

Cordia macleodii Hook f. Thomson-A potential Medicinal Plant

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Received: 02 May 2017

Accepted: 24 July 2017

Published: 02 September 2017

Abstract

Cordia macleodii Hook. f. & Thoms. belongs to family Boraginaceae, is an endangered medicinal plant, commonly known as “Dahiman” or “Dahipalas”. It is distributed in moist and dry deciduous forests of India such as Chhattisgarh, Madhya Pradesh, Odisha, Chotanagpur and is widely used to cure various diseases. These bioactive compounds made this plant as a valuable potent herbal drug. It contains various bioactive compounds including Phenols, Terpenoids, Saponins, Volatile oils, Flavonoids, Glycosides etc. This review presents the pharmacological property, phytochemical constituents, traditional uses and biological activities of the plant and it will be helpful to explore the knowledge about *Cordia macleodii*.

Keywords: *Cordia macleodii*, endangered, phytochemical.

Introduction

The Boraginaceae family consists of about 2,700 species, which are distributed in tropical, subtropical and warmer regions around the world. It is composed of about 130 genera and six sub families, in which *Cordioideae* is one. It contains the genus *Cordia*, which is comprised of evergreen trees and shrubs. About 300 species of genus *Cordia* have been identified worldwide. There are 13 species of this genus found in India. One of them is *Cordia macleodii*, a rare and endangered medicinal Plant [1]. *Cordia macleodii* is frequently distributed in moist and dry deciduous forests of India such as Chhattisgarh, Madhya Pradesh, Odisha, Chotanagpur, Maharashtra. In Chhattisgarh it is found in Marwahi forest Division, Pendra Road, Bilaspur. *C. macleodii* is considered as Native to India.

The pharmacological studies carried out with extracts and purified compounds indicates that the plants of *Cordia macleodii* possess analgesic, anti-inflammatory, antimicrobial, wound healing, hepatoprotective, acute toxicity, antioxidant activities. Various compounds were isolated from different plant parts of *C. macleodii* like flavonoids, triterpenes, tannins, steroids, alkaloid, fatty acid etc. Based on these reports it is clearly indicated that the plants of *C. macleodii* possess potential therapeutic actions. The aim of this review is to provide an overview on the recent status of chemical and pharmacological relevance of the extracts in *Cordia macleodii*.

Plant description

Cordia macleodii (Griff) Hook. F. & Thomasn, is commonly known as Dahiphalas or Dahiman in Hindi. It is an 8-10 m high tree with a

corky grey bark. The leaves are broad ovate, 5 – 10 cm as long as broad, scabrous, base cordate and crenate-serrate margins. They are arranged alternate to sub-opposite. The flowers are white in colour and polygamous, in short terminal axillary corymbs. The calyx is densely tomentose the corolla lobes are oblong in shape and 0.6 to 0.8cm long. The drupes are 1.2 to 1.9 cm long, ovoid, acuminate at apex, seated at persistent calyx. The flowers and fruits appear in February – August.

Taxonomy of *Cordia macleodii*

Domain – Eukaryota
Kingdom – Plantae
Subkingdom – Viridiplantae
Phylum – Tracheophyta
Subphylum: Euphyllophytina
Class – Magnoliopsida
Subclass – Lamiidae
Superorder – Solananae
Order – Boraginales
Family – Boraginaceae
Subfamily – Cordioideae
Genus - *Cordia*
Species - *macleodii*

Vernacular name

Hindi name – Dahiman, Dahipalas, Dhengan, Gonni, Kuhman
Marathi - Daiwas, Dhalm, Bhoti, Dhaim, Dhaiwan, Dhaman
Oriya – Baurlo, Bhoto, Sambarsinga, Panki, Shikari

Tamil – Palandekku
Telugu - Botuku, Peddabattava, Peddabotuku
Kannada - Bili challe, Doddacalle, Hadang, Hirichalle

Synonym

Gerrascanthus macleodii (Hook fill. & Thom.) A. Borhidi
Hemigymnia macleodii (Hook fill. & Thom.) Griff
Lithocardium macleodii (Hook fill. & Thom.) Kunze

