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A Review On Plant Profile, Phytochemistry and Pharmacology of Cordia Dichotoma (Indian Cherry)

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ABSTRACT:

Over half of the global population depends on traditional medicine, which plays a significant role, particularly through the use of plant extracts and their active components. One such plant is Cordia dichotoma Forst., a small to medium-sized species from the Boragenaceaefamily, commonly referred to as bhokar, lasura, gonda, Indian cherry, and shlesmataka.Various parts of the plant, including the leaves, fruit, bark, and seeds, have been noted for their antidiabetic, antiulcer, anti-inflammatory, immune-modulating, and analgesic properties. Analysis of the fruit, leaves, and seeds reveals the presence of pyrrolizidine alkaloids, coumarins, flavonoids, saponins, terpenes, and sterols. This review aims to provide an overview of the geographical distribution, physicochemical characteristics, phytochemical constituents, and pharmacological effects of Cordia dichotoma that have been documented to date.

Keywords: Cordia dichotoma, Anti-diabetic, anti-ulcer, anti-inflammatory, immune-modulating, analgesic Activity.

1. INTRODUCTION

Cordia dichotoma, widely known as Indian Cordia, Lasora, or Assyrian Plum, is a medium- sized tree indigenous to the Indian subcontinent and certain areas of Southeast Asia. As a member of the Boraginaceae family, this species is recognized for its extensive traditional medicinal uses and ecological importance. The plant typically thrives in dry, tropical areas, including India, Sri Lanka, Pakistan, and Bangladesh, and is well-suited to arid and semi-arid climates. This tree is appreciated for its diverse applications, which encompass providing food, medicinal solutions, and even sturdy wood for building and fuel. For generations, the fruit, flowers, leaves, and bark of Cordia dichotoma have been employed in traditional medicine practices like Ayurveda and Unani, due to the various health benefits the plant possesses.

Medicinal plants have held significant importance in Indian culture since the time of the Rig Veda (approximately 5600 BC), where 67 medicinal plants were documented. Among the 250,000 higher plant species, over 80,000 are recognized for their medicinal properties, positioning India as a notable hub among the world's biodiversity centers. These plants have long been utilized in traditional medicine for their properties, including cicatrizant, astringent, anti-inflammatory, anthelminthic, antimalarial,

diuretic, febrifuge, appetite suppressant, cough suppressant, and in treating urinary infections, lung diseases, and leprosy. The practice of utilizing natural substances, particularly plants, to manage diseases dates back centuries and has contributed to the development of more than half of all modern pharmaceuticals. In recent years, there has been an increasing global interest in phyto-pharmaceuticals as complementary or alternative medicine to prevent or alleviate various diseases.[1]

India boasts a diverse array of food plants that enrich the diets of its population. The variety of agro-climatic conditions, combined with people's taste preferences, creates significant opportunities to discover the most suitable fruits for commercial farming. While the nutritional benefits and values of commonly eaten foods have been thoroughly researched and documented, there is a gap in the available information on the nutritional properties of some less frequently consumed foods, which restricts the utilization of these underexploited fruits.

Medicinal plants are viewed as the primary method for preserving health and fighting diseases, and even today, they serve as the main source for new therapeutic drugs. It is estimated that around 72,000 plant species possess medicinal properties, with India acknowledging over 3,000 species that have therapeutic benefits. Ayurveda, which translates to "science of life," emphasizes the idea of positive health as a state of metabolic balance in individuals. Prominent traditional systems identify various medicinal plants: Siddha (600), Ayurveda (700), Amchi (600), Unani (700), and allopathy, which utilizes 30 plant species for treating ailments. Cordia dichotoma (C. dichotoma) is a significant traditional medicinal plant found extensively across India.[7,8]

Geographical distribution:

C. dichotoma is predominantly found in tropical and subtropical areas. It thrives in the sub- Himalayan region and its outer ranges, reaching elevations of approximately 1,500 meters. This species inhabits a variety of forest types, including the dry deciduous forests of Rajasthan, the moist deciduous forests of the Western Ghats in India, and tidal forests in Myanmar.

