IJARSCT
International Journal of Advanced Research in Science, Communication and Technology
International Open-Access, Double-Blind, Peer-Reviewed, Refereed, Multidisciplinary Online Journal
ISSN: 2581-9429
Volume 5, Issue 1, July 2025
Impact Factor: 7.67

Ehretialaevis: A Bioactive Profile

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Abstract: *The Boraginaceae family includes the traditionally prized medicinal plant EhretialaevisRoxb., which is found in China, India, Pakistan, and Southeast Asia. It is well-known for its religious and cultural significance and is used extensively in Ayurvedic and traditional medicine, especially in Maharashtra, India. Different pharmacological characteristics, such as antibacterial, anti-inflammatory, hepatoprotective, antioxidant, wound-healing, and antiprotozoal actions, are displayed by different plant parts, including leaves, bark, fruits, and roots. Bioactive substances such as flavonoids, alkaloids, saponins, terpenoids, cardiac glycosides, and phenolic acids are detected by phytochemical studies. These substances support the plant's medicinal potential in the treatment of conditions like liver malfunction, digestive problems, skin conditions, and respiratory disorders. Ehretialaevis is also utilized in a number of commercially available formulations, such as capsules, oils, syrups, and powders.*

Ehretialaevis is also utilized in a number of commercially available formulations, such as capsules, oils, syrups, and powders. Despite its widespread use, there aren't many toxicity studies, which suggests that more thorough investigation is required to verify its usefulness and safety. This review emphasizes the potential of Ehretialaevis as a multipurpose herbal treatment by highlighting its botanical characteristics, phytochemistry, pharmacological activity, and traditional and contemporary uses.

Keywords: *Boraginaceae*

I. INTRODUCTION

The uncommon Indian medicinal plant Ehretialaevis, which is indigenous to India, Pakistan, Laos, Myanmar, Vietnam, China, and Bhutan, is a member of the Boraginaceae or Borage family. It has been used for centuries. An extremely valuable medicinal plant is EhretialaevisRoxb. plant and is becoming less common in Maharashtra. Hindus consider it to be religiously significant. At Alandi, which is close to the Dnyaneshwar temple, it is flourishing. The usage of therapeutic plants is growing globally. Ehretia has about 150 species

All Ehretia species are shrubs and trees (Ehretiaacuminata).(Ehretiarigida). Traditional medicines are made from the leaves, dinghies, roots, branches, fruits, and heartwoods (Gottschling, M & et al 2004).

Some species have small fruits and are frequented by a wide range of opportunistic bird frugivores. Because to their low fiber content and in vitro turmoil properties, some species may be valuable supplemental feedstuff for ruminant and wild animals.

Numerous species of the genus Ehretia, including EhretialaevisRoxb., E.acuminata R.Br., and Ehretiamicrophylla, have been reported in India.

Because these species respond well to a variety of natural exertions, they are employed in many herbal and traditional medicines in China and India (Anirban Mukherjee, A.M & et al 2018).

It is the tree of worship. It is a misconception that Shree EknathMaharaj pulled a plant root that was touching GnyaneshwarMaharaj's throat. In the Samadhi location of SantGnyaneshwar, Alandi, pilgrims perform GnyaneshwariParayan under the AjanVruksha plant. EknathMaharaj visited this location. He had a dream in which SantGnyaneshwarMaharaj urged him to cut the roots of an Ajan tree from his neck. EknathMaharaj found the Samadhi of SantGnyaneshwarMaharaj and made note of the Ajan tree that was close by. He entered Samadhi's home and pulled out the root.

As an aphrodisiac, its therapeutic qualities are utilized to treat eczema, syphilis, and diphtheria (Jain, A.& et al 2008).The bark is used as a gargle for throat infections, while leaves are used to treat ulcers, headaches, antihelminthics, diuretics,

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demulcents, expectorants, urine infections, and lung ailments. possesses hepatoprotective qualities and is effective against malaria, fever, and fungal infections (Garg, R & et al 2021).

Drug has aphrodisiac property like Rasayan and Vajikaran properties mentioned in the ayurveda.Such drugs are always useful for building immunity and acts as an antioxidant (Zara, S & et al 2012). This property of plant may be useful for fighting viral infections andother complications. Also studies shows that maximum deaths are in vulnerable patients (Velappan, S & et al 2014).

