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**Review Paper**

# A brief study on phytochemical and pharmacological profile of calotropis gigantea

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## ABSTRACT

The main point is that we may access a variety of life-saving medications, either in modified synthetic form or directly in extract form. Calotropis gigantea is a huge, gregarious shrub with many branches and young branches covered in white, cottony hairs. It has been used as a medicinal plant and a key source of pharmaceuticals since ancient times. It has milky latex in it. Commonly referred to as "milkweed," this plant is native to China, Malaysia, and India and is found practically everywhere in the world. It has long been utilized in the Siddha, Ayurvedic, and Unani medical systems. A variety of illnesses may be treated with the help of this plant's parts, including its roots, bark, latex, leaves, and flowers. Among the many isolated compounds found in this medicinal plant are alkaloids, tannins, resins, flavonoids, terpenoids, cardiac glycosides, and many chemical compounds such as giganteol, α and β calotropeol, β-amyrin, giganteol, and isogiganteol. In addition to these chemical compounds, C. gigantea has some pharmacological activity, including anti-inflammatory, anti-diarrheal, hepatoprotective, anti-asthmatic, antioxidant, antibacterial, antiviral, wound healing, and hypoglycemic propertie.

## INTRODUCTION

Animals, plants, and other natural items have had a profound influence on human culture and civilization from prehistoric times to the present in various regions of the world, including India. Since the dawn of civilization, people have revered plants, which are preserved as genetic resources and utilized for fuel, food, fiber, fodder, fertilizer, febrifuge, and other purposes. Calotropis gigantea, a member of the Apocynaceae family, is a well-known medicinal herb that has long been utilized in Ayurvedic, Unani, and Siddha medicine systems. It is also referred to as milkweed or crown flower weed. This is a latex-bearing plant that releases latex when tissue is damaged.

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Combinations of tannins, alkaloids, sugar, starch, resins, protein, and gum make up plant latex.

**Fig: - Calotropis gigantean plant.**

**Vernacular Classification: -**

| | |
|---|---|
| **India** | (Sanskrit) Arka, Ganarupa, Mandara, Vasuka, Svetapushpa, Sadapushpa, Alarka, pratapass, ( Hindi) Aak, Madar, (Kannada) Ekka, (Tamil and Malayalam) Erukku, (Telugu) Jilledi puvvu. |
| **English** | Crown flower, giant indian milkweed. |
| **Vietnam** | B[oot]ng b[oot]ng, 1[as]hen, nam t[it] b[at]. |
| **Indonesia** | Bidhuri ( sundanese, Madurese), sidaguri ( Javanese), rubik (Aceh) |
| **Malaysia** | Remiga, rembega, kemengu. |
| **Laos** | Remiga, rembega, kemengu. |
| **Thailand** | Po thuean, paan thuean (northern), rak (central). |
| **Philippines** | Kapal-kapal (Tagalog). |

**Scientific Classification: -**

| Sr. No | Kingdom | Plantea | Sr. No | Kingdom | Plantea |
|---|---|---|---|---|---|
| **1** | clade | Tracheophytes | **1** | Order | Gentianales |
| **2** | clade | Angiosperms | **2** | Family | Apocynaceae |
| **3** | clade | Eudicots | **3** | Genus | Caloteropis |
| **4** | clade | Asterids | **4** | Species | C.gigantea |

**Taxonomical Classification:**

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

**Morphology: -**

**Root:** Simple, branching, woody at the base, with a fissured bark; branches are heavily white tomentose and rather tasty; it is glabrescent in the early stages. When the plant is cut or broken, white latex is released from every portion.

**Leaves:** Opposite-decussate, simple, subsessile, exstipulate; oval obovate to fully obovate edge, 5-30X 2.5-15.5 cm, base cordate, apex abruptly and

quickly acuminate to apiculate, margins whole, delectable, white tomentose when young, later glabrescent and glacouse.

**Fruit:** A simple, fat, enlarged, subglobose to laterally ovoid follicle with a diameter of at least 10 cm. Numerous tiny, flat, oblong seeds that are 6 × 5 mm in size and packed with smooth white pappus that are at least 3 cm long.

**Flowers:** Actionmorphic, pentamerous, hypogynous, bracteate, complete, sexually unbiased, pedicellate, pedicel 1-3 cm long.

**Calyx:** Sepal 5, glabrescent, quincuncial aestivation, polysepalous, five lobed, connected at the base in a couple of seconds Androecium The anther is dithecous, gynandrous, and has five stamens.

**Inflorescence:** Thick, multibloomed, umbellate, peduncled cymes that appear axillary or terminal emerge from the hubs.

**Gynoecium:** The peltate disgrace has five parallel stigmatic surfaces and is bicarpellary and apocarpous, with styles united at the apex. The embarrassment of framing a gynostegium is akin to anthers.

