



ANTIMICROBIAL PROPERTIES OF THE ROOT EXTRACT OF *DELONIX ELATA*

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ABSTRACT

The present study was carried out to explore the anti-microbial properties of the root extract of *Delonix elata*. In pharmaceutical and food industries plants are widely used due to their biological importance. Among the plant parts, leaves, stem, roots and bark are widely studied for their biological properties. Anti-microbial activity of fraction obtained from ethanolic extract of root was carried against *Bacillus subtilis*, *Escherichia coli*, *Staphylococcus aureus*, *Vibrio cholera*. The anti-microbial studies were carried by Kirby Bauer (well diffusion) method by measuring the zone of inhibition.

KEYWORDS: *Delonix elata*, anti-microbial, well diffusion and zone of inhibition.

INTRODUCTION

In the ancient India, medicinal plants were used to prevent various critical diseases.^[1] Even in recent years, there has been an increasing awareness about the importance of medicinal plants. Generally, herbal drugs are easily available, safe, less expensive, efficient, and rarely have side effects. According to World Health Organization, medicinal plants would be the best source to obtain variety of drugs.^[2] Medicinal plants contain some organic compounds which provide definite physiological action on the human body and these bioactive substances include some of the examples like tannins, alkaloids, carbohydrates, terpenoids, steroids, flavonoids and phenols. The bio-active phytoconstituents are synthesized by primary or rather secondary metabolism of living organisms. Secondary metabolites are chemically and taxonomically extremely diverse compounds with obscure function. They are widely used in the human therapy, veterinary, agriculture, scientific research and countless other areas. Medicinal plants containing active chemical constituents with high antioxidant property play an important role in the prevention of various degenerative diseases and have possible benefits to the humanity.^[3]

Delonix elata is commonly known as white gulmohur belonging to the family of Fabaceae and subfamily Caesalpinoidae. *Delonix elata* is not a classical Ayurvedic drug, but found included in Shodhala Nighantu under the Sanskrit name of ‘-Siddheshwara-’ during 12century AD. The medical usefulness of the tree is acknowledged by people living in the villages who

take a decoction of the leaves and barks to get relief from rheumatic problems like pain and stiffness of the joints, especially affecting the knees. It was observed that local people and Siddha practitioners in Tamil Nadu, India use the *Delonix elata* bark and leaves for treating inflammation and arthritic conditions. Extensive pharmacological studies on *D. elata* and vegetative parts exhibited anti-inflammatory, anti-arthritic, immune modifying potentials, anti-oxidant, anti-diabetic, anti-microbial, larvicidal, anti-diarrhoea, anti-pyretic, hepatoprotective activities.^[4-10]

Plant Profile

- Botanical Name : *Delonix elata* (L.) Gamble
- Synonym : *Poinciana elata*
- Family : Fabaceae
- Sub Family : Caesalpinaceae
- Common Name : White Gulmohur, White poincian

Vernacular Name

- Tamil - Vadhanarayanan, Perungondrai
- English - Yellow Gulmohur, Tiger bean, Creamy peacock flower
- Telugu - Chinnaseibiseri, Chittikeshwaramu
- Kannada - Nirangi, Vatanarayana
- Hindi - Waykaran, Sandeshra
- Marathi - Sanchaila, Sankasura
- Sanskrit - Siddhesvara

Taxonomic Classification

- Kingdom - Plantae

- Phylum - Tracheophyta
- Class - Magnoliopsida
- Order - Fables
- Family - Fabaceae
- Genus - Delonix
- Species - *Delonix elata* (L.) Gamble
- Habitat - Terrestria

Distribution: The species is globally distributed in tropical areas like Africa, Egypt, Arabia to India (Kathiawar and South India).

Description: *Delonix elata* is a perennial, medium-sized, deciduous tree about 2.5-15 meter tall with a spreading, rather rounded crown and very attractive white fragrant flowers. Crooked poor stem form and drooping branches. Bark smooth, shining; sometimes flaking.



Fig: 1 - Whole plant.

