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A REVIEW ON CALOTROPIS PROCERA (AIT) AND ITS PHARMACOLOGICAL ACTIVITIES

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ABSTRACT

Calotropsis procera (Ait) R.Br. is a naturally growing plant. It belongs to the family Asclepiadacea. Calotropis procera is used as herbal medicine traditionally in india. The milky latex of the Calotropis procera is used as folk healers for so many illness. This plant is used as Antihelmintic and ashes behave as an expectorant. In so many countries like African and Asia latex of this plant is used as arrow poison molluscide. It is also used as fungicide, anti syphilitic, anti-inflammatory, lepers and purgative. Calotropis procera act as alternative source for energy producing and taken as large scale cultivation. This plant can be cultivated as fuel crops because the plant containing hydrocarbons. Calotropis procera contains huge ethnomedicinal uses and reported many pharmacological actions recently with active chemical constituents.

KEYWORDS: Calotropis procera, Ethnomedicinal, Latex, Anthelmintic.

INTRODUCTION[1,2]

Calotropis procera (Ait) R.Br. is a naturally growing xerophytic perennial shrub. It belongs to the family of Asclepiadaceae. Aerial parts of the plant having some chemical constituents like alkaloids, cardiac glycosides, tannins, flavonoids, sterols and triterpenes (Moss et al., 1991). This plant parts are utilized for treating many diseases in india traditionally. Various diseases like leprosy, ulcers, tumors, and piles. Some parts of the plant have been used as a purgative and palliative. It also used to treat the problems associated with respiration, blood pressure and involuntary muscleation (Derasari and shah, 1965). By the usage of latex, leaves, stems,

and flower parts (pant and chaturvedi, 1989) different compounds have been identified and isolated in pure form. These compounds have been tested for number of biological activities like anticancer (Ayoub & Kingston, 1981) antibacterial (Akhtar et al., 1992) anti inflammatory (Kumar & Basu, 1994), and spermicidal (Farnsworth & Waller, 1982; Begum et al., 1993) in mammalian laboratory species.

Calotropis procera (Ait). R. Br.

Vernacular names[3]

English : Auricula tree, cabbage tree, calotrope, camel tree, dead sea fruit, desert wick, French cotton, giant milkweed, indian milkweed, mudar fibre, roster tree, rubber bush, rubber tree, sodom apple, sodoms milkweed, swallow-wort

Hindi : Aak, mudar

Sanskrit : Adityapushpika, alarka, ksiraparna, mandara

Telugu : Erra jilledu, jilledu, mandaaramu

Tamil : Vellai erukkan, vellai erukku

Kannada : Bili aekka, bili aekkadagida

Malayalam : Erikku, erukku

Marathi : Mandara, rui

Spanish : Algonda de seda, algonda extranjero

French : Arbe a soie, arbe a soie du Senegal

Arabic : Dead sea plant, kisher, usar, usher

Taxonomical classification[1,4]

Kingdom : Plantae – plants

Subkingdom : Tracheobionta- Vascular plants

Super division : 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) - rostertree

Distribution[5,6]

Calotropis procera originated from the Afro-Asian monsoonal regions. It spread on an arc expanding from north western africa (Mauritania, Senegal), through the Arabian peninsula and middle-east to the indian subcontinent. It was introduced to sub tropical America, the Mascarene Islands, drier parts of Australia and probably south-east asia.

Calotropis is found from sealevel up to an altitude of 1300m in semi arid conditions (150 to 1000mm annual rainfall) on sandy soils. However, it can withstand a wide range of soil textures. It is tolerant of soil salinity and of beach front salt spray. On excessively drained soils, it can withstand up to 2000mm annual rainfall. It quickly becomes established in open habitats with little competition, along degraded roadsides, lagoon edges and in overgrazed native pastures and rangelands (orwa etal., 2009). When calotropis is damaged, it readily develops suckers from the roots (parsons etal., 2001). Calotropis seeds are spread by wind and animals and may be transported long distances in flood waters (parsons etal., 2001).

