

A Review on Phytochemical and Pharmacological profile of *Calotropis gigantea* Linn And *Calotropis procera* Linn.

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ABSTRACT:

Calotropis procera Linn is small, erect and compact shrubs, which is used in several traditional medicines to cure various diseases. This shrub has been known to possess Analgesic, Antitumor, Anthelmintic, Antioxidant, Hepatoprotective, Inflammatory, Antidiarrheal, Anticonvulsant, Antimicrobial, Oestrogenic, Antinociceptive, and Antimalarial activity. *Calotropis gigantea* Linn is a popular restorative herb commonly known as milk weed & has been utilized in Indian system of medication. Various pharmacological activities reported like antioxidant activity, anti-malarial activity, antimicrobial activity, cytotoxic activity, antipyretic activity, anti-asthmatic activity, anti-inflammatory activity, analgesic activity, insecticidal activity, wound healing activity & anti-diarrheal activity. The presented review summarizes the information concerning the ethnobotany, pharmacological, phytochemistry, biological activity and toxicity of the *Calotropis procera* Linn and *Calotropis gigantea* Linn shrubs.

INTRODUCTION:

The plants have remedial properties or apply valuable pharmacological effects on the animal body are generally designated as "Medicinal Plants". It has now been set up that the plants which normally synthesis and collect some optional metabolites, similar to alkaloids, glycosides, tannins, volatiles oils and contain minerals and nutrients, have restorative properties. In antiquated ayurvedic medication the plant *Calotropis gigantea* is known as "Sweta Arka" and *Caotropis procera* as "Raktha Arka"[1]. *Calotropis gigantea* Linn is flowering plants belong to *Asclepidaceae* family. It is also known as Akada, Aak, Mandar, Aakh etc . *Calotropis gigantea* is a common weed in arid lands and is known as giant milkweed. This plant is native to India, Bangladesh, Burma, China, Indonesia, Malaysia, Pakistan, the Philippines, Thailand and Sri Lanka. The plant has oval, light green leaves, a milky stem, and clusters of waxy flowers in either white or lavender. *C. gigantea* is frequently available in India and is used for several medicinal purposes in the traditional medical system. Recently *C. gigantea* has been scientifically reported for several medicinal properties. The flowers have been reported to possess analgesic activity and antimicrobial activity and cytotoxicity. Leaves and aerial parts of the plant have been reported for antidiarrheal activity, anti-candida activity and antibacterial activity, and antioxidant activity. The roots have been reported to have antipyretic activity, cytotoxic activity, antimicrobial activity, insecticidal activity, woundhealing activity and CNS activity and load-blocking properties. Plant latex has been reported to have laxative properties,

procoagulant activity, wound healing activity, and antimicrobial activity. Stem has been reported to possess hepatotoxic effects[2]. *Calotropis procera* Linn. Is often found as a weed throughout India in more or less warm dry places, predominantly in SubHimalayan tracts, Deccan to Kanya- Kumari. *Calotropis procera* Linn is an erect, tall, large, much branched and perennial shrubs or small trees that grow to a height of 5.4 m., with milky latex throughout. Bark is soft and corky. Branches stout, terete with fine appressed cottony pubescence (especially on young). Leaves sub-sessile, opposite, decussate, broadly ovate-oblong, elliptic or obovate, acute, thick, glaucous, green, covered with fine cottony pubescent hair on young but glabrous later and base cordate. Flowers in umbellate-cymes and tomentose on young, Calyx glabrous, ovate and acute. Corolla glabrous, lobes erect, ovate, acute, coronal scales 5 - 6, latterly compressed and equally of exceeding the staminal column. Follicles are sub-globose or ellipsoid or ovoid. Seeds broadly ovate, acute, flattened, minutely tomentose, brown coloured and silky coma is 3.2 cm long. *Calotropis procera* Linn have been widely used in the Sudanese, Unani, Arabic and Indian traditional medicinal system for the treatment of various diseases namely leprosy, ulcers, piles and diseases of the spleen, liver and abdomen. The latex is used as an abortifacient, spasmogenic and carminative properties, antidysentric, antisiphilitic, antirheumatic, antifungal, mullusccide, diaphoretic and for the treatment of leprosy, bronchial asthma and skin affliction. Different parts of the plant have been reported to possess a number of biological activities such as proteolytic, antimicrobial, larvicidal, nematocidal, anticancer, anti-inflammatory. Its flowers possess digestive and tonic properties. On the contrary, the powdered root bark has been reported to give relief in diarrhoea and dysentery[3].



Calotropis gigantea Linn

calotropis procera Linn

1. PLANT PROFILE:

I. TAXONOMY

Table 1: Taxonomical classification of *Calotropis gigantea* Linn[4].