In Maharashtra, it is located within moist monsoon forests. Rather than growing in clusters, it is typically observed as solitary specimens in moist, shaded ravines and valleys. The species is extensively distributed across the Philippines, where it can be found in thickets and secondary forests at both low and medium elevations. Additionally, it is present in Southern China, Formosa, and extends to regions such as Peninsular Malaysia, tropical Australia, and Polynesia. Propagation of this species occurs through seeds.[8,9,10].

Nutritional value of leaves, seed kernels and fruits of C. dichotoma. [11]

Plant part	Nutritional value
Leaves	12%-15% crude protein
	16%-27% crude fibers

	42%-53% nitrogen free extract
	2%-3% ether extract
	13%- 17% total ash
	2%-4% total calcium
	0.3% phosphorus
Seed kernels	32 g water: per 100 g
	46% fatty oils
	31% proteins
Fruits	70% pulp which contains per 100 g
	6 g water
	35 g proteins
	37 g fats
	18 g carbohydrate
	Ca (55 mg), P (275 mg), Zn (2 mg), Fe (6 mg), Mn (2 mg)

Plant part	Nutritional value
	Cr (0.2 mg), Cu (1.6 mg/100 gm)

Macro morphological characters:

C. dichotoma is a 15-meter-tall deciduous tree with a broad crown and an acrooked short trunk. As it ages, the brownish-gray bark of its stem becomes fissured and may be smooth or wrinkled longitudinally. In line with this, the stem features gray branchlets and glabrous, soft wood. It has almost globose buds.

o The fruit is ovoid, drupe-like, globose, pinkish-yellow, or yellow, and it is seated in an enlarged calyx that resembles a saucer. It is 1 to 2.5 cm long. When the fruit is ripe, its pulp becomes viscid and it turns black.

o There are one to four seeds in the hard stone. The ovoid, flattened seed can grow up to 6 mm in length. The bisexual inflorescence of the yellowish white flower is subcorymbose to subthyrsoid, short-stemmed, dimorphic, and sessile.

Biological Classification [7]
Kingdom : Plantae
Division : Magnoliophyta
Class : Dicotyledons
Subclass : Asteridae
Order : Lamiales
Family : Boraginaceae
Genus : Cordia L. – cordial
Species : Cordia dichotoma G. Forst.
Fragrant : Manjack

Figure 1. Parts of C. dichotoma plant.

Botanical description:

Cordia dichotoma is a small to moderately sized deciduous tree that ranges in height from 5 to 10 meters. It has a spreading crown, a short bole, and a short, crooked trunk. The stem bark is either longitudinally wrinkled or smooth and grayish brown. Simple, elliptical-lanceolate to broad ovate, with a round and cordate base, leaves are 6 to 10 cm long, entire, and slightly dentate. [8]

The stalkless, white or yellowish-white, 7 mm long flowers are carried in loose, 5–10 cm long inflorescences. [9] These flowers are short-stemmed, bisexual, white, and appear in loose corymbose cymes. They are followed by 1 in (25 mm) long, dull, pinkish, edible fruits with sticky flesh.

The calyx is round. The corolla tube has relaxed and spreading lobes and is no longer than the calyx. The stamens and corolla throat are hairy. The fruit is a globose or ovoid, luminous, yellow or pinkish-yellow drupe that sits in an enlarged calyx that resembles a saucer. When it ripens, the pulp becomes viscid and turns black. There are 1-4 seeds in the hard stone.[10]

The new leaves begin to bloom in March and continue through May. The trees lose their old leaves in the winter and briefly go leafless in the early summer. Soon after flowering, fruits are formed, grow swiftly, and ripen between June and August in northern India and typically before May in southern India. Birds and monkeys that eat the ripe fruit help spread the seeds.[11]

Odor: Distinct Flavor:
Sweet

2. PLANT NAME IN DIFFERENT LANGUAGES:

Plant name in different languages:
• **Hindi : Lasura, Bhokar Lasura, Bhokar**
• **Gujarati : Vadgundo, gunda**
• **English : Sebesten, Indian cherry**
• **Bangali : bahubara**
• **Sanskrit : bahuvarka**
• **Tamil : vidi, naruli**

Phytochemical constituents:

The presence of metabolites such as flavonoids, phenylpropanoids, phenolic acids, pyrrolizidine alkaloids, coumarins, terpenes, sterols, carbohydrates, amino acids, tannins, and saponins was revealed by the first phytochemical screening of C. dichotoma's various sections.

