

REVIEW ARTICLE

REVIEW ON ETHNOBOTANY AND PHYTOPHARMACOLOGY OF *CORDIA DICHOTOMA*

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ABSTRACT

Cordia dichotoma is a tree of tropical and subtropical regions. It grows in sub-Himalayan tract and outer ranges, ascending up to about 1500 m elevation. Native: India, Nepal. As a qualitative assay, for the presence of the plant phytoconstituents such as carbohydrates, alkaloids, glycosides, flavonoids, tannins and saponins. Various parts of this plant such as leaves, root, seed, bark and fruit, possess immunomodulator, antidiabetic, anthelmintic, antiulcer and as anti-antiarthritic and hepatoprotective activities. Various phytopharmacological evaluations have been reported in this literature for the important potential of the *Cordia dichotoma*.

Keywords: *Cordia Dichotoma*, Phytochemicals, Pharmacological properties

INTRODUCTION

HISTORY: *Cordia dichotoma* is a plant species in the genus *Cordia*. It is called gunda or tenti in Hindi and lasura in Nepali. The fruit of the Fragrant Manjack is called phoa-po-chi in Taiwan where they are eaten pickled. In Burma, the pa-o people are growing the tree (called "thanpet") for its edible leaves. It is a tree about 15 metres high, found spanning from north India and south China to Australia and Polynesia.¹ It grows wild in the northern part of peninsular Malaysia but is planted in south. Various Synonyms are *Cordia myxa* Forsk, *Cordia oblique* Wild, *Cordia myxa* Roxb etc and Common name are Bhokar, Shleshmantaka etc.

CLASSIFICATION:

Kingdom: Plantae

Division: Magnoliophyta

Class: Dicotyledons

Subclass: Astaridae

Order: Lamiales

Family: Boraginaceae

Genus: *Cordia*Species: *Cordia dichotoma* Forst.

Fragrant: Manjack

Veracular name:

Malaysia : Sekendal, sekendai, petekat

English : Sebestan plum, soap berry, fragrant manjack

India : Gonda, lasora, leshora

Javanese : Kendal

Sumatran : Nunang

Thailand : Paw man

Distribution:

Cordia dichotoma is a tree of tropical and subtropical regions. It grows in the sub-Himalayan tract and outer ranges, ascending up to about 1500 m elevation. It is found in a variety of forests ranging from the dry deciduous forest of Rajasthan to the moist deciduous forests of western Ghats and tidal forests in Myanmar. In Maharashtra, it grows in the moist monsoon forest also.

Local Names:

Bangali (buhal, bahubara)

English (sebesten, clammy cherry, Indian cherry)

Gujarati (vadgundo, gunda)

Hindi (lasura, bhokar, borla)

Javanese (Kendal)

Lao (sino-Tibetan) (man, man khok)

Malay (petekat, sekendai)

Tamil (vidi, naruli, kalvirusu)

Nepali (kalo bohori, bohori)

Thai (mandong, manma, phakmong)

Sanskrit (bahuvarka, shleshmatak, shelu)

Botanical description: *Cordia dichotoma* family Boraginaceae small to moderate-sized deciduous tree with a short bole, short crooked trunk and spreading crown. The stem bark is grayish brown smooth or longitudinally wrinkled. Leaves simple, entire and slightly dentate, elliptical-lanceolate to broad ovate with a round and cordate base. These flowers are followed by 1 in (25mm) long dull pinkish edible fruits with sticky flesh flowers are short stalked, bisexual and white in colour, appear in loose corymbose cymes.²

The fruit is a yellow or pinkish-yellow shining globose or ovoid drupe seated in a saucer-like enlarged calyx. It turns black on ripening and the pulp gets viscid. The hard stone is 1-4 seeded. The generic name honours a 16th century botanist, Valerius Cordus³. The specific epithet means having divisions always in pairs.

Phytochemicals: Qualitative assay, for the presence of plant phytoconstituents such as carbohydrates, alkaloids, glycosides, flavonoids, tannins and saponins⁴. Chemicals screening of both the leaves and the fruits showed the presence of pyrrolizidine alkaloids, coumarins, flavonoids, saponins, terpenes and sterols⁵. The fruit contains about 70% pulp, the pulp contains per 100 g: water 6g, proteins 35 g, fat 37g, and carbohydrate 18g. The seed contains per 100 g: water 32 g, fat 46 g, the principal fatty acids are: palmitic acid, stearic acid, arachidic acid, behenic acid, oleic acid and linoleic acid⁶. The petroleum ether and alcoholic extracts showed significant analgesic, anti-inflammatory and anti-arthritic activities in tests with rats. Four flavonoid glycosides (robinin, rutin(rutoside), datiscoside and hesperidin), a flavonoid aglycone (dihydro-robinetin), and 2 phenolic derivatives (chlorogenic acid and caffeic acid) were isolated⁷. The ethanol extract of the leaves reduced acetylcholine-induced contractions of guinea-pig ileum. Ethanol extracts from fruits and leaves showed significant antioxidant activities due to the carotenoids but no antimicrobial activity against gram-positive or gram-negative bacteria. Seeds of the species are anti-inflammatory, 2 compounds alpha-amyrin and 5-dirhamnoside have been isolated⁸.