**Natural habitual, geological, or biological sources:**

Throughout the country, Calotropis grows wild up to 900 meters (msl) and can withstand drought and salt to a moderate degree. It prefers sandy, disturbed soils with 300–400 mm of mean annual rainfall. Because its seeds are dispersed by wind and animals, it quickly becomes a weed along abandoned roads, lagoon shores, and in natural grasslands that have been overgrazed. It usually predominates in areas with disturbed sandy soils and low rainfall, and it loves abandoned agricultural sites. It is said to be an indication of over cultivation. For C. gigantea, a broad habitat with little competition is ideal. This species' plants grow in dry environments with rainfall limited to 150–1000 mm per year and in regions with overly drained soil where annual precipitation can reach up to 2000 mm. Additionally, it may be found in common settings such as densely populated metropolitan areas, seaside dunes, and roadside sand dunes. C. gigantea can also be found at elevations of up to 1,000 meters above sea level. The plant is sometimes planted as an ornamental in arid or coastal areas since it is easy to manage, reproduces, and can survive in xerophytic environments. In addition to Madagascar, the Arabian Peninsula, West Africa, North and East Africa, Macaronesia, and South Asia, C. gigantea is indigenous to Southern Asia and Indo-China. The plant is a natural species in Australia, Central America, North America, South America, and the West Indies. Many countries now tolerate and grow the plant, including those in Mexico, Central and South America, the Pacific Islands, Australia, and the Caribbean.

**The Chief Features: -**

- The plant grows well in a range of climate conditions and soil types.
- Thus, it can be found in tropical and
- It grows best on poor soils, especially in areas where overgrazing has reduced competition from indigenous grasses.
- All the subtropical areas of the world, encompassing all
- It doesn't need cultivating methods.
- One of the few plants that grazing animals avoid eating is this one.
- India

**Therapeutic Uses:**

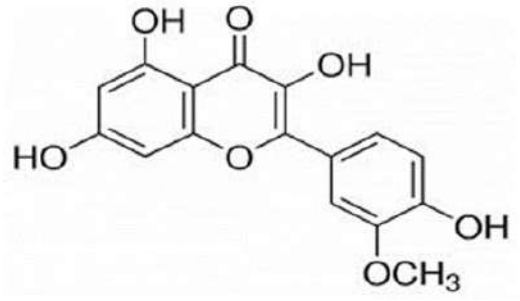
In addition to treating leprosy, leucoderma, ulcers, tumors, piles, and diseases of the spleen, liver, and abdomen, the plant is purgative, anthelmintic, alexipharmic, and its juice prevents leucoderma, tumors, ascites, and disorders of the abdomen. Wounds, painful or paralyzed joints, and swellings are all treated with the leaves. The leaves are tinctured and used as an antiperiodic to treat intermittent fevers. Ascites, inflammation, rat bites, and tumors. The milk relieves piles, is bitter,

purgative, and laxative. The diaphoretic root bark cures asthma and syphilis. The flower is astringent, analgesic, anthelmintic, sweet, bitter, and medicinal

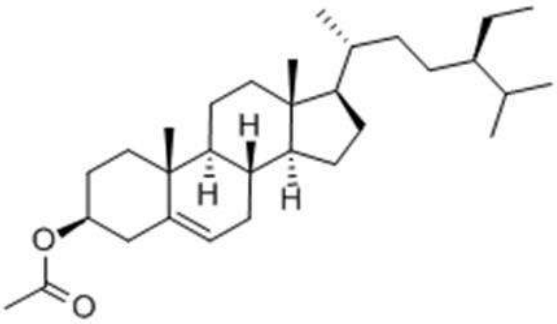
**Chemical Constituent: -**

Various chemical constituent isolated from C.gigantea Linn:

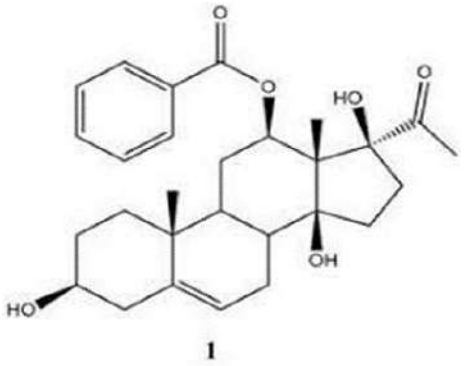
| **Class of chemical constituent** | **Name of chemical constituent** | **Plant Part used** | **Extract Takes** |
|---|---|---|---|
| Triterpenoids | Di-(2-ethylhexyl) Phthalate | Flowers | Ethyl acetate extract |
| | Anhydrosophoradiol-3-acetate | | |
| | Lupeol | Aerial parts | Latex |
| | α-Taraxerol | Root bark | Ethyl acetate extract |
| Triterpene esters | γ-Taraxasterol | Aerial parts | Hexane and methanol soluble extract |
| | Lupenyl-1-acetate | Root bark | Petrolium ether extract |
| Flavonol | Isorhamnetin | Aerial parts | Methanol extract |
| Cardiac glycosides | Calotropone | Root bark | Ethanol extarct |
| | Gofruside | | |
| Steroids | Stigmasterol | Root bark | Methanol extract |
| | β-Sitosterolacetate | | |
| | β-Sitosterolacetate | | Ethyl acetate extract |
| Resin | β-Amyrin | Root bark | 95% Alcohol extract |
| | β-Amyrin acetate | | |
| Fatty acids | Isovaleric acid | Root bark | 95%Alcohol extract |
| Miscellaneous | Asclepin | Roots | Latex |




**Lupeol**

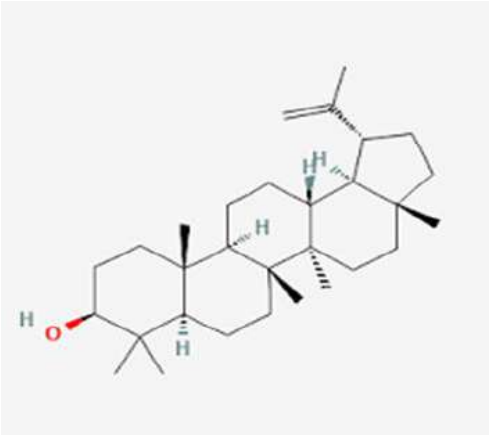



**β- Sitosterol acetate**




1

**Calotropone**




**Isorhamnetin**

Chemical structures of various chemical constituents isolated from C. gigantea.

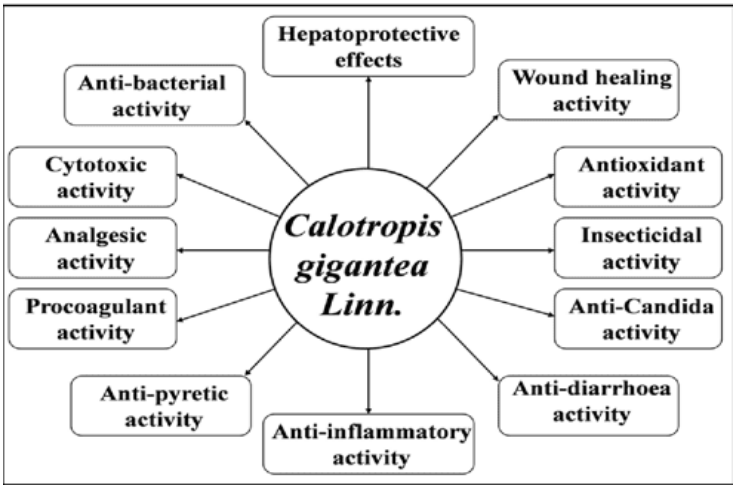



**Fig. Medicinal properties of C.gigantea Linn.**

**Pharmacological Activities: -**

1. **Anti-inflammatory activity:**

   Several experimental animal models were used to assess Calotropis gigantea's anti-inflammatory properties. The anti-inflammatory properties of chloroform, n-butanol, ethanol, and distilled water extract of Calotropis gigantea leaves were examined. Using the carrageenan-induced rat paw oedema method, this activity was contrasted

with that of the common medication, paracetamol. Either a stronger malic enzyme or the filarial worm Setaria digitata: specific drug-and herbal extract properties and effects are indicated by the calotropis gigantea alkaloid fraction's residual anti-inflammatory activity. Conversely, the anti-inflammatory action is assessed using a model of chronic inflammation caused by adjuvant-induced arthritis and a model of acute inflammation caused by carrageenin-induced kaolin-induced rat paw oedema and cotton-pellets granuloma.Additionally, the anti-inflammatory properties were demonstrated against the albumin denaturation approach.

