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TAXONOMICAL STUDIES OF CALOTROPIS SPECIES IN CHURU DISTRICT OF RAJASTHAN

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ABSTRACT

Calotropis a medicinal plant of family Asclepiadaceae has been utilized in Ayurveda, Unani, Siddha and many other traditional systems to cure diseases. There are two common species of *Calotropis* viz. *Calotropis gigantean* (Linn.) R. Br. and *Calotropis procera* (Ait.) R.Br. *Calotropis gigantea* called Swetarka and *Calotropis procera* called Raktarka. Secondary metabolites of *Calotropis* have well known pharmaceutical and therapeutic applications. Chemical constituents of plants such as alkoloids, steroid, terpenoids, resin, glycosides, carbohydrates, etc are reported in Ayurvedic literature. This present review enumerates the morphology and ethno pharmacology utilization of *C. procera and C. gigantea* for the treatment of various human ailments. This plant has been known to possesses antibacterial activity, anti- inflammatory activity, schizontocidal activity, anti larvicidal activity, antioxidant activity, skin disease, jaundice, leucoderma, eczema, ulcer, piles, dysentery, dropsy, ring worm, removing thorn from body, elephantiasis and leprosy and other miscellaneous activities.

KEYWORDS: *Calotropis gigantean, Calotropis procera.*

INTRODUCTION

As stated by Acharya Charak (6th century to 2nd century) that there is nothing in this world which cannot be used as medicine after proper purification, formulation and given in appropriate doses. A poison after proper purification if given in appropriate doses, can act as a medicine. *Calotropis* also called as *Arka*, is an example of plant having both therapeutic and toxicological properties. According to Ayurveda, action of a drug depends upon seven

factors viz. *dravya, rasa, guna, veerya, vipaka, prabhav* and *karma* while active ingredient present in body is solely responsible for its effect and side effect according to modern science, this is the basic difference in the pharmacological principle of both the sciences. Modern science uses the single active principle in the form of medicine while Ayurveda advocate use of effective part of the plant as a whole.

Medicinal plants are used from the ancient time to cure the diseases and it is the sources of different drugs formulation in all systems of medicine. The allopathic, Ayurvedic and Unani medicines were obtained by plant resources, the presently available drugs, either directly in the extract form or in the modified synthetic form. Naturally, plants have the ability to synthesize natural products which are beneficial for us known as phytoconstituents that are used to perform biological functions. *Calotropis* species is used in several traditional medicine and folklore systems to cure various ailments as reported in the Hindu literature. It is widely used in the Indian traditional medicinal system as well as in Arabic, Unani and Sudanese systems. It is also reported widely in various folklore preparations and ethno-medicines, the plant posses many secondary metabolites. The secondary metabolites are biologically active and structurally unique compounds which may be useful for generation of new medicines. Secondary metabolites of *Calotropis* have well known pharmaceutical and therapeutic applications. Chemical constituents of plants such as Alkoloids, Steroid, Terpenoids, Resin, Glycosides, Carbohydrates, Aluminum, Iron, Magnesium, and Sodium are reported in Ayurvedic literature. These chemicals are reported to be Analgesic, Resilient, Anti- inflammatory, Schizontocidal Activity (P. Sharma *et al.*, 1999), Emetic, Expectorant, Stomachic, Digestive, Laxative and Depurative. Further, these phytoconstituents are also reported potentially active for the treatment of several diseases such as Skin disease, Jaundice (Jan *et al.*, 2009), leucoderma, eczema, ulcer, piles, dysentery (Khan *et al.*, 2009), dropsy, ring worm (Kuta, 2008) and removing thorn from body (Rai *et al.*, (2000). *Calotrois* root bark is very largely used as a treatment for elephantiasis and leprosy. The latex is as potent as standard anti-inflammatory drug phenylbutazone (PBZ) in inhibiting inflammatory response induced by various inflammagens in acute and chronic models of inflammation.

Study Area

As we know that the area under district i.e. Churu district belongs to the State of Rajasthan, the State of Rajasthan is located in north-western India. The district of Churu lies in the north-east of Rajasthan State at an altitude of 286.207 metres above the mean sea level. From

