaf and flower at doses of 10, 20, and 50 mg/kg in Streptozotocin-induced diabetic rats was compared to glibenclamide. The extracts of the leaves and flowers were effective in lowering serum glucose levels in normal rats. Treatment with the test drug also resulted in an improvement in oral glucose tolerance. The administration of leaf and flower extracts to streptozotocin-induced diabetic rats resulted in a significant decrease in serum glucose levels. [34]

Antiviral activity:

(+)-pinoresinol 4-O-[60-O-Vanilloyl] is a new lignan glycoside isolated from the latex of Calotropis gigantea. -b-D-glucopyranoside, two known Phenolic compounds, 69-O-vanilloyltachioside and 69-O-vanilloylisotachioside, and one Authentic compound, (+)-pinoresinol 4-O-b-D-Glucopyranoside, were tested for A/PR/8/34 (H1N1) inhibitory activity on MDCK cells using the cytopathic effect (CPE) inhibition Compound 1 inhibited the activity of A/PR/8/34 (H1N1). The CPE inhibition assay was used to test this for in vitro inhibitory activities against a panel of human and avian influenza viruses. It inhibited human influenza viruses in both subtypes A and B while not affecting avian influenza viruses. Its activity against human influenza viruses subtypes A was also confirmed using a plaque reduction assay. The time course indicated by the assay revealed that compound 1 exerts its antiviral activity early in the viral replication process. A mechanistic study revealed that compound 1 effectively inhibited influenza virus-induced NF-kB pathway activation. In a dose-dependent manner, but did not affect Virus-induced activation of Raf/MEK/ERK path-Way. Further studies demonstrated that nuclear Translocation of transcription factor NF-kB induced By influenza virus was significantly blocked by 1, Meanwhile, nuclear export of viral ribonucleoproteins was also effectively inhibited.[35]

Anticancer activity:

Calotropis gigantea R.Br. (Asclepiadaceae), also known as Milkweed or swallowwort, is a common weed in India. A total of 187 plant species from 102 genera and 61 families have been identified as an active or promising source of phyto-Chemicals with antitumor properties, representing a 41% increase over the last five years. Only 15 of them (ten genera and nine families) have been used in clinical cancer chemotherapy, while the rest of the identified species are either active against cancer cell lines or exhibit chemotherapeutic properties on tumor-bearing animals under experimental conditions. The most widely distributed compounds are phenylpropanoids (18 families), followed by terpenoids (14 families), and alkaloids (13 families) The present study was undertaken to identify the potential phy-Tosterols to further substantiate the earlier claims by various re-Searchers on its potential use in traditional medicine. The HPV E6 Protein is one of the viral oncoprotein that is expressed virtually in All HPV-positive cancers. Therefore, E6 is the main anticancer Treatment target. Moreover there are almost negligible works on The docking studies of the phytosterols isolated form Calotropis Gigantean against oncoprotein HPV 16 E6. Therefore,

analysis was Also carried out to assess the anticancer potential of the sterols Isolated from Calotropis gigantean against cervical cancer.[36]

Traditional use of C. gigantea:

In Ayurvedic:

C. gigantea leaves are used to treat paralysis, swellings, and intermittent fevers. Flowers are used to treat conditions such as asthma, catarrh, anorexia, helminthic infections, inflammations, and fever. The plant's root bark is used to treat cutaneous infections, intestinal worms, helmintic infections, coughs, and ascites. The powdered root is used to treat asthma, bronchitis, and dyspepsia, as well as to stimulate gastric secretions.

In Siddha:

The leaves of C. gigantea are used to treat venomous snake bites, periodic fever, vatha diseases, intestinal worms, and ulcers. The root of this plant was crushed and thoroughly applied by rubbing firmly over the bitten area. The latex of this plant is used to treat dental problems, rat bites, swellings, gonococcal arthritis, and other rheumatic ailments. Flowers are used to treat Bronchial Asthma. Calotropis produces a strong fibre (known commercially as Bowstring of India) that is used to make ropes, carpets, fishing nets, and sewing thread. Floss, which is obtained from seeds, is used to make stuffing. A fermented mixture of Calotropis and salt is used to remove hair from goat skins for "nari leather," and from sheepskins for leather, which is widely used for low-cost book binding. Calotropis has been shown to have fungicidal and insecticidal properties. The allelopathic effects of Calotropis on various agricultural crops have received little attention. Extracts of various plant parts, including the root, stem, leaf, and stem and leaf of Calatropis, have been shown to improve germination and seedling vigour in a variety of agricultural crops. Calatropis extracts, on the other hand, had no negative effects on weeds such as Chenopodium album, Melilotus alba, Melilotus indica, Sphaeranthus indicus, and Phalaris minor.[37]

SOME FORMULATIONS OF THIS PLANT:

Abidetal published that the carbonization of Calotropis Gigantea (Giant Stabragh) in a negligibly ventilated atmosphere was used to drive out comparison of K2co3 and Khco3 for volatile preparation, leaving a porous carbon structure with low Carbonaceous Adsorbent. Vidya C et al published a paper on the green synthesis of ZnO nanoparticles using zinc nitrate

and the bio components of Calotropis Gigantea leaves extract. ZnO nanocrystallites with average sizes ranging from 30-35 nm have been synthesised using a quick, simple, and environmentally friendly method. Scanning electron icroscopy (SEM) and X-ray diffraction were used to characterize zinc nanopartic.[38]

Mother tincture: Calotropis gigantea mother tincture (homeopathicMedicine of SBL). Calotropis Gigantea SBL Mother Tincture Q is a homeopathic medicine that is used to treat a variety of health problems, including infections of the skin and lungs. It can also be used to treat joint pain and inflammation. It is also effective in the treatment of syphilis.

CONCLUSION:

Calotropis gigantea is a plant with many Curative principles and other economic values. It is a perennial shrub that grows in all types of soils and environmental conditions and requires no cultivation practices. As a hydrocarbon-rich plant, this plant requires additional research into the aspect of energy conversion. Calotropis gigantea is commonly found throughout India, where it is used as a standard medicine, fuel, ornamental, fiber, auxiliary plant, mosquito repellent, and so on. The presence of phytochemicals in the entire plant of Calotropis gigantea indicates its potential as a source of principles that will supply novel medicines. This review has focused on Pharmacological activity, Biocidal Activity and Toxicological Studies. Pharmacological Activity, Biocidal Activity, and Toxicological Studies were the focus of this review. Antioxidant activity, anti-diarrheal activity,

anticonvulsant and central nervous system activity, and procoagulant activity are all examples of pharmacological activity. Insecticidal and pesticidal activity, antibacterial activity, and antifungal activity are all examples of biocidal activity. Acute Toxicity of the Plant Calotropis Gigantea is included in Toxicological Studies. C. gigantea's pharmacological screenings revealed that it has medicinal potential and is a valuable medicinal plant with a variety of medicinal properties. As the Pharmacologists are looking forward to developed drugs from natural sources, the development of Modern drugs from C. 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 the Development of products for their better economic And therapeutic utilization.

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