Leaves: 3-6 or more, bipinnate; pinnae usually 4-6 pairs; leaflets 10-14 pairs oblong or oblanceolate-oblong, 0.6-1.2 cm long. Leaflets 1.25-4 mm wide.



Fig: 2 - Leaves of *Delonix elata*.

Flowers: Terminal corymbs; stalks pubescent, lowest flowers stalks longest. Flowers open one at a time. Sepals 1.8 cm long, with a broadly ovate or rotundate-cuneate lamina narrowing into a distinct claw. Petals rounded in outline and crisped on margins 1.6-3.8 cm long, 1.8-4.2 cm wide; upper one smaller than rest, pale yellow; the remainder white; later all turning apricot. Staminal filaments pale brown or reddish, hairy at the base, 5-10 cm long; pedicels up to 3.75 cm. Ovary pubescent or tomentose all over.



Fig: 3 - Flower of *Delonix elata*.

MATERIALS AND METHODS

Collection of plant

The roots of *Delonix elata* were collected from different parts of Coimbatore and Namakkal. Taxonomic authentication of the plant was done by Dr. M. U. SHARIEF, Botanical survey of India, Coimbatore.

Preparation of plant extracts

The extraction of the *Delonix elata* root was carried out using known standard procedures.^[11,12] The collected plant material was cleaned, dried in shade and powdered in a mechanical grinder. About 60g of fine dried powdered root of *Delonix elata* was mixed with 150mL of ethanol (75%) using an Ultra Turax mixer for 1min and soaked overnight at room temperature. The sample was then filtered through Whatman No.1 paper in Buchner funnel. The filtered solution was kept in a rotavator at 40°C, then the dried powder filtrate of the root of *Delonix elata* dissolved using solvent was stored inside a freezer below 10°C for the further investigation.

Phytochemical Studies

Phytochemical screening of *Delonix elata* root extract was assessed by standard method as described by Savithamma et al and Selvaraj et al.^[13,14]

Test for Tannins: One mL of the root extract was added to 1 mL of 5% ferric chloride. Formation of dark blue or greenish black indicates the presence of tannins.

Test for Flavonoids: One mL of the root extract was added to 1 mL 2N sodium hydroxide. Formation of yellow color indicates the presence of flavonoids.

Test for Alkaloids: One mL of the root extract was added to 2 mL of concentrated hydrochloric acid. Then few drops of Mayer's reagent was added. Presence of green color or white precipitate indicates the presence of alkaloids.

Test for Glycosides: One mL of the root extract was added to 3 mL chloroform and 10% ammonium solution. Formation of pink color indicates the presence of glycosides.

Test for Phenols: One mL of the root extract was added to 2 mL distilled water followed by few drops of 10% FeCl₃. Formation of blue/green color indicates the presence of phenols.

Test for Coumarins: One mL of the root extract was added to 1 mL 10% NaOH. Formation of yellow color indicates the presence of coumarins.

FT-IR Studies

This method tries to assess functional groups present in a compound. Knowledge of the functional group helps in defining the physical and chemical properties of a given compound. Also, single, double, and multiple bonds were identified through this process. The technique involves passing an organic compound through infrared radiation, which is absorbed in certain frequencies. Liquid samples are identified using sodium chloride plates, whereas solids samples are determined using potassium bromide milled together and compressed into a thin pellet. The result is recorded as a spectrum that is percentage transmittance. Lastly, the spectra are analysed; the peaks obtained at certain wave number were compared with standard reference.

Antimicrobial susceptibility test

Anti-microbial susceptibility test was performed by Kirby Bauer (Well diffusion) method. **Protocol:** 24 h grown culture (*Bacillus subtilis*, *Escherichia coli*, *Staphylococcus aureus*, *Vibrio cholera*) were taken and diluted to 10⁸ CFU / ml using McFarland standard. Muller Hinton agar plates were prepared. The diluted cultures were swabbed over the surface of the medium. The plates were dried for few minutes and using a sterile cork borer (7 mm in dm) wells were punctured. 100 µl of the samples were loaded in the well (Duplicates). All the plates were incubated (For bacteria 37°C for 24 h and for fungus 25°C for 7 days). After incubation period the zone of inhibition was measured using antibiotic zone scale and reported.

