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A REVIEW ON PHYTOCHEMISTRY AND PHARMACOLOGICAL IMPORTANCE OF *CORDIA SEBESTENA*

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ABSTRACT

Over the previous decades, plants possessing biologically active metabolites, which have been proven to be powerful natural medicines. *Cordia sebestena* is a topical blooming plant native to the Caribbean, Florida and central America. It is usually referred to as the Geiger tree or Scarlet *Cordia*. It belongs to the family *Boraginaceae* and it is also known as manjack, and gesho. It is commonly known as Geiger tree. This plant is valued for its own medicinal properties and those are used in traditional medicine for various ailments. It is renowned for its vibrant orange-red flowers, which bloom year-round. *Cordia sebestena* is known for its tolerance to the drought conditions and it is popular in arid regions for adding colours and beauty to the gardens and landscapes. The Geiger-tree aesthetic appeal and adaptability make it a valuable addition to urban and coastal gardens. It is cultivated in tropical and subtropical areas for its ornamental value. It has a low risk of being introduced into temperate area as it does not survive frosts. Its striking flowers, edible fruits, and robust wood have led to its use in reforestation, landscaping, traditional medicine, and sustainable development initiatives. With its low maintenance requirements and wide range of uses, *Cordia sebestena* is a valuable resource for environmental conservation, eco-friendly practices, and community development. The present review describes the habitat, phytochemistry and medicinal uses of *Cordia sebestena*. Thus, this overview draws attention to further biological study on *C. sebestena* to discover its medicinal activities.

INTRODUCTION:

Throughout the human age, plants have been the major source of basic needs for making food, housing, clothing and medicines. The use of plants as a source of medicine in the form of various folklore medicines, decoctions, oils and many other remedies has been described very well in the history. The plants have been continuously providing new remedies and lead to the human race with unique structural diversity. Medicinal plants are very valuable in Medicine. Many human disorders can be treated using *Cordia sebestena*. Plants have been the main source of essential materials for food, clothing, and medicine from the beginning of time. Medicinal plants are very valuable in medicine. One of the medicinal plants is *Cordia sebestena*. This plant belongs to the family *Boraginaceae*. *C. sebestena* is an ornamental plant, thoroughly cultivated for gorgeous garden [1-3].

Plant profile

Local names: Scarlet Cordia, Orange Geiger Tree, Geiger Tree, Sebesten Plum.

Vernacular names: Telugu - Virigi; Hindi – Bohari; Lal lasora; Bengali - Kamla buhal raktarag; Kannada - Challekendala; Tamil - Accinayuvili.

Table 1: Taxonomy

Kingdom	Plantea
Subkigdom	Viridiplantae
Division	Tracheophyta
Subdivision	Spermatophyte
Class	Magnoliopsida
Order	Boraginales
Family	Boraginaceae
Genus	*Cordia*
Species	*Sebestena*

Cultivation: *Cordia Sebestena* is a slow-growing plant and sheds enough leaves and fruit to require some upkeep. This cultivar has a moderate growth rate and has a high tolerance of salt, drought and nutrient poor soils. However, it is sensitive to soil compaction. It is a handy seashore topic that is planted in parking lots and road medians [4-6].

Botanical description: The plants from the genus *Cordia* are broadly scattered in many countries such as Mexico, Brazil, Argentina, Carib-bean Islands, Panama, Salvador, Bolivia, Paraguay, Texas, California, West Indies, Peru, Ecuador, Malaysia, Curacao, Aruba, Colombia, Venezuela, Costa Rica, India, Suriname, Guyana, Myanmar, Thailand, Somalia, Kenya, Pakistan, tropical Africa, Ceylon, Malacca, Java, China and Japan. The systematic pharmacological studies on the genus *Cordia* have given tremendous acceptance to their traditional uses in health problems. The phytochemical studies of the genus *Cordia* revealed isolation of a total of 293 chemical constituents, out of which 173 new compounds were identified and their structure was mentioned in the review. The newly isolated compounds belong to the class of quinones, triterpenoids, flavonoids, lignans, neolignans, alkaloids, saponins, monoterpenoids, diterpenoids, steroids, phenyl-propanoids, phenolic, polyphenols, porphyrins and coumarins. Most of the pharmacological studies have been performed using crude extract and fractions, while only 37newly isolated compounds were evaluated for their pharmacological effects. Furthermore, quinones, terpenoids and flavonoids were found to be the major chemical constituents of the genus *Cordia,* and these constituents are known for their biological effectiveness. Thus, these constituents should be explored for their different pharmaco-logical activities. It is a dense, rounded, evergreen native tree grows up to 30 feet tall and 25 feet wide. It can also grow a trunk that is 1 inch thick. The tree grows slowly. The big, stiff, dark green leaves are 4-9 to inches long, hairy and have a rough, sand paper- like sensation to them. Blooming all year round, but particularly in spring and summer, are 2-inch-wide, dark orange blooms that occur in clusters at the terminals of the branches. These flowers are 1-2 inches long and bear egg- shaped fruits that smell nice but aren't very appetizing. It provides new remedies and lead to the human race with unique structural diversity. The genus *Cordia* is characterised by its alternate petiolate leaves with a dentate or entire margin; white, yellow, or orange flowers with a cyme, spike, or head in floral arrangements; a tubular or campanulate calyx with three to five short teeth; an infundibuliform, hypocrateriform, or campanulate corolla with four to eight lobes; stamens included or exserted with pubescent or glabrous filaments at the base; normally, the ovary contains four locules, each containing one erect ovule; fruits are ovoid, globoid, or ellipsoid in shape with a bony endocarp and viscid pulp [7-12].