Kingdom	Plantae
Order	Gentianales
Family	Apocynaceae
Subfamily	Asclepiadaceae
Genus	Calotropis
Species	C.gigantea

Table 2: Taxonomical classification of *calotropis procera* Linn.[5]

Kingdom	Plantae
Order	Gentianales
Family	Apocynaceae
Subfamily	Asclepiadaceae
Genus	Calotropis
Species	c.procera

II. MORPHOLOGY AND DISTRIBUTION

Calotropis gigantea is a minor tree or a shrub, 4–10m tall. Its stem is straight, about 20 cm in diameter. The leaves are broadly elliptical in shape, with the size of 9–20 cm × 6–12.5 cm but sub sessile. The inflorescence stalk is 5–12 cm elongated; the stalk of flower is 2.5–4 cm extended. Sepal lobes are broadly egg-shaped with a size of 4–6 mm × 2-3 mm. The diameter of Petal is 2.5–4cm. The plant has bunches of Waxy flowers that are either buff white or lavender in colour. Each Flower contains of five pointed petals and a tiny, stylish

“crown” rising From the Centre. The plant has elliptical, light green leaves and milky Stem. The petal parts are generally triangular 5–8 mm ×10–15 mm; they are cream and pale lavender colored near the tips. *Calotropis* is drought Resistant shrub, it is naturally grows up to 900 meters all over the Country. It is a plant which is not consumed by animals. It grow Well on poor soils particularly where overgrazing has removed Competition from native grasses.[5]

Calotropis procera is a soft-wooded, evergreen, perennial shrub. It has one or a few stems, few branches, And relatively few leaves, mostly concentrated near the Growing tip. The bark is corky, furrowed, and light gray. A Copious white sap flows whenever stems or leaves are cut. Giant milkweed has a very deep, stout taproot with few or No near-surface lateral roots. Giant milkweed roots were Found to have few branches and reach depths of 1.7 to 3.0M in Indian sandy desert soils. The opposite leaves are Oblong obovate to nearly orbicular, short-pointed to blunt At the apex and have very short petioles below a nearly Clasping, heart-shaped base. The leaf blades are light to Dark green with nearly white veins. They are 7 to 18 cm Long and 5 to 13 cm broad, slightly leathery, and have a Fine coat of soft hairs that rub off. The flower clusters are Umbelliform cymes that grow at or near the ends of twigs. The flowers are shallowly campanulate with five sepals That are 4 to 5 mm long, fleshy and variable in color from White to pink, often spotted or tinged with purple. The Fruits are inflated, obliquely ovoid follicles that split and Invert when mature to release flat, brown seeds with a tuft Of white hairs at one end [6].

2. PHYTOCHEMISTRY:

Phytochemical studies on *Calotropis procera* have afforded several types of compounds such as Cardenolide, triterpinoids, alkaloids, resins, anthocyanins and proteolytic enzymes in latex, flavonoids, tannins, sterol , saponins, cardiac glycosides. Flowers contain - terpenes, multiflorenol, and cyclisadol [3].

Various chemical constituents isolated from *Calotropis gigantea* Linn such as Triterpenoids Di-(2-ethylhexyl) Phthalate, Anhydrosophoradiol-3-acetate, Lupeol, Triterpene esters, γ -Taraxasterol, Flavonol, Isorhamnetin[2]. The fixed oil separated from seeds of *C.gigantea* was reported to contain lauric acid, myristic acid, palmitic acid, palmitoleic acid, stearic acid, oleic acid, linoleic acid, linolenic acid, arachidic acid and behenic acid[7].

Table 1: phytochemical constituents of *Calotropis gigantea* Linn and *Calotropis procera* Linn.

CHEMICAL CONSTITUENTS		
Plant part	<i>C. gigantea</i>	<i>C. procera</i>
Stem bark	Giganteol, α and β calotropeol, β -amyrin.[8]	Secondary metabolites (%), such as polyphenols (4.78 gm), teriterpene glycosides (5.98 gm), flavonoids (5.36 gm), steroids (3.42 gm), tannins (7.15 gm), coumarins, anthraquinones, saponins, cardiac glycosides, sterols, and alkaloids[6]
root	Calotropnaphthalene [naphthalenederivative], calotropisesquiterpenol, calotropisesterterpenol [terpene derivatives], calotropbenzofuranone [aromatic product] and sucros.[8]	α -amyrin, β - amyrin, taraxasterol and its four J-isomer, taraxasteryl isovalerate, taraxasteryl acetate, β -sitosterol and quercetin-3- rutinoside[6]
seed	Oil extracted from seeds contains palmitic, oleic, linoleic and linolenic acid. The unsaponifiable fraction contains phytosterol, stigmasterol , melissyl alcohol and laurane[8].	0.23-0.47% cardenolides, mainly coroglaucigenin or frugoside, carotoxoxigenine, calotropin [10]
flower	Ester of α -and β -calotropeols[8]. amyrin, glycosides, mudarine, asclepin, akundarin[9]	α -and β -amyrins, an alkaline phosphate, cyaindin-3-rhamnoglucoside, cycloart-23-en-3 β , 25-diol, cyclosadol, multiflorenol, procestrol, quercetin-3-rutinoside, β -sitosterol, β -sitost-4en-3one, stigmasterol. Cyanidin-3-rhamnoglucose, triterpene calotropenyl Acetate[1].
leaves	Sapogenins, holarrhetine; cyanidin-3-rhamnoglucoside; taraxasterol isovalerate. mudarine and three glycosides calotropin uscharin, calotoxin along with phenol.[8]	α -amyrin, α -amyrin acetate, β -sitosterol, urosilic acid, cardenolides, calotropin, calotropagenin, ascorbic acid, calactin, calotoxin, polysaccharide containing D-arabinose, D-glucose, D-