This plant is used by the locals to treat respiratory disorders, diphtheria, headaches, and demulcent and expectorant properties. This plant's characteristic may help with respiratory tract illnesses and viral infection symptoms. Decoction can be used for sore throats because it is used to gargle throat infections.One sign of a viral infection is sore throat.Its pain-relieving properties are excellent.

Oil from plant leaves can be used by people to relieve discomfort (Dangol, D.R 2015).

Local names of Ehretialeavis (Roxb):

English: Ehretia
Gujarati: Vadhavaradi
Hindi: Bhairi, Chamror, Datranga, Tamoriya
Nepali: Datingal
Konkan: KaloGamdo
Marathi: Ajaanvruksha, Datrang
Tamil: Kuruviccai, Kalvirasu
Telugu: Tellajuvvi, Paldattam
Malayalam: Harandi
Sanskrit: Charmavriksha

Plant Discription:

Morphology

The stem can reach a height of three to six meters and is cylindrical, upright, and branching. The grayish-brown bark is smooth with a hint of roughness.

The leaves have a basic, elliptic-lanceolate shape and alternate. They have a sharp tip and a full edge, measuring 5–12 cm in length and 2–5 cm in width. The leaves are smooth and glabrous, with a dark green top and a pale green underside.

- Blooms: The tiny, greenish-yellow blooms are grouped in terminal or axillary groups. With a small, tubular calyx and campanulate corolla, they are five-merous.
- Fruits: The purple-black fruits are globose and tiny. Their surface is smooth and glabrous, and their diameter is 5–6 mm.

Other Features

The roots are taprooted, and they are thick and woody.

Wood: The wood is solid, hard, and has a grayish-brown hue.

The bark is grayish-brown, smooth, and a little rough.

Distribution and Habitat

China, Southeast Asia, and the Indian subcontinent are the native habitats of EhretialaevisRoxb. It may grow in a range of environments, such as meadows, woodlands, and forests. The plant favors full sun over partial shade and well-drained soil.

Taxonomical classification

Botanical name: EhretialaevisRoxb.
Synonyms: Ehretialaevis Var. platyphylla Merrill.
Common/Local Name: Khanduchakka
Kingdom: Plantae
Division: Tracheophyta

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Class: Magnoliopsida
Order: Boraginales
Family: Boraginaceae
Genus: Ehretia
Species: Ehretialaevis (Roxb) (Sakharkar, A & et al 2023).

Phytochemistry

The nutritional significance of E. laevis leaves is highlighted by the quantitative assessment of phytoconstituents and trace elements in the leaves, which include phenolic acids, flavonoids, cyanogenetic glycosides, benzoquinones, and resources of lipids, proteins, carbohydrates, and vitamins C, E, A, and riboflavin. Alkaloids, tannins, flavonoids, and terpenoids are among the phytochemical elements that can be found in the leaf's hexane extract.Additionally, the leaf is abundant in cardiac glycosides, glycosides, and saponins.(Sharma, P &et al 2021).

E. laevis has strong anti-inflammatory and antioxidant properties that are attributed to its phenolic acids and lignans.These phenolic compounds have anti-inflammatory enzyme inhibitory and free radical scavenging properties. Thiamine, Fatty acids and phenolic compounds are among the chemical components found in the plant (Rabaey, D & et al 2010).

Features of Biology

Antimicrobial action: Both Gram-positive (Staphylococcus aureus and Bacillus subtilis) and Gram-negative (Escherichia coli and Pseudomonas aeruginosa) bacteria were found to be susceptible to broad-spectrum antibacterial activity. When compared to aqueous and chloroform extracts, methanolic extracts had greater antibacterial effectiveness**.**

Anti-inflammatory, antiarthritic, and analgesic effects: In animal models, extracts of E. laevis (methanol, chloroform, and aqueous) showed anti-inflammatory and antiarthriticeffects.It was determined that important phytoconstituents such oleanolic acid and High radical scavenging capabilities were demonstrated by methanolic and hydroalcoholic extracts, with IC50 values of 478.76 µg/mL for nitric oxide and 56.50 µg/mL for DPPH (Jyothirmai, N & et al 2016).

