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Exploring the Ethanobotany, Phytochemistry and Pharmacology of *Calotropis Procera* L.

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Ever since ancient times, in search of treating their disease, the people looked for medicine in nature. Medicinal plants are known to human beings throughout history. Humans have highly relied on the use of plants for their needs as shelters, medicines, fragrances, foodstuffs, flavours, clothing and fertilizers (Gurib-Fakim, 2006). The acknowledgement of medical and financial aids of these plants is on the rise in both industrialized and developing nations. For thousands of years, the increased the trend of traditional systems of medicine that already have made fruitful contributions to modern medicine gets from plant sources. This medicinal flora remains to introduce human beings with new medicines or remedies. Some of the valuable characters attributed to plants have acknowledged being flawed and medicinal plant treatment is based on the experimental findings of hundreds to thousands of years (Dar *et al*., 2017). The traditional medicine practice is widespread in India, China, Pakistan, Japan, Thailand and Sri Lanka. In China, approximately forty percent of the total medicinal consumption is ascribed to traditional tribal medicines. The tropical plant *Calotropis procera*, which belongs to the Asclepiadaceae family, grows wild up to roughly 1050 meters in elevation in warm climates. It is a North African native plant. This plant is widely distributed over India, although it is especially common in Rajasthan. Pakistan, Africa, Mexico, Australia, Egypt, Central and South America, and Caribbean islands are among its other locations. Plants, animals, and other natural items have had a significant impact on human culture and civilization from prehistoric times to the present in various places of the world, including India. Humans have worshipped plants from the dawn of civilization, and these plants are preserved as genetic resources and utilized for fuel, fertilizer, food, fodder, fiber, and febrifuge purposes, among other purposes. In ancient Ayurvedic medicine the plant Calotropis procera is popularly known as "Raktha Arka" and Caotropis gigantea as "Sweta Arka". Both of them are often similar in their botanical aspects and also have similar pharmacological effects.[3] Common names for the plant include apple of Sodom, Sodom apple, Stabragh, Kapok tree, King's crown, Rubber bush or Rubber tree. There are several documented ethanomedicinal uses for the medication. The entire plant was used to treat common ailments like fever, rheumatism, indigestion, cold, eczema, and diarrhea, either by itself or in combination with other plants (Jain *et al*., 1985), paste of root bark was locally applied in the treatment of elephantiasis and Root bark powder was used to treat diarrhea and dysentery and it is an excellent substitute for ipecac. Traditionally it was used to treat cholera, extracting guinea worms and indigestion.

Morphology

Morphologically the plant is erect, tall, large, much branched and perennial shrub or small tree that grows on a height of 5.4m, with milky latex throughout. Bark is soft and corky, branches stout, leaves sub sessile, opposite, decussate, broadly ovate, oblong, elliptic or obovate, acute, thick, glaceous, green coloured with fine cottony pubescent hair on young.

Flowers in umbellate cymes and tomentose on young. Seeds broadly ovate, acute, flattened, minutely to mentose, brown coloured and silky (Sharma *et al*., 2011). Fruits consist of green, spongy ovoid fruits (follicles), up to 15 cm long by 10 cm wide. They split open to release plumed, papery light brown seeds with a pappus of white filaments up to 6 cm long on one side.

Phytochemical Components of *Calotropis procera*

Benzoylinesolone and benzoylisolinelone are found in the root bark, while proceragenin and cardenolide are found in the plants. Calotropenyl acetate, multiflavenol, uzarigenin, and terpenol ester are found in the flower, whereas calotropin and calotropagenin are found in the leaves and stalk. Triterpenoids, calotropursenyl acetate and calopfriedelenyl, a norditerpenyl ester, calotropternyl ester, oleanene triterpenes such as calotropoleanyl ester, procerleanol A and B, and cardiac glycosides calorotropogenin, calotropin, uscharin, calotoxin, and calactin have all been found in this plant according to chemical analysis.

Leaves : The leaves contain mainly a-amyrin, a-amyrin acetate, ß-sitostero, urosolic acid, cardenolides, calotropin and calotropagenin.