		glucosamine and L-rhamnose, calotropagenin, and 3-proteinase.
latex	Water and water soluble substance (86-95.5%) and caoutchouc (0.6-1.9%). The coagulam consist of caoutchouc (5.1-18.6), resin (73.6-87.8) and insoluble matter (4.5-13.8%).18 α - and β -calotropeols (also in latex); latex-protease, calotropains FI & FII, flower β -amyrin, stigmasterol.17 Calotoxin, uscharin, and calactin.23 Two new Triterpine ester-3'-methyl butanoates of α -amyrin and Ψ taraxasterol- isolated from latex[8].	Caoutchoc, calotropin, calotoxin 0.15%, calactin 0.15%, uscharin 0.45%, trypsin, voruscharin, uzarigenin, syriogenin and proceroside[11] calotropin, α -calotropeol, 3-epimoretenol, gigantini, giganteol, isogiganteol, α -lactuceryl acetate, α -lactuceryl isovalerate, lupeol, proceroside, proceragenin, syriogenin, taraxast-20 α - (30)-en-(4-methyl-3-pentenoate), 3'-thiazoline cardenolide s 11-23% rubber, the triterpenoids α - and β -amyrin, lupeol, taraxasteryl acetate, α - and β -calotropeol, 3-epimoretenol, multiflorenol, cyclosadol, several triterpene esters, the sterols β -sitosterol and stigmasterol, the non-toxic cysteine proteases calotropin, procerain and procerain-B and the alkaloid choline[1].
Root bark	Root bark contains β -amyrin, two isomeric crystalline alcohols, giganteol, and cardenolides .[12]	benzolisoleneolone, benzollineolone, long-chain fatty acids, and C (18) isoursane. The plant also reported to contain calactinic acid, choline and O-pyrocatechuic acid, β -sitosterol, taraxasterol, its ϕ - isomer: taraxasteryl isovalerate and taraxasteryl acetate. alotropterpenyl ester, calotropursenyl acetate and calotropfriedelenyl acetate, α -amyrin, β - amyrin, taraxasterol and its four J-isomer, taraxasteryl isovalerate, taraxasteryl acetate, β -sitosterol and quercetin-3-rutinoside.[1]

Table 2: Trace elemental composition of Latex, leaves and bark of *Calotropis gigantea* and *Calotropis procera* [13]

Elements Tested	Samples description					
	<i>Calotropis gigantea</i>			<i>Calotropis procera</i>		
	Latex	Leaves	Bark	Latex	Leaves	Bark
Al	300.00	nd	nd	200.00	nd	nd
Ca	300.00	3987	1774	340.00	3694	1650
Cd	100.00	4.54	2.27	120.00	2.10	2.12
Co	690.00	4.20	3.62	80.00	2.54	2.52
Cr	nd	nd	nd	nd	nd	nd
Cu	0.00	5.75	11.96	0.00	6.01	7.23
Fe	1000.00	164.81	61.44	50.00	72.69	38.32
Mg	40000.00	1544.00	1401.00	39400.00	11.32	529.00
Mn	27.00	26.20	3.43	17.00	8.07	nd
Ni	50.00	nd	nd	50.00	nd	nd
Pb	0.00	0.55	0.31	0.00	0.36	0.33
Zn	106.00	11.77	19.60	2.00	11.62	8.93
K(%)	nd	3.85	3.67	nd	3.82	4.29
N(%)	nd	3.82	1.97	nd	4.46	1.44
P(%)	nd	0.34	0.46	nd	0.58	0.29

nd = not detected

Values are in (mg/kg)

