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Review on- *Calotropis gigantea*

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ABSTRACT

Calotropis gigantea is a medicinal plant having the major source of drugs. In fact, many of the currently available drugs were derived either directly or indirectly from them. The purpose of the present study was to evaluate scientifically the anticonvulsant activity of Petroleum ether. All parts of the plant possessed enzymes with proteolytic and milk clotting activities (except milk- clotting activity in root) which can be utilized in food industries and for medicinal purposes. Phytochemical screening reveals the presence of alkaloids, cardiac glycosides, flavonoids, steroids, tannins, triterpenoids, carbohydrates and saponins in the hydro-alcoholic leaf extract of *C. gigantea Linn*. The present review was focused an overall outline of the medicinal properties and biomolecules of *C. gigantea* and its future prospects for the further scientific investigation for the development of effective therapeutic compounds.

INTRODUCTION

Calotropis gigantea Linn is a perennial shrub commonly known as milkweed or wasteland weed. It belongs to family Asclepiadaceae and was evaluated for its anticonvulsant activity [1]. It is a large shrub growing to 4 m tall. It has clusters of waxy flowers that are either white or lavender in colour[2]. Herbs and plants have been in use as a source of therapeutic compounds in traditional medicinal system since ancient time. There is a continuous need of the development of new effective antimicrobial drugs because of the emergence of new infectious diseases and drug resistance[4]. The plant is reported for analgesic activity, antimicrobial activity, antioxidant activity, anti-pyretic activity, insecticidal activity, cytotoxicity activity, hepatoprotective activity, pregnancy interceptive properties, purgative properties, procoagulant activity and wound healing activity[5]. Leaves are used in asthma, skin diseases like eczema. Juice is used in leprosy, syphilis and idiopathic ulceration etc.

Fig 1: *Calotropis gigantea* plant

Traditionally roots and barks of *C. gigantea* are used for all kinds of fits, epilepsy, convulsions in children's and paralysis complaints[6]. Roots are reported to contain antipyretic activity, cytotoxic activity[5]. There are different types of wounds which range from mild to potentially fatal. Wound healing is the body's natural process of regenerating dermal and epidermal tissues[7]. Many drugs that increase the brain content of GABA (gamma-aminobutyric acid) have exhibited anticonvulsant activity against seizure induced by MES

(Methyl Ethyl Sulphate), PTZ (Pentylenetetrazol) and lithium Pilocarpine[8]. The plant resistant to variety of infectious diseases and to the extreme harsh conditions are partly attributed to the presence of hydrolytic enzymes of the latex especially proteases (Boller 1986)[9]. The genus *C. gigantea* (Asclepiadaceous) is distributed in tropical and subtropical regions of Asia and Africa (The wealth of India 1959). It is a common plant in Nigeria but it is more abundant in the northern part of the country (Sofowora 1984)[10]. In 1996 Reported that *C. gigantea* was used in traditional medicine as a purgative, anthelmintic, anticoagulant, anticancer as well as antipyretic, analgesic and antimicrobial agent[10].

MAIN FEATURE

- The plant grows very well in a variety of soils and different environmental conditions[11].
- All parts of the plant have an abundance of milky latex.
- The buds and young parts are densely wooly, as are the underside of the leaves[12].
- It is one of the few plants not consumed by grazing animal[11].
- 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[11].

TAXONOMY

Table 1: Scientific classification of *C. gigantea*

SCIENTIFIC CLASSIFICATION	
Kingdom	Plantae
Order	Gentianales
Family	Apocynaceae
Subfamily	Asclepiadoideae
Genus	Calotropis
Species	C. gigantea

GEOGRAPHIC DISTRIBUTION

*C. giganteas*is native to India, Nepal, Afghanistan, Algeria, Iran, Iraq, Israel, Kenya, Kuwait, Niger, Nigeria, Oman, Saudi Arabia, United Arab Emirates, Vietnam, Yemen and Zimbabwe[17].

CULTIVATION AND COLLECTION

It is a large shrub growing to 4 m (13 ft) tall. It has clusters of waxy flowers that are either white or lavender in color. Each flower consists of five pointed petals and a small "crown" rising from the center which holds the stamens[14]. Plants are tolerant of salt-laden winds. One hectare of ground stocked with plants 30 cm apart can yield 24 tonnes of green stems from which 260-350 kilos of fiber can be obtained. The plant is of great religious significance in India where it is sacred to the god Shiva. Plants can flower all year round but the main flowering is in the hot season[15].

MICROSCOPY

Transverse sections through the midrib showed an upper and lower, single- layered epidermis that was externally covered with a thick, striated cuticle a few epidermal cells on both lower and upper surfaces, parenchymatous cells that were thin-walled and isodiametric to circular[16].

