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Review On *Calotropis Gigantea* And It's Antimicrobial Activity

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ABSTRACT

The beginning of civilization, human beings have worshiped plants and such plants are conserved as a genetic resource and used as food, fodder, fibre, fertilizer, fuel, febrifuge and in every other way. *Calotropis gigantea* is one such plant. In this review the systematic position, vernacular names, vegetative characters, Ecology and distribution, phytochemistry and the economical values of the *Calotropis gigantea* are discussed.

Calotropis gigantea (L.) Dryand (Giant milk weed; family Asclepiadaceae) has been traditionally used in the treatment of bronchitis, asthma, leprosy, eczema and elephantiasis. This review emphasizes on ethnopharmacology, chemical constituents and pharmacology of *C. gigantea*. The available information on *C. gigantea* was collected through electronic search of major scientific databases. A survey of literature revealed that cardenolides, flavonoids, terpenoids, glycosides, steroids and nonprotein amino acid constitute major groups of chemical constituents in *C. gigantea.*

The plant has been evaluated for varied pharmacological activities, and reported to exhibit analgesic, antimicrobial, antioxidant, anti-pyretic,anti-inflammatory, insecticidal, cytotoxic, hepatoprotective, pregnancy interceptive, procoagulant and wound healing activities. Further, thorough scrutiny of literature revealed a startling fact that clinical reports are not available on the plant. The pharmacological work carried out on the plant for validation of its traditional claims is not convincing as crude extracts used in experimental studies have not been characterized. It is concluded that *C. gigantea* is a medicinally promising plant, which needs to be exploited systematically. The plant could provide therapeutically active constituents, which may be developed as clinically potential drugs.

KEYWORDS: Asclepiadaceae, *Calotropis gigantea*, Cardenolides, Flavonoids, Milkweed, sweta Arka, crown flower, economic va

INTRODUCTION :

A family named Calotropis was first depicted around 1810. These are flowering plants belonging to the Apocynaceae (dogbane) family. Southern Asia and North Africa are its native regions. They are typically referred to as milkweeds because the plant produces the plastic. The English name for the plant Calotropis gigantea is "Crown Blossom," whereas its Sanskrit names include "Madar," "Ganarupa," "Vasuka," "Svetapushp," and so on. It is known by a variety of names in India, including "Ekka" in Kannada, "Erukku" in Tamil and Malayalam, "Jilledi Puvvu" in Telugu, and "Rui" in Marathi. Also, it is known by a number of localised names in other parts of the world, including French cotton, Alarka, Chicken tree, and Widuri. The family Calotropis is widespread in Asia's tropical and subtropical regions, as well as in Africa. (1959's The Abundance of India)

Since the beginning of time, herbs and plants have been used as a source of therapeutic compounds in the traditional medical system. The creation of novel, effective antimicrobial medicines is always required due to the emergence of newer infectious illnesses and drug resistance. Recently, scientists have focused heavily on plants in the development of complementary medications to treat a variety of severe diseases.

It has been proven through research that C. gigantea has medicinal value. This plant's latex, roots, stem, flowers, and leaves are all used in conventional medicine to treat a variety of ailments. The flowers of C. gigantea are used in medicine for their stomachic, bechic, antiasthmatic, and analgesic properties. Roots can be used to treat lupus, tuberculous leprosy, and syphilitic ulcers. The effects of roots on the Brain, cytotoxic action, antibacterial activity, and effects on pregnancy are also present. The plant's leaves and aerial parts are used to treat external swellings and diarrhoea because latex possesses procoagulant activity, purgative properties, and wound healing ability. Additionally, C.giganteas is used to treat earaches, toothaches, and sprains.

This review paper's objectives are to identify, describe, and summarise C. gigantea's characteristics and, in general, its health advantages. This paper will discuss the significance of the plant and go over some of C. gigantean's uses. This species has already been listed as an endangered species in some countries. This article's goal is to serve both scientific and non-scientific readers

PLANT PROFILE:-

Although it is native to India, southern China, Malaysia, and Indonesia, *Calotropis gigantea*, often known as crown flower or gigantic milkweed, has been widely planted across tropical regions of the world. The normal height of this member of the milkweed family is 8–15'.

Biological Source:-

Calotropis gigantea, commonly called crown flower or giant milkweed.

