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Phytochemistry and Ethno-Pharmaceutics of *Calotropis procera*

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Abstract

Calotropis procera is a small, erect plant, which is used in several traditional medicines to treat many diseases. It is a native of most of the Asian and African countries. All plant parts exude thick white milky juice (latex) on cut or break. This shrub has been known to possess analgesic, antitumor, antihelmintic, antioxidant, hepatoprotective, antidiarrhoeal, anticonvulsant, antimicrobial, oestrogenic, antinociceptive, and antimalarial activity**.** This article summarized information concerning pharmacognostical aspects of *Calotropis procera* plant.

Introduction

Medicinal plants have remained the major sources of drugs; in fact many of the currently available drugs were derived either directly or indirectly from them. The approach to find new drugs through natural products has supposed to be the most successful strategy for the discovery of new drugs (Sharma., 2011).

The traditional medicinal system uses the plant material for the treatment of various diseases (Muzammal., 2014). Herbal medicines have been primitive cures in medicinal systems from the early age to present day. With the advancement of scientific knowledge, the ethnobotanical pharmacology grew. These plant based medicines are supposed to have less side effects and easily accessible to the consumer (Farooq Azhar et al., 2014).

Calotropis procera (Figure 1) is a flowering shrub of family Asclepediaceae. It is famous with different names based on its habitat, such as Dead Sea plant, Kisher and Usher in Arabic; Calotropis, Calotrope, Dead Sea fruit, Desert wick, Giant milkweed, Mudarfibre, Rubber tree, Rubber bush, Swallow-wort and Sodom apple in English; Akdo, Akada and Madar in Hindi and Aak or Ak is the local name of this shrub (Farooq Azhar et al., 2014 ; Kumar et al., 2013).

In Encyclopedia of Dehkhoda two meaning for milkweed *(C. procera*, Istabraq in Persian, Astbrk in Arabic) are listed including; Diba, thick Diba, fabric woven using gold and silk, and also shrub species grows in tropical areas which is rubber plants grow Iran (Dehkhoda., 1970). Shoushtari Diba (a garment from milkweed) has been woven in the Achaemenid period from this plant. In the past, the milkweed fabric, especially Curtain of the Kaaba was made using fibers and beads on silk cover of *Calotropis procera*, seeds which grows in the southern parts of Iran and the Persian Gulf (Ghahraman., 1994).

Figure 1: a *Calotropis procera* shrub in south of Kerman province (IRAN)

This plant seen as a single or many stemmed soft-wooded shrub, and occasionally a tree reaching to 6m. All parts of the plant exude milky latex when cut. It has been widely used in the Sudanese, Unani, Arabic and Indian traditional medicinal system for the treatment of various diseases namely leprosy, ulcers, piles and diseases of the spleen, liver and abdomen (Sharma., 2011).
Hence, regarding to this ethnomedicinal uses of *C. procera*, the recent reported pharmacological actions with active chemical constituents in the plant, was discussed in this study.

- **Taxonomy of *Calotropis procera***

Kingdom : Plantae – Plants
Subkingdom : Tracheobionta – Vascular plants
Superdivision : Spermatophyta – Seed plants
Division : Magnoliophyta – Flowering plants
Class : Magnoliopsida – Dicotyledons
Subclass : Asteridae
Order : Gentianales
Family : Asclepiadaceae – Milkweed family
Genus : Calotropis R. Br. – calotropis
Species : *Calotropis procera* (Aiton) W.T. Aiton – roostertree (Khairnar et al., 2012 ; Rahman & Wilcock., 1991).