Propagation: Seed - very slow to germinate, the process can be sped up if the seed is scarified by lightly abrading the seedcoat to allow easier ingress of water.

Figure 1: *Cordia sebestena L.*

Figure 2: Leaf of *Cordia sebestena*

Flower: Colour: orange red

- Features: Very colourful, funnel-shaped; appears in cluster at the branches
- Flowering: summer is the season with the most flowers

Figure 3: Flower of *Cordia sebestena*

Fruit: Shape: oval or egg- shaped

- Measurement: 1 to 2 inches
- Covering: arid
- Colour: turns from green to white when ripen

Figure 4: Fruits of *Cordia sebestena*

Figure 5: Trunk of *Cordia sebestena*

Uses:

Cordia sebestena fruit is emollient. It is employed in the diagnosis of different types of fever. Emollient leaves are used in the treatment of bronchitis, coughing, fever and influenza. Ripe white fruit of *C. sebestena* is edible and used in the treatment of indigestion, gastro intestinal problems and dyspepsia. Unripe fruit is poisonous. *Cordia sebestena* (Geiger tree) is helpful in following conditions like indigestion, gastro intestinal disorders, kidney pains, renal dysfunction, cough and bronchial ailments. Leaves used as emollient and in the treatment of bronchitis, cough, fever and influenza [13,14].

Phytochemistry: *Cordia sebestena* whole plant extracts revealed the presence of alkaloids, sterols, tannins, proteins, amino acids, flavonoids, terpenoids, saponins, carbohydrates, total fatty acid (71.1%). Total 19 compounds were identified as major compounds being 9-octadecene (E) (20.29%); 5-Octadecene (E); 9-eicosene

(13.99%). Cyclopropane, nonyl (12.42%); 3-eicosene (E) (72.29%); phenol, 2,4- bis(1,1-dimethyl ethyl) (4.71%); 1-nonadecene (3.17%); 7,9-di-tert-butyl-1oxaspiro (4,5) deca-6,9-diene-2,8-dione (2.70%); and 2,6-diisopropyl naphthalene (2.17%) [6,15,16].

Pharmacological importance [8, 9, 17-22]

Anti-diabetic activity: The levels of biochemical parameters, hematological indices, serum electrolytes level are improved by the ethanolic extract of fruit in streptozotocin (STZ) which is induced by the diabetogenic rodents and consequences are also evaluated. Blood glucose measurements were used to assess anti-diabetic activity in the chronic biological model by using STZ (65 mg/kg/i.p.)- induced diabetes in rodents. Further studies reveal the effect on body weight, aspartate aminotransferases, alanine, total bilirubuin, and total protein, transformations in serum electrolytes such as Na^+, K^+, Cl^- and Ca^{+2} along with estimation of hematological indices such as RBC, WBC, hemoglobin, lymphocytes, neutrophils, eosinophils, and monocytes. The results demonstrated the anti- diabetic potential of plant extract in STZ induced diabetes in rodents, and its affiliated complexities inclusive of anemia, diabetic nephropathy, retinopathy, neuropathy, and hepatitis.

Anti-inflammatory activity: The study involved to evaluate the analgesic and anti-inflammatory properties of ethanolic extract of plant leaves in Wistar albino rats. Eddy's hot plate method is used to determine the analgesic activity. The anti- inflammatory activity was determined by using Carrageenan- induced paw oedema. The dose-dependent extract was exhibited significant anti-inflammatory effects in the carrageenan-induced inflammation test. Further scientific studies and scientific investigation is required to establish its analgesic and anti-inflammatory properties in other experimental models and clinical settings.

Hepatoprotective activity: To evaluate the evaluate the hepatoprotective effect of the ethanolic extract of *Cordia sebestena* fruit extract (CSFE) against simvastatin- induced hepatotoxicity was induce by simvastatin in rodents. Hepatoprotective potential of CSFE was determined at the 200 to 400 mg/kg body weight by estimating the altered levels of biological and chemical parameters like serum glutamic pyruvic transaminase(SGPT), serum glutamic oxaloacetic transaminase (SGPT), cholesterol, bilirubin, albumin, total protein and hematological indices including red blood cells (RBC), white blood cells (WBC), hemoglobin (Hb), platelets and lymphocytes along with impact on body and liver weight of treated rats. These fruit extract at dose 400 mg/kg reversed liver deteriorations induced by simvastatin in rats, therefore manifesting its traditional use as hepatoprotector.

