CALOTROPIS GIGANTEA: A REVIEW ON ITS PHARMACOLOGICAL ACTIVITY

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ABSTRACT

Calotropis gigantea Family Asclepiadaceae commonly known as Madar in Hindi is a perennial herb with a long history of use in traditional medicines. Calotropis gigantea (Asclepiadaceae) is a hoary, laticiferous shrubs tree, also known as “the milkweed”. Calotropis is used as a traditional medicinal plant. C. gigantea contain chemical constituents are cardenolides, flavonoids, terpenes, pregnanes and a nonprotein amino acid. The root bark contains α-amyrin, β-amyrin, taraxasterol and its ψ-isomer taraxasteryl isovalerate, taraxasteryl acetate, gigantin, giganteol, isogiganteol, β-sitosterol and wax (United State Department of Agriculture). The Plant root shows Nootropic activity in methanolic extract. The latex, leaves, flowers, bark is also used as caustic, acrid, expectorant, removes body hairs, antihelmintic, Also useful in leprosy, ulceration, cough, scabies ring worm of the scalp, piles, explosion on the body, asthma, enlargement of spleen and liver, edema applied to painful joint swellings. Also evaluate possible anxiogenic activity, sedative property and anxiolytic potential of crude ethanolic extract of Calotropis gigantea leaves, memory enhancing activity in methanolic extract of Calotropis gigantea root. This review gives a brief idea about its pharmacological activity (K.S. Krishanan marg).

KEYWORDS: Calotropis gigantea, Memory, Scopolamine, Pharmacological activity.
INTRODUCTION
Natural world has gifted us with many herbs having mystical dragging properties that are used widely in number of ailments. The use of herbs and medicinal plants as the first medicines is a universal phenomenon. Today, as much as 80% of the world’s population depends on traditional medicine as primary health care needs. Ayurveda is an intricate system of healing that originated in India thousands of years ago. Herbal blends and formulations combine the benefits of multiple herbs, which typically produce a synergistic action while minimizing the potential toxic effects of a single herb. Herbs provide many unique qualities that are very limited in conventional medicine, such as anti-cancer, anti-viral and immunoregulation properties. Herbs are an excellent alternative to antibiotics in the treatment of infectious diseases, with wider antibacterial effects as well as various antifungal and antiviral actions. Some herbal formulations serve as detoxification agents, antioxidants, and anti-cancer therapies. The present work objectives are to investigate indigenous plants used in protection against cognitive dysfunction in India (Havagiray R). We hereby reported our findings related to cognitive dysfunction activities of plant Calotropis gigantea (Asclepiadaceae) (Basha, S.K).

CALOTROPIS GIGANTEA

PLANT NAME IN DIFFERENT LANGUAGE
Hindi: Gauri akavana, Aka, Mandara
English: Madar
Sanskrit: Svetarka
Malayalam: Vella Erukku

AYURVEDIC PROPERTIES
Rasa: Katu, Tikta
CLASSIFICATION OF CALOTROPIS GIGANTEA

Kingdom: Plantae (plants)
Sub-kingdom: Tracheobionta (vascular plant)
Super division: Spermatophyta (seed plant)
Division: Magnoliophyta (flowering plants)
Class: Magnoliopsida (dicotyledons)
Subclass: Asteridae
Order: Gentianales
Family: Asclepiadaceae (milkweed family)
Genus: Calotropis
Species: gigantea (giant milkweed)

DISTRIBUTION

Calotropis gigantea is a large shrub growing to 4 m (13 ft) tall. It has clusters of waxy flowers that are either white or lavender in colour. Each flower consists of five pointed petals and a small, elegant "crown" rising from the centre, which holds the stamens. The aestivation found in calotropis is valvate i.e. sepals or petals in a whorl just touch one another at the margin, without overlapping. The plant has oval, light green leaves and milky stem. The latex of Calotropis gigantea contains cardiac glycosides, fatty acids and calcium oxalate (Ayurvedic medicinal plants).

