Review Article

A Review on Phytochemical And Pharmacological Activity of *Cordia sebestena*

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Received: 11-12-2021; **Revised:** 26-02-2022; **Accepted:** 05-03-2022; **Published on:** 15-03-2022.

ABSTRACT

Cordia sebestena Lin is an understudied medicinal plant which belongs to the family Boraginaceae is commonly named as Geiger tree. It is used for the treatment of various disorders. We explored the chemical composition of *Cordia sebestena* plant and the conducted review is based on the physiochemical, pharmacognostical and phytochemical standards could be helpful for the identification, authentication, standardisation and preparation of monograph for *Cordia sebestena*. Microscopic, macroscopic and physiochemical evaluation of the plant was done using the standardised procedures. The thin layer chromatography was performed with the use of different mobile phase for the identification of drugs. The main aim of this review is to provide the in-depth knowledge of *Cordia sebestena* plant such as the phytochemical evaluation, pharmacognostical evaluation and the medicinal value of the plants given may helpful to the further researchers.

Keywords: Boraginaceae, Cordia Sebestena, Geiger tree, Aloe wood, Geranium tree.

QUICK RESPONSE CODE →

DOI:
10.47583/ijpsrr.2022.v73i01.025

DOI link: http://dx.doi.org/10.47583/ijpsrr.2022.v73i01.025

INTRODUCTION

Medicinal plants possess high therapeutic values. It can act as remedies for various human diseases and ailments. From the ancient period the plants have been the major source of basic needs for making food, housing, clothing and medicines[1]. The plants have been continuously providing the new remedies and lead to the human race with unique structural diversity[2]. Cordia is a genus of deciduous flowering trees or shrubs belongs to the family Boraginaceae[3]. Many of the species cordia have long since been used to treat several ailments in the various traditional system of medicine. Cordia are used for the treatment of wounds, boils, tumour, gout and ulcer and these species are also used as a blood purifier and febrifuge. Bioactive compounds such us sebestenoids have been isolated from the ethyl acetate extract of the fruit. The nutritional property of the seeds has also been evaluated. They have the antioxidant, antibacterial toxicity potential of the ethyl acetate extract of *Cordia sebestena* plant leaves. The plant leaves are used in the treatment of cough, bronchitis, fever and influenza. Decoction of leaves of the several species is used for the treatment of flu, cough, cold, asthma, menstrual cramps, dysentery, diarrhoea, headache, snakebite and as a tonic. Bark is used as an astringent and hepatic stimulant; The root decoction is used to cure tuberculosis, bronchitis and malaria. Externally, the poultice prepared from leaves is used to treat migraine, inflammation and wound. Fruits of the plants from the genus are very mucilaginous used as a demulcent, blood purifier, in the disease of spleen, kidney, and lungs[4].

The major pharmacological activities reported for extracts and isolated compounds include anti-inflammatory, anti-oxidant, larvicidal, hepatoprotective, analgesics, antimicrobial and antidiabetic

The major secondary metabolites isolated from this species include terpenoid hydroquinone, triterpenoids, prenylated hydroquinone, meterpenoid napthoquinone, polysaccharides, fatty acids, sequesterpenes, flavonol, glycosides, oleanane, ursane-type triterpenes and hydrocarbons[5].

PLANT PROFILE

Scientific name: *Cordia sebstena*.

Figure 1: *Cordia sebestena* L.[6]

Taxonomical Classification

Kingdom- Plantae - Plantes, Planta, Vegetal, plants

Subkingdom- Viridiplantae – green plants

Infrakingdom - Streptophyta – land plants

Superdivision - Embryophyta

Division - Tracheophyta – vascular plants, tracheophytes

Sub-division - Spermatophytina – spermatophytes, seed plants, phanérogames

Class - Magnoliopsida

Superorder - Asteranae

Order - Boraginales

Family - Cordiaceae

Genus - Cordia L.

Species - Cordia sebestena L

Commonly known as aloe wood, geranium tree, largeleaf geigertree, orange geiger tree, scarlet cordia, sea trumpet, sebesten plum tree, Spanish cordia, Texas olive, ziricote.

• **Bengali**: kamla buhal, raktarag

• **Hindi**: लाल लसोड़ा lal lasora, bohari

• **Kannada**: challekendala

• **Tamil**: அச்சிநறுவிலி accinayuvili[7].

Native to: Florida Keys, the West Indies, and northern South American

Cultivation

Cordia sebestena is widely planted throughout the tropics as an ornamental plant in gardens for its showy flowers. It is a slow-growing plant and sheds enough leaves and fruit to require some upkeep. The wood is rather light in density, but branches are not prone to breakage. The tree should be pruned in its youth to establish a structure, as it is prone to low branching. Soil tolerance is fairly broad, provided the soil drains well. *Cordia sebestena* tolerates drought, but not frost. It is not particularly susceptible to pests and diseases, other than the *Geiger tortoise beetle*, which can cause occasional defoliation. This plant tolerates salt spray found near the ocean. It enjoys full sun, and can grow in a part-day sun situation as well. Its uses include: street tree, shade tree, even as a container subject in its youth. It is planted in traffic medians and parking lots, and is a useful seaside subject[8].