geographical spread point of view has extension from 27°24' to 29° north latitudes and 73°40' to 75°41' east longitudes. It is bounded by Hanumangarh in north, Bikaner in west, Nagaur in south and Sikar, Jhunjhunu districts and boundaries of Haryana State in the east. It covers six tehsils namely: Taranagar Rajgarh, Churu, Sardarshahr, Ratangarh and Sujangarh. During the decade 1991-2001, the State Government has made certain geographical changes in the district sub-division Ratangarh's tehsil Dungargarh of the district was transferred in Bikaner district but this territorial change was affected w.e.f. 1.4.2001, hence for the purpose of census, Dungargarh tehsil is treated as part of the Churu district but here the author for the purpose of study area i.e. Churu district, Dungargarh tehsil is not treated as part of the Churu district. The total area of Churu district consist 1354623 sq. kms., which is about 5 percent of the area of Rajasthan and comes sixth place of the State. It is second bigger district in Bikaner division. The district is extended up to 150 kms. in east to west and 120 kms. in north to south. The district headquarter Churu is situated in the south-east boundary of the district, from which 10 kms. south-east the boundary of Jhunjhunu district is situated. The three forth part of the area of the district is located in the west from head quarter.

Taxonomical study of Calotropis species

In india, the genus is represented by two species viz. *Calotropis procera 5* and *Calotropis gigentia* The first species being abundant and other being restricted to forest area.

Preferred Scientific Name: *Calotropis procera*

Calotropis gigentia

Preferred Common Name: Akwan, Arka, Madar in India

Systematic classification of *Calotropis procera* given by three taxonomists.

Classification	Bentham and Hooker	Engler and Prantl	Hutchinson
Kingdom	Plantae	Plantae	Plantae
Class	Dicotyledones	Dicotyledones	Dicotyledones
Division	Gamopetalae	Sympetalae	Lignosae
Order	Gentianales	Asclepiadaceae	Asclepiadaceae
Family	Asclepiadaceae	Asclepiadaceae	Asclepiadaceae
Genus	Calotropis	Calotropis	Calotropis
Species	Procera	Procera	procera

Systematic classification *of Calotropis gigentea* given by three taxonomists.

Classification	Bentham and Hooker	Engler and Prantl	Hutchinson
Kingdom	Plantae	Plantae	Plantae
Class	Dicotyledones	Dicotyledones	Dicotyledones
Division	Gamopetalae	Sympetalae	Lignosae
Order	Gentianales	Asclepiadaceae	Asclepiadaceae
Family	Asclepiadaceae	Asclepiadaceae	Asclepiadaceae
Genus	Calotropis	Calotropis	Calotropis
Species	Gigentia	Gigentia	gigentia

Calotropis procera

Geographic distribution

C. Procera is drought-resistant, salt-tolerant to a relatively high degree, and it disperses seeds through wind and animals. It quickly becomes established as a weed along degraded roadsides, lagoon edges and in overgrazed native pastures. It has a reference for and is often dominant in areas of abandoned cultivation especially sandy soils in areas of low rainfall; assumed to be an indicator of over-cultivation. *C. Procera* is native to India, Pakistan, Nepal, Afghanistan, Algeria, Iran, Iraq, Israel, Kenya, Kuwait, Niger, Nigeria, Oman, Saudi Arabia, United Arab Emirates, Vietnam, Yemen and Zimbabwe (Chatterjee A, Chandra PS, 1995).

Botanical description

Calotropis procera occurs as a single or many stemmed soft-wooded shrub, and occasionally a tree reaching to 6m. All parts of the plant exude white milky latex when cut. Botanical description of *Calotropis procera* incudes following parts of the plant.

Root

The root occurs in the entire condition. The bark is separated from the wood 0.5-2.0 cm. in diameter bearing rootlets with diameter varying from 0.2 to 0.5 cm. externally whitish grey in colour, wrinkled in the fresh condition, plenty of whitish latex exudes from cuts or wounds in the bark. Fracture is incomplete.

Stem and Branches

The stem is thick, rough and corky and a yellow-brown colour; twigs are green and fleshy and may have a covering of tomentum (white fur like hairs). It is also herbaceous with lower portion woody, aerial, erect, cylindrical, branched, solid, milky latex present.

Leaves: Leaves are opposite-decussate, simple, ovate to obovate with 4-6 pairs of subopposite nerves prominent on the abaxial surface, an acute apex, sessile (almost

decurrent) base, a pale green colour, and quite large which is about 30x25 cm (Nandkarni AK.2000). Leaves are slightly thick, fleshy, coriacious,10-15 cm. long and 4.5 to 6.5 cm. broad, broadly cuneate, obovate or obovate oblong, slightly cordate and auricled at base with tuff of short simple hairs on the upper side near place of the attachment to the petiole. The tender leaves are covered with ashy gray pubescence. Mature leaves are nearly smooth or even glabrous and pale green (Evans WC, 2005).

Inflorescences

Inflorescences arise from the base of the leaves in pedunculate (c.7cm) cymes of 3-20. Polychasial cyme.