Geographical Source:-

It originated in India, China, and Malaysia and is now distributed practically everywhere. mostly in lower Bengal, Himalya, Punjab, Assam, Madras, and south India in India. Common from Punjab to Assam in the Himalayas, climbing to a height of around 1000 m, on waste land, road sides, and railroad embankments.

Common Name:-

Calotropis gigantea, crown flower , giant milkweed ,Rui, Arka.

Fig 1: calotropis gigantea plant.

Fig2:--calotropis leaves and flowers.

TAXONOMY CLASSIFICATION:

Table no :-1 Taxonomical classification

Kingdom	Plantea
Order	Gentianales
Family	Apocynaceae
Subfamily	Asclepiadoideae
Genus	Calotropis
Species	Gigantea

SYNONYMS :-

Asclepias gigantea L.

Calotropis gigantea (L.) R. Br. ex Schult.

Madorius giganteus (L.) Kuntze

Periploca cochinchinensis Lour.

Streptocaulon cochinchinense (Lour.) G. Don

VERNACULAR NAME:-

Table No-2 Vernacular Names.

India	(Sanskrit)Arka,Ganarupa,Mandara,Vasuka,Svetapushpa,sadapushpa,Alarka,Prata pass,(Hindi)Aak,Madar,(Kannada)Ekka,(Tamil and Malayalam)Erukku,(Telugu)Jilledi Puvvu.
Malaysia	Remiga, rembega,kemengu.
English	Crown flower,giant indian milkweed.
Indonesia	Bidhuri(sundanese,madurese),sidaguri(Javanese),Rubik(Aceh).
Philippines	Kapal-Kapal(Tagalog).
Laos	Kok may ,dok kap,dok hak.
Thailand	Pothuean,paan thuean(northern),rak(central).
Vietnam	B[ooy]ng b[oot]ng,1[as]hen,nam t[it] b[at].
French	Faux arbre desoie,Mercure vegetal.

VEGETATIVE CHARACTER:-

Table no-3 vegetative Character

	Shrub or a small tree up to 2.5 m (max.6m) height.
Root	Simple, branched, woody at base and covered with a fissured; corky bark; branches somewhatsucculent and densely white tomentose; early glabrescent. All parts of the plant exude white latexwhen cut or broken.
Leaves	Opposite-decussate, simple, sub sessile, extipulate; blade-oblong obovate to broadly obovate, 5-30X2.5-15.5 cm, apex abruptly and shortly acuminate to apiculate, base cordate, margins entire, succulent, white tomentose when young, later glabrescent and glacouse.
Flowers	Bracteate, complete, bisexual, actinomorphic, pentamerous, hypogynous, pedicellate, pedicel 1-3 cm long.
Floral characteristics	Inflorescence: A dense, multiflowered, umbellate, peducled cymes, arising from the nodes and appearing axillary or terminal
Calyx	Sepal 5, Polysepalous, 5 lobed, shortly united at the base, glabrescent, quincuncial aestivation.
Corolla	Petals five, gamopetalous, five lobed, twisted aestivation.
Androcium	Stamens five, gynandrous, anther dithecous, coherent.
Gynoecium	Bicarpellary, apocarpus, styles are united at their apex, peltate stigma with five lateral stigmatic surfaces. Anthers adnate to the stigma forming a gynostegium.
Fruit	A simple, fleshy, inflated, subglobose to obliquely ovoid follicle up to 10 cm or more in diameter.
Seeds	Many, small, flat, obovate, 6x5 mm ,compressed with silky white pappus, 3 cm or more long.

MORPHOLOGICAL CHARACTER:-

The laticiferous shrub or small tree known as the enormous calotropis Linn, commonly referred to as milkweed or swallow-wort, is about 3–4 m tall and glabrous or old. The sub sessile leaves are widely elliptical to oblong-obovate in form and measure 9–20 cm x 6–12.5 cm. The diameter of the cymes ranges from 5 to 12.5". A single flower's stalk measures 2.5–4 cm in length, as opposed to the inflorescence's 5–12 cm stem.

The sepal lobes are roughly egg-shaped and are 4-6 mm by 2-3 mm in size. A petal's diameter ranges from 2.5 to 4 cm. It produces clusters of waxy blooms that are either white or lavender in colour. Each flower's five pointed petals are connected by a tube.The sub sessile leaves are widely elliptical to oblong-obovate in form and measure 9–20 cm x 6–12.5 cm. The diameter of the cymes ranges from 5 to 12.5". A single flower's stalk measures 2.5–4 cm in length, as opposed to the inflorescence's 5–12 cm stem.