3. PHARMACOLOGICAL PROFILE:

Part of plant	ACTIVITY	
	<i>Calotropis gigantea</i> [5]	<i>Calotropis procera</i>
Whole plant	Antidepressants, sedative and hypnotics, antianxiety, anticonvulsant, analgesic and neuritogenesis	Antieczema, dermatophytic activity, Antilithic, Antimycoplasmal activity, Antifungal activity, In-vitro spasmolytic effect [14], Insecticidal activity, Schizontocidal activity, Molluscicidal activity[1]
Leaves	anti-inflammatory myocardium, stimulatory effect on smooth muscle motility, Analgesic, antiplasmodial, and proliferative	Anti-implantation activity, Antihyperbilirubinemic, Antiplasmodial activity, Antitussive activity, Antitumor studies Antiproliferative and cell death, Glucose tolerance, hypoglycemic Effect,

		Hypotensive, Lipolytic, lipoxygenase inhibitors [1]
Latex	Procoagulant Fibriogenolytic, Cytotoxic and antimicrobial, wound healing, antproliferative Cytotoxic, antioxidant Toxic, pesticidal. allergic, larvicidal, antihelmintic, ascaricidal, Protective to oxidative stress and renal damage, insecticidal, schizonticidal, antifungal, insecticidal, antioxidant anticancer, insecticidal, proteolytic activity, antimycoplasmal, antibacterial	Allergic contact dermatitis Immunological and allergenic responses, Immunomodulatory activity, Asthma ,Bullous eruption, Cardiotoxic action, Clot inducing and dissolving properties, Cognition enhancer, Effect on diverse muscles Enzyme purification potential Enzymatic activity, 5-fluorouracil-induced oral mucositis stem bark Gastric ulcers, gastric mucosal protective activity Anti-Helicobacter pylori and urease inhibition, Hepatoprotective activity Hepatorenal functions, Hemorrhagic septicemia or poisoning, Antifertility screening[1]. Skin melanoma, gastric ulcer, urease inhibitor, histamine [14]
Flowers	sedative, antipyretic Analgesic, anticonvulsant, ant arthritis	Anti Antifertility screening bacterial and antiparasitic antimicrobial activities, Anticoccidial activity, Hepatoprotective activity, Glucose tolerance, hypoglycemic Effect[1]
Root	Antisyphilis, Purgative, antiworm, insecticidal, antipyretic, contraceptive, antioxidant Anticoccidial, antidiarrhea, analgesic, antitumor, Anthelmintic, antimicrobial, Wound healing activity, Anti metastatic, anticancer	Antiangiogenesis, Analgesic, antinociceptive, antipyretic activity, Antifertility screening, Anticancer and in vitro cytotoxicity hepatocellular carcinoma, skin melanoma, Antitumor studies, Antioxidant and free-radical scavenging activity

		Antitumor studies Antiproliferative and cell death Pro- and anti-inflammatory activities acute inflammation
Ariel parts	Anthelmintic, antimicrobial, Wound healing activity, Asthma, CNS activity, A Novel Insect Antifeedant Non protein Amino Acid, antitumor, cytotoxic. Coagulant, hepatoprotective, and venom	Antidiarrheal activity, Effect on diverse muscles, Reproductive potential, Purgative[1]

4. TOXICOLOGICAL STUDY:

Calotropis procera (giant milkweed) has been reported to have numerous medicinal and economic importance, but was observed to be potentially injurious to the body especially after pro-longed or chronic use. Calotropin which is found in latex cause slowing of heart beat and gastroenteritis if injected into the lymph sac of frog. It is supposed to cause death if it is given more than 0.12 mg/k.g. Latex is irritant to the skin and mucous membrane and said to cause blindness. Approximately 4-5 ml of latex may cause death. It may rupture the muscle of intestine and colon and death may occur. The plant may cause severe bullous dermatitis, slowed but stronger heart beat, labored respiration, increased blood pressure, convulsions and death. Latex is highly toxic to human eyes presented with sudden pain-less dimness of vision with photophobia. [3]

If *Calotropis gigantea* is taken orally above the therapeutic dose causes nausea, vomiting and diarrhoea. Prolonged higher doses cause headache, burning micturition and weakens the intestine. In pregnant women it may lead to abortion, injurious to liver and lungs[7]

CONCLUSION

This review briefly explained the phytochemistry, pharmacological profile and toxicological study of *Calotropis procera* plant and *calotropis gigantea* plant. Various parts of the *C.procera* plants are useful for treating fever, leprosy, eczema, diarrhea, dysentery and jaundice. The plant *Calotropis gigantea* is a traditional therapeutic plant having large numbers of phytochemical values with the antioxidant, anti-malarial, anti-asthmatic, antimicrobial, cytotoxic, antipyretic activity, anti-inflammatory activity, analgesic activity, insecticidal activity, wound healing activity & anti-diarrheal activity.

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