Physical characteristics

Stem: Herbaceous, lower portions woody, aerial, erect, branched, cylindrical, solid, lower portions smooth, upper portions covered with woolly hairs, pale green, contains milky latex.

Leaves: Cauline and ramal, acute, hairy, woolly, unicostate reticulate, hermaphrodite, pentamerous, hypogynous and cyclic.

Inflorescence: Polychasial cymes.

Flowers: Large, purplish, sometime white, not scented, bracteates, bracteolate, pedicellate, complete, actinomorphic, hermaphrodite, pentamerous, hypogynous and cyclic. Calyx made up of 5 sepals, polysepalous, quincuncial. Corolla made up of 5 petals, gamopetalous, twisted, coloured. Stamens 5, united with the stigma to form gynostegium, each stamen is represented by two pollinia with their retinaculae. The pollinia of the adjacent anthers are joined by their retinaculae to corpusculum in a groove, to form a unit known as translator. A coronary outgrowth is present at the back of each stamen. Carpels 2 distinct, ovaries free but upper portion of style and stigma are fused, superior, placentation marginal, ovules many per locule, stigmatic head pentagonal.

Fruit: Etaerio of follicles.

Uses of Calotropis procera[10,15]

The medicinal value of Calotropis procera has been described in older pharmacopeia. It strongly recommended in leprosy, hepatic and splenic enlargements, dropsy and worms.

Latex: The latex is applied to painful joints and swelling, fresh leaves are also use for the same purpose. The milky juice is used in India as purgative. The local application of latex is recommended in hair fall and baldness. It also, is useful in piles. The latex also mitigates the dental aches.

Flowers: flowers are considered as digestive, stomachic, tonic and useful in cough, asthma catarrh and loss of appetite. Flowers are useful in asthma.

Root: 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. The fresh roots are used as a toothbrush and are considered by pathans to cure toothache.

Leaves: Traditionally the leaves of aak are warmed and tied around any body organ in pain. Warm leaves also relieve from stomach ache if tied around. The traditional folk healers use the milky latex of aak for several ailments. Leaf latex if applied on fresh cut, stops bleeding immediately. Leaves are used against guinea worms.

Flowers and roots are used in Ayurvedic medicine. The plant is anthelmintic; the ashes act as an expectorant. **Seed oil** is geriatric and tonic.

Phytochemical composition[17]

Detection of alkaloids

The residue obtained from the evaporation of 50mL of the alcoholic extract was titrated with 20mLof dilute hydrochloric acid and 0.5 g of sodium chloride and filtered. The filtrate was rendered alkaline with ammonium hydroxide and then extracted with successive portions of chloroform. The combined chloroform extract evaporated to dryness, the residues dissolved in 2mL hydrochloric acid and tested with silicotungestic acid and Mayer's reagents. The formed precipitate was, in each case, indicates the presence of primary, secondary and tertiary alkaloids. The aqueous alkaline layer was acidified with hydrochloric acid and tested with silicotungestic acid and Mayer's reagents. A precipitate was formed indicates the presence of quaternary alkaloids.

Detection of flavonoids and anthocyanidins

About 50mL of alcoholic extract was evaporated to dryness. The residue was titrated with 15mL of petroleum ether (60–80◦C) while warming. The residue was filtered and re-extracted again in the same manner. The defatted residue was titrated with 50mL of 80% methanol while warming then filtered. To 2mL of the filtrate, 0.5mL of hydrochloric acid was added and the mixture was warmed on a steam bath for 5 min, a red-violet colour, indicates the presence of leuco anthocyanidins. To another 2mL of the filtrate Shinoda test for flavonoids was applied. A red colour observed within 10 min indicates the presence of flavonoid compounds.