The sepal lobes are roughly egg-shaped and are 4-6 mm by 2-3 mm in size. A petal's diameter ranges from 2.5 to 4 cm. It produces clusters of waxy blooms that are either white or lavender in colour. A tiny, beautiful "crown" that rises from the centre of each flower and housing the stamens connects the five pointed petals that make up each bloom.

MICROSCOPICAL CHARACTER :-

A thick, striated cuticle externally encased an upper and lower, single-layered epidermis that was visible in transverse sections obtained through the midrib. On the bottom and top surfaces of the epidermis, there were a few epidermal cells as well as thin-walled, isodiametric to circular parenchymatous cells. The crescent-shaped stele was constructed of bicollateral and open vascular bundles, and the ground tissue contained intracellular gaps. It was seen that the dorsiventral lamina, along with the mesophyll, had differentiated into a palisade and spongy tissue. A thick, striated cuticle outwardly coated the upper and lower epidermise. Three rows of palisade parenchyma, which were lengthy and grouped closely, were present beneath the upper epidermis. Intracellular gaps were virtually radially extended in the spongy parenchyma tissues. Laticifers and vascular bundles were dispersed in the region, and the central cells were atypical in morphology.

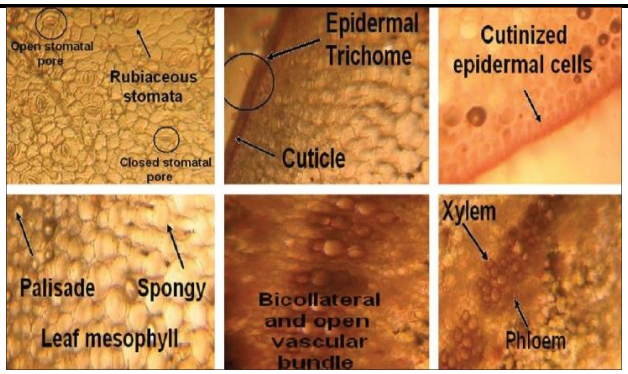

Fig no-3:Microscopy of *Calotropis Gigantea* leaf.

SYSTEMIC POSITION Of CALOTROPIS GINGANTEA:-[13]

Table no-4 Systemic classification of *Calotropis Gigantea.*

Characteristic	Leaf	Root	Flower
			
Colour	Green	White grey	White or lavender
Shape	Sessile a sub-sessile, opposite, ovate, cordate at the base	Cubical	Five pointed petals and a small "crown" rising from the center which holds the stamens
Size	6-15 cm by 4.5-8 cm	Depending on size of plant	3.8 to 5.1 cm
Odor	Unpleasant	No Fragance	No Fragance
Chemical constituent	Sapogenins, holarrhetine;cyanidin-3-rhamnoglucoside;taraxasterolisovalerate. mudarine and three glycosides calotropin uscharin, calotoxin along with phenol.[2]	Calotropnaphthalene [naphthalenederivative],calotropisesquiterpenol,calotropisesterterpenol [terpene derivatives],calotrope benzofuranone [aromatic product] and sucrose.[3]	Ester of α-and β-calotropeols.[4]

Uses	Anti-diarrhoeal activity, anti-Candida activity and antibacterial activity, antioxidant activity	Anti-pyretic activity, cytotoxic activity, antimicrobialactivity , insecticidal activity, wound healing activity, CNS activity and pregnancy interceptive properties	Analgesic activity, antimicrobial and cytotoxic activity

T.S OF *CALOTROPIS* LEAF AND FLOWER:

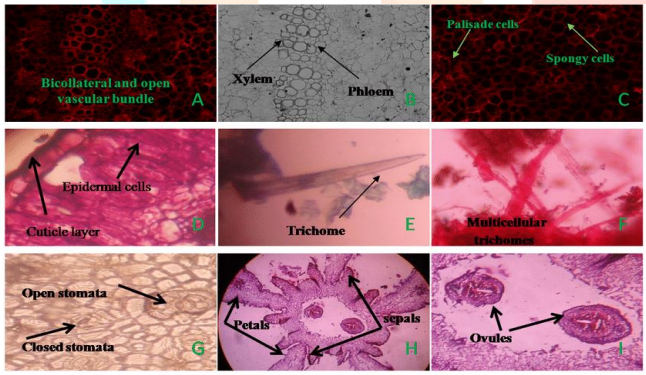

Fig-2T.S of *Calotropis* leaf and flower

CHEMICAL CONSTITUENTS:-

Studies on *Calotropis'* phytochemistry have revealed a variety of different chemicals, including Cardenolide, triterpinoids, alkaloids, resins, anthocyanins, and proteolytic enzymes in the latex. Multiflorenol, cyclisadol, and -terpenes are all found in flowers.[1].