- **STEM**

Epidermis: Uni and multicellular hairs clothe epidermis almost completely. Cells are barrel to rectangular and are compactly arranged[17].

Cortex: The upper and lower epidermis was covered externally with a thick striated cuticle. Below the upper epidermis were three rows of elongated closely arranged palisade parenchyma[16].

Endodermis: Central cells were irregular in shape laticifers and vascular bundles were also present scattered in this region[16, 17].

- **LEAF**

Vascular tissue: The xylem consisted mostly of vessels and tracheids, and a strip of cambium was present between the xylem and phloem tissues[16].

Pith: Centre is occupied by thin walled parenchyma and also many latex vessels[17].

PHYTOCHEMICAL ANALYSIS

Table 2: Phytochemical analysis of *C. gigantea*

Sr. No.	Test	Plant Part				Chemical constituent
		Flower	Bud	Root	Leaves	
1	Mayer's test Wagner's test Dragendorff's test	+	+	+	+	Alkaloids
2	Chrysorbin test Legal test	+	+	+	_	Glycosides
3	Molisch test Fehling test Benedict's test	+	+	+	+	Carbohydrates
4	Xanthoproteic test Libermann Burchard test	+	+	+	+	Proteins
5	Salkowski test Sulphur test	+	+	+	+	Steroids
6	Shinoda test Zinc dust test	+	+	+	+	Flavanoids
7	Liberman buchard sterol reaction	+	+	+	+	Saponins

CHEMICAL CONSTITUENTS

In *Calotropis gigantea*chemical constituent such as calotropin, Calotoxin, Giganteol α and β calotropeol, β-amyrin, Calotropisesquiterpenol, Calotropisesterterpenol [terpene derivatives], Calotropbenzofuranone, β-amyrin [aromatic product], Sapogenins, holarrhetine, Cyanidin-3-rhamnoglucoside, taraxastero and sucrose are present[13].