Detection of unsaturated sterols and triterpenoids

The petroleum ether extracts, which were collected from flavonoid test, were evaporated to dryness. The residue was dissolved in 10mL chloroform, dried over anhydrous sodium sulfate and filtered. The filtrate was divided into three portions. The first portion was subjected to Liebermann-Burchard test a blue green colour indicated a positive test for sterols while red-pink or violet indicate a positive testfor triterpenoids. The second portion was subjected to Salkowski test; a red colour indicates a positive test for sterol. The third portion was used as control for colour changes.

Detection of saponins

About 1 g of the dried powdered organs was macerated with 4mL of water, filtered, and the filtrate was shaken vigorously. A persisting froth for about 30 min was formed, indicating the possible presence of saponins. Five ml of the alcoholic extract was evaporated to dryness

under vacuum and the residue was dissolved in 10mL of normal saline. To 8mL of this solution 2mL of defibrinated blood in normal saline (1: 40) were added and left for 24 hours. Blood haemolysis was noticed, indicating the presence of saponins.

Detection of tannins

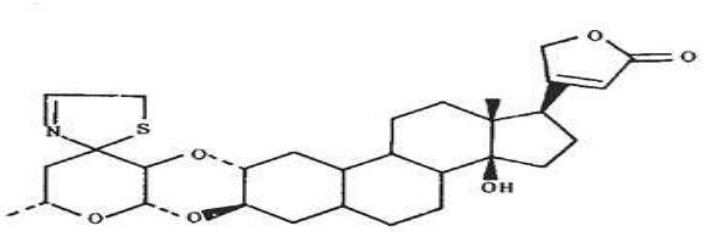
About 20mL of alcoholic extract was evaporated under vacuum (temperature not more than 35◦C). The residue was stirred with 10mL of distilled water and filtered. On the addition of ferric chloride reagent to a portion of the filtrate, the formation of a green blue to bluish black colour or precipitate may indicate the presence of tannins.

Detection of cardiac glycosides

The 80% alcoholic extract remaining after the flavonoid test was divided to three portions. 5mL of the solution were placed in small porcelain evaporating dish, 5mL of kedde's reagent, and 5mLof 2 N sodium hydroxide solution were added. The appearance of purple colour indicates a positive test for cardiac glycosides. Another 10mL of the solution were evaporated to dryness, the residue was triturated with 3mL of ferric chloride solution and filtered. The filtrate was transferred to a test tube and 1mL of concentrated sulphuric acid was added slowly down the side of the test tube. The appearance of purple ring indicates presence of cardiac glycosides (desoxy sugar). If the above two tests are positive, 5mL of the solution were evaporated to dryness. The residue was dissolved in 2mlchloroform and transferred to a small test tube. Acetic anhydride (0.3 ml)was added and mixed gently then a drop of concentrated sulphuric acid was added. The appearance of blue-green colour, observed during 60 min, indicates presence of cardiac glycosides (as steroids).

Chemical constitutions[16]

Calotropis procera plant has many medicinal properties due to the presence of numerous secondary metabolites. Calotropis procera the latex revealed that the plants contain cardenoids such as calotropin, calotoxin, uscharin, usechardin, glycoside calotropaginin, choline, opyrocatechuric acid, Benzoyllineolone, benzoylisoloneolane, uzariganin and syriogenin. In the root of the Calotropis procera pentacyclic triterpenes, alkaloid, cardinolides phytosterols and triterpenoid saponins have been isolated from roots. The leaves, flower and roots contained high amount of ash and protein (10.9- 11.7%) with varying quantities of alkaloids, leaves contained calotropin and calotropegenin. A polysaccharide was isolated from aq. Extract of leaves of this plant. It also indicates the presence of D-glucose, D-abrabinose, D-glucosamine and L-rhamnose.