Flowers

Flowers consist of 5 small triangular dirty white sepals, 5 thick ovate petals (c1cm x 1cm) which are white at the base and purple at the tips and 5 purple tipped stamens, which surround a white 5 lobed stigma (Rastogi RP, Mehrotra BN,1997). Regular,bisexual, liliac or pale rose, purple or light greenish yellow and have a faint odour. They are arranged in simple or rarely compound cymose corymbs at the ends of laterally placed or interpetiolar peduncles arising from alternate sides of the nodes. Each cluster is surrounded by an involucre of several small oblong pointed scaly caducous bracts. Flower buds ovoid.

Calyx

Five lobes broadly ovate with small fleshy teeth like glands within the base. 5 sepals, polysepalous, quinquincial.

Corolla

Regular, gamopetalous, pale rose purple or liliac, subcordate to broadly sub- campanulate with a short tube and five broad ovate, lanceolate, valvate, spreading lobes.5 patels, twisted.

Stamens: Five, inserted at the base of the corolla. Filaments united to form a large stamina column provided with five conspicuous radiating coronal appendages that are completely adnate to, but slightly shorter than the column. The appendages are fleshy, pale purplish or yellowish white and laterally compressed with a circinnately recurved hollow corsal spur at base and two short obtuse obliquely divergent cuticles towards the top just below the apex. Anthers short, broad, somewhat horny with broadly triangular membranous anther tips that are inflexed over the sides of the stigmatic hood.

Gynoecium

Bicarpellary, apocarpus, styles are united at their apex, peltate stigma with five (5) lateral stigmatic surfaces. Anthers adnate to the stigma forming a gynostegium. 2 carpels (bicarpellary), syncarpous; the pistil free below and fused above; two distinct ovaries end in two styles forming a pentangular stigmatic head to the sides of which the anthers are coherent; ovary superior, unilocular, many ovules, marginal placentation. Placentation axile. Ovules 30–50 per locule ('many').

Fruits

Fruits consist of green, spongy ovoid fruits (follicles), up to 15cm long by 10cm wide. They split open to release plumed, papery light brown seeds with a pappus of white filaments up to 6cm long on one side.

***Calotropis procera* with flowers and fruits**

Calotropis gigantea

Geographical distribution: *C. gigantea* is a common wasteland weed and commonly known as giant milk weed. This plant is a native of Bangladesh, Burma, China, India, Indonesia, Malaysia, Pakistan, Philippines, Thailand and Sri Lanka. *C. gigantea* is frequently available in India and used for several medication purposes in traditional medicinal system. (Yelne MB, Sharma PC, Dennis TJ, 2000) Most recently *C. gigantea* is cientifically reported for several medicinal properties viz. the flowers are reported to possess analgesic activity, antimicrobial and cytotoxic activity (MR Habib; MR Karim, 2009). Leaves and areal parts of the plant are reported for anti-diarrhoeal activity (Chitme HR, Chandra R, Kaushik S, 2004), anti-Candida activity (Kumar G, Karthik L, Bhaskara Rao KV, 2010) and antibacterial activity (Kumar G, Karthik L, Bhaskara Rao KV, 2010), antioxidant activity (Singh N, Jain NK, Kannojia P, Garud N, Pathak AK, Mehta SC, 2010). Roots are reported to contain anti-

pyretic activity (Chitme HR, Chandra R, Kaushik S, 2005), cytotoxic activity (Wang Z, Wang M, Mei W, Han Z, Dai H, 2008).

Botanical description

Morphology of Calotropis gigantea leaf twig with oppositely arranged subsessile leaves; Broadly ovate or elliptical, cottony,pubescent when young and glabrous on maturity; Portion of the lamina showing venation pattern]*Calotropis gigantea* occurs as a single or many stemmed soft-wooded shrub, and occasionally a tree reaching to 6m. All parts of the plant exude white milky latex when cut.

Root

The root occurs in the entire condition. The bark is separated from the wood 0.5-2.0 cm. in diameter bearing rootlets with diameter varying from 0.2 to 0.5 cm. externally whitish grey in colour, wrinkled in the fresh condition, plenty of whitish latex exudes from cuts or wounds in the bark. Fracture is incomplete.

Stem and Branches

The stem is thick, rough and corky and a yellow-brown colour; twigs are green and fleshy and may have a covering of tomentum (white fur like hairs).

Leaves

Leaves are opposite-decussate, simple,ovate to obovate with 4-6 pairs of subopposite nerves prominent on the abaxial surface, an acute apex, sessile (almost decurrent) base, a pale green colour, and quite large which is about 30x25 cm.

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***Calotropis gigantea* with flowers and fruits.**

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