Review article

PHARMACOGNOSTIC,PHYTOCHEMICAL, PHARMACOLOGICAL REVIEW OF CALOTROPIS GIGANTEA Pavale Durgesh Atmaram^{*}, Pokharana Pritam Ajit

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ABSTRACT:

Calotropis gigantea is commonly known as 'Milkweed, Rui (madar) which is 2.5cm in height .Plant contains latex almost in all parts; the plant is distributed throughout India. Traditionally the plant is used in fevers, rheumatism, indigestion, cough, cold, eczema, asthma, elephantiasis, nausea, vomiting, and diarrhea. Also the plant reports various active chemical constituent as sitosterol, -Amyrin, -Amyrin. The different parts of *Calotropis gigantea* reports alkaloids, glycosides, flavonoids, saponins, sterols, triterpenes, proteins, and carbohydrates, etc. According to Ayurveda, dried whole plant is a good tonic, expectorant, depurative, and anthelmintic.The objective of report is to review and present various parts of *Calotropis gigantea* and their medicinal uses.

Keywords: Calotropis gigantea, sitosterol, -Amyrin, -Amyrin, expectorant, antipuretic and antiasthmatic.

INTRODUCTION

PLANT PROFILE⁽¹⁾

Kingdom: Plantae

Order: Gentianales

Family: Apocynaceae

Subfamily: Asclepiadoideae

Genus: Calotropis

Species: C.gigantean

Common name: Milkweed, Rui (madar)

Botanical name: *Calotropis gigantea* (*Linn.*) *R.Br.* (*White variety*)

Synonym: Asclepias gigantean

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Volume 5 Issue 2, 2015

PLANT DESCRIPTION :-⁽³⁾

Perennial shrub, growing up to 2.5 meters with branches and sub branches. Plant is slow growing compared to the blue variety. Leaves are simple, opposite and subsessile, ovate, and cordate at base. Plant contains latex almost in all parts. Flowers beautiful, white in color, in umbellate lateral cymes. Fruits are fleshy follicles green; seeds attached with abundant white coma of Calotropis.

DISTRIBUTION :(3,4)

Throughout India on plains on wastelands.

ORIGIN :(3)

Iran to China; India to Sri Lanka; Indo-China; Indonesia; Malaysia

SPECIAL CHARACTERISTICS GIGANTEA:

Its typical leaves and flowers, which are quite unique in structure.

FORM AND MORPHOLOGY (Fig -1)

The giant milkweed is a relative of the hoya and the scarlet milkweed. It is an evergreen shrub or small tree. Shrubs are often dense with leaves. As the plant becomes more treelike it produces an airy crown of a few twisted branches. There is often a significant amount of dead stems in the canopy of these small trees. If a tree, the trunk is often at an angle as if pushed by the wind. All parts of the plant produce abundant white sap. $^{(3), (6)}$

1. BARK $(^{3, 6)}($ Fig -2)

The bark is whitish, thick and deeply grooved. The wood is whitish and soft.

2. LEAVES: ^(3, 6) (Fig -3)

The leaves are opposite, entire, nearly stalkless, or sessile, with broad light yellow midvein and main veins. They are broadly elliptic or oblong and heart-shaped at the base. The leaves are slightly leathery, and pale green or green above. When young they are whitish green below being covered by a coat of fine soft hair that easily rub off. Leaf blades are 3 to 8 inches long and 2 to 5 inches wide.

3. FLOWERS: $^{(3, 6)}$ (Fig – 4,5)

The inflorescence is an umbel like cymes at or near the ends of twigs. Many flowers are borne on the inflorescence.

The 5 sepals are ¹/₄ inch long. The corolla has 5 showy petals that are whitish and tinged with purple at the apex. They are about 0.75 inches long. Flowers are replaced by a kidney-shaped fruit, 2.7 to 4 inches long. It is green and becomes brown when mature.

4. FRUIT: ^(3, 6) (Fig -6)

The fruit is a follicle, kidney-shaped, 2.7 to 4 inches long.

The fruit contains many seeds embedded in a rough fiber.

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Volume 5 Issue 2, 2015

5. SEED: ^(3, 6) (Fig -7)
Seeds are used for Propagation of plant.



Figure -1: Calotropis Gigantea (L.)



Fig 2 : Bark



Fig-3: Leaves



Fig 4: Inflorescence

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Volume 5 Issue 2, 2015



Fig 5: Flower



Fig 6: Fruit

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Fig 7: Immature seeds

PHYTO-CHEMICAL REVIEW (Table 1)

TABLE 1. PHYTO-CHEMICAL REVIEW^(7,8,9,10,11,12)

Sr.no.	Plant Part	Compound isolated
1.	Root bark	Stigmasterol, -Sitosterol
2.	Latex of C.gigantia	Framycetin sulphate
3.	Leaves, Root, Root	alkaloids, cardiac glycosides, flavonoids,
	bark & fruit	saponins, sterols, triterpenes
4.	Fresh latex	alkaloids, flavonoids, saponins, sterols, triterpenes phenols, tannins
5.	Leaves	alkaloids, glycosides, flavonoids, Saponins, sterols, triterpenes, proteins, and carbohydrates.
6.	Whole plant	-Amyrin, -Amarin, taraxasterol, -Sitosterol