Anti-microbial activity: The anti-mycobacterial activities of these plants were investigated in *Mycobacterium fortuitum*. The agar cup diffusion method was used for the screening at concentration of 10, 20, 100 and 200 mg/ml. Agar dilution method is used to evaluate the minimum inhibitory concentration.

Larvicidal activity: In this study, an attempt has been made to explore one such plant *Cordea sebestena l*eaves. Leaves for its larvicidal properties. In the developing countries like India, one of the biggest threats for public is the tiny creature-mosquitoes. These mosquitoes can be controlled through mosquito repellent, which cause mortality and kill them. Plants serve as a rich source for potential insecticide. The leaves of the plant were collected and extracted using solvents of increasing polarity such as 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 or fourth instar larvae of Aedes aegypti. The evolution

clearly shoes all the extracts exhibit 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.

Anti-tumor activity: Since antiquated times, plants act as a treasure of effective drugs for cancer therapy. The total content of phytoconstituents such as phenolic, flavonoid, tannins, and nutrient content like carbohydrates, protein are notably observed acetone extract. The natural proficiency of extricates was too assessed by anti-bacterial moment against chosen human pathogens. Confined hesperetin compound altogether uncovered cytotoxicity for HeLa cell line and its anticancer capacity was revalidated by in silico atomic docking study, which shown solid interaction with E6 protein HPV16.

Anti-helminthic activity: Anti-helminthic properties of *Cordia sebestena* leaves extracts, petroleum ether, chloroform, ethyl acetate and methanol were evaluated against Indian earthworms *Pheretima posthuma* at 10mg/ml, 20mg/ml, 30mg/ml, 40mg/ml and 50mg/ml, piperazine citrate is used as standard. This study reveals that *Cordia sebestena* chloroform, and methanolic extract possess anti-helminthic properties. However, the effect of these extracts was found to be less significant as compared to the standard drug piperazine citrate.

Anti-oxidant activity: The chemical composition of the essential oil from the bark of the *Cordia sebestena* obtained by hydrodistillation was determined using gas chromatography –mass *spectroscopy* and analysed for its free radical scavenging potential, thereby preventing oxidative stress and damage to cells. This is typically analysed assessed using assays such as DPPH (2,2-diphenyl-1-picrylhydrazyl). The hydrocarbons may well be valuable for chemotaxonomic characterization of *Cordia sebestena.* The total phenolic content was determined using spectrophotometric methods with a Folin-Ciocalteu reagent. The anti-oxidant activity of the extracts was determined by its ability to inhibit DPPH radicals through IC_{50} values (ppm). The highest total phenolic content (167.61 ± 0.56 mg GAE/g) and best anti-oxidant activity (31.41 ppm) were found in 70% ethanol extract of *C. sebestena* compared to other extracts (ethyl acetate > dichloromethane > n-hexane).

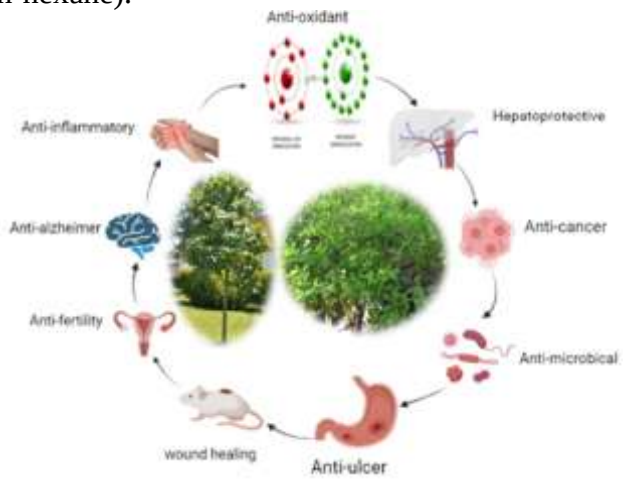

Figure 6: Common pharmacological activities of *Cordia sebestena*

CONCLUSION

The conventional medical system has grown in significance within the pharmaceutical industry from ancient times. A vast majority of people in the majority of developing nations rely on traditional healers who are fervent about healthy herbs to meet their basic medical needs. For historical and cultural reasons, seasoning remedies have maintained their reputation despite the availability of fashionable medications. Due to the increased use of such flavouring medications, concerns and remarks about their efficacy, safety, and quality have arisen in both developed and developing nations. Scientists are being obliged to objectively evaluate a variety of old claims due to growing curiosity. Because everyone seems to be interested in using traditional medicine in this modern age, it is necessary to verify the conventional claims. Therefore, before using any recommended healthy plants as a medicine, both regular users and medical

experts currently get updated, varied information regarding the safety and efficacy of these plants. *Cordia sebestena* has a number of pharmacological properties, including those that are anti-microbial, anti-diabetic, insulin sensitizing, anti-microbial, hepatoprotective, anti-inflammatory, larvicidal, anti-helminthic, anti-oxidant, anti-tumor and that also have some psychiatric and neurological conditions. Thus, the present study also helps to check the falsification of this important medicinal plant and to be significant and encouraging towards the goal for standardization.

Conflicts of interest: - None -

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