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Calotropis procera (Sodon Apple) and its Pharmacological Activities: A Review

Zaman HU[1,2*] , Akther S[1], Mir S[2], Dar AM[2], Shrivastava RM[1], Lone JA[2]

[1]*Department of Chemistry, Government Motilal Vigyan Mahavidyalaya, Bhopal, India*

[2]*Department of Chemistry, Government Degree College Kulgam, University of Kashmir, India*

ABSTRACT

Natural products are obtained from plants sources for maintaining human health, especially in the last decade, with more precise studies for natural therapies. Now a day, phytochemicals are used for pharmaceutical purpose has regularly increased in many countries. Varieties of drugs are obtained from medicinal plants as reported by World Health Organization (WHO). In the developed countries near about 80% of the total population use the traditional medicine (medicines that are obtained from medicinal plants). Investigation has been focused on scientific evaluation of traditional medicines for the management of various diseases, the drugs that are obtained from plant origin as reported in ancient times. C. procera is small, erect and compact shrub, which is used in several traditional medicines to cure various diseases. As reported C. procera has known to possess anti-cancerous, anti-inflammatory, anti-microbial, anti-diarrheal, anthelmintic, antifertility, wound healing, antimalarial, analgesic, anti-hyperglycemic, anti-coccidial and antipyretic activity. Different phyto constituents obtained from plants are used in many therapeutic applications and the plant is a gift for human kind by nature. The present review discusses the uses of C. procera in health care management.

Keywords: *C. procera*, Anticancer, Antimicrobial, Phytoconstiuents

INTRODUCTION

Well-recorded and traditionally well proficient knowledge of herbal medicines as recorded in India, as a goldmine. India is considered as a Botanical garden in the world that produces a large number of medicinal herbs. In India There are about 3000 plants having medicinal properties as per official sources. It is generally estimated that over 6000 plants in India are in use in traditional, folk and herbal, representing about 75% of the medicinal needs of the third world countries [1]. *C. procera* (Aiton) W. T. Aiton (Asclepiadaceae) is a traditional medicinal plant growing wild from West Africa to South East Asia. In India as a purgative milky juice of the plant is used and the flowers are used as a digestive, a stomachic and a tonic and have an anti-asthmatic effect. It was reported that for the treatment of skin diseases, enlargement of abdominal viscera, intestinal worms and ascites root bark is used [2]. Further, the root of *C. procera* is used as a carminative in the action of dyspepsia [3]. The Latex extract of *C. procera* inhibits cellular infiltration and protects against the development of neoplastic changes in the transgenic mouse model of hepatocellular carcinoma [4]. The chloroform extract of the root exhibits protective activity against carbon tetrachloride induced liver damage [5]. The biopharmaceutical forthcoming future potential of *C. procera* Linn. discusses in the present review.

Pharmacological aspects of Calotropis procera

As per pharmacological activities the plant has attracted much interest due to following biological activities. Anticancer and antifungal activities of *C. procera* have been reported as per previous pharmacological studies and also insecticidal activity of *C. procera*. It was reported that hepatoprotective activity exhibit by the flowers of *C. procera*. [6] antimicrobial, larvicidal, analgesic, antipyretic and anti- Inflammatory [7,8]. It was reported that latex of *C. procera* exhibit analgesic, antipyretic, schizonticidal, antidiarrheal and anti-inflammatory activities [9,10].

Traditional medicine generally obtained from plants contain a number of phytoconstituents, as a prospective natural antimicrobial combination and which may serve as an alternative, effective, cheap and safe antimicrobial agents for treatment of common microbial infections. As reported in early and late pregnant rats, *C. procera* showed harmful affects [11]. In traditional medicine *C. procera* is used as antimicrobial, analgesic, antipyretic, anticancer and antiseptic for skin infections [12]. It was reported that root of sodon apple weed is used as a carminative in the management of dyspepsia and also used by various tribes of central India as a curative agent for jaundice [3].

Anti-cancerous activity

Drugs used in chemotherapy of different cancers having side effects, however long established herbal medicines and complementary and alternative (CAM) becoming in style among cancer patients in the developed countries [13,14]. No change in the levels of canonical markers of apoptosis such as Bcl2 and caspase 3 was observed [4,15]. The root extracts of *C. procera* inhibited the proliferation of Hep2 cancer cells via apoptotic and cell cycle disruption based mechanism [16]. It was observed that cardio tonic steroid UNBS1450 (derived from 2-oxovoruscharin), *C. procera* was shown to furthermore exert an anticancer activity. In Sodium pump inhibitor UNBS1450 has been confirmed to be a potent, showing anti-proliferative and cell death-inducing activities. This anti-cancer potential of UNBS1450 is achieved by disorganization of the actin cytoskeleton after binding to the sodium pump at the cellular membrane, by inducing autophagy-related cell death, by repressing NF-KB activation as well as by down-regulating c-Myc in cancer cells [16].