Description

i. **Height:** 25 to 30 feet.

ii. **Spread:** 20 to 25 feet

iii. **Crown uniformity:** symmetrical

iv. **Crown shape:** round, vase

v. **Crown density:** moderate

vi. **Growth rate:** slow

vii. **Texture:** coarse

Foliage

- **Leaf arrangement:** alternate
- **Leaf type:** simple
- **Leaf margin:** undulate
- **Leaf shape:** ovate
- **Leaf venation:** brachidodrome, pinnate
- **Leaf type and persistence:** evergreen, broadleaf evergreen
- **Leaf blade length:** 4 to 9 inches
- **Leaf color:** green and rough on top, paler green and pubescent underneath
- **Fall color:** no color change
- **Fall characteristic:** not showy

Figure 3: Leaf of *Cardia sebestina*.

Flower

1. **Flower color:** orange red
2. **Flower characteristics:** very showy; funnel-shaped; emerges in clusters at branch tips
3. **Flowering:** most of the year, but abundant in summer

Figure 4: Flower of *Cardia sebestina*.

Fruit

A. **Fruit shape:** oval; egg-shaped

B. **Fruit length:** 1 to 2 inches

c. **Fruit covering:** dry or hard.

D. **Fruit color:** turns from green to white when ripe

E. **Fruit characteristics:** does not attract wildlife; showy; fruit/leaves a litter problem; fragrant; fleshy 1-4 seeded drupe.

Trunk and Branches

A. **Trunk/branches:** branches droop; not showy; can be trained to one trunk; no thorns

B. **Bark:** dark gray or brown, and deeply furrowed

C. **Pruning requirement:** needed for strong structure

D. **Breakage:** resistant

E. **Current year twig color:** brown

F. **Current year twig thickness:** medium

G. **Wood specific gravity:** 0.70

Figure 5: Bark of *Cardia sebestina*.

Culture

- **Light requirement:** full sun to partial shade
- **Soil tolerances:** clay; sand; loam; alkaline; acidic; well-drained
- **Drought tolerance:** high
- **Aerosol salt tolerance:** high

Other

- **Roots:** not a problem
- **Winter interest:** no
- **Outstanding tree:** no
- **Ozone sensitivity:** unknown
- **Verticillium wilt susceptibility:** unknown
- **Pest resistance:** resistant to pests/diseases[9].

Use Management

The fruit is emollient. It is used in the treatment of fevers. The leaves are emollient. The are used in the treatment of bronchitis, cough, fevers and influenza. Essential oils have been reported to possess various medicinal properties in folkloric medical practices. Their application in modern medicine has also increased recently. Syrup of the bark, flowers, or fruit is taken for coughs and bronchial aliments. Teas made from the flowers are used to treat venereal disease. The tree's sap is applied to wounds. Leaves washed in warm water or dressed with oil are used as poultices for headaches and sprains. Unripe fruit are emetic[10].

Phytochemical Study

Preliminary phytochemical screening was carried out using 25 g powdered air-dried material and subjecting it in a reflux apparatus, was extracted with 250 ml ethanolic for 30 minutes. The extract was filtered and concentrated using a rotary evaporator. The ethanol extract of *C.sebestena* leaves was performed for the detection of various phytoconstituents such as steroids, alkaloids, phenols, tannins, flavonoids, triterpenoids and saponins using standard procedures, described by Indonesian Herb Pharmacopoeia[11].

Leaves

Preliminary phytochemical screening of appropriate solvent extracts showed the presence of alkaloids, sterols, tannins, proteins and amino acids, flavonoids, terpenoids, saponin, carbohydrates and absence of glycosides and volatile and fixed oil. Microscopic analysis and other parameters were informative and provide valuable information in the authentication, standardization of *C.sebestena* leaves[12].

Flower

Cordia sebestena (C. sebestena) flower in various solvent extracts (hexane, chloroform, acetone, methanol, water) were explored for its biological importance. The total content of phytoconstituents such as phenolic, flavonoid, tannin and nutrient content like carbohydrate, protein are notably observed in acetone extract. Acetone extract has revealed the potent antioxidant property against various free radicals and has good reducing power activity[13].

Seed

The properties of the seed oil show that it may be useful in alkyd resin synthesis, biodiesel and soap production[14]. The fatty acid profile shows that the seed oil has predominantly oleic acid (C18:1) being 71.1% of the total fatty acid in the oil which is good for human consumption. Cordia sebestena seed and seed oil demonstrate potentially valuable applications, there is however need to further study the amino acid profile of the seed and the effects of domestic processing on the anti-nutrient components[15].

