



REVIEW ON “*CORDIA DICHOTOMA* AS MEDICINAL TREE”

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ABSTRACT

Cordia dichotoma is one of the traditional medicinally important deciduous plants available all over India. Bhokar is the common name used for *Cordia dichotoma* belonging to family Boraginaceae. *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 forests of Rajasthan to the moist deciduous forests of Western Ghats and tidal forests in Myanmar. In Maharashtra, it grows in moist monsoon forest also. The plant parts like fruits, leaves, stem bark, seeds and roots of most species have long been used in traditional medicine as astringent, anti-inflammatory, anthelmintic, antimalarial, diuretic, febrifuge, appetite suppressant, cough suppressant and to treat urinary infections, lung diseases and leprosy. Chemical screening of both fruit and leaves shows the presence of pyrrolizidine alkaloids, coumarins, flavonoids, saponins, terpenes and sterol. Pharmacologically proved activities are anti-ulcer, wound healing, anti-inflammatory, antioxidant, anti-diabetic and hepatoprotective activity. Pharmaceutical application of *Cordia dichotoma* includes as tablet binder, Emulsifier. It is also used in sustained controlled drug delivery system and microparticulate drug delivery system.

KEYWORDS: *Cordia dichotoma*, microparticulate, hepatoprotective.

INTRODUCTION

Natural products have served as a major source of drugs for centuries, and about half of the pharmaceuticals in use today are derived from natural products. The use of natural substances, particularly plants, to control diseases is a centuries old practice that has led to the discovery of more than half of all modern pharmaceuticals. A growing worldwide interest in the use of phytopharmaceutical as complementary or alternative medicine either to prevent or ameliorate many diseases has been noted in recent years. *Cordia* is a genus of trees or shrubs, sometimes subscandent in the borage family Boraginaceae. About 300 species have been identified worldwide, mostly in warmer regions. The plant parts like fruits, leaves, stem bark, seeds and roots of most species of plants of the genus *Cordia*, especially *Cordia dichotoma*, *C. myxa*, *C. oblique*, *C. verbenacea*, *C. martinicensis*, *C. salicifolia*, *C. spinescens*, *C. latifolia*, *C. ulmifolia*, among others, has long been used in traditional medicine for cicatrizant, astringent, anti-inflammatory, anthelmintic, antimalarial, diuretic, febrifuge, appetite suppressant, cough suppressant and to treat urinary infections, lung diseases and leprosy.^[1]

Cordia dichotoma is one of the traditional medicinally important deciduous plants available all over India. The fruit has been reported to be rich in polysaccharide. Ripe fruit of *C. dichotoma* produces a jelly-like, sticky mass.

Unani system of medicine uses plant as antibacterial, antiviral and antitussive. Joshandah, polyherbal formulations, are extensively used by the masses in India for the treatment of common cold, catarrh, cough, respiratory distress, fever of which *C. dichotoma* is chief ingredient. From the ancient time, leaves and stem bark are used in treatment of dyspepsia, fever, diarrhea, leprosy, gonorrhea and burning sensation.^[2]



Fig 1: *Cordia dichotoma* plant.

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. Common name are Bhokar, Shleshmantaka etc. The genus *Cordia*, with about 300 identified species and worldwide distribution, is one of the largest genera in the family boraginaceae.^[2, 3]

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 1 500 m elevation. It is found in a variety of forests ranging from the dry deciduous forests of Rajasthan to the moist deciduous forests of Western Ghats and tidal forests in Myanmar. In Maharashtra, it grows in moist monsoon forest also. It does not grow gregariously, but is found growing singly in moist shady ravines and valleys. In areas with annual rainfall less than 500 mm, it thrives along streams or depressions where moisture is available. It does not grow gregariously, but is found growing singly in moist shady ravines and valleys. In areas with annual rainfall less than 500 mm, it thrives along streams or depressions where moisture is available.^[4] It is found in a variety of forests ranging from the dry deciduous forests of Rajasthan to the moist deciduous forests of Western Ghats and tidal forests in Myanmar. In Maharashtra, it grows in moist monsoon forest also. It does not grow gregariously, but is found growing singly in moist shady ravines and valleys. In areas with annual rainfall less than 500 mm, it thrives along streams or depressions where moisture is available.^[5]

Scientific information

Kingdom: plantae

Division: magnoliophyta

Class: dicotyledons

Subclass: asteridae

Order: lamiales

Family: boraginaceae

Genus: cordia

Species: *Cordia dichotoma* Forst.