Table no-5 The chart of *Calotropis Gigantea* chemical constituents[15]

Plant part	Chemical constituents
Root	Cardiacglycosides, calotroposides A-G (oxypregnane-oligoglycosides), calotropnaphthalene, calotropisesquiterpenol, calotropisesterterpenol, calotropbenzofuranone
Root bark	β-amyrin, giganteol, isogiganteol, and cardenolides.
Flower	α- and β-calotropeol, amyrin, glycosides, mudarine, asclepin, akundarin
Leaves	Sapogenins, calotropin, uscharin, calotoxin,alkaloids, and mudarine
Latex	Calotoxin, calactin, calotropin,uscharin, α- and β-calotropeol, β-amyrin and calcium oxalate
Seed	Palmitic acid, oleic acid, linoleic acid and linolenic acid,stigmasterol, phytosterol, melissyl alcohol
Stem bark	α- and β- calotropeol, β- amyrin, and giganteol

USES:

TRADITIONAL USES :-

Traditional medicine makes use of the special qualities of calotropis. In order to treat a variety of ailments, the herbs are frequently employed in Afghan, Unani, and Ayurvedic medicine. (11) Calotropis species are widely used to treat eczema, jaundice, rheumatism, fever, diarrhoea, and colds. In addition, bronchitis, pain, asthma, leprosy, ulcers, pisces, tumours, liver, abdomen, and dyspepsia are all treated with it. The stem, for instance, was used to cure leprosy, leucoderma, intestinal worms, and skin disorders. Leprosy, asthma, cough, elephantiasis,

rheumatism, and diarrhoea were all treated with the roots. Joint discomfort and swelling were treated with the latex and leaves. Parts that are paralysed may be treated with oil massage. For purgation, the Calotropis plant's juice was employed.

PHARMACOLOGICAL ACTIVITY:-

1.Antimicrobial Activity:

Anti-microbiological action The leaves of *C. gigantea* have been found to have anti-Candida activity against clinical isolates of *Candida albicans*, C. parapsilosis, C. tropicalis, and C. krusei in aqueous, methanol, ethanol, and petroleum ether extracts.[17]

The test microbe is effectively inhibited by the root of C. gigantea in zones with a diameter of 10 to 16 mm. And only a small amount of inhibition against E. coli was seen in the benzene extract when compared to the hexane and benzene extracts.[18]

The test microbe is sufficiently inhibited by the ethanolic and aqueous extracts of C. gigantea's latex, resulting in inhibitory zones that range in diameter from 10 to 18 mm. Out of all the extracts, including root and latex, the aqueous extract of latex had the largest zone of inhibition against Staphylococcus aureus, a common Gram positive pathogenic bacteria.[18]

For antibacterial activity, the root bark of the *akonda* was extracted in methanol, and its petroleum ether, chloroform, and ethyl acetate fraction was also examined.[19]

2.Antibacterial Activity:-

Calotropis gigantea is a common wasteland weed that is known for having a variety of therapeutic benefits. The goal of the current study was to test clinical bacterial isolates and *Calotropis gigantea* leaves for antibacterial activity. For its antagonistic action against Staphylococcus aureus, Escherichia coli, Bacillus cereus, Pseudomonas aeruginosa, Micrococcus luteus, and Klebsiella pneumoniae, the aqueous extract of the *C. gigantea* was investigated. In MHagar, the well diffusion method was used to perform in vitro antimicrobial action. The examined organisms responded favourably to the extract. Next to *E. coli*, the extract displayed the greatest zone of inhibition.[20]

3.Mosquito Repellent Activity:-

Extracts from *C. gigantea* flowers were highly effective at repelling the *C. quinquefasciatus* vector.Additionally, *C. gigantea* flower extract can be used as a substitute for conventional insecticides to control mosquitoes. Additionally, toxicological examinations of floral extracts have demonstrated that they are safe to use and do not irritate human skin. The flower of the *C. gigantea* can be used by itself or

in combination with other plants that repel mosquitoes to make mosquito repellents. Additionally, it may be able to prevent mosquito breeding

4.Insecticidal Activity:-

The fumigant toxicity, residual film toxicity, and repellent effect of a methanol extract of the root bark of *C. gigantea* against a variety of larval and adult forms of Tribolium castaneum were all assessed. Following the petroleum ether fraction and chloroform fraction in terms of insecticidal activity against T. castaneum was the methanol extract. The sample didn't exhibit any fumigant toxicity.