GEOGRAPHICAL SOURCE

Calotropis gigantean (Asclepiadaceae) whole plant found allover India upto an altitude of 900m is including the Andman. Also found in dry Waste places commonly known as mudar in English.\textsuperscript{[10]} It occurs throughout India from Punjab and Rajasthan in the north to Kanniya kumara in the south, extending into West Bengal, Assam in the East (K.S. Krishanan marg).

MORPHOLOGY AND MICROSCOPY

Roots are externally whitish grey in color. Transverse section of mature root shows cork zone. Composed of 30 – 50 or rows of polyhedral to nearly cubical thin walled cell. Very small sized cubical crystals are found in the inner row. Phellogen is distinct. Cortex is comparatively narrow of few rows of cubical, rectangular, or oblong thin walled cells, most
of which are filled with numerous starch grains. Phloem is a broad zone consisting of a number of broad radial band of thin walled cell transversely by very narrow strips of medullary rays. Laticiferous cells and crystal of calcium oxalate are present. Cambium is distinct.

- Leaves are freshly, obviate, oblong, apex acute, rarely rounded, base corrugate, 6-20 cm long and 3-8 cm wide glaucous green, smooth above, cottony below. Petioles 0.3-2 cm long.
- The stem is woody with yellowish white bark, young stem and branches covered with soft, loosely appressed, whitish, waxy, or sometimes powdery pubescence.
- Fruits are single or paired, tumid, recovered, 7-10 cm long.
- Seeds are numerous, broadly ovate, flattened, brown in color 2.5-3.5 cm long, including the white tuft of silky hair and pointed end.
- Flowers with lilac, pale rose or purple, rarely light greenish – yellow or white, inodorous, with spreading reflexed corolla lobes, born in axillary pedunculate corymbs. Flowers are almost throughout the year but most commonly from November to March in central India (Jagtab V.A).

CHEMICAL CONSTITUENT
The root bark contains α-amyrin, β-amyrin, taraxasterol and its ψ-isomer taraxasteryl isovalerate, taraxasteryl acetate, giantin, giganteol, isogiganteol, β-sitosterol and wax. Root parts are also contains cardiac glycosides, seven oxypregnane-oligoglycosides, calotroposides A-G.

Latex: akundarin, 0.45% uscharin, 0.15% calactin, 0.15% calotoxin also consists α β-calotropeol, β-amyrin. Latex also consists glutathione and proteoclastic enzyme.

In 1980, Pal and Sinha had isolated, crystallized and studied the properties of Calotropins D1 and D2 from C. gigantea. The new oxypregnane-oligoglycosides named Calotropis A and B have been isolated from the root of C. gigantean (Havagiray R, United State Department of Agriculture).

THERAPEUTIC USES
The root bark of C. gigantea resembles Ipecac in its action and is for its substitute for it. In small doses, the root bark is diaphoretic and expectorant. It acts as a mild stimulant and is given with carminatives in dyspepsia. It is useful in leprosy and eczema. The powdered root
bark gives relief in diarrhea and dysentery. It is also given in cough and asthma and as a febrifuge.

In the homeopathic system of medicine, it is reported to be useful in the elephantiasis, lupus and chronic rheumatism. The ethanolic (50%) extract of root exhibited anti cancer activity (Jagtab V.A).

PHARMACOLOGICAL ACTION
In Pharmacological trials, the extract of root exhibited a wide degree of physiological activity in experimental animals; low doses of crude Methanolic extract (90% and 10%) of the root was observed to show hypertensive effect with irregularity of cardiac function in the frog heart, cardio tonic activity, deep tonic contraction of reversible nature on the uterus of guinea pig and strong reaction on the intestinal loop, depending upon the concentration and doses (Jagtab V.A).

SIDE EFFECT OF C. GIGANTEAN
In large doses, the drug causes nausea, vomiting and diarrhea. Prolonged higher doses cause headache, burning in micturition and leucorrhoea (Jagtab V.A, United State Department of Agriculture).