Healing of wounds; In the Wardha region of Maharashtra, India, Ehretialaevis is used to treat wounds with encouraging results. Thakre et al. investigated the wound-healing properties of a paste made from Ehretialaevis leaves, which have a broad range of antibacterial activity and may help treat anal fissures(Borkar, A.V & et al 2020).

Tooth caries management: In traditional medicine, E. laevis parts such as stems and leaves are used to treat gum disease and tooth caries. Its extracts' antibacterial qualities further support its effectiveness of oral hygiene maintenance

Hepatoprotective activity: In rats, hydroalcoholic and ethyl acetate extracts demonstrated a strong defence against the hepatotoxic effects of paracetamol. They improved histological liver conditions and decreased liver enzyme levels, returning the hepatic architecture to nearly normal (Rangnathrao, T.S & et al 2019).

Antitubercular action; Mycobacterium tuberculosis is the main cause of tuberculosis, an infectious disease that is communicable in humans. TB can be treated with certain regimens, although they are not ideal. Given the rise in infections linked to the human immunodeficiency virus and immunocompromised people, developing effective treatment techniques for tuberculosis in humans has been difficult. Although many diseases have been traditionally treated with phytoconstituents, a thorough evaluation of these substances' potential to treat tuberculosis has not been conducted. Ehretiolide and prenylhydroquinone, two substances that were isolated from the root of Ehretialongiflora, show antitubercular properties (Sharma, P & et al 2021).

Activity against snake venom; In India and other Asian nations, snakebite is one of the main health issues and a significant cause of illness and mortality. It was stated that Ehretiabuxifolia might be used to treat snake poison. The Ehretia genus's possible antivenom impact was assessed in this study. E. buxifolia'sMeOH extract contains a chemical called ehretianone, which possesses anti-snake venom properties.

Antiprotozoal and antitrypanosomal properties; Infectious diseases malaria, leishmaniasis, sleeping sickness, and Chagas disease are brought on by unicellular eukaryotic parasites known as "protozoans." The medications now on the market to treat protozoa and trypanosomiasis are antiquated, costly, and ineffective; they also have significant adverse effects and

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struggle with drug resistance. This circumstance emphasises how urgently new, affordable, and efficient medications for the treatment of parasite disease must be developed. This study's quest for novel antitrypanosomal and antiprotozoal drugs is grounded in ethnomedicine. When leaves, bark, and roots are extracted with ethanol, E. amoena exhibits limited antitrypanosomal potential. E. acuminata exhibits antiprotozoal action when its leaves are extracted in methanol.

Activity of antioxidants; Numerous substances that are found naturally in plants have been found to be active oxygen scavengers or free radical scavengers. Finding naturally occurring antioxidants to replace synthetic antioxidants, which are being banned because of their negative effects like carcinogenicity, in foods or pharmaceutical materials has garnered a lot of attention lately (Hashem, F& et al 2016). Natural antioxidants can slow the progression of many chronic diseases, shield the body from free radicals, and slow down the oxidative rancidity of lipids in meals. The ethyl acetate fraction of fruits and the 1-butanolic and chloroform fractions of leaves demonstrated notable anti-free radical effects in Ehretia serrate (Sivasankari, V & et al 2013).