Flavonoids, alkaloids, proteins, tannins, saponins, glycosides, phytosterols, and carbohydrates were among the various phytoconstituents found in the fruit. GC-MS was used to identify 17 fatty acids from the stem bark.Numerous phenolic compounds and lignans were found in the fruit of C. dichotoma's

ethyl acetate extract. Prenylated hydroquinone, naphthoquinone, terpenoid hydroquinone, sesquiterpenes, triterpenoids, fatty acids, anthocyanins, steroids, phytosterols, polysaccharides, flavonoids, phenolic acids, glycosides, and hydrocarbons are the most significant secondary metabolites found in C. sebestena. The flower contained far more of these secondary metabolites than the leaves or bark did.

Functional Applications: [13,14,15,16]

1. **Food:** The young fruits are pickled and used as vegetables. Fodder: The leaves are lopped for fodder because they make good fodder. The high percentage of fatty oils and proteins (46 and 31%, respectively) in C. dichotoma seed kernels suggests that they could be used as cattle feed.
2. **Fuel:** The wood from the tree is used as fuel. Timber: Agricultural tools are made from the wood.
3. **Insecticide**: C. dichotoma fruit extract inhibits Meloidogyne incognita larval hatching.
4. **Pharmaceutical applications**: C. dichotoma's therapeutic qualities have long been recognized. Alpha-amyrin and 5- dirhamnoside, two compounds that have been isolated from the species' seeds, have anti- inflammatory properties. Several compounds have been identified from the bark, including beta-sitosterol, allantoin, and 3', 5dihydroxy-4'-methoxy flavanone-7-O-alpha- Lrhamnopyranoside. The seed kernel has numerous therapeutic uses as well.
5. **Services Boundary, barrier, or support:** C. dichotoma is a fruit tree that grows quickly, thrives in semi-arid environments, and is appropriate for planting alongside farm roads and boundaries.
6. **The Corrosion Inhibitor Study:** Used extracts from C. dichotoma to examine how mild steel was inhibited from corroding. Alcoholic extracts outperformed toxic chemicals as corrosion inhibitors, according to the results.
7. **Uses of medications:** Hepatoprotective, anthelmintic (chloroform extract), antiulcer, wound healing, anti- inflammatory, analgesic, antidiabetic, antimicrobial, anti-aging, laxative (fresh fruit), gonorrhea, and expectorant. Ayurveda uses leaves and stem bark to treat leprosy, fever, diarrhea, and dyspepsia. To speed up ripening, the bark is moistened and applied to tumors and boils. used to treat stomachaches and headaches as well. Bark has antidyseptic and febrifuge properties. Bark powder is applied to mouth ulcers. Bark infusion used as a gargle. Colicky pain is alleviated by combining the bark juice with coconut milk.
8. **Additional applications:** The bast is used to make rope in the Philippines. The white, gelatinous material from the fruit is used as glue. - Leaves are used to cook fish. The leaves are used in place of cigar wrappers in Burma. The following are some examples of pharmaceuticals' industrial uses. The gum of Cordia dichotoma in(a)Tablet binder Because of its extremely sticky nature, Cordia dichotoma fruit is used to bind tablets.

   In the future, cordia gum and gelatin may be able to compete well as binder ingredients in tablet formulations. (b) Emulsifier As a pharmaceutical excipient, cordia gum can be employed as an

emulsifier. In the list of pharmaceutical excipients, cordia gum will be a good choice because it is inexpensive, readily available, biodegradable, and economical. used to treat mouth ulcers

3. PHARMACOLOGICAL ACTIVITIES OF CORDIA DICHOTOMA

Anti-ulcer activity:

This study examined the gastroprotective effects of several extracts from the ripe fresh fruit of Cordia dichotoma in rats with pylorus ligation and gastric ulcers caused by aspirin. Alcoholic extract and water both exhibited antiulcer properties. In conclusion, it has been discovered that water extract works better than alcoholic extract when compared to standard ranitidine in both

the pylorus ligation model and the aspirin-induced gastric ulcer model. [Shah Darshan et al. (2011):][25]

Anti-cancer activity:

The purpose of the study was to assess the anticancer potential of Cordia dichotoma leaf methanolic extract (MECD) in relation to the human prostate carcinoma cell line PC3. The flavonoid content of MECD is 160 mg QE/g extract, conclusion. Its scavenging action and reduction of oxidative stress can prevent carcinogenesis. It also has antioxidant properties and induces apoptosis, which is mediated by excessive ROS generation and results in PC3 cell death. Because of its encouraging activity, the extract MECD may be a significant cancer chemopreventive or chemotherapeutic agent for prostate cancer. [Md. Rahman Azizur et al. (2016)][26]

Anti-oxidant activity:

The methanolic and butanol extracts of Cordia dichotoma bark were investigated for potential antioxidant properties. It was discovered that both extracts had a discernible level of total phenols, which are crucial for regulating oxidation. This study demonstrates that the extract is a readily available natural antioxidant source. This kind of activity could be caused by the extract's chemical components, which include proteins, terpenoids, alkaloids, flavonoids, and tannins. According to the current study, the bark of C. dichotoma exhibits strong radical scavenging properties.[Nariya Pankaj B et al. (2018)[28]

Anti-microbial and antifungal activity:

Research was done to find out if the bark of Cordia dichotoma had antibacterial and antifungal properties. Methanol and butanol extracts of the bark were tested for their antibacterial properties against two gram-negative bacteria (Escherichia coli and Pseudomonas aeruginosa) and two gram-positive bacteria (Staphylococcus aureus and St. pyogenes). The extracts' antifungal properties were tested against three common pathogenic fungi: Candida albicans, Aspergillus niger, and Aspergillus clavatus. Common medications with antibacterial properties include Amplicilline, Ciprofloxacin, Norfloxacin, and Chloramphenicol; for antifungal properties, use Nystain and Greseofulvin. According to the current study, when compared to a standard medication, methanolic and butanol extracts of C. dichotoma bark were found to be effective against bacteria and fungi. Nariya Pankaj B et al. (2018)[28]

Analgesic, antipyretic, and anti-inflammatory activity:

The study assessed the leaf extract of C. dichotoma G. Forst. for its analgesic, antipyretic, and anti-inflammatory properties. The high dose of methanol extract (400 mg/kg) was found to be highly significant in all three tests when compared to the standard medication. The analgesic, anti-inflammatory, and antipyretic properties of the leaf methanol extract were determined by this study, which also validated the traditional uses of plant leaves. Gupta and Kaur (2014)[30]

Anti-fertility activity:

The anti-fertility properties of a hydroalcoholic extract of Cordia dichotoma Forst. leaves were examined. In albino rats, an acute toxicity study was conducted. The number of implants, vaginal cornification, body weight, uterus weight, and biochemical analysis were used to test two experimental animal models for estrogenic/anti-estrogen activity and anti-implantation in female rats. In immature rats, the extract significantly altered biochemical parameters and increased uterine weight. Significant estrogenic activity was demonstrated when the extract and ethinyl estradiol were administered simultaneously. In conclusion, C. dichotoma leaf hydroalcoholic extract exhibits strong anti-fertility properties. Gupta and Kaur (2014)[30]

Lipid-lowering effect:

The antioxidant potential of an aqueous extract of Cordia dichotoma fruits was examined in vitro, as well as how it affected nutritional parameters in rats given a high-fat diet. Ascorbic acid and butylated hydroxytoluene, two common substances, were assessed and contrasted with

C. dichotoma extract. Dietary and fecal lipid components, as well as the serum and liver lipid profiles, were identified. Both total feed intake and total body weight gain were decreased by extract. high extract dosage. When compared to hyperlipidemic control values, C. dichotoma significantly reduced intake of fat and cholesterol while increasing excretions in the feces. Low dosage was superior to high dosage. extract from C. dichotoma. Samah A. El-Newary et al. (2018)[32]

4. CONCLUSION:

More than half of all contemporary pharmaceuticals were discovered as a result of the centuries-old practice of using natural substances, especially plants, to treat illnesses. The beneficial qualities of Cordia dichtoma, such as its anthelminthic, antimalarial, and diuretic effects, are described in a number of literary works and research studies in contemporary science, demonstrating the plant's value and utility. Few studies have been conducted on this

plant, though, and there is much room for more research to fully explore its potential in the fields of pharmaceutical sciences and medicine.

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