

A review on *Ehretia laevis*: A potential medicinal herb



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Abstract

For years, medicinal plants have served as the foundation of traditional medicine, providing a wealth of bioactive chemicals with potential therapeutic applications. The purpose of this review is to thoroughly investigate the medicinal properties, phytochemical profile and traditional uses of *Ehretia laevis*. Plants like *Ehretia laevis* have been shown in scientific studies to be effective in treating various diseases including inflammation, oxidative stress, cancer and neurological problems, as it contains chemical constituents like flavonoids (Quercetin, Kaempferol), alkaloids (Ehretine, Ehretinine) saponins (Oleanolic acid, Ursolic acid) etc. These chemical constituents are obtained from the *Ehretia laevis* plant extract with different extraction methods. It emphasizes the promise of plants as a source of new drugs and also highlights current research limitations. This review provides a platform for future research into the development of botanical therapies.

Keywords: Phytochemical Profile, Traditional Medicine, Therapeutic Applications

1. Introduction

Plants are known in the pharmaceutical industry for their great structural diversity and spectrum of medicinal activities. Phytochemicals are biologically active molecules found in plants that are produced from various plant parts including leaves, flowers, seeds, bark and roots. Plants used in traditional medicine contain a diverse spectrum of phytochemicals and are used to treat acute, chronic and infectious diseases. *Ehretia laevis*, a tribal herb found in Maharashtra's Wardha region, has been proven to be highly effective in wound healing (1).

2. Plant profile

Ehretia laevis is a rare Indian herb in the medicinal industry due to its extensive therapeutic properties. It belongs to the Boraginaceae or Borage family. *Ehretia laevis* is a very valuable medicinal plant which is becoming rare in Maharashtra. It has sacred significance among Hindus (2).



(a)

(b)

(c)

Figure 1. (a) Flowers; (b) Leaves; (c) Tree of *Ehretia laevis* (2,3,5)

2.1. Morphology

Ehretia laevis is a medium-sized tree with dark green leaves ranging from 2-7.8 cm in length and 1.2 to 3.8 cm in width. The plant has obtuse leaves with 5-7 lateral veins and short 2-3 cm, and its bark is uneven and light grey. *Ehretia laevis* flowers and fruits, which bloom from January to April, are white and can reach up to 8 mm in size (4).

2.2. Taxonomical classification

Table 1. Taxonomic hierarchy of *Ehretia laevis*

Kingdom	Plantae
Division	Tracheophyta
Class	Magnoliopsida
Order	Boraginales
Faminy	Boraginaceae
Genus	<i>Ehretia</i>
Species	<i>Laevis</i>
Botanical Name	<i>Ehretia laevis</i> (Roxb)

Table 2. Synonyms of *Ehretia laevis*

English	<i>Ehretia</i>
Hindi	Bhairi, Chamror, Datranga, Tamoriya
Gujarati	Vadhavaradi
Konkan	Datingal
Marathi	Datrang, Ajaanvruksha
Telugu	Tellajuvvi, Paldattam
Tamil	Kuruviccai, Kalvirasu

2.3. Geographical distribution

Ehretia laevis is primarily grown in India, Australia, Pakistan, Africa, Bhutan, Vietnam, Sri Lanka, Burma, Nepal, and Bhutan found primarily in upland forests and mountain slopes (4).

2.4. Cultivation

Ehretia laevis is a tropical plant that prefers direct sunlight to well-drained soil and partial shade. Cultivation requires a warm and humid environment with a temperature of 20 to 30 degrees Celsius. Seeds, cuttings and layering are all used for plant propagation. Sow seeds in nursery beds or polybags with 60-80% humidity (6). After 6-8 months, plant the seedlings in the field at a distance of 3-4 meters. During the growing season, use organic manure or fertilizer containing nitrogen, phosphorus and potassium (10:10:10). Regular watering, pruning and pest control ensures healthy growth. *Ehretia laevis* can grow up to 10 meters tall and has a lifespan of 20-30 years. Harvest the leaves, stems and roots as needed for medicinal use (7).

3. Methods used for extraction

Various methods of extraction used for extraction of phytoconstituents from *Ehretia laevis* are (4).

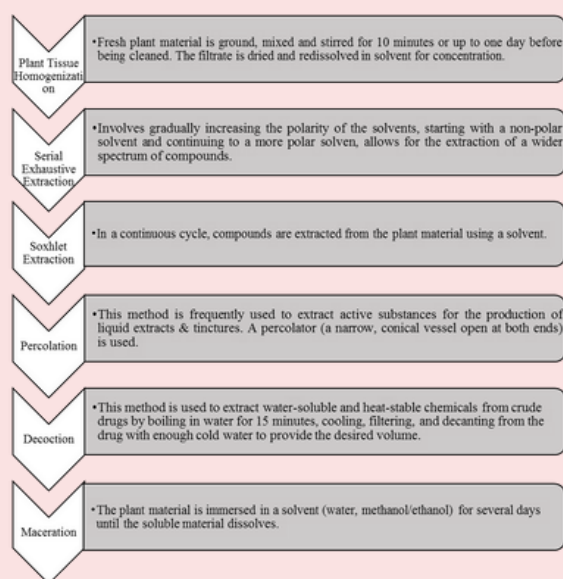


Figure 2. Extraction methods of phytoconstituents from *Ehretia laevis*

4. Phytochemical screening

Investigations have shown that the leaves, stem bark, root, fruit, seed of *Ehretia laevis* contain phytoconstituents, including primary metabolites and secondary metabolites from aqueous, ethanolic and ethyl acetate extracts (4).