The bark is medicinal and several chemicals have been identified, Allantoin, β -sitosterol and 3',5-dihydroxy-4'-methoxy flavanone-7-O- α -L-rhamnopyranoside⁹. *Cordia dichotoma* seeds have disclosed the presence of alpha-amyrins, betulin, octacosanol, lupeol-3-rhamnoside, beta-sitosterol, beta-sitosterol-3-glucoside, hentricontanol, hentricontane, taxifolin-3-5-dirhamnoside and hesperitin-7-rhamnoside. The seed contains α -amyrin and toxifolin 3,5, dirhamnoside, which shows significant anti-inflammatory activity by an oral dose of 1 gm/kg in albino rats. The seeds of this plant reported to contain fatty acids and flavonoids¹⁰. The chemical compounds: robinin, rutin, datiscoside, hesperidin, dehydro-robinetin, chlorogenic acid and caffeic acid isolated from *Cordia francisci*, *C. myxa* and *C. serratifolia*. The leaves contain 12-15% crude protein, 16-27% crude fibres, 42-53% nitrogen free extract, 2-3% ether extract, 13-17% total ash, 2-4% total calcium and about 0.3% phosphorus.

Traditional used: The bark decoction is used to treat dyspepsia. The powdered bark is applied to mouth ulcers. The bark is also used to treat fever, abscesses and tumors. It is mixed with the pomegranate rind to treat dysentery. The extract of the bark mixed with the coconut water relieves severe colic. The mucilage of the fruit treats coughs and chest complaints. It is also used to treat uterus and urethra disorders. The kernel of the fruits in the powder form is mixed with oil to heal tinea. The plant is also a diuretic and a laxative¹¹.

PHARMACOLOGICAL PROPERTIES

Acute toxicity study: This study was designed to elucidate the toxicity of the widely used plant *Cordia dichotoma* in rats¹². The methanolic, chloroform, aqueous

extracts isolated from the leaves of *Cordia dichotoma* and studied their toxic effects. Acute toxicity and LD₅₀ values were determined in experimental rats. The dead animals were obtained from primary screening studies, LD₅₀ value determination experiments and acute studies subjected to postmortem studies. The external appearance of the dead animals, the appearance of the viscera, heart, lungs, stomach, intestine, liver, kidney, spleen and brain were carefully noted and any apparent and significant features or differences from the norm were recorded. Following the chronic administration of the *Cordia dichotoma* for 14 days, the vital organs such as heart, liver, kidney, testis, spleen and brain were carefully evaluated by histopathological studies and any apparent and significant changes or differences from the norm were studied. From the acute administration of *Cordia dichotoma* the LD₅₀ values were determined using graphical method. The heart stopped in systolic stand-still in the acute experiments. There were no remarkable changes noticed in the histopathological studies after 50 mg/kg body weight of the extracts of *Cordia dichotoma*, when administered intraperitoneally for 14 days successively. Pathologically, neither gross abnormalities nor histopathological changes were observed. After calculation of LD₅₀ values using graphical methods, we found broad therapeutic window and a high therapeutic index value for the *Cordia dichotoma* extracts. Collectively, these data demonstrate that the extracts of the leaves of the *Cordia dichotoma* have a high margin of drug safety.

Antiulcer activity: The antiulcer effect of the extract of *Cordia dichotoma* Forst. Fruits (300 mg/kg body weight) was studied in albino rat of Wistar strain using three different models i.e pyloric ligation, aspirin and indomethacin induced ulcers¹³. The extractions of *Cordia dichotoma* fruits were carried out using ethanol. The extract was fractionated using petroleum ether, solvent ether, ethyl acetate, butanol and butanone in succession. The Gastric mucosal injury was produced in rats by pyloric ligation, aspirin and indomethacin induced models. Extracts of petroleum ether, solvent ether, ethyl acetate, butanol and butanone were administered in a dose of 300 mg/kg body weight. The parameters taken to assess anti-ulcer activity were volume of gastric secretion, free acidity, total acidity and ulcer index. The results indicate that, extracts of ethyl acetate, butane and butanone i.e significantly ($p < 0.001$) decrease the volume of gastric secretion, free acidity, total acidity and ulcer index with respect to control. The results suggest that the extracts of *Cordia dichotoma* Forst.f. fruits possess significant anti-ulcer activity.