- **Monograph**

In ancient ayurvedic medicine of India the plant *Calotropis gigantea* is known as "Sweta Arka" and *Caotropis procera* as "Raktha Arka". Both of them are often similar in their botanical aspects, and also have similar pharmacological effects (Suresh Kumar et al., 2013).
Calotropis gigantea is Worldwide known by various names such as swallowwort, dead-sea apple, sodom apple or milk weed. In India, the plant is known as madar in Hindi, orka in Oriya, and alarka in Sanskrit (Farooq Azhar et al., 2014). Giant milkweed is also known as Sodom apple, calotrope, French cotton, small crown flower in English, algodón de seda, bomba in Spanish, cotton-france, arbre de soie, and bois canon in French (Khairnar et al., 2012 ; Suresh Kumar et al., 2013).
In Iran, the plant is known as Gghlablab, Ashar, Kharag or Karg (Dehkhoda., 1970). Its vernacular names are Istabraq (Fars and Shooshtar), Gghlablab (Dezful), Vsherr and Ousher (Ahwaz), Kharag (Lar and Bandar Abbas), Karg (south of Kerman) (Zaeifi., 2001).

- **Morphology**

Morphologically, *Calotropis procera* is multi branched shrub with yellowish barks having white, soft and corky fissures. Leaves are simple, opposite, sub sessile, blade broadly obvate and oblong. It has relatively few leaves, mostly concentrated near the growing tip. The leaf blades are light to dark green with nearly white veins. They are 7 to 18 cm long and 5 to 13 cm broad, slightly leathery, and have a fine coat of soft hairs that rub off. It is densely blossomed and the flowers are white (purple from inner side) in color, pentamerous and hermaphrodite. Its fruit is simple, inflated and contains numerous brown colored seeds with white silky hairs. Matured fruits erupt to disperse seeds which are widely spread by wind and animals (Farooq Azhar et al., 2014; Khairnar et al., 2012).

- **Distribution and Habitat**

C. Procera is drought-resistant, relatively drought and salt-tolerant, and it disperses seeds through wind and animals. It quickly become established as a weed along degraded roadsides, lagoon edges and in overgrazed native pastures. It 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, Kenya, Kuwait, Niger, Nigeria, Oman, Saudi Arabia, United Arab Emirates, Vietnam, Yemen and Zimbabwe (Sharma., 2011; Suresh Kumar et al., 2013).
The plant grows very well in a variety of soils and different environmental conditions. It is one of the few plants not consumed by grazing animals. It grows on poor soils, particularly where overgrazing has removed competition from native grasses. Sometimes this plant is the only survivor in some areas, where nothing else grows. Presence of latex,

extensively branched root system and thick leaves with waxy coverage are the xerophytic adaptations. Hence, it is distributed in tropical and subtropical area of the world (Suresh Kumar et al., 2013) and throughout Iran.

The plant is native of India, China and Malaysia and distributed in the following countries: Afghanistan, Algeria, Burkina Faso, Cameroon, Chad, Cote d'Ivoire, Democratic Republic of Congo, Egypt, Eritrea, Ethiopia, Gambia, Ghana, guinea-Bissau, India, Iran, Iraq, Kenya, Kuwait, Lebanon, Libyan, Arab Jamahiriya, Mali, Mauritania, morocco, Mozambique, Myanmar, Nepal, Niger, Nigeria, Oman, Pakistan, Saudi Arabia, Senegal, sierra Leone, Somalia, Sudan, Syrian Arab Republic, Tanzania, Thailand, Uganda, United Arab emirates, Vietnam, Yemen, Republic of Zimbabwe, Exotic: Antigua and Barbuda, Argentina, Australia, Bahmas, Barbados, Bolivia, Brazil, chile, Colombia, Cuba, Dominica, Dominican Republic, Ecuador, French Guina, Grenada, Guadeloupe, Guatemala, Guyana, Haiti, Honduras, Jamaica, Martinique, Mexico, Montserrat, Netherlands Antilles, Nicaragua, Panama, Paraguay, Peru, Puerto Rico, St Kitts and Nevis, St Lucia, St Vincent, and the Grenadines, Surinam, Trinidad and Tobago, Uruguay, Venezuela and US Virgin Islands (Suresh Kumar et al., 2013)**.**

In Iran milkweed is found in southern parts of the country, including Khouzestan, at altitudes of 100 to 950 meters, Lorestan Andimeshk, between Shush and Dehloran, Dezful and Fars, between Borazjan and Dalaki, and also between Bushehr and Kazeroon, and south of Kerman, near the Persian Gulf and Bandar Abbas, Chah Bahar, Iran Shahr, Nikshahr (Mozaffarian., 1991; Zaeifi., 2001).