RESULTS AND DISCUSSION

Phytochemical Screening

Phytochemical screening was the basic strategy for identifying the bioactive compounds present in the various parts of the plant *Delonix Elata L*. The compounds such as alkaloids, flavonoids, and saponins act as a good anti-microbial, anti-cancer anti-oxidant properties. It was previously reported that the plant *Delonix Elata L* was used for cure jaundice, bronchial and rheumatic problems. It also having anti-fungal, anti-viral, hepatoprotective, wound healing, and analgesic activity. So that the chosen plant would possess enough characteristics for anti-microbial activity. The results of phytochemical screening were recorded in the table 1, (+) indicates the presence of phytochemicals and (-) indicates the absence of phytochemicals.

The phytochemical test with ethanolic root extract of *Delonix elata*, manifest the presence of various phytoconstituents like alkaloids, glycosides, tannins, flavonoids, phenols, coumarins.

Tab: 1 - Results of Phytochemical screening of ethanolic extract of root *Delonix elata L*.

S. No	Test	Ethanolic Extract of Root
1	Test for Tannins	+
2	Test for Flavonoids	+
3	Test for Alkaloids	+
4	Test for Glycosides	+
5	Test for Phenols	+
6	Test for Coumarins	+

FT-IR Spectrum Analysis

The IR spectrum of ethanolic root extract of plant *Delonix elata* was studied by using FT-IR spectroscopy by KBr disk method. The results obtained from FT-IR shows the presence of functional group present in the extracts.

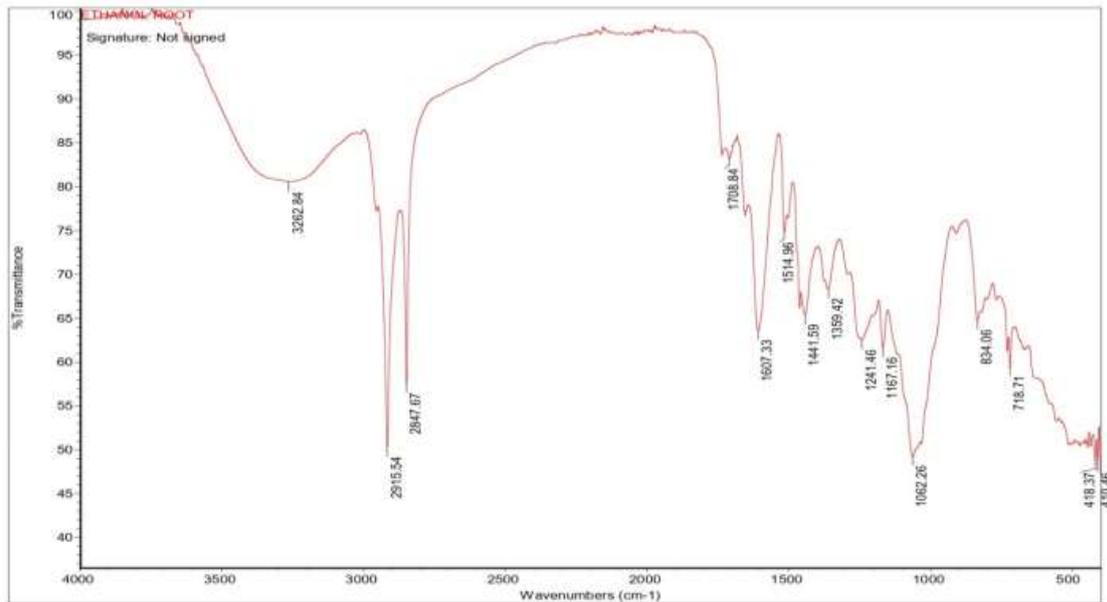


Fig 4 - FT-IR spectrum of Ethanolic Root extract of *Delonix elata*.