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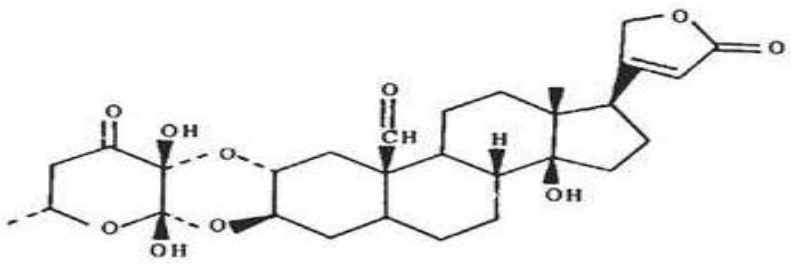

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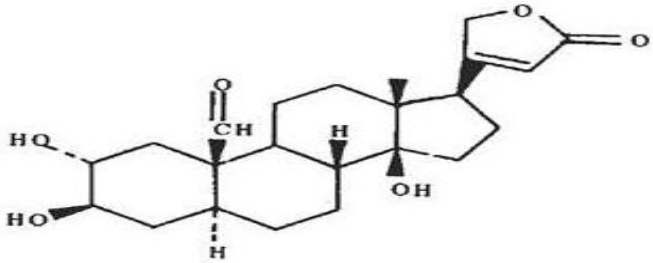
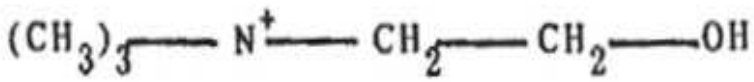
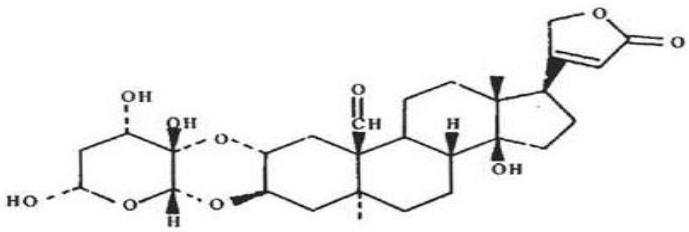


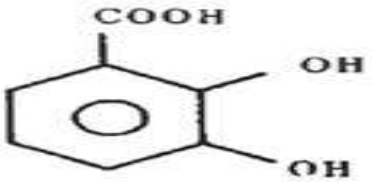
Glycoside calotropoginin



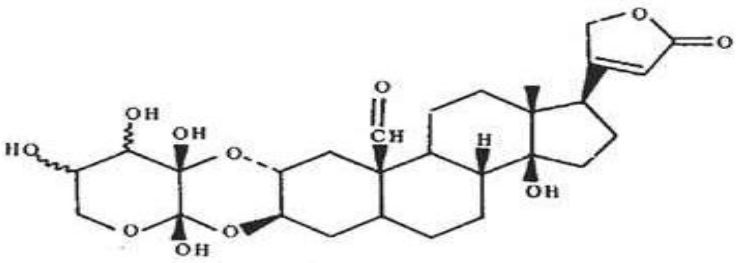
Choline



Calotropin



o - Pyrocatechuric acid



Calotoxin

Pharmacological activities[7,11]

Protective activity

(Kumar V.L et al., 2010) studied the protective effect of methanolic extract of C.P. latex on experimentally induced gastric ulcers in rats. The methanolic extract was found to inhibit mucosal damage in both ethanol (85-95%) and aspirin (70- 80%) model, with significant reduction in gastric hemorrhage and tissue integrity was maintained. Further the level of oxidative stress markers like glutathione, thiobarbituric acid reactive substance and superoxide dismutase were found to be regulated.

Antihelmintic activity[14]

(Zafar Iqbal etal, 2005) has compared the CP flower with levamisole through in-vitro and in vivo studies. For invitro studies it was found that anthelmintic effect ($p<0.05$) of crude aqueous extracts and crude methanolic extracts of CP flower on live haemonchus contortus as evident from their mortality or temporary paralysis and in in-vivo studies CP flower were administered as a crude powder, crude aqueous extract and crude methanolic extracts to sheep. The egg count percent reduction (ECR) when infected with GI nematodes was found to be 88.4% and 77.8% in sheep treated with mixed CAE.

