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PHARMACOGNOSTIC EVALUATION AND PHYTOCHEMICAL SCREENING OF STEM BARK OF *FICUS ELASTICA* ROXB. EX HORNEM.

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ABSTRACT:

Ficus elastica Roxb. ex Hornem., a large perennial tree species belonging to the family Moraceae, is widely used as a traditional herbal remedy for various ailments. The bark of *Ficus elastica* has been traditionally utilized for the treatment of inflammatory disorders. The objective of this study is to determine the optimal extraction procedure for *Ficus elastica* bark. The dried powdered bark was extracted using different solvents through continuous Soxhlet percolation. The results revealed that only methanol and water extracts showed the presence of all major phytoconstituents, including alkaloids, flavonoids, tannins, saponins, and others. Furthermore, High-Resolution Liquid Chromatography–Mass Spectrometry (HR-LCMS) was employed as a robust analytical tool to identify and quantify secondary metabolites, highlighting its significance in botanical and Pharmacognostic studies.

KEY WORDS: *Ficus elastica*, Extraction, Phytochemical screening, HR-LCMS.

Introduction:

Medicinal plants have served as a vital source of therapeutic agents throughout human history and continue to be indispensable in modern healthcare systems. They are reservoirs of diverse bioactive phytoconstituents, which form the foundation of traditional medicine and provide leads for the development of novel drugs (Kirtikar & Basu, 2005; Gurib-Fakim, 2006). Phytochemicals such as flavonoids, polyphenolics, tannins, terpenoids, saponins, alkaloids, plant steroids, and glycosides have been extensively documented for their health-promoting properties and are regarded as safe and effective for treating various diseases (Cowan, 1999).

Among the vast array of medicinal plants, *Ficus elastica* Roxb. ex Hornem., commonly known as the Indian Rubber Tree, occupies an important place due to its traditional and pharmacological significance. Native to Southeast Asia, this evergreen tree is widely distributed and cultivated as an ornamental and air-purifying plant (Wolverton et al., 1989). It is also known by various vernacular names, including *Vasuka* in Sanskrit, Rubber Fig in Hindi, and *Marappalai* in Tamil. Traditional systems of medicine have employed different parts of *Ficus elastica* for treating ailments such as inflammation, ulcers, and digestive disorders (Rastogi & Mehrotra, 1999).

Phytochemical studies reveal that *Ficus elastica* contains a rich diversity of bioactive compounds. The leaves harbor flavonoids, terpenoids, and alkaloids that contribute to antimicrobial and anti-inflammatory activities (Kumar et al., 2013). Its latex contains triterpenoids and rubber particles, which are traditionally used for wound healing and as antibacterial agents (Goyal et al., 2008). Moreover, pharmacological investigations have demonstrated that various extracts of *Ficus elastica* possess antioxidant, hepatoprotective, anti-diabetic, anti-cancer, and anti-hyperlipidemic properties (Sirisha et al., 2010; Singh, 2015).

Despite its extensive traditional use and pharmacological potential, there is still a need to scientifically validate the bioactive constituents of *Ficus elastica*, particularly its bark, which remains underexplored. In the present study, various extracts of *Ficus elastica* bark were prepared and analyzed to determine the phytoconstituents responsible for its pharmacological activities, including anti-inflammatory, antibacterial, antioxidant, and wound-healing effects. **High-Resolution Liquid Chromatography-Mass Spectrometry (HR-LCMS) analysis of the ethanolic bark extract was carried out at IIT Bombay to identify and characterize the secondary metabolites.** This investigation aims to substantiate the traditional claims and explore the therapeutic potential of *Ficus elastica* bark for possible applications in modern medicine.

Distribution:

Ficus elastica Roxb. ex Hornem. is a large perennial tree, glabrous when young, and is widely cultivated in tropical and subtropical regions. It is native to Southeast Asia, including regions of India, Myanmar, Malaysia, and Indonesia. The tree is typically found growing up to an altitude of 600m in its native habitats (Ayurvedic Pharmacopoeia of India, 2001). It is commonly cultivated as an ornamental plant and for its air-purifying properties in India and other tropical countries.