Antimicrobial susceptibility test

Anti-microbial susceptibility test was performed by Kirby Bauer (Well diffusion) method. The study shows the presence of anti-microbial activity for the root extract

against the selected organisms. The extract showed better results for organisms *Escherichia coli* and *Bacillus subtilis*.

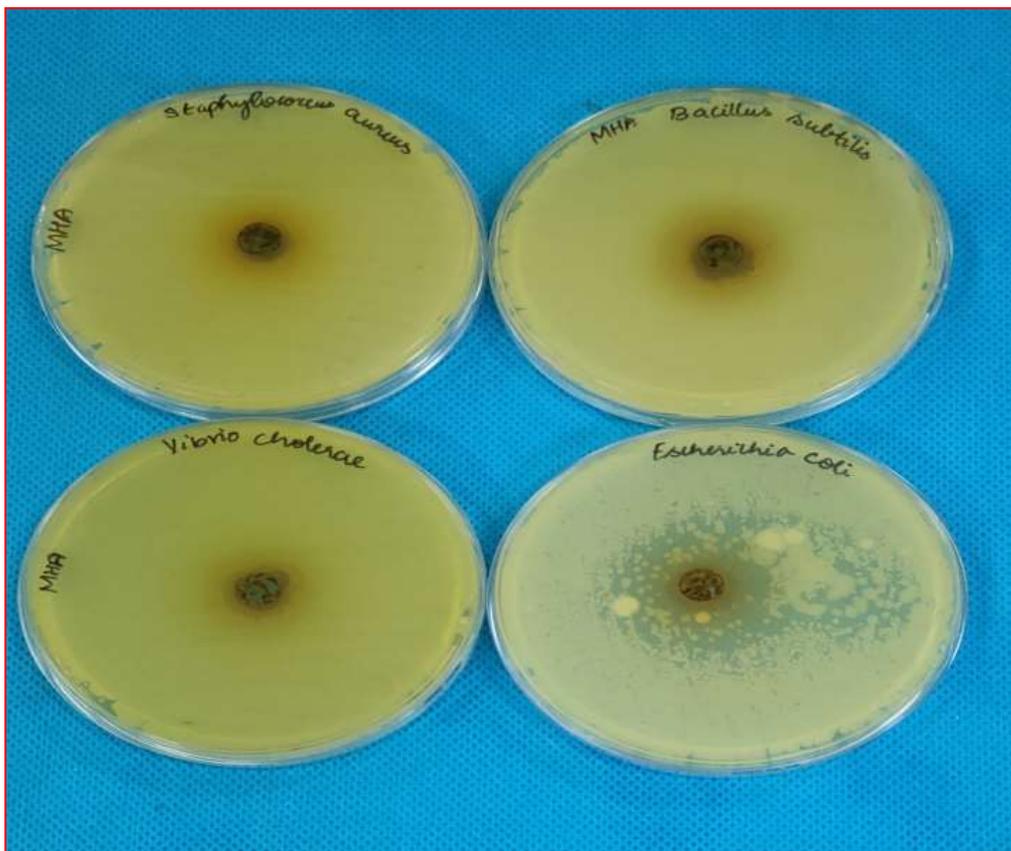


Fig 5 – Anti-microbial studies of Ethanolic Root extract of *Delonix elata*.

CONCLUSION

In the present study the ethanolic root extract of *Delonix elata* manifested the presence of various

phytoconstituents in the phytochemical screening of extracts. The results obtained from FT-IR also shows the presence of functional groups present in the extract. The

study shows the presence of anti-microbial activity for the root extract against the selected organisms. The extract showed better results of anti-microbial activity for organisms *Escherichia coli* and *Bacillus subtilis*. This shows that the root extract can be used for medicinal purposes. The presence of phytochemicals in this study might be a factor for the antibacterial activity of *Delonix elata*. Further anti-microbial studies using different microorganisms must be performed in order to find out the true property of root extract.

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