- **Phytochemistry**

The *Calotropis procera* plant has many medicinal properties due to the presence of numerous secondary metabolites, and phytochemicals. This compound includes various chemicals which are useful for various activities (Begum et al., 2013; Moronkola et al., 2011; Sheth., 2011).

Previous workers have reported many phytochemical constituents in the various parts of *Calotropis gigantea* especially in the leaves (Table 1) (Sharma., 2011; Suresh Kumar et al., 2013). Usharin, gigantin, calcium oxalate, alpha and beta-calotropeol, beta-amyrin, fatty acids (both saturated and unsaturated), hydrocarbons, acetates and the benzoates, a mixture of tetracyclic triterpene compounds, terols, giganteol and giganteol are also found to be present. Cardenolide calotropin,*α*-amyrin, *β*-amyrin, taraxasterol, *β*- sitosterol, *α*-amyrin methylbutazone, *β*- amyrin methylbutazone, *α*-amyrin acetate, *β*-amyrin acetate, taraxasteryl acetate, lupeol acetate B, gigantursenyl acetate A, gigantursenyl acetate B, flavonol glycoside, akundarol, uscharidin, calotropin, frugoside, calotroposides A to G are responsible for many of its activities (Suresh Kumar et al., 2013). The following cardenolides are also described in the literature: calactin, calotoxin, calotropagenin, proceroside, syriogenine, uscharidin, uscharin, uzarigenin, and voruscharin. Other found compounds are benzoylisolineolon and benzoyllineolone (Suresh Kumar et al., 2013). Flavonoids, triterpenoids, alkaloids, steroids, glycosides, saponins, terpenes, enzymes, alcohol, resin, fatty acids and esters of calotropeols, volatile long chain fatty acids, glycosides and proteases have been isolated from the various parts of the plant *Calotropis* (Suresh Kumar et al., 2013).

The laticifer fluid of *Calotropis*, have strong proteolytic activity, because of having the cysteine proteinase and aspartic proteinase. Due to the presence of these components, the plants are resistant to phytopathogens, and insects; mainly in leaves where the latex circulates abundantly. The milky latex of the plant is rich in lupeol, calotropin, calotoxin, and uscharidin, the latex protein (Suresh Kumar et al., 2013). The major phytochemicals viz. alkaloids, carbohydrates, glycosides, phenolic compounds/tannins, proteins and amino acids, flavonoids, saponins, sterols, acid compounds, resins in flower, bud, root of *Calotropis* has been secreened (Seiber et al., 1982; Suresh Kumar et al., 2013).

Cardenolides, the principal steroidal toxins isolated from *C. procera*, are cardiac poisons and it has reported to inhibit the ubiquitous and essential animal enzyme Na+/K+-ATPase. Moreover, only some special sorts of insects are known to feed on cardenolide-containing plants (Begum et al., 2013).

The latex contains caoutchouc, calotropin, uscharin, calotoxin, calactin (composed of calotropagenin and hexose), trypsin, voruscharin, uzarigenin, syriogenin and proceroside. The leaves and stalks bear calotropin and calotropagenin (Farooq Azhar et al., 2014; Khairnar et al., 2012; Mascolo et al., 1988). The root bark possesses the phenolics benzoyllineolone, benzoyl isolineolone, madaralban and madar fluavil. The flowers contain the anthocyanin cyanidin-3-rhamnoglucoside. The whole plant contains various enzymes such as trypsin, α-calotropeol, β-calotropeol and β- amyrin. Inorganic components such as calcium oxalate, nitrogen and sulphur are also found. The isolated fatty acid composition in the extract of *C. procera*, has 7 saturated fatty acids and 11 unsaturated fatty acids. The elements such as Al, As, Cu, Ca, Cr, Cd, Fe, K, Mn, Na, Pb, and Zn have been found in this medicinal plant in variable range. The total protein in *C. procera* is between 27%-32% (Begum et al., 2013).