Sr. No.	Part	Chemical content	Medicinal use
1.	Leaves	Naphthoquinone derivative Minerals such as Na, NH3, Fe, Mn, K, P, Zn, Cu, Si, Mg, Acidegallique, acidetannique, Rutin, acidevitaminique, acideascorbique, Phytol, pipéridine, betuline et acidebetulinique, lupeol.	antiviral, insecticidal, cytotoxic, anti-inflammatory, antipyretic, antibacterial, antifungal (Harne, K & et al 2021). heart disease, liver and brain disorders, diabetes mellitus, obesity, antiparasite analgesia, and immune system disorders (Mohiuddin, M & et al 2015).
2.	Bark	Tanins: Phenilepherin, Pythol, Baurinol, and Tanic Acid	Tannins inhibit the growth of bacteria, fungi, and yeasts. blood coagulation, lower hypertension, regulate lipid levels, induce hepatic necrosis, and enhance immunological response (Sharma, J & et al 2012).
3.	Fruits	Phenylephrine, amyrin, piperazine, phytol, phthalic acid, and decanoic acids. Lewisone, 1,4-naphthoquinone, betulin, Î±-amyrin, beugenol, and beuerenol acetate are examples of benzoquinones (Torane, R.C & et al 2009).	Larvicidal action, antiseizure, antioxidant, anticancer, and immune-boosting properties (Rangnathrao, T.S & et al 2019). prevent cellular senescence, treat arthritis, asthma, and mosquitoes; they are also antimalarial, anticancer, antiviral, antibacterial, and anti-inflammatory (Thakre, R & et al 2021).

Marketed formulations

The standardized extract of Ehretialaevis found in Herbal Hills' EhretiaLaevis Extract Capsules is advertised as having anti-inflammatory and antioxidant qualities.

Made from the dried and processed leaves of Ehretialaevis, EhretiaLaevis Powder by Ayurveda2go is used in traditional Ayurvedic therapy.

EhretiaLaevis Oil by Bioayurveda: Purified from Ehretialaevis seeds, this oil is sold for its antibacterial and anti-inflammatory qualities (Tichkule, S.V & et al 2019).

The standardized extract of Ehretialaevis found in Zandu Pharmaceuticals' EhretiaLaevis tablets is advertised as having anti-inflammatory and antioxidant qualities.

EhretiaLaevis Syrup from Dabur Pharmaceuticals: This syrup is sold for its antibacterial and anti-inflammatory qualities and contains a standardized extract of Ehretialaevis.

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Himalaya Herbals' EhretiaLaevis Face Cream: Promoted for its anti-aging and antioxidant qualities, this face cream contains a standardized extract of Ehretialaevis.
Biotique'sEhretiaLaevis Hair Oil is marketed for its benefits to hair development and scalp health. It contains a standardized extract of Ehretialaevis.

Utilizations

Applications in Medicine

1. Fever: Typhoid and malarial fevers are among the illnesses that the plant is used to treat.
2. Bronchitis, asthma, and coughs are among the respiratory conditions that Ehretialaevis is used to treat.
3. Dermatitis, acne, and eczema are among the skin disorders that the herb is used to cure.
4. Wounds: We utilize Ehretialaevis to treat cuts, wounds, and injuries.
5. Digestive problems: Diarrhea, dysentery, and stomach ulcers are remedies for the herb (Tichkule, S.V & et al 2020).

Conventional Applications

1. Anti-inflammatory: Ehretialaevis helps to lessen pain and inflammation (Memon, F.S & et al 2022).
2. Antimicrobial: The plant is used to stop the growth of bacteria and treat infections.
3. Antioxidant: Ehretialaevis guards against cell damage and oxidative stress.
4. The plant is utilized as an antipyretic to lower fever.
5. Analgesic: Pain is alleviated by Ehretialaevis (Shukla, A & et al 2018).

Additional Uses

1. Food: Traditional food makes use of the edible leaves and fruits of Ehretialaevis.
2. Dye: Fabric and other things can be naturally dyed with the plant.
3. pesticide: To manage pests, Ehretialaevis is utilized as a natural pesticide.
4. Rituals: Because of the plant's spiritual and cultural value, it is utilized in customary rituals and ceremonies.

Toxicology

E. microphylla leaf alcoholic extract showed no chromosome-fragmentation-generating activity in the laboratory tests for mutagenicity or genotoxicity (Balboa and Sylianco, 1993; Legaspi and Bagaoisan, 2020). Regarding acute oral toxicity for E. laevis, just one report complies with OECD recommendation 423. According to Sharma et al. (2021) and Velappan and Thangaraj (2014), all of the methanolic extracts from the fruits, stems, and leaves in this study were shown to be safe at a dosage of 2,000 mg/kg. Only a small number of insufficient toxicity data now available support the safety and efficacy of E. laevis and E. microphylla extracts and fractions for a variety of ailments. Furthermore, little information about the toxicity of this genus is available in the literature.

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