Pharmacological properties

Analgesic activity and Acute Toxicity

Analgesics are commercially available drugs or group of drug used to achieve relief from pain, which acts in various ways on central and peripheral nervous system. The extracts of *C. macleodii* leaves were evaluated for analgesic activity using hot Plate test in mice at different time intervals in hot plate analgesiometer study. The extracts were found to have significant analgesic activity as compared to the reference standard Pentazocin. [2]

In acute toxicity study the whole alcohol extracts of *C. macleodii* leaves were found to produce no mortality or any significant toxicity even at a dose of 2000 mg/kg. None of the doses of the extracts showed any mortality, but the animals were depressed. [2]

The alcoholic extract of *C. macleodii* bark was used for the acute toxicity and study was carried out at 2 g/kg oral dose. For that the albino Nulliparous and nonpregnant female were used and observed continuously for 24 h for behavioral, neurological and autonomic profiles. The result shows that the oral administration of the *C. macleodii* did not produce toxic effect up to 2g/kg in oral dose. [3]

Anti-inflammatory activity

Inflammation is a compile pathophysiological response of tissue to injury leading to local accumulation of plasmic fluid and blood cells. Pain and inflammation have always been a matter of concern for the physicians. Pain describes the normal process of nociception and the responses to noxious stimuli that are damaging or potentially damaging to normal tissues. Several plants containing flavonoids have been studied for their analgesic and anti-inflammatory effects. Hence it was considered worthwhile to evaluate anti-inflammatory activity of *C. macleodii* leaf extracts [4]. The extracts of *C. macleodii* leaves were evaluated for anti-inflammatory activity by carrageenan induced rat paw edema method. *C. macleodii* extracts inhibited carrageenan induced edema when compared with the control group. At 0.5Hr, the mean increase in paw volume in the group treated with *C. macleodii* extract was 0.252 ± 0.012 which at 5 hrs got significantly reduced

to 0.102 ± 0.004 . The ethanolic extracts demonstrated significant anti-inflammatory activity. [2]

Antioxidant activity

Antioxidants are micronutrients that have gained importance in recent years due to their ability to neutralize free radicals or their actions. The majority of the antioxidant activity is due to the Flavonoids, are the phenolic compounds found in many plants as a major phytochemical work as an antioxidant. Phenolic compounds from plants have great potential to scavenge free radicals and toxic ROS and referred as antioxidants. [5]

The alcohol extracts of *C. macleodii* leaves were evaluated for antioxidant activity in comparison with ascorbic acid by four in-vitro methods viz. DPPH radical scavenging method, Nitric oxide radical scavenging method, Reducing power method and Iron chelation method. *C. macleodii* were found to have good radical scavenging activity against DPPH and Nitric oxide radicals. The extracts also had good reducing ability as evaluated by the Reducing power method and Ion chelation method. [6]

The alcoholic extracts of *C. macleodii* bark were evaluated for in vitro antioxidant activity by two methods viz. DPPH, Ferric ion chelation method in comparison with standard. The study shows that the presence of phenols play major role in controlling oxidation. Phenols are very important plant constituents because of their scavenging ability due to their hydroxyl groups. The Phenolic compounds may contribute directly to antioxidative action. The extracts of *C. macleodii* bark can be used as easily accessible source of natural antioxidant. [7]

Hepatoprotective activity

The extracts were also evaluated for hepatoprotective activity by carbon tetrachloride (CCl₄) induced liver damage model in rats in comparison with reference standard Silymarin. Extracts of *C. macleodii* leaves inhibited CCl₄ induced increase in total bilirubin and GOT, GPT and ALP levels in serum as compared with CCl₄ treated group as compared to the reference standard Silymarin. [8]

Biosynthesis of silver Nano-particle

Numerous methodologies have been formulated in the past to synthesize metal nanoparticles with different compositions, sizes and controlled. In this way the biological methods are eco friendly and cost effective as compared to the physical and chemical process. In biological method plants provide a better platform for nanoparticle synthesis as they are free of toxic contaminants as well as better reducing and stabilizing agents [9]. An attempt was made for the synthesis of silver nanoparticles using stem extracts of *C. macleodii*. The synthesis nanoparticle was characterized by UV-VIS spectrophotometer, Fourier transform infrared

spectroscopy (FTIR) and Scanning electron microscope (SEM). The SEM image showed high density silver nanoparticles. [10]

Wound healing activity

A wound is a disruption of tissue integrity that results in damage and is typically associated with loss of function. Medicinal plants have great potentials and have been shown to be very beneficial in wound care and promoting the rate of wound healing with minimal pain.