Bark

The bark have a total of nineteen compounds were identified with the major compounds being 9-octadecene (E) (20.26%), 5-octadecene (E) (18.68%), 9-eicosene (13.99%), cyclopropane, nonyl (12.42%), 3-eicosene (E) (7.29%), phenol, 2,4-bis(1,1-dimethylethyl) (4.71%), 1-nonadecene (3.17%), 7,9-di-tert-butyl-1-oxaspiro (4,5)deca-6,9-diene-2,8-dione (2.70%), and 2,6-diisopropylnaphthalene (2.17%)[16].

Pharmacological Activity

Anti-microbial Activity

Cordia sebestina Linn. [Borginaceae] used in these study were ti investigate and justify their local use in the treatment of cough, catarrh, sore throat, pneumonia and tuberclousis. Those are associated with respiratory tract diseases. The antimycobacterial activities of these plants were investigated in *Mycobacterium fortuitum* ATCC 684, *Mycobacterium smegmatis* ATCC 19420, *Mycobacterium abscessus* and *Mycobacterium phlei* ATCC 19240. The agar cup diffusion method was used for the antimycobacterial screening at concentrations of 10, 20, 100 and 200 mg/ml. While the agar dilution method was used for the determination of the minimum inhibitory concentration (MIC) [17].

Antidiabetic activity

In these study, investigated the antidiabetic outcome of ethanolic extract of *Cordia sebestena* fruit (EECSF) in streptozotocin (STZ) - induced diabetogenic rodents and evaluated its consequence to improve the level of biochemical parameters, serum electrolytes level, and hematological indices along with its impact on body weight[18].

Antidiabetic activity was estimated in the chronic biological model by STZ (65 mg/kg/i.p.)-induced diabetes in rodents escorted by the determination of blood glucose. Further pharmacological research was carried out to explore the effect of EECSF on body weight, variations in biochemical parameters including aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, total bilirubin, and total protein, transformations in serum electrolytes such as Na^+, K^+, Cl^-, and Ca^{2+} along with estimation of hematological indices such as red blood cells, white blood cells, hemoglobin, lymphocytes, neutrophils, eosinophils, and monocytes. It was discovered that EECSF significantly lowered the blood glucose level of diabetic rodents along with enhancement in body weight. Correspondingly, EECSF significantly ameliorated the biochemical parameters, serum electrolytes, and hematological indices. The results demonstrated the antidiabetic potential of EECSF in STZ-induced diabetes in rodents, and it could be selected to benefit from diabetes and its affiliated complexities inclusive of anemia, diabetic nephropathy, retinopathy, neuropathy, and hepatitis[19].

Hepatoprotective Activity

To evaluate the hepatoprotective effect of the ethanolic extract of Cordia sebestena fruit (CSFE) against simvastatin-induced hepatotoxicity in rats. Hepatotoxicity was induced by simvastatin in rodents[20]. Hepatoprotective potential of CSFE was evaluated at 200 and 400 mg/kg, body weight by determining the altered levels of biochemical parameters like serum glutamic oxaloacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), cholesterol, bilirubin, urea, albumin, total protein and hematological indices including red blood cells (RBC), white blood cells (WBC), hemoglobin (Hb), platelets, and lymphocytes along with the impact on body and liver weight of treated rats. Results: The treatment with CSFE at 200 mg/kg and 400 mg/kg, significantly at ($p<0.05$, $p<0.001$) and dose-dependently reversed simvastatin-induced altered level of SGOT, SGPT, cholesterol, urea, total bilirubin and restored the total protein and albumin level in rodents. Hematological indices also were significantly ameliorated at both the doses of CSFE. Histopathological study revealed the regeneration of hepatocytes. The Cordia sebestena fruit extract (CSFE) at dose of 400 mg/kg reversed liver deteriorations induced by simvastatin in rats, therefore manifesting its traditional use as hepatoprotector. Future studies should be performed for isolating biologically active phytoconstituents[21].

Anti-Inflammatory Activity

The study was to evaluate the analgesic and anti-inflammatory properties of the ethanolic extract of plant leaves in Wistar albino rats. The analgesic activity was evaluated using the hot plate method and acetic acid-induced writhing, and the anti-inflammatory activity was determined using carrageenan-induced paw oedema[22]. The results showed that the Cordia sebestena ethanol extract (100, 200 and 400 mg/kg) exhibited significant analgesic effects in a dose-dependent manner in the two pain models tested. The extract also exhibited significant anti-inflammatory effects in the carrageenan-induced inflammation test[23]. The data obtained support the traditional folklore therapeutic claim about its analgesic and anti-inflammatory properties. Nonetheless, further scientific investigation is required to establish its analgesic and anti-inflammatory properties in other experimental models and clinical settings[24].