Table 3. Phytochemical screening of *Ehretia laevis*

S.No.	Phytoconstituent	Part of Plant	Ethanolic extract	Aqueous extract	Ethyl acetate extract
1	Alkaloid	All Parts	+	-	-
2	Carbohydrates	All Parts	+	++	-
3	Triterpenoids	Leaves, Root, Seed	-	-	+
4	Phenolic Compounds	All Parts	+	+	-
5	Reducing sugar	Leaves, Stem bark, Root, Fruit	-	+	-
6	Flavonoids	Leaves, Stem bark, Fruit	+	+	+
7	Glycosides	Leaves, Root, Fruit, Seed	++	-	+
8	Sterols	All Parts	+	-	+
9	Saponins	Stem bark, Root	+	++	-
10	Proteins	Absent	-	-	-

5. Chemical constituents

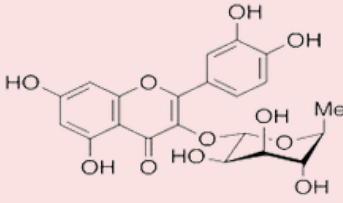
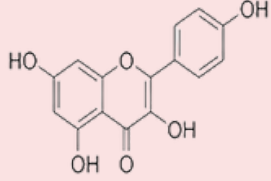

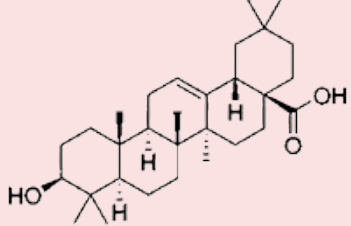
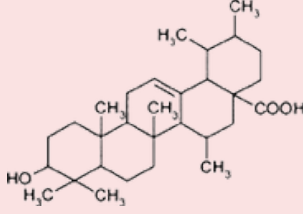
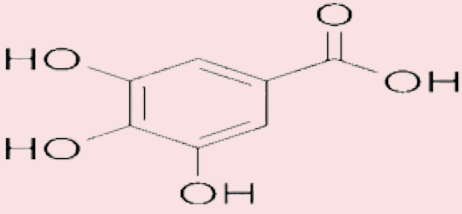
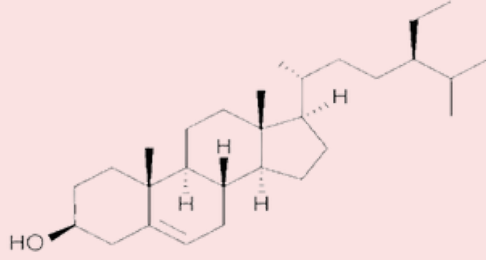
Table 4. Chemical constituents in parts of *Ehretia laevis* (8)

S. No.	Part	Chemical Constituent
1	Leaves	Rutin, Tannic acid, Ascorbic acid, naphthoquinone derivative minerals such as Sodium (Na), Calcium (Ca), Magnesium (Mg), Zinc(Zn), Copper (Cu), Lupeol, Gallic acid
2	Fruit	Betulin, Decanoic acid, phytol, piperazine, amyrin, phthalic acid, phenylephrine
3	Bark	Tannins, Baurinol, Phytol, Phenylephrine

Table 5. Chemical constituents & their role of *Ehretia laevis* (4)

S. No.	Chemical constituents	Role of chemical constituent
1	Flavonoid (Quercetin, kaempferol)	Antimicrobial, antioxidant, anti-inflammatory, anticancer and antimalarial
2	Decanoic acid	Antiseizure
3	Gallic acid	Treating Alzheimer's and Parkinson's disease by inhibiting the development of amyloid fibrils.
4	Phenylephrine	Decongestant, Hemorrhoids, vasopressor
5	β -sitosterol	Boost immunity and prevent influenza, rheumatoid arthritis, psoriasis
6	Decanoic acid	Antiseizure
7	Phytol	Antimalarial, Anti-inflammatory
8	α and β amyrin	Prevent persistent periodontitis-related bone loss.
9	Piperzine	Anti-helminthic
10	Phenylephrine	Decongestant, hemorrhoids, vasopressor
11	Betulin	Anti-inflammatory, Antipruritic, promotes skin cell differentiation, wound healing & cosmetic purposes. Inhibits the development of sterol regulatory element-binding protein (SREBPS) and reduces the production of cholesterol and fatty acids.
12	Lupeol	Chemoprotective, Anti-inflammatory and Antiprotozoal
13	Phthalic acid	Anti-viral against dengue, chikungunya
14	Ehretinine	Antimicrobial, anti-inflammatory, anticancer and antimalarial
15	Oleanolic acid	Antimicrobial, Neuroprotective, anti-inflammatory, anticancer and antimalarial