Table 1: Phytochemical components in *Calotropis*

Class of Compounds	Plant Part		
	Flowers	Bud	Root
Alkaloids	+	+	+
Carbohydrates	+	+	+
Glycosides	+	+	+
Phenolic Compounds/tannins	+	+	+
Protein and Amino acids	+	+	+
Flavonoids	+	+	+
Saponins	+	+	+
Sterols	+	+	+
Acid compounds	+	+	+
Resins	+	+	+

Plant parts such as leaves, flowers and roots contained high amount of ash and protein (10.9%-11.7%) with vary quantities of alkaloids, leaves contained calotropin and calotropegenin. The root bark was found to contain long chain of fatty acid, sterol, and resin (Sharma., 2011). A polysaccharide was isolated from aq. Extract of leaves of this plant. It also indicates the presence of D-glucose, Dabrabinose, D-glucosamine and Lrhamnose (Khairnar et al., 2012).

Different parts (flowers, leaves and roots) of *C. procera* were analyzed also for the concentrations of N, crude fiber (CF), crude protein (CP), ash, Ether extract fat (EEF), P, K in a study by Farooq Azhar et al., (2014). The results showed the presence of nutritive chemicals and secondary metabolites in almost all parts of the plant which has made this plant as acceptable forage and effective medicine for human as well as for the livestock. The concentration of N was the highest (3.48%) in flowers as compare to other parts. Similarly, CP was observed higher (21.69%) in flowers while the concentrations of CF were found almost same in leaves (29.65%) and flowers (29.5%). In leaves of the plant, the concentration of ash and EEF was in the maximum level (20.11% and 7.61%). Maximum concentration of P and nitrogen free extract (NFE) was present in the roots of collected plant samples (Farooq Azhar et al., 2014). The presence of essential nutrients in different parts of the plant indicates that in sufficient concentrations makes it a good source of nutrients for livestock feed. The concentration of phenolics was recorded higher (126.6 mg/g DW) in leaves while total flavonoid contents were same in leaves and roots (6.33 mg/g DW) (Farooq Azhar et al., 2014; Suresh Kumar et al., 2013).

- **Folk remedies and Traditional uses**

Herbal medicines are used by the tribal mainly through the traditional healers with a strong spiritual belief. These magico- spiritual and religious beliefs may not have any scientific basis, but they cannot be ignored (Misra et al., 1993).

Calotropis procera is one of the important numbers of traditional herbal medicine in many countries. *Calotropis procera* has been reported to possess numerous medicinal properties. In the traditional Asian medical system, it has been used for bronchitis, pain, asthma and tumors. The plant is also known for its toxic properties that include dermatitis, iridocyclites, and acts like a poison andproduces lethal effects (Muzammal., 2014). The root skin, latex, flowers, leaves and the ksara of arka are used for medicinal purposes. Milk weed is useful both, internally and externally (Khairnar et al., 2012). The latex of *Calotropis procera* extract is easily available and is used in medicine for treatment of many diseases (Kumar et al., 2013). It is used as wound healing agent, anti-diarrheas, anti inflammatory, and anti- rheumatism agent (Kumar et al., 2001; Kumar et al., 2011). It is also used against malaria and skin infection. The milky latex and flowers were considered to improve digestion, Catarrh, and increases appetite (Muzammal., 2014; Seifu., 2004).

Leaves and roots of this plant have been used to relieve pain under different conditions. Its milky sap, i.e. latex, has been shown to possess significant anti-inflammatory activity against carrageenin, and formalin induced paw oedema and antipyretic effect (Dewan et al., 2000). Different parts of the plant have been used as purgative and anthelmintic.