Latex : The latex contains caoutchouc, calotropin, calotoxin 0.15%, calactin 0.15% uscharin 0.45%, trypsin, voruscharin, uzarigenin, syriogenin and proceroside (Atef *et al*., 1999).

Flowers : The flower contains the flavonoids, queretin- 3- ratinoside, sterol, calactin, calotoxin, calotropagenin, calotropin, polysaccharides with D arabinose, glucose, glucosamine and L-rhamnose. Flowers also contain enzymes 3-proteinase and calotropain (protease). Other chemical constituents of Calotropis procera flowers are lupeol, uscharin, proceroside, proceragenin (cardenolide), syriogenin, taraxast-20(30)-en-3-(4-methyl-3-pentenoate), 3 thiazoline cardenolide, gigantin, giganteol, isogiganteol, uscharidin, uzarigenin voruscharin a-calotropeol, 3 epimoretenol, a- lactuceryl acetate and a-lactuceryl isovalerate.

Bark : Root bark of Calotropis procera contains triterpenes, A new norditerpenyl ester, named Calotropterpenyl ester, and two unknown pentacyclic triterpinoids, namely calotropursenyl acetate and calotropfriedelenyl acetate35, akundarol isovalerate, mundarol isovalerate and quercetin -3- rutinoside.

Taxonomic Position

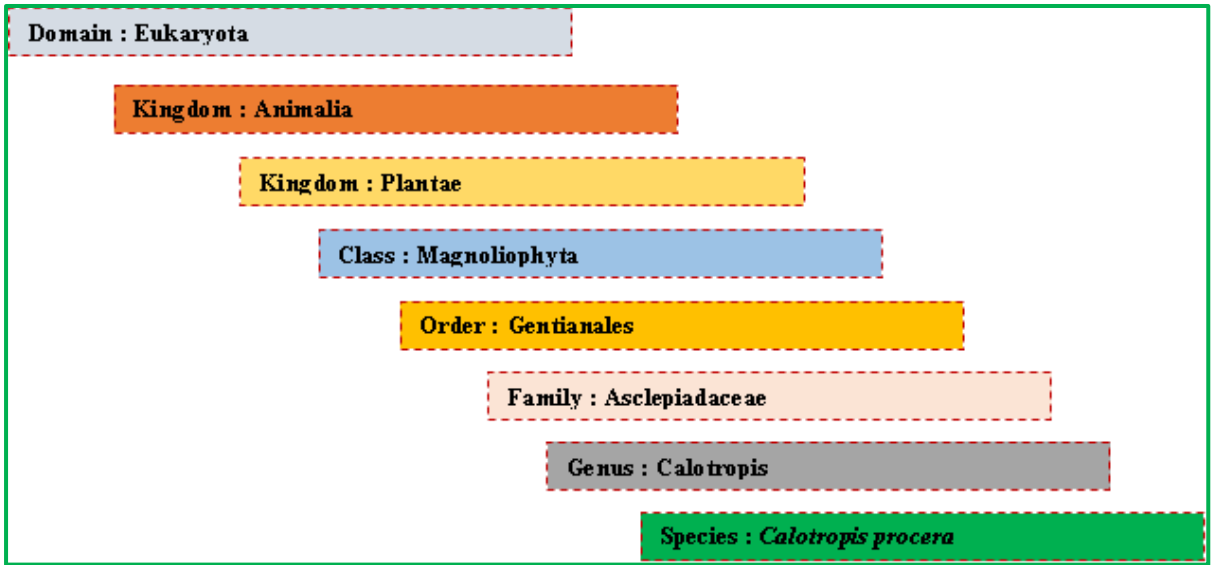

Table 1: Medicinal utility of *Calotropis procera*

Plant part	Medicinal Utility
Whole Plant	To treat common diseases such as fever, rheumatism, indigestion, cold, eczema and diarrohea. In boils and also to remove thorn from body for the treatment of jaundice.

Root	Eczema, leprosy, elephantiasis, asthma, cough and rheumatism. In the treatment of Diarrhoea and dysentery. In case of diarrhoea it changes the faecal matter into a semisolid mass with in the first day of treatment.
Stem	For the treatment of skin diseases, enlargements of abdominal viscera, intestinal worms, leprosy and in Leucoderma.
Leaves	To prompt healing, used for joints and waist pain, for asthma. To cure malarial fever. Eczema, leprosy, elephantiasis, asthma, cough and rheumatism. In rheumatism, gout and to relieve pains.