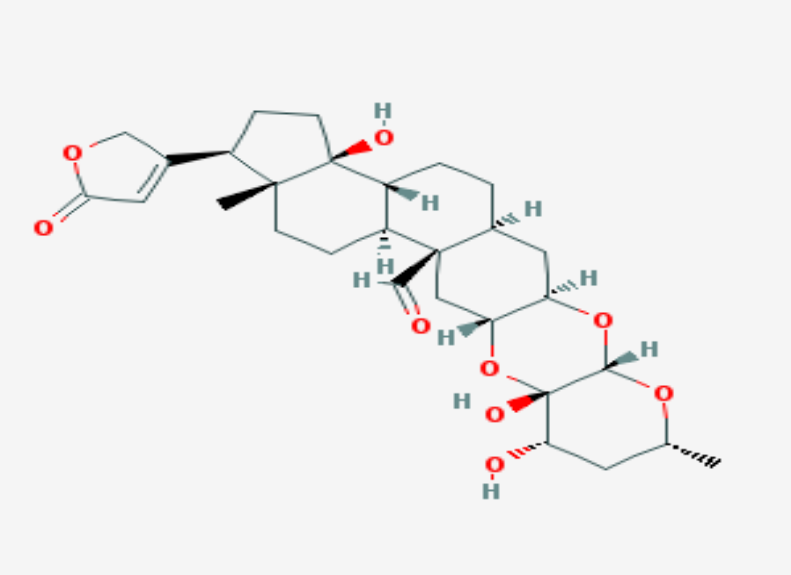

Fig 2: Structure of Calotropin

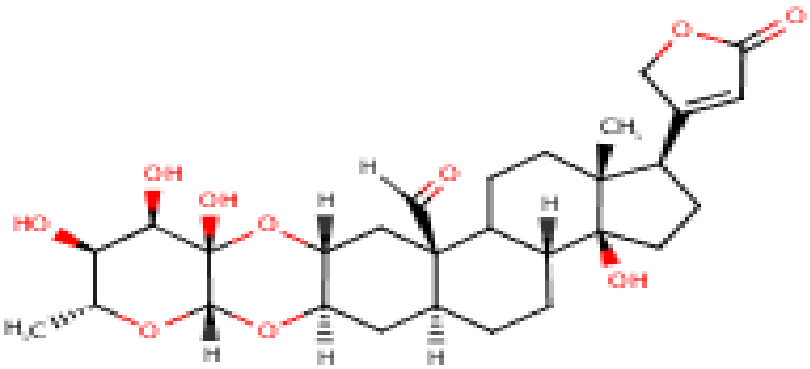

Fig 3: Structure of Calotoxin

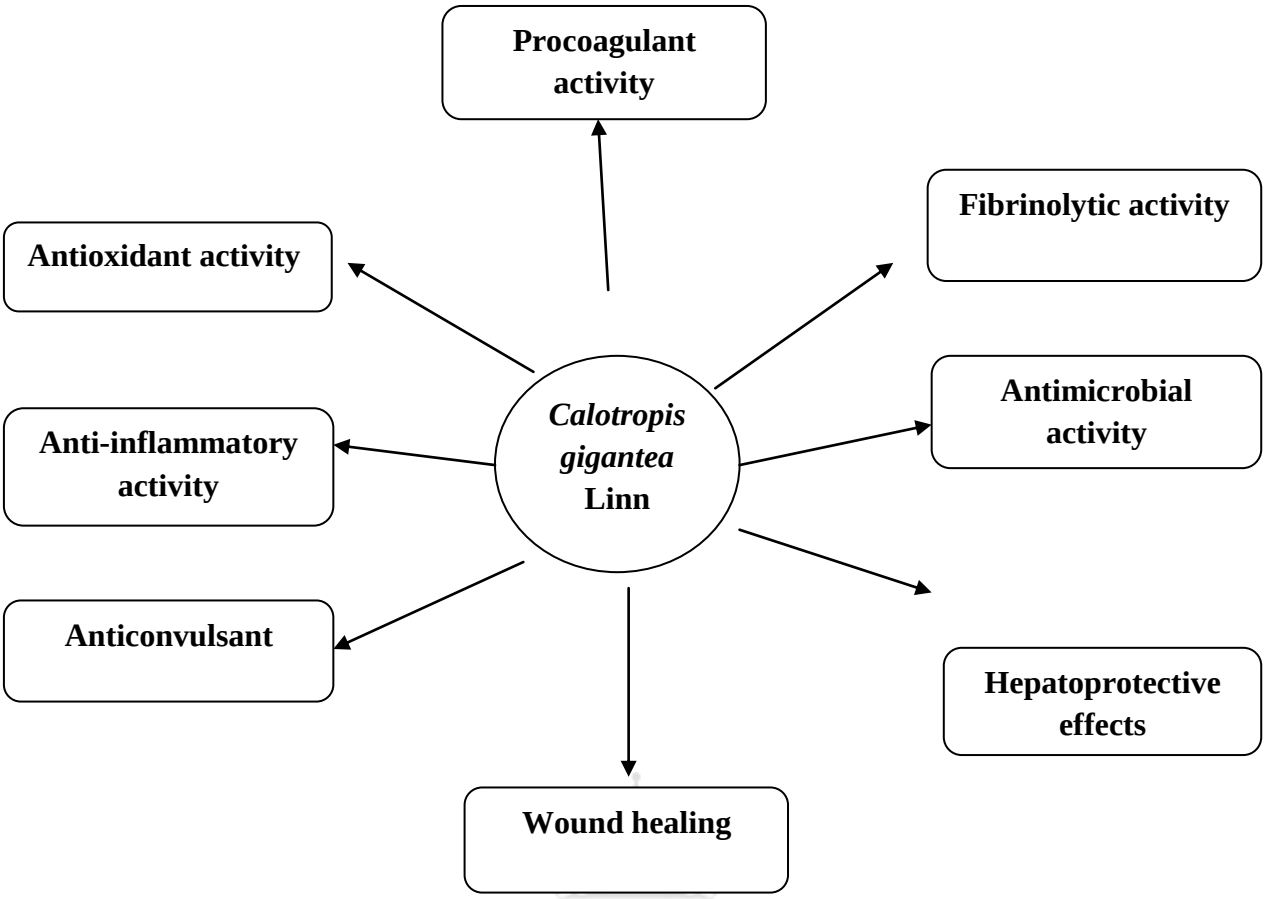

Fig 4: Medicinal properties of *C. gigentea* Linn.

PROCOAGULANT ACTIVITY

The latex of *C. gigantea* is reported to carry procoagulant (tending to promote coagulation) activity. The latex extract hydrolysed casein, human fibrinogen and crude fibrin clot in a dose dependent manner[5]. Recalcification time was determined according to the procedure described by Condrea et al. (1983). Fresh human blood was mixed with 0.11 M tri-sodium citrate in the ratio of nine parts to one. The mixture was centrifuged for 15 min at 500 g. The supernatant was used as PPP (platelet poor plasma)[9]. The crude extract hydrolysis crude fibrin clot strongly compared to trypsin and papain. Proteins present in the latex of *C. gigantea* are strongly proteolytic and responsible for procoagulant activity of *C. gigentea*[5].

FIBRINOLYTIC ACTIVITY

Fibrinolytic activity was carried out using human blood clot and plasma clot as substrates. One hundred microlitres of EDTA (Ethylenediamine tetra acetic acid) 2 mg/ml treated human

blood was mixed with equal volume of 100 mM $CaCl_2$ and allowed to stand for 30 min to form clot[9].