It strongly recommended in leprosy, hepatic and splenic enlargements, dropsy and worms. The latex has been applied to painful joints and swelling, fresh leaves are also use for the same purpose. Oil gained by boiled leaves is applied to paralyzed part. The milky juice is used in India as purgative, while flowers are considered as digestive, stomachic, tonic and useful in cough, asthma catarrh and loss of appetite (Khairnar et al., 2012). The root bark is said to promote secretion and to be useful in treating skin disease, enlargement of abdominal viscera, intestinal worms, ascites and anasarca. Traditionally the leaves of milk weed are warmed and tied around any body organ in pain. It is practically useful in backache and in joint pains. Warm leaves also relieve from stomach ache if tied around. Inhalation of burnt leaf cures headache. The traditional folk healers use the milky latex of the plant for several ailments (Khairnar et al., 2012).

Traditionally, leaf latex applied on fresh cut, stops bleeding immediately. Recent investigations have found that the alkaloids calotropin, calotaxein and uskerin are stimulant to the heart. The plant is anthelmintic ashes act as an expectorant. The leaves are applied hot to the abdomen to cure the pain inside. The flower is tonic and antisialagogue. It is used as appetizer and also used to cure stomach chace, and piles and asthma. Flowers are believed to have detergent properties so they are given in cholera. The fresh roots are used as a toothbrush. Milk weed

is an alternative tonic and diaphoretic, in large dose emetic (Begum et al., 2013).

Root bark is useful for treating chronic cases of dyspepsia, flatulence, constipation, loss of appetite, indigestion and mucus in stools. Seed oil is geriatric and tonic. Green copra is given in asthma. The medicated oil is beneficial in otitis and deafness. The topical sprinkle of dried leaves powder hastens the wound healing. In glandular swellings the topical application of latex reduces the inflammation. In skin diseases, associated with depigmentation, the latex combined with mustard oil, works well. The fomentation with its leaves, slightly warmed with thin coat of castor oil, is beneficial to relieve the abdominal pain. The local application of latex is recommended in hair fall and baldness. It also, is useful in piles. Internally, milk weed is very useful for many diseases, especially in ascites. The latex as a strong purgative and accumulations breaking, imparts excellent results in ascites of kapha type and hepatosplenomegaly with ascites. To alleviate the oedema in such conditions, of kapha origin, the decoction of its roots combined with triphala and honey, is salutary. In asthma and cough, the flowers and the root skin of arka are commonly used. In chronic dermatoses, the root skin is recommended with honey. The high doses of its latex produces toxic symptoms like burning in throat, irriation of the stomach, nausea, vomiting, diarrhoea, tremors, vertigo and convulsions (Khairnar et al., 2012).

There are some reports showing application of different parts of milkweed in traditional medicine of Iran (Sadeghi et al., 2014). Mostly used part of the plant in Iran is the roots of plant which has many different medicinal uses. Milk weed tissues especially the skin, are used to treat various diseases such as leprosy, fever, malaria, snake bites and bleeding uterus (Sheth., 2011).

There are also negative results about the uses of medicinal plants, the efficacy of them may depend on the total effect of the plant contents rather than on the one of the few chemical fractions separated from the herbs or the age of the plant part(s) extracted. There is a controversy regarding use and disuse of drugs. Therefore, the validity of medicines should be assessed at both based on the prevailing folk etiological belief and on the objective "scientific' criteria (Misra et al., 1993).

- **Pharmacology**

Khairnar et al., (2012) categorized pharmacological activity of *C. procera* as follow: protective activity anthelmintic activity, anti-inflammatory activity, anti-diarrhoeal activity, antinociceptive activity, antioxidant, and antidiabetic activity, myocardial infarction, antifertility activity, schizontocidal activity, analgesic activity, anticancer and cytotoxic properties, antioxidant and antibacterial activity (Khairnar et al., 2012)

Sharma and Sharma (1999) summarized numerous biological activities of the plant as are given in table 2 (Sharma & Sharma., 1999).