Pharmacological Activities

Analgesic Activity : The ethanol extract of aerial parts, chloroform extracts of roots and the aqueous solution of dried latex were tested in acetic acid induced writhing model and exhibited significant analgesic activity. A single oral dose of dry latex ranging from 165 to 830 mg/kg produces a significant dose dependent analgesic effect against acetic acid induced writhing. The effect of dry latex at a dose of 415 mg/kg is more pronounced than a 100 mg/kg oral dose of aspirin. In addition, dry latex (830 mg/kg) produces marginal analgesia in a tail-flick model which is similar to that of aspirin. The analgesic effect of dry latex is delayed 1 h by naloxone at a dose of 0.5 mg/kg, which completely blocks the analgesic effect of morphine (10 mg/kg). However, the effect of aspirin was not blocked by naloxone. An 830 mg/kg oral dose of dry latex did not produce any toxic effects in mice and the LD50 was found to be 3000 mg/kg (Ahmed *et al*., 2005).

Wound Healing Activity : According to its traditional use, Calotropis procera was tested for its ability to heal wounds. Four full thickness excisional wounds measuring 8.0 mm in diameter were applied topically twice daily for seven days, using 20 µl of a 1.0% sterile solution of the plant's latex. The study found that the latex significantly accelerated the healing process by significantly increasing collagen, DNA, and protein synthesis and epithelization, which in turn reduced the area of the wound. As a result, the study offered a scientific justification for the traditional use of this plant in healing (Rasik *et al*., 1999).

Anti-diarrhoeal activity : Kumar *et al*. (2001) assessed the anti-diarrheal properties of Calotropis procera's (Asclepiadaceae) dry latex (DL), a strong anti-inflammatory drug. A single dose of DL (500 mg/kg), similar to atropine and phenyl butazone, significantly reduced the frequency of bowel movements, the intensity of diarrhea, and provided protection against diarrhea in 80% of rats treated with castor oil-induced intestinal fluid accumulation and electrolyte concentration in intestinal fluid.

Anti-convulsant effects : The anticonvulsant activity of different root extracts of Calotropis procera was studied in rats in order to evaluate the traditional use of this plant. The anticonvulsant activity of different extracts of Calotropis procera roots was studied using seizures induced by maximal electroshock seizures (MES), pentylenetetrazol (PTZ), lithium-pilocarpine and electrical kindling seizures. In the MES test, the chloroform extract of Calotropis procera roots showed the most significant. The extracts also inhibited convulsions induced by lithium pilocarpine and electrical kindling. The results of this study indicate that the chloroform extract and aqueous extract of Calotropis procera roots may be beneficial in absence (petit mal) and tonic clonic (grand mal) types of seizures.

Antioxidant effect : Dry latex (DL) of *Calotropis procera* possessing potent anti-in flammatory activity was evaluated for its antioxidant and anti-hyper glycemic effects against alloxan- induced diabetes in rats. Daily oral administration of DL at 100 and 400 mg/kg doses produced a dose dependent decrease in the blood glucose and increase in the hepatic glycogen content. DL also prevented the loss of body weight in diabetic rats and brought down the daily water consumption to val ues comparable to normal rats. DL also produced an increase in the hepatic levels of the endogenous antioxidants, namely superoxide dismutase (SOD), catalase and glutathione, while it brought down the levels of thiobarbituric acid-reactive substances (TBARS) in al loxan-induced diabetic rats (Kumar *et al*., 2005).

Conclusion

Calotropis plants have several sections that can be used to treat jaundice, diarrhea, eczema, leprosy, fever, and dysentery. This is crucial for the pharmaceutical industry and will lead to new research avenues in the future. There are about half a million plants in the world, and the majority have not yet been investigated for their potential medical uses. These untapped medical uses could be important in treating current and upcoming research. As a result, the future of herbal medicinal plants appears bright. Predicting the safety of these plants requires an understanding of their inherent toxins. The secondary metabolite that plants produce is what gives them their therapeutic qualities.

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Different Plant Parts of *Calotropis procera*