PHYTO-CHEMICAL SCREENING:⁽⁹⁾

Specific qualitative tests were used to identify bioactive compounds of pharmacological importance through standard methods.

www.earthjournals.org Volume 5 Issue 2, 2015

- **A.** Test for Alkaloids (Mayer's test): 2.0ml of extract was measured in a test tube to which picric acid solution was added. The formation of orange coloration indicated the presence of alkaloids.
- **B.** Test for Cardiac glycosides (Keller-Killani test): 5ml of each plant part extracts was treated with 2 ml of glacial acetic acid containing one drop of ferric chloride solution. A brown ring of the interface indicates a deoxysugar characteristic of cardenolides. A violet ring may appear below the brown ring, while in the acetic acid layer, a greenish ring may form just gradually throughout thin layer which shows the presence of Cardiac glycosides.
- **C.** Test for anthraquinines: To the test substance, sodium hydroxide was added. Blue green or red color indicates the presence of Anthraquinone.
- **D.** Test for tannins: The substance (extracts) mixed with basic lead acetate solution. Formation of white precipitate indicates the presence of Tannins.
- **E.** Test for Saponins: Froth test for saponins was used. 1g of the sample was weighed into a conical flask in which 10ml of sterile distilled water was added and boiled for 5 min. The mixture was filtered and 2.5ml of the filtrate was added to 10ml of sterile distilled water in a test tube. The test tube was stopped and shaken vigorously for about 30 second. It was then allowed to stand for half an hour. Honeycomb froth indicated the presence of saponins.
- **F.** Test for Flavonoids: 5 ml of dilute ammonia solution were added to a portion of the aqueous filtrate of each plant part extract followed by addition of concentrated H2SO4. Formation of yellow color observed in each extract indicated the presence of flavonoids.
- **G.** Test for steroids: One gram of the test substance (plant extracts) was dissolved in a few drops of acetic acid. It was gently warmed and cooled under the tap water and a drop of concentrated sulphuric acid was added along the sides of the test tube. Appearance of green colour indicates the presence of Steroids.
- **H.** Test for Terpenoids (Salkowski test): 5ml of each plant part extract was mixed in 2 ml of chloroform, and concentrated H2SO4 (3 ml) was carefully added to form a layer.Formation of reddish brown coloration at the interface shows the positive results for presence of terpenoids.
- I. Test for reducing sugars: One gram of the aqueous extract was weighed and placed into a test tube. This was diluted using 10 ml of de-ionised distilled water. This was followed by the addition of Fehling's solution. The mixture warmed to 40°C in water bath. Development of brick-red precipitate at the bottom of the test tube was indicative of the presence of a reducing sugar.
- **J. Test for resins:** Two grams of the ethanolic extract was dissolved in 10ml of acetic anhydride. A drop of concentrated sulphuric acid was added. Appearance of purple colour, which rapidly changed to violet, was indicative of the presence of resins. Same procedure was repeated using the aqueous extract of the plant material.

Sr.no	Plant Parts	Plant Extract	Activty
1.	Flower	Chloroform, ethanol	Anti-inflamatory & Anticancer
2.	Whole plant	Carbontetra-chloride, ethanol	Hrptoprotective
3.	Root & Bark	Methanol	Anti-convulsant
4.	Whole plant	-	Anti-inflamatory
5.	Leaves	Methanol	Anti-convulsant& Sedative- Hypnotic
6.	Crude Latex		Vsodilation Effect
7.	Whole Plant	Ethanolic extract	Contraceptive Activity
8.	Aerial Part	Hydro-alcoholic	Anti-diarrhoeal
9.	Fresh Latex	Ethanolic Extract	Anti-fungal
10.	Root Bark	Alcoholic Extract	Hepato-protective
11.	Root and Leaves		Snake –Bite
12.	Flower's	Ethanolic Extract	Acute and sub-actue toxicity.

PHRMACOLOGICAL REVIEW (Table 2)

TABLE.2 PHRMACOLOGICAL REVIEW^(13,14,15,16,17,18,19,20,10,21,22)

USES (Table 3) :-

1. MEDICINAL USES OF CALOTROPIS GIGANTEA :(27)

Dry leaf powder used for treating wounds and boils. Leaves found to be effective on elephantiasis. Flowers along with jaggery are useful against cough and improving appetite. The mixture of latex, turmeric and sesame oil, useful in treating scabies.