Table 2: The biological uses of different parts of *Calotropis procera* and dose range of their extracts/fractions

Part used	Extract/fraction	Compound isolated	Biological activity
Flower	Ethanol	N.D [a]	Cytostatic activity
Flower	Rectified spirit	N.D [a]	Cytostatic activity
Flower	Fried in cow`s ghee	N.D [a]	Asthma
Flower	Ethanol	N.D [a]	Analgesic activity
Latex	-[b]	N.D [a]	Antitermites property
Latex	-	N.D [a]	Mosquito control
Latex	95% aqueous ethanol	N.D [a]	Anti-inflammatory activity
Latex	Dried latex, Methanol	Uscharin	Molluscicidal activity
Latex	Methanol, Acetone	N.D [a]	Anti-microbial activity
Latex	Double distilled water	N.D [a]	Anti-inflammatory activity
Latex	-	N.D [a]	Anti-bacterial activity
Terminal leaves	Dried	N.D [a]	Effect on migraine
Leaves	Dried and aqueous extract	N.D [a]	Anti-molluscicidal activity
Leaves	50% Ethanol	N.D [a]	Anti-implantation activity
Leaves	95% Ethanol	N.D [a]	Anti-fungal activity
Leaves	Aqueous	N.D [a]	Hypotensive
Leaves	Aqueous	N.D [a]	Insecticidal activity
Leaves	Powder	N.D [a]	Insecticidal activity
Leaves	Hot aqueous	N.D [a]	Anti-inflammatory activity
Leaves	Methanol	N.D [a]	Anti-fungal activity

Roots	Chlorophorm	N.D [a]	Hepatoprotective effect
Roots	Chlorophorm	N.D [a]	Anti-ulcer activity
Roots	Ayurvedic procedure	N.D [a]	Anti-diarrheic activity
Roots	Chlorophorm	N.D [a]	Anti-inflammatory activity
Whole plant	Chlorophorm Methanol	N.D [a]	Analgesic and antibacterial activity
Roots/flowers	Methanol aqueous	Calotropin	Abortifacient activity
Flower	Ethyl acetate, n butanol	N.D [a]	Molluscicidal activity
Leaves	Ethyl acetate, n butanol	N.D [a]	Molluscicidal activity
Latex	Aqueous ethanol	N.D [a]	Molluscicidal activity
Latex	Aqueous extract	N.D [a]	Molluscicidal activity
Root	Ethanol	N.D [a]	Respiration and blood pressure
Leaves	Ethanol	N.D [a]	Tissue culture
Root	Chlorophorm	N.D [a]	Antisperm activity
Flower, leave branch	Methanol 21% decoction	N.D [a]	Pesticidal activity
Stem	50% ethanol	N.D [a]	Anti-ulcer activity
Leaves Flowers Root bark	Ethanol	Oil	Anti-bacterial activity
Leaves Stem Root	Ethanol	N.D [a]	Anti-microbial activity
Flower Fruit Root bark	Ethanol	N.D [a]	Anti-fungal activity

[a] N.D : not detected
[b] - : not mentioned

For its ability to contract smooth muscles of gastrointestinal tract, it exhibits spasmogenic and carminative properties. Its flowers possess digestive and tonic properties. On the contrary, the powdered root bark has been reported to give relief in diarrhea and dysentery. Some studies have demonstrated potent anti-inflammatory, analgesic and antipyretic activities in the latex of *C. procera*. Drugs possessing anti-inflammatory activity have been shown to delay castor oil induced diarrhoea, suggesting the involvement of prostaglandins in this mechanism (Arya & Kumar., 2005; Basu & Chaudhuri., 1991; Kumar & Basu., 1994; Misra et al., 1993; Roy et al., 2005).The aqueous flower extract has been shown to possess analgesic, antipyretic, and anti-inflammatory activities. Decoction of the aerial parts of plant exhibits neuromuscular blocking activity. The ethanolic extracts of the different parts specially flower and bud extracts have been reported to possess an antimalarial activity. The chloroform extract of seeds displays antimicrobial activity (Jain et al., 1996; Kareem et al., 2008; Muzammal., 2014). Most of the published reports on the biological activity of *C. procera* are related with the latex and some organic extracts derived from the aerial parts (Kumar et al., 2013; Sharma & Sharma., 1999).