The aqueous extract of *Cordia macleodii* leaves was investigated for its wound healing activity. Analysis of the results generated in wound healing activity which involved studying the impact of local application of *C. macleodii* on excision wound, incision wound and dead space wound show that it has no influence over excision wound contraction. It has weak tensile strength promoting property in incision wound and neovascularization and ground substance formation in the dead space wound. [11]

An attempt has been made to evaluate the wound healing properties of ghrita based formation of *C. macleodii* leaf through exploratory, open and controlled study. They were randomly allotted 20 patients in two groups respectively. One is treated with *C. macleodii* ghrita and second one is povidine iodine as local application. The effect of drug on sign and symptoms was observed in discharge, tenderness, wound margin and wound size in *C. macleodii* ghrita treated group while the povidine iodine group showed highly significant result.

Antifungal activity

Cordia macleodii leaf and bark extracts of different solvents have evaluated for their antifungal activity.

In the study of [12], the extract of *Cordia macleodii* bark was evaluated against three common pathogenic fungi (*Aspergillus niger*, *Aspergillus clavus* and *Candida albicans*) and the inhibition zone with the extract was compared with different standard Griseofulvin and Nystatin. The results showed a notable inhibition of the growth zone of the both fungi.

The antifungal activity of the extract of *C. macleodii* leaf was evaluated on two common pathogenic fungi viz *Aspergillus niger* and *Candida albicans*. The testing was done by the agar plate method zone of inhibition and extracts were compared with that of standard Nystatin. Both the water and methanolic extract showed the antifungal activity against *Candida albicans* [2].

[13] were determined antifungal activity of both leaves and bark extracts against three fungal strains viz. *Aspergillus niger*, *A. flavus* and *Candida albicans*. The extracts did not show the antifungal activity against all tested fungus.

In study of [14], leaf and stem extracts of *C. macleodii* of different solvents were investigated for evaluating antifungal properties. For that only single fungal strain was taken. It was observed that

antifungal potential of the water extracts were found to be excellent i.e. leaf (38mm) and stem (22mm) compared to the other extract.

Antimicrobial activity

Cordia macleodii shows broad spectrum of antimicrobial potential. Leaf and bark extracts of different solvents have evaluated in relation to their antimicrobial activities.

Ethanollic extracts of leaves *C. macleodii* exhibited strong inhibition against five common pathogenic bacteria viz *E. Coli*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* (gram negative bacteria), *Bassillus subtilis* and *Staphylococcus aureus* (gram positive bacteria). compared with that of standard Chloramphenico for antibacterial activity. Results shows that the strongest activity was observed against *E. coli* and *S. aureus* as compared to the other tested organisms [2].

The methanolic extract of *Cordia macleodii* bark also showed significant antibacterial activity against two gram negative bacteria *E. coli*, *Pseudomonas aeruginosa* and two gram positive bacteria *Streptococcus pyogenes*, *Staphylococcus aureus* by agar plate method zone of inhibition with different standard. The inhibition of bacterial growth was more pronounced on *E. coli* and *S. aureus* as compared to the other tested organism [12].

[15] carried out studies to determine the antibacterial activity of extract of *C. macleodii* leaf and its leaves along with ghrita. They observed activity against two gram positive bacteria *Staphylococcus aureus*, *Streptococcus pyogenes* and two gram negative bacteria *E. coli*, *Pseudomonas aeruginosa* using agar disc diffusion method at different concentrations zone of inhibition of these samples was compare with different standards viz Ampicilline, Ciprofloxacin, Norfloxacin and Chloramphenicol for antibacterial activity but only ghrita showed more effective result.

Antivenom potential

The ethanolic extract of bark of *Cordia macleodii* was carried out to evaluate the antivenom potential of *Naja* venom against pharmacological effects such as lethality, hemorrhagic lesion, necrotizing lesion, edma, cardiotoxicity and neurotoxicity. The extract also antagonized the cardiotoxic and neurotoxic effect of venom in isolated frog heart and rectus abdominus muscle of frog. The result shows that at the dose of 400 and 800 mg/kg ethanolic extract of *Cordia macleodii* bark significantly inhibited the *Naja* venom induced lethality, hemorrhagic lesion, necrotizing lesion and edema in rats. The protective effect of extract of *C. macleodii* against *Naja* venom poisoning may be due to precipitation of active venom constituents [3].