Fragrant: Manjack

Vernacular name

Malaysia: Sekendai, Sekendal, Petekat

English: Soap berry, Sebestean plum, Fragrantmanjack

India: Leshora, Gonda, Lasora

Javanese: Kendal

Sumatran: Nunang

Thailand: Paw man

Local names

Bengal: Buhar, Bahubara

English: Sebesten, Clammy cherry, Indian cherry

Gujrati: vadgundo, Gunda

Hindi: Lasura, Bhokar, Borla

Javanese: Kendal

Lao: Man, SinoTibetan, Man Khok

Malay: Petekat, Sekendai

Tamil: Kalvirusu, Vidi, Naruli

Nepali: Bohori, Kalobohori

Thai: Mandong, Manma, Phakmong

Sanskrit: Shelu, Bahuvarkha

Botanical Description^[5]

Cordia dichotoma L. family Boraginaceae small to moderate-sized deciduous tree with a short bole, short crooked trunk and spreading crown. The stem bark is greyish 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.^[6] Flower^s are short stalked, bisexual and white in colour, appear in loose corymbose cymes. 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 German botanist, Valerius Cordus.^[7]

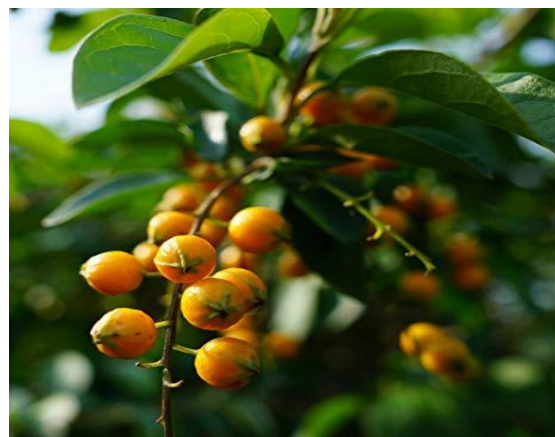


Fig 2. seeds of cordia dichotoma.



Fig 3: leave of cordia Dichotoma.



Fig 4: fruits of *cardia dichotoma*.



Fig 5: bark of *cardia dichotoma*.



Fig 6: flowers of *cardia dichotoma*.

A tree growing to a height of 5 to 10 meters, deciduous and smooth or nearly so. Leaves are alternate, ovate to oblong-ovate or elliptic-ovate, 6 to 10 cm long, with entire or undulate margins, pointed tip and with pointed, rounded or heart-shaped base. Flowers are stalkless, white or yellowish-white, about 7 mm long and borne in lax inflorescences 5 to 10 cm long. The calyx is ovoid. The corolla tube no longer than the calyx with spreading and reflexed lobes. Throat of the corolla and stamens are hairy. Fruit is a drupe, yellowish white or pinkish, ovoid, 10 to 13 mm long with a rather scanty pulp and a hard stone. Flowering takes place from March to May with the new leaves. The old leaves are shed during winter and the trees are leafless for a short period in early summer. Fruits are formed soon after flowering, develop quickly and ripen from June to August in north India and normally before May in south India. Seed dispersal is

aided by birds and monkeys which feed on the ripe fruit. The Odour is Characteristic and Taste is Sweet.^[8,9]

Phytochemical constituents

Qualitative assay, for the presence of plant phytoconstituents such as carbohydrates, alkaloids, glycosides, flavonoids, tannins and saponins. Chemical screening of both the leaves and the fruits showed the presence of pyrrolizidine alkaloids, coumarins, flavonoids, saponins, terpenes and sterols. The fruit contains about 70% pulp; the pulp contains per 100 g: water 6 g, protein 35 g, fat 37 g and carbohydrate 18 g. 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 acid.^[10,11,12]

The crude ethanol extract from the leaves showed antilarvicidal potency against the brine shrimp *Artemiasalina*. Initial studies indicated potential antioxidant properties based on direct measurement of radical scavenging activity of crude extracts from the tree's bark. Crude methanolic extract of the bark showed inhibition of number of implants in laboratory female rats. In a related study, leaf extract from the tree showed anti-implantation activity, suggesting its possible use as a natural contraceptive drug. The fruit, leaves and seed contain pyrrolizidine alkaloids, coumarins, flavonoids, saponins, terpenes and sterols. Taxifolin from the seeds of *C. dichotoma* showed promising DPPH free radical scavenging activity at a concentration of 100 µg/mL.^[13]