PHARMACOLOGICAL ACTIVITIES
NEUROPHARMACOLOGICAL ACTIVITIES OF CALOTROPIS GIGANTEA ROOTS

Predictable Phytoconstituents of Calotropis gigantea (L.). The present study has been envisaged to examine Calotropis gigantea (L.) Dryand for Neuropharmacological activities. The powdered plant material was extracted in a Soxhlet apparatus successively using solvents in order of increasing polarity viz., petroleum ether (60-80°C), chloroform and methanol. Ethyl acetate portion was prepared by partitioning methanol extract with ethyl acetate. The
methanol extract and EAF were evaluated for anticonvulsant, antidepressant, sedative, antianxiety, antistress and analgesic activities in mice (Kawalpreet Kaur et al. 2014).

**CALOTROPIS GIGANTEA PHYTOCHEMICAL & PHARMACOLOGICAL PROFILE**

*Calotropis gigantea* (Asclepiadaceae) is a constant herb with a long the past of use in traditional medicines. A spacious range of chemical compounds with flavonoids, resins, alkaloids, Cardiac glycosidis, tennins, & terpenoids have been remote from this plant. The Plant has been used for various disease condition counting leprosy, ulcer, tumours and piles. Various pharmacological activities reported like Analgesic activity, Antipyretic activity, Pregnancy interceptive activity, CNS activity, Anti-inflammatory activity, Procoagulant activity, Anti-diarrhoeal activity, free redical scavenging activity, Antimicrobial Activity, Anti-tumor activity, Antifungal activity, Antitussive activity and Antifeedent activity (Singh Namrat a et al. 2014).

- **PHARMACOLOGICAL AND BIOLOGICAL OVERVIEW OF CALOTROPIS GIGANTEAN**

*Calotropis gigantea* (Asclepiadaceae) is a glabrous or snowy, laticiferous bushes or small trees, commonly known as “the milkweed”. *Calotropis* is used as a conventional medicinal plant. *C. gigantea* contain chemical constituents are cardenolides, flavonoids, pregnanes, terpenes and a nonprotein amino acid. The latex, leaves, flowers, bark, root is also used as caustic, acrid, expectorant, depilatory, antihelmintic, useful in leprosy scabies ring worm of the scalp, piles, eruptions on the body, asthma, enlargement of spleen and liver, dropsy applied to painful joint swellings. This evaluation gives a concise idea about its Phytochemistry and pharmacological action (Baby Joseph et al. 2013).

- **ANTIBACTERIAL ACTIVITY OF CALOTROPIS GIGANTEA LEAVES (IN VITRO)**

*Calotropis gigantea* is a ordinary wasteland weed and identified for different medicinal properties. The aspire of the present study was to screen leaves of *Calotropis gigantea* for the antimicrobial activity beside clinical isolates of bacteria. The aqueous extract of the *C. gigantea* was studied for its antagonistic action against *Staphylococcus aureus*, *Escherichia coli*, *Bacillus cereus*, *Pseudomonas aeruginosa*, *Micrococcus luteus* and *Klebsiella pneumoniae*. In vitro antimicrobial action was performed by well diffusion method in MH
agar. The extract showed considerable effect on the tested organisms. The extract showed maximum zone of inhibition beside *E. coli* (Gaurav Kumar *et al.* 2010).

➢ **ACTIVITY ON PATHOGENIC MICROORGANISMS OF CALOTROPIS GIGANTEA**

The aqueous, methanol and ethanol extracts of *Calotropis gigantea* leaves, apical buds and flowers were ready and used to study the effect of *Calotropis gigantea* extracts on growth & continued survival dynamics of *Escherichia coli, Staphylococcus aureus, Candida albicans* and *Xanthomonascampestris*. Microbial enlargement and survival dynamic profiles in the presence of solvent extracts in potage cultures were obtained and in most of the cases the flowers and apical buds extract have also exposed the maximal growth reduction in adding to the leaves, but in some cases growth was quick and accelerated than the control growth curves. *Calotropis gigantea* containing active metabolites such as antho-cyanins, mudarin, calactin, calotropin, non-protein amino acids, protease inhibitors, 18, 20-epoxy-cardenolides, constitutive α-amylase inhibitors, lectins etc. may be the ones accountable for the obtained growth and continued existence dynamics in microbial broth culture. Over all the study has provided the potential of *Calotropis gigantea* as a foundation for biopesticides and future antibiotics (Devid M *et al.* 2011).