Table 6. Chemical structure of phytoconstituent (8)

S. No.	Phytoconstituent	Structure	
1	Flavonoids	 <p>Quercetin</p>	 <p>Kaempferol</p>
2	Alkaloids	 <p>Ehretinine</p>	
3	Saponins	 <p>Oleanolic acid</p>	 <p>Ursolic acid</p>
4	Phenolic acids	 <p>Gallic acid</p>	
5	Terpenoids	 <p>β-Sitosterol</p>	

6. Uses

Ehretia laevis, including its leaves, bark, stems, seeds and fruits, has long been used alone or in combination with other medicinal plants to treat various ailments.

Table 7. Uses of *Ehretia laevis* (10)

S.No.	Part of Plant	Preparation Used	Ailment/Use
1	All parts of plants	Decoction and juice	Abdominal pain
2	Root	Root extract	Acute and chronic inflammations
3	Fruits	Juice of fruits, decoction	Astringent, Diuretic, demulcent
4	Fruits and seeds	Decoction	Anthelmintic
5	Seeds	Three times a day, a paste made from soaked seeds and <i>Amomum subulatum</i> powder was administered with milk	Liver diseases/ jaundice
6	Bark	Bark paste has been used to treat pain, particularly in the lower limbs	Analgesic
7	Bark & stems	Decoction of stem and bark	Diphtheria
8	Powder of flowers	Flower powder mixed with the milk has been used as an aphrodisiac	Aphrodisiac
9	Powdered kernel	To treat ringworm infections, oil was combined with powdered kernel and administered topically to the afflicted region	Ringworm infection
10	Bark & leaves	Bark juice, leaf juice and decoction	Asthma, Malaria and fever
11	Leaves	Fresh leaves were used to make ghrit, which was then administered topically to the anal fissure twice daily for 21 days.	Fissure
12	Leaves	After making Kalka (paste), it was smeared all over the fracture. Cotton roll & pad were firmly applied. Kalka has a thickness of 0.5-1cm. For two weeks, this kalka Lepana was maintained in dressing for 24 hours per day.	Fracture
13	Leaves	Ten equal portions of leaf powder and sugar were combined & taken orally every day with goat milk or curd	Dysuria
14	Leaves	The leaves were mashed and wounds are treated topically with the resulting paste	Cuts and wounds
15	Leaves	The leaves were ground into powder and mixed with equal parts of sugar	Mouth blisters

7. Biological activity of *Ehretia laevis*

7.1. Anti-inflammatory activity

Ehretia laevis Roxb. extracts anti-inflammatory and antibacterial qualities were tested using agar well diffusion and carrageenan-induced rat paw edema. The results of the investigation showed that the aqueous, methanolic and chloroform extracts had significant anti-inflammatory efficacy (paw volume decreases). Outstanding antibacterial action against both Gram-positive like *Bacillus subtilis*, *Staphylococcus aureus* and Gram-negative like *Pseudomonas aeruginosa*, *Escherichia coli* bacteria, with the best efficacy being demonstrated by the methanolic extract activity against *Aspergillus niger* that is antifungal. According to these results, extracts from *Ehretia laevis* Roxb. Can be used as natural treatment for bacterial infections & inflammation (4).

7.2. Wound healing

Ehretia laevis is used for wound healing in Maharashtra, India's Wardha region, with promising outcomes. A paste prepared from *Ehretia laevis* leaves, which has a wide spectrum of antibacterial activity and may help cure anal fissures, was examined by Thakre et al. for its wound healing qualities (11).

7.3. Antimicrobial activity

Ehretia laevis Roxb, leaf extracts loaded silver nanoparticles shows: antimicrobial activity against various microorganisms, larvicidal activity (70% kill rate against *Culex quinquefasciatus* larvae), cytotoxic activity against HeLa (Henrietta Lacks) and MCF-7 (Michigan Cancer Foundation-7) cancer cells (LC50 (Lethal concentration): 12.7 and 14.5 µg/mL), dye degradation efficiency (~85% Congo red degradation within 8 hours). These nanoparticles have potential applications in water purification, cancer treatment, insect control and textile industry (6).

8. Marketed product

Khandu chakka oil is an ayurvedic medicine containing natural ingredients for effective pain relief, powerful blend of herbs and oils that works synergistically (8).



Figure 3. Khandu chakka oil

9. Conclusion

The synthetic medications are expensive, symptomatic, and often have a limited half-life. The inherent science of the *Ehretia laevis* was assessed, along with its scientifically proven properties, a safe and affordable method, and its medicinal uses which include anti-inflammatory, antimicrobial, antioxidant, and anticancer qualities that make them useful in the treatment of chronic illnesses. Additionally, it would be the greatest crop-cultivating opportunity to the farmers in terms of financial support.

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