ANTIMICROBIAL ACTIVITY

Antimicrobial activity of essential oil was performed using agar well diffusion method. The aqueous extract of leaves of *C. gigantea* was reported to possess antimicrobial activity against *Staphylococcus aureus*, *Escherichia coli* (*E. coli*), *Bacillus cereus*, *Pseudomonas aeruginosa*, *Micrococcus luteus* and *Klebsiella pneumoniae*. Where agar plate of nutrient were prepared and autoclaved at 121 ºC for 20 min and these sterile plates were inoculated by spreading 100 µ l of 0.5 McFarland standard respective overnight grown microbial culture over the media viz. *Klebsiella pneumoniae*, *E. coli* on the nutrient agar plate and potato dextrose agar was prepared for antimicrobial activity [2,5]. The antibacterial activity of methanol extract from the root barks of *C. gigantea* and its petroleum ether, chloroform and ethyl acetate fractions. Both methanol extract and its chloroform fraction showed activity against *Sarcina lutea*, *Shigella sonnei*. [5]

HEPATO-PROTECTIVE EFFECTS

Ethanol extract of stems of *C. gigantea* was reported for hepatoprotective activity in male Wistar rats against carbon tetrachloride induced liver damage[5]. In the treatment groups, *C. gigantea* extract and silymarin were administered orally once daily starting 2 hr before the CCl_4 injection. After 1 week of treatment, the rats were sacrificed blood was collected and serum was separated[3].

WOUND HEALING

The crude latex of *C. gigantea* was evaluated for its wound healing activity in albino rats using excision and incision wound models[5]. The studies were carried out using two different wound models at two different dose levels of 400 and 800 mg/kg body wt[7]. At a dose of 200 mg/kg/day *C. gigantea* latex showed the significant wound healing activity as treated animals exhibit 83.42 % reduction in wound area[5].

ANTICONVULSANT

Seizures were induced in rats with PTZ (Pentylenetetrazol) at 80 mg/kg i.p. (Intraperitonial-cavity). This is the convulsive dose in 97 % of the animals. PTZ was dissolved in 0.9 %

saline and injected i.p in rats at 0.2 ml/100 gm[8]. Animals were randomly divided into seven groups of six animals each (n=6). Experiments were conducted at the same time each day and the rats were subjected to MES (maximal electroshock) at 150 mA, 60 Hz for 0.2 sec through pinnal electrodes at 60 min after vehicle/drug administration. In all electrically induced convulsions, the rats were manually restrained and released immediately[6, 8]. The criterion for anticonvulsant activity and protection against MES induced seizures is abolishing HLTE (hind limb tonic extension) which is taken as the end point of the test[6].

ANTI-INFLAMMATORY ACTIVITY

Ethanol extract of *C. gigantea* was reported for the anti-inflammatory activity against carrageenan induced paw edema in wistar albino rats. The oral administration of 400 mg/kg of *C. gigantea* showed significant anti-inflammatory activity the activity was found more than that of 100 mg/kg of Ibuprofen[5].

ANTIOXIDANT ACTIVITY

Leaves of *C. gigantea* were reported to carry antioxidant activity. The study reports the DPPH (1,1-diphenyl-2-picrylhydrazyl) radical scavenging activity reducing power activity and nitric oxide scavenging activity of the hydroalcohlic extract of *C. gigantea* leaves[5].

RESULTS AND DISCUSSION

The present study attempts the evaluation of leaf of *C. gigantea* for preliminary phytochemical studies and pharmacological screening. The selection of this plant for the present study was based on its medicinal properties and use in traditional medicinal system. This plant is known for antimicrobial, anti-diarrhoeal, antipyretic, wound healing and CNS (Central nervous system) activity etc. In this study crude aqueous extract of latex of *Calotropis gigantea* was tested against pathogenic species of bacteria and fungi. In this study, an attempt has been made to evaluate the anticonvulsant activity of hydro-alcoholic leaf extract of *C. gigantea*. Extraction of flowers of *C. gigantea* gave 0.13% w/w essential oil.

CONCLUSION

Thus the plant extract might be useful as a wound healing agent. The potent wound healing capacity of the extract of *Calotropis gigantea* Linn as. The preliminary phytochemical investigation of the extract revealed the presence of alkaloids, cardiac glycosides, flavonoids,

steroids, tannins, triterpenoids, carbohydrates and saponins in the hydro-alcoholic leaf extract of *C. gigantea.* The actual phytoconstituents responsible for anticonvulsant activity is needed to be determined. Hence there is a further scope for phytochemical investigation and activity guided isolation of active constituents from the leaves of *C. gigantea*.

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