Anti-Inflammatory activity

It was reported that latex of *C. procera* display effective anti-inflammatory activity against carrageenin and formalin, to release various mediators. Also it was reported that inflammation induced by histamine, serotonin, compound 48/80, bradykinin (BK), and prostaglandin E2 (PGE2) in the rat paw oedema model was evaluated by the efficiency of extracts prepared from latex of *C. procera* [4]. The anti-inflammatory activity of petroleum ether, acetone, methanol and aqueous extracts of dry latex of the plant were tested in the carrageenan induced rat paw oedema model. All the fractions exhibited anti-inflammatory activity but inhibition of oedema was found to be greatest with the acetone and aqueous extracts. Latex of *C. procera* is as effective as standard anti-inflammatory drug phenylbutazone (PBZ) in inhibiting inflammatory response induced by various inflammagens in acute and chronic models of inflammation [17]. The effect of MeDL was compared with Rofecoxib, a selective COX-2 (cyclooxygenase-2) inhibitor, and phenylbutazone (PBZ) a nonselective COX inhibitor. The result obtained was satisfactory because MeDL of *C. procera* markedly reduces cell influx, release of mediators, and oxidative stress associated with arthritic condition and therefore has the potential to be used as an anti-arthritic agent.

Anti-microbial activity

Due to resistance developed in microorganisms to many antibiotics create an immense clinical problem in the treatment of infectious diseases [18]. Growth inhibition was determined in some microorganisms by Disc diffusion method against *Pseudomonas aureginosa*, *Salmonella typhi*, *Eschericha coli*, *Staphylococcus aureus* and *Streptococcus pyogenes*. Alkaloids, flavonoids, tannins, saponins and cardiac glycosides, balsams and volatile oil and steroids with higher amount in water extracts was determined by phytochemical screening from the extracts, the concentration of these phytoconstituents were present in the order of water>methanol>ethanol. The water extracts obtained from the plant showed extensive spectrum activity against the organisms at concentrations of 30, 60, 90 and 120 mg/ml. The extracts of methanol and ethanol not show a significant effect against the tested organisms against the tested organisms at 120 mg/ml. as compared with those of tetracycline. [19]. An in vitro antimicrobial activity against four types of bacteria namely *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, and bioassayed for their response when the extracts are used. All of the extracts irrespective of their types, inhibited growth of all microbes to varying degrees. Aqueous extract showed strode superior antibacterial activity against all bacterial strains especially with regard to gram positive bacteria (*Staphylococcus aureus* and *Bacillus subtilis*) as campared to methanol or chloroform. Less or no activity was observed against *Aspergillus niger* and *Candida albicans* in some the extracts used. The Minimum Inhibitory Concentration (MIC) value of the different extracts was 10 $mgml^{-1}$ in chloroform extract against *Candida albicans* and aqueous extract for E. coli. It was clearly noticed that latex of *C. procera* had a broad spectrum activity against all of the bacteria and fungi in all of tested extracts. These findings support the conventional use of the plant in the management of different infections in the area [20].

Anti-diarrhoeal activity

Antidiarrhoeal movement of methanol extract of leaves of *C. procera* was undertaken for assessment in Albino mice (male) 40-50 g in weight was used in the study. The authenticated plant extracts selected by experts was prepared by maceration with methanol as solvent for 7 days. From the toxicity study, it was observed that plant extract is nontoxic and caused no death up to dose of 500 mg/kg [21]. Anti-diarrheal activity of dry latex of *C. procera* was evaluated as reported by Kumar et al.[22].

Anthelmintic activity

It was reported that flowers of *C. procera* shows anthelmintic activity in contrast with levamisole was evaluated in a series of in vivo and in vitro studies. Antihelmintic effects (P 0.05) of crude aqueous extracts and methanolic extracts of *C. procera* flowers on live Haemonchus contortus as shown by mortality or temporary paralysis was demonstrated in vitro studies. The crude extracts of flowers of *Calotropis procera*, CAE and CME to sheep naturally infected with a mixed sample of gastrointestinal nematodes by in vitro studies. Sheep treated with CAE and CP at 3000 mg/kg body weight on 7 day and 10 post-treatment, respectively, it was found that that was reducting in egg count as 88.4 and 77.8%. CME was the least effective producing only a 20.9 % reduction in ECR on day 7 PT. Antihelmintic activity against nematodes was found to be less than that exhibited by levamisole by the action of flowers of *C. procera*. In the present study higher doses are used in animals, it is suggested that further research to be carried out on a large scale involving a greater no of animals and also identification of active principles, and standardization of the dose and toxicity studies for drug development.