Calotropis is used as a traditional medicinal plant with unique properties. Traditionally calotropis is used alone or with other medicinal to treat common disease such as fevers, rheumatism, indigestion, cough, cold, eczema, asthma, elephantiasis, nausea, vomiting, and diarrhea. According to Ayurveda, dried whole plant is a good tonic, expectorant, depurative, and anthelmintic. The dried root bark is a substitute for ipecacuanha. The root bark is febrifuge, anthelmintic, depurative, expectorant, and laxative. The powdered root used in asthama, bronchitis, and dyspepsia. The leaves are useful in the treatment of paralysis, arthralegia, swellings, and intermittent fevers. The flowers are bitter, digestive, astringent, stomachic, anthelmintic, and tonic Calotropis is also a reputed Homoeopathic drug .A yellow bitter resin; a black acid resin; Madaralbum, a crystalline colourless substance; Madarfluavil, an ambercoloured viscid substance; and caoutchouc, and a peculiar principle which gelatinizes on being heated, called Mudarine.

www.earthjournals.org

Volume 5 Issue 2, 2015

Lewin found a neutral principle, Calatropin, a very active poison of the digitalis type. In India the author's husband experimented with it for paper-making, the inner bark yielding a fibre stronger than Russian hemp. The acrid juice hardens into a substance like guttapercha. It has long been used in India for abortive and suicidal purposes. Mudar root-bark is very largely used there as a treatment for elephantiasis and leprosy, and is efficacious in cases of chronic eczema, also for diarrhea and dysentery.

Antidotes: As an antidote to poisoning atropine may be administered. In severe cases the stomach pump may be used and chloral or chloroform administered. Amyl nitrite may also be useful.

2. THERAPEUTIC USES (AYURVEDA)^(23, 24) (TABLE 4)

- Ayurveda recommends the purified root bark powder in vitiated conditions of Kapha, skin diseases, elephantiasis, and cough, enlargement of abdomen, intestinal worms and ascites. In all these conditions, Arkah acts as a purgative.
- In Ayurveda, the root bark is ground with sour rice gruel and applied externally on legs and scrotum for elephantiasis.
- Ayurveda recommends the Arkah powder internally in leprosy, hepatic and splenic diseases, dropsy and worms.
- The milk juice is dried and preserved and used as a strong purgative in Ayurveda
- In folk medicine, the root bark is given with salt for jaundice.
- o Ayurveda recommends the powdered root bark for smoking in syphilis.
- Ayurveda recommends the fresh leaves fried with oil and applied on painful joints and swellings. The oil is applied on the paralytic parts.
- In Ayurveda, the powder of the leaves is used as dusting powder for wounds, ulcers and surgical wounds.
- Ayurveda advises the leave powder with turmeric to be applied externally for eczema, skin eruptions, old sores and ulcers, paralysed parts, lockjaw, convulsions in children, paralytic complaints, cold sweats, asthma and loss of appetite.

TABLE 3: TRADITIONAL REFERENCES AVAILABLE ABOUT ARKAH26)

Charaka Samhita	Root bark - Piles; Leaves - to cover boils
Susrutha Samhita	Root bark - Ear ache, asthma and dog bite
Chakra Datta	Elephantiasis, hydrocele and scorpion bite
Bhava Prakasha	Enlargement of spleen

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TABLE 4: PROPERTIES (AYURVEDA)^(23, 25)

Dried Whole Plant Qualities	Tonic, expectorant, depurative and anthelmintic
Root Bark Qualities Useful conditions	Febrifuge, anthelmintic, depurative, expectorant and laxative Cutaneous infections, intestinal worms, cough and ascites
Powdered Root Qualities Useful conditions	Promotes gastric secretions. Asthma, bronchitis and dyspepsia
Leaves Useful conditions	Paralysis, swellings and intermittent fevers
Flowers Taste Qualities Useful conditions	Bitter and Astringent Digestive, stomachic, anthelmintic and tonic Asthma, catarrh, anorexia, inflammations and fever

3. SIDDHA MEDICINAL USES (24, 26)

- 1. For poisonous snake bites, 2 to 4 leaves of this plant is chewed well by the patient. Also fresh root of this plant are crushed well and applied well by rubbing firmly over the bitten area.
- 2. The leaf juice 5ml with equal quantity of honey is given for frequently occuring fever or periodic fever.
- 3. For aphthous ulcers the latex of this plant is mixed with honey and applied over the affected area.
- 4. The leaves are used as a very effective remedy as kizhi or ottradam (fomentation) for vatha diseases.
- 5. The leaf juice along with honey is given internally for intestinal worms.
- 6. The leaves are dried well and powdered and externally applied for unhealing ulcers. The flowers of this plant (one or two part), pepper (one part), clove or athimathuram (1/2 part) is ground well and given in the dose of pepper size for bronchial asthma.
- 7. The latex is externally applied over rat bite, swellings, gonococcal arthritis, and other rheumatic complaints.
- 8. The latex is externally applied over dental problems.
- 9. The Arakkashara thylam prepared from the latex is a best medicine or any vatha complaints.

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Volume 5 Issue 2, 2015

CONCLUSION

From above report the calotropis gigantia is important plant which is used in fever rheumatisum, cough, asthma, vomiting, and diarrhea. So it is essential to study calotropis gigantia detailly and also to find out constituent responsible for above mention activities and convert this constituent into suitable formulation.

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