Phytochemistry

Cordia macleodii contains variety of biological compounds which plays an important role in medicine. These biological compounds



belong to secondary metabolites include terpenoids, steroids, flavonoids and alkaloids. Three known compounds Stigmasterol, Cholest-5-EN -3OL (3 Beta)-Carbonyl chlorinated, Camphesterol

were determined from *Cordia macleodii* bark. These compounds were isolated from *C. macleodii* plant for the first time [12].

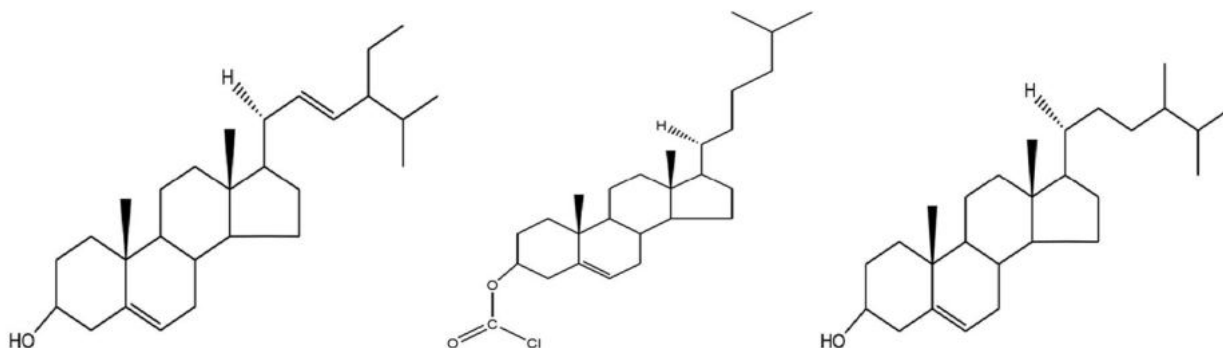


Figure. 1: Structure of the compound (A) Stigmasterol (B) Cholest-5-EN -3OL (3-beta) -carbonyl chlorinated (C) Camphesterol

Conclusion

This review gives comprehensive information on the genus *Cordia macleodii*, featuring phytochemical, pharmacological and biological aspects by the various researchers. Very less research work has been done on this plant as compared to other *Cordia* species.

Traditionally it has a number of medicinal activities but many of its traditional uses are still scientifically unproved. So it is required to explore the knowledge about its morphology and histology as well as its phytochemicals and biological evaluation of various traditionally mentioned activities.