Larvicidal Activity

In these study, an attempt has been made to explore one such plant *Cordea sebestena.L* leaves for its larvicidal properties. In the developing countries like India, one of the biggest threats for the public is the tiny creature – mosquitoes. *Aedes aegypti* causes numerous health hazards for the people in the form of dengue fever, yellow fever, malaria, etc,. These mosquitoes can be controlled through mosquito repellent, which cause mortality and kill them. Plants serve as a rich sources for potential insecticide[25]. These plant derived insecticides are found to be effective, less expensive, easily bio degradable and non toxic products**.** The leaves of the plant was collected and extracted using solvents of increasing polarity such as viz., Petroleum ether(60-80), Chloroform, ethyl acetate and methanol. The prepared extracts were evaluated for its larvicidal properties at 100, 250, 500, 1000, 2000 µg/ml against third and fourth instar larvae of *Aedes aegypti*. The study period was 24 hours and the percentage mortality was calculated at various intervals. The evaluation clearly shows all the extracts exhibits poor larvicidal property. However, the methanolic extract was found to be little effective as compared to the other extracts but not up to a significant level[26].

Anthelmintic Activity

Anthelmintic properties of Cordia sebestena leaves extracts *viz.,* petroleum ether, chloroform, ethyl acetate and methanol were evaluated against Indian earthworms *Phertima posthuma* at 10mg/ml, 20mg/ml, 30mg/ml, 40mg/ml and 50mg/ml, using piperazine citrate as standard[27]. The study clearly reveals that Cordia sebestena chloroform, ethyl acetate and methanolic extract possess anthelmintic properties. However, the effect of these extracts was found to be less significant as compared to the standard drug piperazine citrate[28].

Antitumor Activity

Since ancient time, plants serve as a treasure of effective drugs for cancer therapy. In the present study, phytoconstituents and antioxidant activity of Cordia sebestena (C. sebestena) flower in various solvent extracts (hexane, chloroform, acetone, methanol, water) were explored for its biological importance. The total content of phytoconstituents such as phenolic, flavonoid, tannin and nutrient content like carbohydrate, protein are notably observed in acetone extract. Acetone extract has revealed the potent antioxidant property against various free radicals and has good reducing power activity.

The biological efficiency of extracts was also evaluated by antibacterial activity against selected human pathogens. Isolated hesperetin compound significantly revealed cytotoxicity for HeLa cell line and its anticancer ability was revalidated by in silico molecular docking study, which exhibited strong interaction with E6 protein of HPV16 cervical carcinoma with significant binding energy[29].

Antioxidant Activity

The essential oil may be further explored for its potential as an antioxidant contributor in food and phytotherapeutic medicine.

The chemical composition of the essential oil from the stem bark of *Cordia sebestena* obtained by hydrodistillation was determined using gas chromatography–mass spectrometry and analyzed for its free radical scavenging potential using the 1,1-diphenyl-2-picrylhydrazyl (DPPH) assay.

Several hydrocarbons contained in the essential oil may have contributed to the aromatic and antioxidant properties of the plant. The hydrocarbons could be useful for chemotaxonomic characterization of Cordia sebestena[30].

CONCLUSION

Since the ancient times, the traditional system of medicines has gained the importance within the field of drugs. In most of the developing countries, an oversized variety of populations depend upon ancient practitioners, World Health Organization successively passionate about healthful plants to fulfill their primary health care wants. though trendy medicines are out there, seasoning medicines have preserved their image for historical and cultural reasons. Because the usage of those seasoning medicines has enhanced, problems and saying relating to their quality, safety and effectivity in industrialised and developing countries have cropped up. Increasing interest has forced the scientist to scientifically screen varied ancient claims. There's a necessity for screening the standard claims as a result of during this scientific era, everyone seems to be curious about scientific support before exploitation ancient medicine.

Therefore, at present, each common users and health care professionals obtain updated, various info toward the safety and effectivity of any suggested healthful plants as a drug before this use. The relevancy of Pharmacognosy in standardization of seasoning drug was long been stressed. The method of standardization will be achieved by stepwise pharmacognostic studies. These studies facilitate in identification and authentication of stuff. An examination to work out these characteristics is that the opening move towards establishing the identity and degree of purity of such materials. In gift study varied standardization parameters like Pharmacologic studies, extractive price and phytochemical screening. Alkaloids, proteins, tannins, carbohydrates, Flavonoids, glycosides, saponins were distributed that can be useful in authentication of magnoliopsid genus sebestena L. The results of this study will function as a reference material in preparation of monograph.

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Source of Support: The author(s) received no financial support for the research, authorship, and/or publication of this article.

Conflict of Interest: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.