5.Anti Inflammatory Activity:-

The anti-inflammatory effects of *C. gigantea* ethanol extract against carrageenan-induced paw edoema in Wistar albino rats have been documented. Significant anti-inflammatory activity was found following oral administration of 400mg/kg of *C. gigantea*; the activity was greater than that of 100mg/kg of ibuprofen.

6.Anti Diarrhoeal Activity:-

Calotropis gigantea aerial parthydroalcoholic (50:50) extract was tested against a rat model of castor oil-induced diarrhoea for its anti-diarrheal effects. The percentage of the longest distance the charcoal travelled divided by the entire length of the small intestine was used to calculate the gastrointestinal transit rate. By using the enteropooling method, the weight and volume of intestinal content brought on by castor oil were examined.

7.Anti Oxidant Activity:-

The in vitro antioxidant activity of Calotropis gigantea root extract was investigated using the 2, 2-diphenyl-1-picrylhydrazyl and fluorescence recovery after photobleaching techniques. Extract has more antioxidant activity as compared to standard ascorbic acid because of the high concentration of several phytochemicals in both techniques.

8.Wound Healing Activity:-

The therapeutic activity of *Calotropis gigantea* root bark was studied for wound healing effect in rats was examined with the help of excision, incision and dead space wound healing models by Deshamukh P. T. and from the study he concluded that *Calotropis gigantean* enhanced the wound healing effect in rats.

9.Hepatoprotective Activity:-

Evaluated Hepatoprotective effects can be found in the alcohol extract of Calotropis gigantean root bark. Alcoholic root bark extract from Calotropis gigantea suspended in 0.6% carboxyl methylcellulose. The alcoholic extract from the root bark of the plant Calotropis gigantea demonstrated a potent protective effect in rats given D-galactose amine by restoring aspartate amino transferase, alkaline phosphatase, and alanine amino transferase levels to baseline.

10.Analgesic Activity:-

Mice were given oral alcohol extracts of Calotropis gigantea flowers to evaluate for analgesic effectiveness using chemical and thermal models. In the acetic acid-induced writhing test, an inhibition of 20.97% and 43.0% in the number of writhes was seen at dosages of 250 and 500 mg/kg, respectively. The hot plate method required more time for paw licking. After the dose was given, the analgesic effect started to show up 30 minutes later and peaked 90 minutes later.

ETANO PHARMACOLOGICAL IMPORTANT Of CALOTROPIS SPECIES:-

Table no-6 Pharmacological important

Sr.no	Pharmacological importance	Plant and part used
1	Antibacterial activity	Leaf, Flower, Root or Whole plant
2	Antiviral activity	Leaf, or Whole plant
3	Antifertility and emmenagogue	Antifertility and emmenagogue
4	Anti-inflammatory activity	Leaf,latex
5	Anti tumor activity	Leaf, Flower, Root, Latex or Whole plant
6	Anti-diarrheal and anti dyssentry activities	Leaf, Flower, Root,
7	Anti cancer activity	Leaf, Flower, Root,
8	Asthma	Flower
9	Anxiety and pain	Leaf, Flower, Root,
10	Abortifacient	Leaf, Flower, Latex
11	Analgesic and Antinociceptive activity	Leaf, Root,
12	Cytotoxic activity	Leaf, Flower, Root,
13	CNS activity	Leaf
14	Cold	Leaf
15	Cytostatic activity	Flower, Root,
16	Dyspepsia	Leaf, Flower, Root, Latex
17	Diabetes mellitus	Leaf, Flower, Root,
18	Eczema	,Latex
19	Expectorant	Leaf, Flower