References

- [1]. Mittal AK, Chisti Y, Banerjee UC. Synthesis of metallic nanoparticles using plant extracts. *Biotechnology Advances*. 2013;346–356.
- [2]. Sharma A, Acharya RN, Gupta SK, Dudhamal TS, Mohanto VD. Clinical Evaluation of Shikari (*Cordia macleodii*) Ghrita on Vrana Ropana (Wound Healing) Property. *Ayurpharm Int J Ayur Alli Sci*. 2013;2(4) 98 –104.
- [3]. Sharma A, Acharya RN, Shukla VJ, Gupta SK. A comparative antimicrobial study on *Cordia macleodii*. Hook. leaf water extract and its ghrita base formulation. *International Journal of Ayurvedic Medicine*. 2013;4(1), 9-16.
- [4]. Bhide B, Pillai APG, Shukla VJ and Acharya RN. Pharmacognostic evaluation of leaf of *Cordia macleodii* Hook., An ethnomedicinally important plant. *Journal of research in Ayurveda*. 2016;32(2): 254–257.
- [5]. Bhide B, Acharya RN, Nari P, Pillai A PG and Shukla VJ. Pharmacognostic Evaluation of *Cordia macleodii* Hook. Stem Bark Pharmacognosy Journal. 2011;3(26): 49-53.
- [6]. Bhide BK, Ashok RN, Acharya B, Ravishankar. Anti-microbial and wound healing activities of *Cordia macleodii* Hook. f. & Thoms. Leaves. *Indian Journal of Natural Products and Resources*. 2011;1(2):198-203.
- [7]. Joshi, Patel R, Patel N, Patel D and Pandya C. Antimicrobial Evaluation of Leaf and Stem Extract of *Cordia macleodii*. *Open Pharmaceutical Sciences Journal*. 2014;1: 1-3.
- [8]. Allan L and Miller ND. Antioxidant Flavonoids: Structure, Function and Clinical Usage *Alternative Medicine Review*. 1996;1(2):101–111.
- [9]. Ozaa MJ and Kulkarnia YA. Traditional uses, phytochemistry and pharmacology of the medicinal species of the genus *Cordia* (Boraginaceae). *Royal Pharmaceutical Society, Journal of Pharmacy and Pharmacology*. 2017;1-35.
- [10]. Qureshi NN, Kuchekar BS, Logade N A, Haleem MA. Antioxidant and Hepatoprotective activity of *Cordia macleodii* leaves. *Saudi Pharmaceutical Journal*, 2009;17(4):299-302.
- [11]. Qureshi NN, Kuchekar BS, Logade NA and Haleem MA. Analgesic, Anti-Inflammatory and Acute Toxicity Studies on *Cordia macleodii* and *Leucas ciliate* Leaves. *International Journal of Pharm Tech Research*. 2010;2(2):1311-1315.
- [12]. Qureshi NN, Kuchekar BS, Logade N A, Haleem MA. Investigation of antimicrobial activity of *Cordia macleodii* and *Leucas ciliate* leaves. *Int.J. Pharm Tech Res*. 2010;2(1):118-120.

- [13]. Chaubey ON, Upadhyay R, Tripathi N K, Ranjan A. Phytochemical analysis, phenolics and flavonoids contents of *Cordia macleodii* Hook leaves and bark. International Journal of Phytomedicine. 2015;7 (2): 231-234.
- [14]. Chaubey ON, Upadhyay R, Tripathi N K, Ranjan A. Comparative Antimicrobial Study of *Cordia macleodii* Hook. *IOSR Journal of Pharmacy and Biological Sciences*. 2015; 10:1-3.
- [15]. Nariya PB, Bhalodia NR, Shukla VJ, Nariya MB. *In vitro* Evaluation of Antimicrobial and antifungal Activity of *Cordia macleodii* Bark. (Hook. F. & Thomson). *Int.J. PharmTech Res*. 2010; 2(4):2522-2526.
- [16]. Nariya PB, Shukla VJ, Acharya RN, Nariya MB, Bhatt PV, Pandit CM and Tada R. Isolation and characterization of Phytosterols from *Cordia Macleodii* (Hook F. And Thomson) Bark By Chromatographic and Spectroscopic Method. *Asian J Pharm Clin Res*. 2014; 7(5):86-88.
- [17]. Nariya PB, Shukla VJ, Acharya RN. Phytochemical screening and in vitro evaluation of scavenging activity of *Cordia macleodii* bark. (Hook. F. & Thomson). *Pubmed, Free Radicals and Antioxidants*. 2012;2: 36-40.
- [18]. Nayak P and Kalidass C. Ethnobotany, Phytochemistry, Pharmacognostic and Pharmacological Aspects of *Cordia macleodii* Hook.f. & Thomson - A review. *Journal of Non-Timber Forest Products*. 2016;23(2): 1-4.
- [19]. Soni P and Bodakhe SH. Antivenom potential of ethanolic extract of *Cordia macleodii* bark against *Naja* venom. *Asian Pac J Trop Biomed*. 2014; 4(1): 1-8.
- [20]. Dhal S, Panda SS, Rout NC and Dhal NK. Biosynthesis of silver nanoparticles using *Cordia macleodii* (Griff.) Hook. F & Thomas and its antibacterial activity. *World J Pharm Sci*. 2014;2(9),1051-057.
- [21]. Kumar V, Shashi S, Tiwari A, Shukla N, Srivastava S and Rawat AKS. Pharmacognostic and phytochemical evaluation of *Cordia macleodii*. *Jou. Med. PI Sciences*.2013; 33(1): 59-63.