**CYTOTOXIC ACTIVITY OF CALOTROPIS GIGANTEA LINN**

Evaluated the dissimilar concentrations of ethanolic extract of the roots of *C. gigantea Linn* were used for cytotoxic action by Brine shrimp lethality bioassay (BSLB) and *Allium cepa* root meristem (ACRM) models. The ethanolic root extract of *c.gigantea* exhibits potent cytotoxic property analogous to that of standard drug. Therefore, his might be utilized for the progress of novel anticancer drug leads (Raut G Ravi *et al.* 2011).
ANTITUMOR ACTIVITY OF CALOTROPIS GIGANTEA LINN

Evaluate experimentally the possible antitumor effect of methanol extract (ME) of Calotropis gigantea L. (C. gigantean) root bark and its petroleum ether (PEF) and chloroform (CF) soluble fractions against Ehrlich ascites carcinoma (EAC) in Swiss albino mice. The effects of ME, PEF and CF on the growth of EAC and life span of EAC bearing mice were studied. Hematological profile and biochemical parameters were also estimated. Methanol extract (ME) of C. gigantea root bark and its chloroform soluble fraction (CF) possesses significant antitumor activity. Results of in vivo study showed a significant decrease in viable tumor cell count and a significant increase of life span in the ME and CF treated group compared to untreated one (Habib MR, et al. 2011).

HEPATOPROTECTIVE ACTIVITY OF CALOTROPIS GIGANTEA ROOT BARK

Evaluated Hepatoprotective effects of alcoholic extract of Calotropis gigantea root woof. The suspension of alcoholic extract of plant Calotropis gigantea root bark in 0.6% carboxyl methyl cellulose (CMC). Alcoholic extract root bark of the plant Calotropis gigantea exhibited a significant guard effect by normalizing the levels of aspartate amino transferase (ASAT/GOT), alkaline phasphatase (ALP) alanine amino transferase (ALAT/GPT), which were significantly greater than before in rats by treatment with D-galactoseamine (Deshmukh Pradeep et al. 2008).

WOUND HEALING PROPERTIES IN CALOTROPIS GIGANTEA ROOT BARK

Evaluated Calotropis gigantea ethanolic extract was agreed orally in incision and dead freedom wound healing models. Rats of standard groups were treated with Povidone iodine topically. The fraction wound closure; epithelization time, hydroxyproline content and blemish area on complete epithelization were measured. Topical application of Calotropis gigantea in cutting out wound model increased the fraction of wound contraction. Scar area and epithelization time were decreased. In incision wound and dead space wound breaking strength of wounds and hydroxyproline was increased. At last it was concluded that Calotropis gigantea accelerated wound healing in rats and thus chains its traditional use (Deshmukh PT, et al. 2009).
CNS ACTIVITY OF CALOTROPIS GIGANTEA ROOTS

Evaluation of Alcoholic extract of peeled roots of Calotropis gigantea R.Br. (Asclepiadaceae) was experienced orally in albino rats at the bodyweight for CNS activity. Well-known analgesic activity was observed in Eddy's hot plate method and acetic acid induced writhings. The paw licking time was delayed and the numbers of writhings were greatly reduced. Significant anticonvulsant commotion was seen as there was a delay in the onset of pentylenetetrazole induced convulsions as well as decrease in its sternness. The extract treated rats spent more time in the open arm of EPM showing its antianxiety activity. There was a decrease in the locomotor activity. The fall off time (motor coordination) was also decreased. A potentiation in the pentobarbitone-induced slumber due to the sedative effect of the extract was practical. These results illustrate the anxiolytic, analgesic, anticonvulsant and sedative effect of the extract (Agral A, et al. 2006).