20	Elephantiasis of the legs and scrotum	Leaf, Flower, Root,
21	Fever	Leaf, Flower, Root, Latex OR Whole plant
22	Free radical Scavenging activity	Leaf, Flower, Root, Latex OR Whole plant
23	Fibrinolytic activities	Leaf, Flower, Root, Latex OR Whole plant
24	Healing the ulcers and blotches	Leaf,flower,latex
25	Indigestion	Leaf
26	Jaundice	Leaf
27	Leprosy	Latex
28	Liver injuries as well as on oxidative stress	Leaf, Flower, Root,
29	Mental disorders	Flower,
30	Piles	Latex
31	Pregnancy interceptive activity	Leaf, Flower, Root, Latex or Whole plan
32	Removing anemia	Leaf, Flower, Root, Latex or Whole plan
33	Rheumatism	Leaf,
34	Ringworm of the scalp	Leaf, Flower, Root, Latex
35	Secondary syphilis	Leaf, Flower, Root,
36	Skin diseases	Leaf, Flower, Root, Latex
37	TB	Leaf, Flower, Root,
38	Uterus stimulant	Leaf, Flower, Root
39	Vermicidal activity	Leaf, flower
40	Warm	Leaf, flower,root
41	Wound healing	Leaf, flower, root

ANTIMICROBIAL ACTIVITY:-

1. To get rid of the dust, the leaves of the plants were washed. Remove the middle ridge of the leaves and chop it up into small pieces.
2. Five grammes of leaves were crushed in a mortar and pestle by adding five millilitres of distilled water and five millilitres of ethanol. The obtained extract was filtered.
3. Different sterile nutrient agar plates were covered with the test organism suspension (Pseudomonas aeruginosa, E. coli, Klebsiella spp., Bacillus subtilis, Staphylococcus aureus, Salmonella spp.).
4. Gel punch was used to create the wells. The wells received the extract.
5. For 24 hours, the plates were incubated at 37°C.
6. The zones of inhibition on the plates were examined.

PHYTOCHEMICAL ACTIVITY:-

1. The plant leaves and flowers were crushed in various solvents such as of ethanol, methanol and distilled water. The plant extract is filtered.
2. The filtrate is used for testing of phytochemical activity such as alkaloids, phenols, steroids, flavonoids, and saponins.

a) Alkaloids

500 µl leaf extract was treated with 5 ml of aqueous 1% HCl on boiling water bath for 20 minutes then this solution centrifuged for 10 minute at 3000 rpm after centrifugation. 1 ml of supernatant was taken and then the Wagner's reagent (2 gm of Iodine and 6 gm of KI dissolved in 100 ml of water) was added.

b) Flavonoids

For 3 minutes, 500 ml of flavonoids-rich leaf extract was cooked in a water bath at 80 to 90 oC. Purify the sample. Using 1 ml of diluted ammonia solution, 4 ml of filtrate, and a few drops of concentrated H_2SO_4 were taken.

c) Phenol

2 ml of distilled water were added to 500 l of phenol leaf extract. Filter the solution after boiling it for one minute in a water bath (100OC). 10% ferric solution was added to the filtrate.

d) Saponin

Leaf extract was heated in 5 ml of distilled water to remove the saponin, then the sample was filtered. 1.5 ml of distilled water and 2.5 ml of filtrate were combined, then violently shaken

e) Terpenoids

In order to treat 2 ml of leaf extract, 1,4 dinitrophenyl hydrazine (DNP) was dissolved in 100 ml of 2 M HCl.

f) Anthraquinone

After shaking with 10 ml of benzene, 500 l of leaf extract was filtered. 5 cc of a 10% ammonia solution were added to the filterate and blended.

g) Tannins :

10 ml of distilled water was added to 500 l of leaf extract before it was heated and filtered. 1 M Fecl3 was added to the filtrate

PHYTOCHEMICAL COMPONENTS IN *CALOTROPIS*

Sr no.	Class of compounds	Flower	Bud	Root	Tests performed
1	Alkaloids	+	+	+	Dragendorff's test,Mayer's test
2	Carbohydrates	+	+	+	Molish test ,fehling test
3	Glycosides	+	+	+	Keller killiani test
4	Phenolic compounds/tannins	+	+	+	Ferric chloride test
5	Protein and amino acids	+	+	+	Xantho protein test
6	Flavonoids	+	+	+	Ammino test
7	Saponin	+	+	+	With water with Na_2CO_3
8	Sterols	+	+	+	Liebermann -Burchard test,,Salkowski reaction,Hess's reaction
9	Acid compounds	+	+	+	With Na CO ,with litmus paper
10	Resins	+	+	+	With double distilled water, With acetone and conc.HCL
11	Peroxides	-	-	-	Potassium iodide test
12	Polyuronoids	-	-	-	Haemotoxylin test

Table7 : Phytochemical components in *Calotropis*

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.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.

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