Antifertility activity

It was found that roots of *C. procera* has been studied in albino rats to explore its ant fertility and hormonal behavior, as reported by giving dose of 250 mg/kg (1/4 of LD50), strong anti-implantation (IC=100%) and uterotropic activity was found and no anti estrogenic activity was detected [23].

Wound healing activity

On the bases of traditional use, it was reported that in wound healing potential in guinea pigs, *C. procera* was selected for evaluation [24]. The main aim was to remove the four full thickness wounds that were infected in the back of pigs, i.e, 8.0 mm. Tropical application of 20 µl of 1.0% of germ-free solution of the latex of the plant, daily was followed for 7 days. Considerably latex improved the healing process by clearly increasing collagen, DNA and protein synthesis and epithelisation leading most important to reduction in wound area. The results provide a scientific foundation for the traditional use of this plant in the supervision of wound healing.

Antimalarial activity

It was reported that IC50 values ranging from 0.11-0.47 mg/ml against P. falciparum MRC2 CQ-sensitive by ethanol extracts of *C. procera* and also the values from obtained from 0.52-1.22 against MRC76CQ-resistant strains, but the most active are flower and bud extracts. While 220-440 times less efficient than CQ, further study aimed to recognition of the active constituents. The results obtained sustain the ethno botanical use of this plant [25].

Analgesic Activity

Analgesic effect against acetic acid induced writhing was obtained from a single dose of DL ranged from 165-830 mg/kg. It was found that that DL at a dose of 415 mg/kg effect showed more distinct as compared to a 100 mg/kg oral dose of aspirin. On the other hand minor analgesia in a tail-flick model minor analgesia in a tail-flick model which was similar to aspirin produced to DL (830 mg/kg) which was similar to aspirin. By Naloxone at a dose of 0.5 mg/kg, i.p. analgesic effect of DL WAS delayed by 1h, that completely blocked the analgesic effect of morphine (10 mg/kg, i.p.). However, the effect of aspirin was not blocked by Naloxone. Oral dose of DL did not produce toxic effects in mice by applying 830 mg/kg and the LD50 was found to be 3 g/kg. A momentous analgesic property by the hot plate method was showed [26] described previously against mice [27]. It is concluded that *C. procera* shows tremendous analgesic potential which is a roar for medicinal world.

Anti-hyperglycemic effect

It was reported that *C. procera*, dry latex (DL) possess powerful anti-inflammatory action was evaluated for its antioxidant and antihyperglycemic effects in rats with alloxan-induced diabetes. Decrease in blood pressure and

increase in hepatic glycogen was reported by daily oral management of dry latex at 100 and 400 mg/kg. Body weight loss in diabetic rats reduced the water spending to values comparable with those of normal rats from dry latex. Also it was reported that dry latex of *C. procera* produced an increase in the hepatic levels of endogenous antioxidants, namely superoxide dismutase (SOD), catalase and glutathione, while it reduced the levels of thiobarbituric acid-reactive substances (TBARS) in alloxan-induced diabetic rats. It was reported that competence of dry latex of *C. procera* as an antioxidant and as an anti-diabetic agent was analogous with that of the standard antidiabetic drug, Glibenclamide [28].

Anti-coccidial activity

An experimental study in Eimeria ovinoidalis infection in Najdi lambs which has been infected with single dose of 150,000 infected oocysts, is a comparative study on anti-coccidial activity of *C. procera* latex and Sulfadimidine [29].

Antipyretic activity

It was reported that mice was induced Hyperpyrexia 20 ml/kg s.c. Hyperpyrexia was induced in mice by 20 ml/kg s.c. 20% aqueous suspension of brewer's yeast was running [30]. These animals were then fasted for the duration of the experiment. The rectal temperatures were in use 24 h after the yeast infection to determine the pyretic response to yeast. Taken 1 h temperature proceeding to drug administration in fevered animals served as pre-drug control. It was reported that orally plant extract was administered in a dose of 500 mg/kg body weight temperatures were recorded at 30, 90 and 150 min. following drug administration.

CONCLUSION

It had revealed that noteworthy pharmacological importance representing as a strong competitor in the medical ring. The plant has proved to be a good gauge for the purpose of above elements when it is exposed to them from any source. Historically, as a remedial agent the plant used in rural community for pest control against various diseases. Therefore, it is fascinating to study the biological activity of this plant to assess their worth after characterizing the bioactive principle. It is to be supposed that exhaustic and systematic examination of this plant will give new approach for further pharmacological and phytochemical research. A review of the published literature on *C. procera* shows that it is a trendy medication in a variety of ethnic groups, as well as Ayurvedic and traditional petitioners for the action of a range of ailments. Researchers are exploring the therapeutic potential of this plant as it is likely to have more remedial properties than a currently known.

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CONFLICT OF INTREST

Authors declare they have no conflict of interests in publishing the work

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