Hepatoprotective activity: Study of the methanolic extract of *Cordia dichotoma* studied its hepatoprotective action in male Wistar rats with carbon tetrachloride induced heart damage (14). Protective role of *Cordia myxa* L. (CM) against liver fibrosis induced by the carbon tetrachloride (CCl₄) or thioacetamide (TA) was investigated. Plant was extracted in different solvents and the extracts were evaluated for their phenolic content and anti-oxidant activity. Phenolic content was measured using Folin-Ciocalteu reagent and was calculated as gallic acid equivalents. Antiradical activity of *C. myxa* extracts was measured by α , α -diphenyl- β -picrylhydrazyl (DPPH) assay and was compared to ascorbic acid. One milligram

of the crude extract was found to be equivalent to 15 µg of ascorbic acid. Protective role of *C. myxa* against carbon tetrachloride or thioacetamide induced fibrosis was assessed in serum aspartate³ transaminase (AST), transaminase (ALT) and alkaline phosphatase (ALP). Level of these enzymes significantly improved in rats after administration of (CCl₄)+CM, or (TA)+CM as compared to rats that were treated alone with CCl₄ or TA. It was found that the fresh *C. myxa* extract offered better protection against liver fibrosis induced by these chemicals.

Wound Healing activity: Study of fruit extracts of *C. dichotoma* showed significant wound healing activity on three different models, viz. excision, incision and dead space wound models on albino rats¹⁵. The extraction of fruits of *Cordia dichotoma* Forst.F. was carried out using ethanol. This extract was further fractionated using petroleum ether (40-60%), solvent ether, ethyl acetate, butanol and butanone in succession. These fractions were screened for wound healing activity using three different models, viz. excision, incision and dead space wound models on either sex of albino rats of Wistar strain. All the fractions showed significant (P<0.001) activity on the fruits contain large quantities of amino acid, flavonoids, and saponins and are used as wound healing agent in households.

Anti-Inflammatory activity: Screening showed the ethanol extract and aqueous fraction of *C. dichotoma* possess acute anti-inflammatory activity⁴. The effects of *Cordia dichotoma* Forst. seeds extracts on different phases of acute inflammation were examined. Investigations were performed using different phlogistic agents induced paw edema viz., carrageenan -induced paw oedema and Dextran -induced paw oedema in rats. Various extracts (ethanol and aqueous) of *Cordia dichotoma* Forst seeds at a dose of 250 mg/kg and 500 mg/kg orally were tested. Diclofenac sodium at the dose of 10mg/kg was used as a standard. Both the extracts showed significant activity (*p<0.05 & **p<0.01) compared with the control in both of these model. The dry powdered seeds were found to contain alkaloids, glycosides, saponins, tannins and carbohydrates. Thus it is revealed from the screening model used that the ethanol extract and aqueous fraction of this plant possesses acute anti-inflammatory activity¹⁰.

Antidiabetic activity: Antihyperglycemic effects of *Cordia dichotoma* Forst in the glucose induced hyperglycemia(1). The effect of the aqueous extract of alloxan induced and normoglycemic Wistar rats has been investigated. Three doses of the extract (250mg/kg; 500 mg/kg and 1000 mg/kg) were administered orally. The 500 mg/kg extract of *Cordia dichotoma* did not show any significant change in the blood glucose levels in normoglycemic and 250 mg/kg did not show any significant change in the blood glucose levels in alloxan induced Diabetic Wistar rats, when compared to untreated control. The dose 500 & 1000 mg/kg of extract showed a significant (p<0.5) decrease in blood glucose levels after 4,

8, and 24 hours. In normoglycemic rats, the dose of 1000 mg/kg of the extract significantly (p<0.05) decrease the blood glucose levels at 8 and 24 hours. In conclusion, The doses of extract has shown both significant (p<0.05) hypoglycemic and antihyperglycemic effects in Wistar rats¹⁶.

Degenerative disorders: Role of *Cordia dichotoma* seeds and leaves extract in degenerative disorders². A common theme which underlies etiology of several degenerative disorders is free radical induced stress. free radicals prime the immunomodulatory response, recruit inflammatory cells and are innately bactericidal. in the body, excess production of free radicals affect lipid cell membranes to produce lipid peroxides and reactive oxygen species (ROS), Which leads to decline in membrane fluidity and many biological changes, such as DNA damage, ageing, heart disease and cancer etc.

Antioxidants serve as free radical scavengers neutralizing and defending the body from a number of diseases which are born because of generation of free radicals. They offer defense against radical toxicity by antagonizing the damages caused by free radicals.