Another study reported that apigenin (5 mg/kg, p.o.) from *C. dichotoma* showed significant healing and reduction in inflammatory enzymes when screened for ulcerative colitis. The fatty oil content in the seeds of *C. dichotoma* was found to be 7.60% with stearic, oleic and linoleic acids as the major constituents. Three flavonoids, kaempferol, quercetin and isorhamnetin, were isolated from the butanol fraction of fruits of *C. dichotoma*. Six flavonol glycosides and two phenolic compounds were isolated from butanol extract of the leaves of *C. dichotoma* with rosmarinic acid as a major constituent. In another study, the ethanolic extracts were reported to contain polyphenolic compounds (1.0%), triterpenoids (0.075%), amino acids (1.39%), and rosmarinic acid (0.0028%).^[14,15]

Functional Uses.^[16,17,18]

1. **Food:** The immature fruits are pickled and are also used as a vegetable. Fodder: The leaves yield good fodder and are lopped for this purpose. The seed kernel of *C. dichotoma* contains a high proportion of fatty oils and proteins (46 and 31%, respectively) which has potential as cattle feed.
2. **Fuel:** The tree is used as a fuel wood. Timber: The wood is used to make agricultural implements.
3. **Poison:** Fruit extract of *C. dichotoma* suppresses larval hatching of *Meloidogyne incognita*.

4. **Medicine:** The medicinal use of *C.dichotoma* have been known since a long time. Seeds are anti-inflammatory. The bark is medicinal and several chemicals have been identified; Allantoin, beta - sitosterol and 3',5-dihydroxy-4'-methoxy flavanone-7-O- alpha -L-rhamnopyranoside. The seed kernel has medicinal properties.
5. **Services:** As *cardia dictoma* is fast growing plant it is used for planting in boundary and farm roads.
6. **Pests and diseases:** A large number of insect pests are reported, defoliators being among the most important. Larvae of some insects of the families Chrysomelidae, Glyphipterygidae, Noctuidae, Lymantriidae, Notodontidae, Pyralidae, Sphingidae and Yponomeutidae defoliate the leaves. Larvae of Gracilariidae and Lyonetiidae mine the leaves and those of Eucosmidae roll the leaves. Larvae of some insects belonging to families Eucosmidae, Curculionidae and Pyralidae bore into the fruits and shoots. *Austrothrips cochinchinensis* forms galls and feeds on the sap. *Aceriagallae* and *A. pobuzii* infest *C. dichotoma* in Taiwan and cause galls on leaves, fruits, shoots and tender stems. The weevil *Barioscapus cordiae*, adults attack the fruits and feed on the green pedicel, sepals and pollen grains inside the buds.
7. **Corrosion Inhibitor** Study investigated the alcoholic extracts to be a better corrosion inhibitor than toxic chemicals.
8. **Medicinal uses** Antiulcer, wound healing, anti-inflammatory, analgesic, antidiabetic, antimicrobial, anti-aging, hepatoprotective, anthelmintic (chloroform extract), laxative (fresh fruit), gonorrhea, expectorant.

Pharmaceutical Applications^[20, 21]

1. Tablet binder

The fruit of *Cordia dichotoma* is highly sticky in nature this property is used for binding of tablets.

2. Emulsifier

The *Cordia* gum as pharmaceutical excipient, May used as an emulsifier. The *Cordia* gum will be a good option as bio-degradable, cheap, economic and easily available emulsifier in the list of pharmaceutical excipient.

3. Sustained/controlled drug delivery system

Natural polysaccharides and their derivatives are widely explored in the area of sustained /controlled drug delivery systems to improve patient compliance and to provide extended periods of effective blood-levels. Application of *Cordia* gum in this area is investigated by various researchers in recent years.

4. Matrix material

An effort has been made to evaluate the efficacy of *Cordia* gum as a novel sustained release matrix forming material in tablet formulations using diclofenac as model drug. The effect of gum on *in vitro* drug release profile was examined and compared with a commercially

available sustained release diclofenac formulation. It became evident from the study that *in vitro* dissolution profile of gum formulation was similar to the marketed product. Study suggested that *Cordia* gum may be a suitable option as an excipient for matrix forming agent to impart enteric resistant and sustained drug delivery in tablet or similar formulations of other drugs too.

5. Transdermal Films

Cordia gum due to its good bioadhesivity may be used in preparation of transdermal patches.

6. Microparticulate drug delivery

Cordia gum also used for the preparation of microspheres. Because it is a gum shows good adhesion, as it is natural there is a biodegradation after drug release.