ANTICONVULSANT AND CENTRAL NERVOUS SYSTEM ACTIVITY

Alcoholic extract of peeled roots of Calotropis gigantea (Asclepiadaceae) was tested orally in albino rats for CNS activity. Well-known analgesic activity was pragmatic in Eddy's hot plate method and acetic acid induced writhings. The paw licking time was belated and the numbers of writhings were extremely reduced. Significant anticonvulsant action was seen as there was an impediment in the onset of pentylenetetrazole induced convulsions as well as decrease in
its cruelty. The extract treated rats spent more time in the open arm of EPM showing its antianxiety activity. There was a decrease in the locomotor activity. The fall off time (motor coordination) was also decreased. A potentiation in the pentobarbitone-induced sleep due to the sedative effect of the extract was observed. These results show the analgesic, anticonvulsant, anxiolytic and sedative effect of the extract (Agral A, et al. 2006).

ANTI-DIARRHOEAL ACTIVITY

The anti-diarrheal effect of hydro alcoholic extract of aerial part of Calotropis gigantea was studied beside castor oil-induced-diarrhea replica in rats. The gastrointestinal transport rate was spoken as the percentage of the longest space traversed by the charcoal alienated by the whole length of the small intestine. The weight and volume of intestinal satisfied induced by castor oil were studied by enter pooling technique. Like atropine there were important reductions in fecal output and incidence of droppings when the plant extracts administer intraperitoneally compared with castor oil treat rats. All doses of the plant extracts also significantly slow down the castor-oil induced enter pooling and intestinal abolish. Significantly inhibited weight and volume of intestinal satisfied. The remarkable anti-diarrheal effect of C.gigantea extract against castor oil-induced diarrhea model attests to its efficacy in a broad range of diarrhoeal states (HR, Chandra, 2004).

PROSPECTIVE OF CALOTROPIS GIGANTEA

The traditional medicines were derived from the medicinal plants, minerals and other organic matters. But the herbal drugs are obtained from the medicinal plants alone (Sath SD).

Medicinal plants are used widely for the encouragement of primary health care needs of the people existing in the rural areas (Kamboj).

Calotropis gigantea is a common desert weed with therapeutic properties. Studies conducted indicates that the plant have antiasthmatic, antibacterial, wound healing, free radical scavenging, vasodilation, procoagulant, anticancer, antifertility, analgesic, anti inflammatory, cytotoxic, anti pyretic, anti convulsant and anti diarrheal activities. calotropisesjuiterpenol, calotropisesterterpenol, calotropbenzofuranone, Calotropnaphthalene were the chief phytochemical compounds resulting From the root extract of the plant. Latex was found to contain the cardiac glycosides, calotoxin, calotopin, uscharin and calactin and uscharidin gigantin and hence take the pharmacological actions. The plant was also mention in Ayurveda and Unani for the management of asthma and for a lot of other diseases.
The inheritance of the utilization of plant as the source of medicine plays an essential component of the health care system in India (Bent S, 2004).

CONCLUSION
Calotropis gigantea is commonly distributed in India, Family Asclepiadacea commonly known as Madar in Hindi is a perennial herb with a long history of use in traditional medicines. This review has listening carefully on the Pharmacological activity of this plant. Pharmacological activity includes Neuropharmacological activity, Antibacterial activity, Antidiarrhoeal activity, Anticonvulsant and Central nervous system activity, Procoagulant activity, Wound healing activity, Hepatoprotective activity, Cytotoxic activity, Antitumor activity etc. Herbs provide many unique qualities that are very limited in conventional medicine, such as anti-cancer, anti-viral and immunoregulation properties. Herbs are an excellent alternative to antibiotics in the treatment of infectious diseases, with wider antibacterial effects as well as various antifungal and antiviral actions. Some herbal formulations serve as detoxification agents, antioxidants, and anti-cancer therapies (United State Department of Agriculture, Krishanan marg).

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