The current study is therefore carried out to investigate the free radical scavenging potential of methanolic extract of seeds and leaves of *Cordia dichotoma* using in-vitro models viz. DPPH and hydrogen peroxide model. These models demonstrate positive antioxidant activity in a concentration dependant manner and demonstrate that highest concentration exhibits highest (100 µg/ml) antioxidant activity. This activity was more pronounced in leaves as compared to seeds.

Antimicrobial activity: Consequently, data pertaining only to that showed inhibitory activities against all the tested bacterial, fungal and yeast species. Extracts of *Cordia dichotoma* showed moderate activity against the tested organisms. Water extracts of the *Cordia dichotoma* plants did not show any antimicrobial activity against all the tested microorganisms¹⁷.

Miscellaneous activity: A method of treating a human body for delaying effects of ageing on skin thereof, by applying to a part of the skin in need thereof of a cosmetic or pharmaceutical composition containing an amount of an extract of *Cordia dichotoma* effective to inhibit activity of elastase in the skin, obtaining thereby the delaying of the effects of ageing on the skin and also some extend Larvecidal activity.¹⁸

CONCLUSION

Numerous phytochemical and pharmacological studies have been conducted on different parts of the *Cordia dichotoma*. The present literature supports the potential of the *Cordia dichotoma* as a medicinal tree. In view of the nature of the plant, more research can be done to investigate the unexplored and unexploited potential of this plant.

REFERENCES

1. Kirtikar KR, Basu BD, Indian Medicinal Plants, Edition 11, Vol 3, Orient enterprises, 1935, 1029-1030.
2. Sharma A, Bhardwaj S, Mann AS, Jain A, Kharya MD, Screening Methods of Antioxidant Activity :An Overview, Phcog Rev, Issue 2, Jul-Dec 2007, 232-238.
3. Ilhami GO et al, Journal of Ethnopharmacology, 90, 2004, 205-215.

4. Parmar NS and Shikha parmar., Anti-ulcer potential of flavonoids, Indian J. Physiol. Pharmacol., 1998, 48, 343-351.
5. D.L., Martin Alarcon, M.J. and Motilva, V.J. Ethnopharmacol., 1994, 42, 161-170.
6. Srivastava SK, Srivastava SD, Taxifollin 3,5-dirhamnoside from the seeds of *Cordia dichotoma*, Phytochemistry, Volume 18, 1979, 205-208.
7. Yang., Fu, P.P., Y.C., Xia, Q., Chou, M.C., Cui, Y.Y., Lin G., "Pyrrolizidine alkaloids-tumorigenic components in Chinese herbal medicines and dietary supplements", Journal of Food and Drug Analysis, Vol. 10, No. 4, 2002, 198-211.
8. Larson RA, The antioxidants of higher plants, phytochem. 27, 1998, 969-78.
9. Tiwari KP and Srivastava SSD. 1979. Chemical investigation of the stem bark of *Cordia oblique*, Planta Medica. 36(2): 191-192.
10. Al-Awadi FM, Srikumar TS, Anim JT and Khan I. Antiinflammatory Effects of *Cordia myxa* Fruit on Experimentally Induced Colitis in Rats. Nutrition. 2001;17(5):391-396.
11. Ficarra R, Ficarra P, Tommasini S, Calabro ML, Ragusa S, Barbera R & Rapisarda A., Leaf extracts of some *Cordia* species: Analgesic and Antiinflammatory activities as well as their chromatographic analysis. Farmaco., 1995, 50(4): 245-256.
13. Wassel G, El-Menshaw B, Saud A, Meharuna G. and El-Merzabani M., Screening of selected plant for Pyrrolizidine alkaloids and antitumor activity, Pharmazine, 1987, 42, 709.
14. Thirupathi K, Sathesh Kumar S, Govardhan P, Ravikumar B, Krishna D, Krishna G Mohan/Nigerian, Hepatoprotective action of *Cordia dichotoma* against carbon Tetrachloride induced heart injury in Rats. Journal of Natural Products and Medicine. 2007, vol. 11.
15. Kuppasta IJ, Nayak PV., Wound healing activity of *Cordia dichotoma* Forst. fruits. Natural Products Radiance. 2006, 5: 99-102.
16. Day C. Traditional plants treatments for diabetes mellitus: Pharmaceutical Foods., Brit. J. Nutr. 1998, 80: 5-6.
17. Kuppasta IJ. & Nayak PV. Anthelmintic activity of fruits of *Cordia dichotoma*. Ind. J. Nat. Prod. 2003, 19(3): 27-29.
18. Anjana K. Patel, Nimish pathak, Hardik Trivedi, Mahendra G, Mihir P, Nitin P. Phytopharmacological properties of *Cordia dichotoma* as a Potential Medicinal Tree: an overview. Int. J. of Institutional Pharmacy and Life Sciences., 2011, 1(1): 40-51.