Pharmacological activities

1. Anti-Inflammatory activity

Screening showed the ethanol extract and aqueous fraction of *C.dichotoma* possess acute anti-inflammatory activity. The effects of *Cordia dichotoma* forst seeds extract on different phases of acute inflammation were examined. Investigations were performed using different phlogistic agents. The dry powdered seeds were found to contain alkaloids, glycosides, saponins, tannins and carbohydrates. Thus it is found that ethanol extract and aqueous fraction of this plant possesses acute anti-inflammatory activity. induced paw edema viz., carrageenan -induced paw oedema and Dextran -induced paw oedema in rats.^[22]

2. Antidiabetic activity

Antihyperglycemic effects of *Cordia dichotoma* Forst in the glucose induced hyperglycemia. The effect of the aqueous extract of alloxan induced and normoglycemic Wistar rats has been investigated.^[23]

3. Degenerative disorders

Role of *Cordia dichotoma* seeds and leaves extract in degenerative disorders. 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 affects 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 dependent

manner and demonstrate that highest concentration exhibits highest (100µg/ml) antioxidant activity. This activity was more pronounced in leaves as compared to seeds.^[24]

4. Anti-fertility activity

Ethanol leaf extracts of different local folklore plants (Azadirachta indica, Beaumontia grandiflora, Chordia dichotoma, Casiarea tomentosa, Diospyros embryopteris, Milletia auriculata and Melia azedarach) were investigated for antifertility effects on male rats in oral doses of 100 mg/kg daily for 21 days. Though, none of these extracts interfered with spermatogenesis, anti-implantational and abortifacient effects were observed in females mated by the males fed with leaf extracts of A. indica and C. dichotoma. Leaf extract of B. grandiflora besides having anti-implantational and abortifacient effects, had luteolytic effects. Abolition of libido in 100% males by leaf extracts of D. embryopteris and M. azedarach and in 60% of males by extract of C. tomentosa preclude these plants for antifertility use.^[25]

5. Antimicrobial activity: Extract of cordia dichotoma also shows moderate activity against bacterial, fungal and yeast species. Water extracts of the *Cordia dichotoma* plants did not show any antimicrobial activity against all the tested microorganisms.^[26]

6. Antidepressant activity

Study of ethanolic and aqueous extracts of leaves in behavioral animal models showed antidepressant activity.^[27]

7. Anti-ulcer agent:

The gastro protective effect of some extracts of the ripe fresh fruit of *Cordia dichotoma* was investigated in aspirin induced gastric ulcer model and pylorus ligation model in rats. Effective reduction in ulcer index is observed in water extract treated wistar rats as compared to Methanolic extract and results were compared with standard ranitidine (50 mg/kg). The water extract showed significant antiulcer effects.

8. Anti-fungal activity

The extract of the bark of C. dichotoma was evaluated against three common pathogenic fungi (Aspergillus niger, Aspergillus clavatus, and Candida albicans) and the inhibition zone with the extract was compared with that for the conventional antifungal drug statin and griseofulvin. The results showed a notable inhibition of the growth zone of the fungi, with better results for C. albicans than A. niger or A. clavatus.^[28]

9. Anti-aging agent

According to one of its essential characteristics, the invention relates to the use of an extract of the plant *Cordia dichotoma* as active principle of a cosmetic composition intended to combat the effects of ageing on the Skin, especially by preserving or improving the biomechanical properties of the skin, particularly its

elasticity, by delaying the appearance of Wrinkles or by reducing their depth, and by improving the firmness of the skin. According to another essential characteristic of the invention, it also relates to the use of an extract of the plant *Cordia dichotoma* for the preparation of a pharmaceutical, especially dermatological, composition intended for the treatment of intrinsic or actinic ageing effects on the skin.

10. Antioxidant activity

Activity was evaluated by in-vitro models viz. DPPH and hydrogen peroxide model. These models showed positive antioxidant activity in a concentration dependent manner and highest concentration exhibit highest (100 µg/ml) antioxidant activity. This activity was more pronounced in Methanolic extract of leaves as compared to seeds.^[29]

11. Anti-helmentic activity

Study evaluated the anthelmintic activity of ethanolic and aqueous extracts of C. dichotoma on Eudrilus euginae earthworms. Both extracts showed concentration dependent paralysis and death of worms, with the aqueous extract showing more significant activity.^[30]

CONCLUSION

Various phytochemical and pharmacological studies have been conducted on *Cordia dichotoma*. The present literature focus on the pharmacological importance of *Cordia dichotoma* as a medicinal tree.

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