The leaves of this plant have also been used to relieve toothache, joint pain and to cure migraine. It is quite possible that the analgesic activity of different parts of the plant is due to the presence of latex as reported earlier for its anti-inflammatory effect. Latex also exhibits toxic properties like irritation, inflammation and iridocyclitis, cardiotoxicity, liver damage and testicular necrosis. It has also been used as a poison and as an abortifacient. It contains a number of cardioactive glycosides, calactin, calotropin, calotoxin, uscharin, uscharidine, voruscharin, tannins, flavonoids, sterols and: triterpenes (Dewan et al., 2000).

There are some reports by Iranian researchers showing pharmacological effects of. *C. procera* in reducing ocular pressure as blindness factors in humans. But this wine is pure eye symptoms such as burning pain that investigations are going to resolve these problems. Therapeutic effects of liquid, hydro alcohol extracts of *Calotropis* spp., against *Haemoproteus spp*. infection in pigeons were also reported by Iranian researchers (Sadeghi et al., 2014).

Conclusion

Empirical knowledge about medicinal plants plays a vital role in health and has a great potential to discover and find new herbal drugs.

Calotropis procera is a plant with many medicinal properties and other economic values with the following features: a perennial shrub, salt and drought resistant, growing in tropical and subtropical environment.

The ethnobotanical study on *C. procera* reveal the great diversity of its popular medicinal uses, and common uses for a wide range of ailments like fever,

rheumatism, indigestion, cough, cold, eczema, asthma, elephantiasis, nausea, vomiting and diarrhoea. The following activities such as antioxidant, antibacterial activity, anticancer, cytotoxic properties, analgesic activity, schizontocidal activity, antifertility activity, etc. are shown by the plants. Moreover, it can be initiative for further phytochemical and pharmacological investigations about the medicinal use of the plant, which may be a step ahead towards the new drug discoveries.

References

1. Arya S, Kumar VL. Antiinflammatory efficacy of extracts of latex of *Calotropis procera* against different mediators of inflammation. Mediat Inflamm. 2005(4):228-232.

2.Basu A, Chaudhuri A. Preliminary studies on the antiinflammatory and analgesic activities of *Calotropis procera* root extract. J Ethnopharmacol. 1991;31(3):319-24.

3. Begum N, Sharma B, Pandey RS. *Calotropis procera* and *Annona squamosa*: Potential Alternatives to Chemical Pesticides. British J Appl Sci Technol. 2013;3(2):254-67.

4. Dehkhoda AA. Encyclopedia (In Persian): Tehran: University Press; 1970.

5. Dewan S, Sangraula H, Kumar V. Preliminary studies on the analgesic activity of latex of *Calotropris procera*. J Ethnopharmcol. 2000;73:307-11.

6. Farooq Azhar M, Tahir Siddiqui M, Ishaque M, Tanveer A. Study of ethnobotany and indegenous use of *Calotropis procera* (Ait.) in Cholistan desert, Punjab, Pakistan. J Agrice Res. 2014;52(1):117-26.

7. Ghahraman A. Chromophytes of Iran (in Persian): Tehran: University Press Center; 1994.

8. Jain S, Sharma R, Jain R, Sharma R. Antimicrobial activity of *Calotropis procera*. Fitoterapia. 1996;67(3):275-7.

9. Kareem S, Akpan I, Ojo O. Antimicrobial activities of *Calotropis procera* on selected pathogenic microorganisms. Afr J Biomed Res. 2008;11(1).