Anti-inflammatory activity[8]

(Kumar V.L. et al., 2002) studied the anti-inflammatory property of latex of CP on carragenin and formalin induced rat paw odema model. A single dose of aqueous suspension of the dried latex was effective to significant level against the acute inflammatory response.

Anti-diarroheal activity

(Kumar V.L. et al., 2001) evaluated the antidiarrhoeal activity of dry latex of CP. The author found significant decrease in frequency of defecation (dose DL 500mg/kg) severity of diarrhoea and afforded protection from diarrhoea in 80% rats treated with castor oil induced intestinal accumulation and electrolyte concentration in the intestinal fluid. It was observed that dry latex produce a decrease in intestinal transit (27-31%) as compared to both normal and castor oil treated animals. It was found that like atropine, dry latex significantly Inhibited castor oil induced enteropooling.

Antioxidant and Anti diabetic activity[12]

(Kumar V.L. et al., 2005) author has evaluated the antioxidant activity of dried latex of CP and anti diabetic effect against alloxan-induced diabetes rats. By administrating the oral dose of dry latex at 100 and 400 mg/kg the decrease in blood glucose and increase in the hepatic glycogen content was observed

Myocardial infraction

(K.K. Mueen Ahmed et al., 2004) latex obtained from CP was evaluated for protection against isoproterenol (20 mg/100g) induced myocardial infarction in albino rats. The pretreatment with an ethanolic latex extract of CP at a dose of 300 mg/kg body weight administered orally three times a day for 30 days, reduced significantly ($p<0.01$) the elevated markers enzyme levels in serum and heart homogenates in isoproterenol induced myocardial infarction.

Antifertility activity[13]

(Kamath J. V. et al., 2002) has studied the anti fertility activity of ethanolic extract of roots of CP. A strong anti implantation (inhibition 100%) and uterotropic activity was observed at the dose level of 250 mg/kg (1/4 of LD50). No anti estrogenic activity could be detected.

Schizontocidal activity

(P. Sharma and J.D. Sharma 1999) author has attempted to see the effect of crude fractions of its flower, bud and root again a chloroquine sensitive strain, MRC 20 and a chloroquine resistant strain, MRC 76 of Plasmodium falciparum using the Desjardins method and the effectiveness of its fractions compare better with the CQ sensitive strain than the CQ resistant strain in vitro.

Analgesic activity[9]

(Kumar V.L. et al., 2000) has evaluated the analgesic activity of dry latex of CP. It was observed that a single dose of dried latex ranging from 165 to 830 mg/kg produced a significant dose dependent analgesic effect against acetic acid induced writhings. Another thing was noticed that the dried latex (830 mg/kg) produced marginal analgesia in tail-flick model which was comparable to aspirin. The 830 mg/kg dose of dried latex did not produce toxic effects in mice and the LD50 was found to be 3g/kg.

CONCLUSION

In the present scenario, traditional knowledge system in our country is fast eroding and there is an urgent needs to inventoried, record all ethno-botanical and cultural information among the diverse ethnic communities before the traditional cultures is completely lost. Therefore, documentation of information on ethnomedicinal uses will help in conserving the knowledge. A comprehensive database of the plants used for various purposes could be saved for the forthcoming generations. Medicinal plants have been used since prehistoric period for the cure of various diseases. Since these are in common use by the local people and are of great importance that's why a lot of people are engaged in the trade of important medicinal herbs throughout the world. Especially, people living in villages have been using indigenous plants as medicines. since ages because this knowledge transfers from generation to generation and is based on lifelong experiences. This ethno-medico-botanical study on the plant *C. procera* has revealed the enormous diversity of its medicinal uses and popular use of the plant *C. procera* for a wide range of common 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 development.

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