2. **Anticancer activity:**
   Anhydrosophoradiol-3-acetate (A3A), an isolated chemical found in Calotropis gigantea flowers, kills viable tumor cells and reduces body weight growth. A3A's ability to effectively suppress EAC growth in vivo has been shown to improve cancer-induced complications.
3. **Antitusive activity:**
   Calotropis gigantean leaf extract has antitussive properties since it contains alkaloids and glycosides.
4. **Antidiarrheal activity :**
   The anti-diarrheal properties of Calotropis gigantean aerial component hydroalcoholic (50:50) extract were evaluated in a rat model of castor oil-induced diarrhea. The gastrointestine transit rate was determined by dividing the proportion of the longest distance traveled by the charcoal by the total length of the small intestine. The weight and volume of intestinal content caused by castor oil were measure dusing the enterpoling method. The extract significantly reduced the frequency of fecal dropping and fecal output at dosages of 200 and 400 mg/kg body weight (interaperitoneal dose). Additionally, the extract greatly decreased the weight and volume of intestinal material.
5. **Analgesic activity:**
   Alcohol extract from Calotropis gigantea flowers was administered orally, and its analgesic effects were evaluated in mice utilizing thermal and chemical methods. In the acetic acid-induced writhing test, a 20.97% reduction in the number of writhes was seen at doses of 250 mg/kg, respectively. The hot plate method extended the time spent licking the paws. Thirty minutes after the dose was given, the analgesic effect became apparent, and ninety minutes later, it peaked. The analgesic potential of dry latex (DL) derived from C. gigantea was evaluated in this study. The effect of DL at a dose of 415 mg/kg against acetic acid-induced writhing was more noticeable than that of an oral dose of aspirin (100 mg/kg). DL (830 mg/kg) produced a modest analgesic effect in the tail-flick assay that was similar to that of aspirin.
6. **Wound healing activity:**
   Studies on the activity of wound healing using animal models are many. Utilizing an excision and incision wound model, Calotropis gigantea latex was first applied to albino rats. When comparing the latex-treated animal to the control, which was 76.22% with framycetin sulphate cream (1%) as a standard, the latter showed an 83.42% reduction in wound area.
7. **Hair growing Activity:**
   The purpose of Calotropis gigantea with Hibiscus rosa sinensis (HRSF) and polyherbal formulation (HCF) was to determine the effects of the two plants on the commencement and encouragement of hair development in albino rats. The findings and observations of the study were contrasted with those of Minoxidil. Compared to other treatments, Calotropis gigantea had reduced potential hair growth activity.

8. **CNS Activity:**
   Calotropis gigantea extract exhibits a variety of neuropharmacological activities, including sedative and hypnotic, antidepressant, antianxiety, analgesic, and more, because it contains the flavonoids chrysin and apigenin. The C. gigantea extract enhances collateral branching, axonal and dendritic length, quantity, and branching orders, even in this kind of activity.
9. **Anti-venom Activity:**
   Antivenom action against viper russell snake venom is provided by Calotropis gigantea plant extract. Calotropis gigantea methanolic extract has beneficial effects that counteract the venom's different actions, including mortality, oedema formation, necrotizing, and hemorrhagic activity.The deadly effects of 2LD50 and 3LD50 venom were substantially mitigated in mice by oral administration of extract at 200 and 400 mg/kg. The plant extract effectively neutralized the 2LD50 and 3LD50 of venom in in vitro experiments at doses of 100, 200, and 400 mg/kg. Methanolic extract from viper venom had an effect on oedema at 60, 120, 180, and 240 minutes.
10. **Anti-malaria:**
    Calotropis gigantea extract exhibits antimalarial action against Plasmodium falciparum and Plasmodium berghei. This plant has outstanding anti-malarial action because it exhibits anti-plasmodial activity against the chloroquine-sensitive Plasmodium falciparum.

**Traditional Uses of Calotropis Gigantea:-**

1. In Ayurveda: Paralysis, swellings, and intermittent fevers are all treated with the leaves of the C. gigantea plant.Flowers can be used to treat fever, inflammation, helminthic infections, anorexia, asthma, and catarrh. The root bark of the plant is used to treat skin diseases, intestinal worms, helminth infections, and ascites.

2. In Siddha: - The leaves of C. gigantea are utilized for the treatment of dangerous snake bites, periodic fever, vatha illnesses, intestinal worms and ulcers.The roots of this plant are crushed completely and then firmly rubbed over the bite area. The latex of this plant can be used to treat gonococcal arthritis, swellings, dental problems, rat bites, and other rheumatic conditions. Using flowers to treat bronchial asthma

3. In Unani: In the Unani system, root bark powder has traditionally been used to treat dysentery and diarrhea. The plant's root helps with dyspepsia and has carminative properties.

## CONCLUSION:

Calotropis gigantea is a potential plant with various healing principles and economic values. It is generally assigned through all over the India, which is use as traditional medicine, ornamental, fuel, fibre, auxiliary plant, mosquito controlling etc. and the various part of this plant viz. root, leaves, root bark, milk, flower are used ethnomedicinally as a remedy for various diseases for human beings. Though Calotropis gigantea has various medicinal applications, but still in future the phytochemicals and unknown compound of this plant need to be standardized and characterization of new potent molecule that suppress various pathological disorders and development of new class of drug therapies for the betterment of health of human beings.

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