10. Khairnar AK, Bhamare SR, Bhamare HP. *Calotropis procera*: An ethnopharmacological update Adv Res Pharm Biol. 2012;2(2):142-56.

11. Kumar S, Dewan S, Sangraula H, Kumar V. Anti-diarrhoeal activity of the latex of *Calotropis procera*. J Ethnopharmacol. 2001;76(1):115-8.

12. Kumar S, Dewan S, Sangraula H, Kumar V. Anti-diarrhoeal activity of the latex of *Calotropis procera*. J Ethnopharmacol. 2011;76:115-8.

13. Kumar S, Gupta A, Pandey AK. *Calotropis procera* Root Extract Has the Capability to Combat Free Radical Mediated Damage. ISRN Pharmacol. 2013;2013:691372.

14. Kumar V, Basu N. Anti-inflammatory activity of the latex of *Calotropis procera*. J Ethnopharmacol. 1994;44(2):123-5.

15. Mascolo N, Sharma R, Jain S, Capasso F. Ethnopharmacology of *Calotropis procera* flowers. J Ethnopharmacol. 1988;22(2):211-21.

16. Misra MK, Mohanty MK, D. PK. Studies on method-ethnobotany of *Calotropis procera* and *C. gigantea*. Ancient Sci Life. 1993;13(1 & 2):40-56.

17. Moronkola D, Ogukwe C, Awokoya K. Chemical compositions of leaf and stem essential oils of *Calotropis procera* Ait R. Br [Asclepiadaceae]. Der Chemica Sinica. 2011;2(2).

18. Mozaffarian V. Plant Systmematics: Amir Kabir: University Press; 1991.

19. Muzammal M. Study on antibacterial activity of *Calotropis procera* http://dxdoiorg/107287/peerjpreprints430v1. 2014;CC-BY 4.0 Open Access.

20. Rahman M, Wilcock C. A taxonomic revision of *Calotropis* (Asclepiadaceae). Nord J Bot. 1991;11(3):301-8.

21. Roy S, Sehgal R, Padhy BM, Kumar VL. Antioxidant and protective effect of latex of *Calotropis procera* against alloxan-induced diabetes in rats. J Ethnopharmacol. 2005;102(3):470-3.

22. Sadeghi Z, Kuhestani K, Abdollahi V, Mahmood A. Ethnopharmacological studies of indigenous medicinal plants of Saravan region, Baluchistan, Iran. J Ethnopharmacol. 2014;153(1):111-8.

23. Seiber JN, Nelson CJ, Lee SM. Cardenolides in the latex and leaves of seven *Asclepias* species and *Calotropis procera*. Phytochem. 1982;21(9):2343-8.

24. Seifu T. Ethnobotanical and ethnopharmaceutical studies on medicinal plats of Chfra district, Afar

region, MSC Thesis. North eastern Ethiopia: Addis Ababa University; 2004.

25. Sharma AK. Pharmacognostical aspects of *Calotropis procera* (Ait) R. Br. Int J Pharma Bio Sci. 2011;2(3):480-8.

26. Sharma P, Sharma JD. Evaluation of in vitro schizontocidal activity of plant parts of *Calotropis procera*—an ethnobotanical approach. J Ethnopharmacol. 1999;68:83-95.

27. Sheth F. Range of Seasonal Phytochemical Variations in *Calotropis procera* (Ait.) R. Br. Int J Med Aroma Plants. 2011;1(2):180-3.

28. Suresh Kumar P, Suresh E, Kalavathy S. Review on a potential herb *Calotropis gigantea* (L.) R. Br. Scholars Acad J Pharm. 2013;2(2):135-43.

29. Zaeifi M. The flora of Hormozgan province. Vol. 1. Bandar Abbas: Research Center of Agriculture and Natural Resources Publications; 2001.