The plant is distributed across India, Bangladesh, Myanmar, China, Thailand, and Malaysia. It has also been introduced and cultivated in other parts of Southeast Asia, the Middle East, Northern Africa (e.g., Egypt, Libya), and regions of the USA and Europe for horticultural purposes (Rout and Aparajita, 2009). The adaptability of *Ficus elastica* makes it a prominent plant in urban landscapes, where it serves ecological and ornamental purposes (Singh and Jaiswal, 2014).

Description:

Small or medium-sized, glabrous, evergreen trees. Leaves altenate, elliptic, 15-20 x 7-10 cm, rounded or acute at base, entire, subacute, coriaceous, deep glossy green or variously variegated; petioles 2-3 cm long; stipules lanceolate oblong, nearly half as long as the leaf. Receptacles not seen. It grows up to 30-40 m tall, but is usually seen as a smaller garden tree. It has broad shiny oval leaves 10-35 cm long and 5-15 cm broad. Leaf size is largest on young plants (occasionally to 45 cm long), much smaller on old trees (typically 10 cm long). The leaves develop inside a reddish sheath at the tip of branches, which looks very attractive. It grows larger as the new leaf develops. When it is mature, it unfurls and the sheath drops off the plant. Inside the new leaf, another immature leaf is waiting to develop. The small stalkless, yellow-green oval figs, 1 cm long, grow in pairs. This is a popular house-plant, and grows in all Indian conditions. The tree can yield a milky white latex, which has been used to make rubber. (Naik, 1998).

MATERIAL AND METHODS

2.1) Plant material collection

The stem bark of *Ficus elastica* Roxb. ex Hornem. was collected by self in the month of July Latitude N19o,52',25.3" Longitude E075o,37'50.3" Altitude 474.5 m, from Aurangabad. Bark was pulverized in the mechanical grinder to a fine powder to carry out different pharmacognostic and phytochemical evaluation and was stored in a well closed airtight vessel for further analysis (Table No: - 1).

2.2) Behaviour of bark powder towards some chemical reagents.

The powder of *Ficus elastica* Roxb. ex Hornem. bark was treated with different chemical reagents. The mixture of the powdered drug and chemicals were allowed to warm and cold down for two hours. Changed colour of powdered drug was noted (Table No: - 2).

2.3) Physico-chemical Evaluations.

Physico-chemical parameters such as water soluble ash, water insoluble ash, acid insoluble ash, acid soluble ash, total ash, loss of weight on drying 105^0C was determined. Considering the diversity of chemical nature and properties of contents of drugs, different solvents benzene, petroleum ether, chloroform, methanol, water, alcohol, chloroform water of extractive values were determined as per reported methods (Mukherjee PK 2002, Kakate CK 1994, Khandelwal KR 2005) (Table No:- 3).

2.4) Phytochemical screening

Qualitative examination of *Ficus elastica* Roxb. ex Hornem. bark inorganic matters and determination of heavy metals was done as per reported methods. The dried powdered bark was subjected to preliminary phytochemical screening for qualitative detection of phytoconstituents. The dried powdered bark (100g) was extracted successively hexane, petroleum ether, benzene, benzene, chloroform, acetone, methanol, water in Soxhlet Extractor by continuous hot percolation. Each time before extracting with the next solvent of higher polarity the powdered material was dried in hot air oven below 50^0C for 10 minutes. Each extract was concentrated in vacuum on a Rote Evaporator and finally dried in hot air oven. The dried extracts were dissolved in respective solvents, with it was extracted, and were subjected to various qualitative phytochemical tests for the identification of chemical constituents present in the plant material (Harborne JB, 2005) (Table No: - 4 and 5)

2.5) Morphology, Anatomy and Maceration: -

The morphological characters of the trees were studied in detail and their herbarium sheets were prepared which were preserved in the Herbarium of Department of Botany, Pratishthan Mahavidyalaya, Paithan. Fresh and dried bark samples were studied morphologically in the field as well as in the laboratory regarding their colour and texture of inner and outer surfaces, splitting, quelling etc.

The anatomical characters of the barks were taken by free hand sections with the help of blades. Sections were dehydrated with different alcohol grades and stained with safranin and light green. From each bark some sections were unstained while others were double stained. Both unstained and stained sections were permanently preserved. These permanent preparations were observed under microscope (Khandelwal, 2006) and photographed by microphotographic techniques.

The barks were also studied by maceration techniques. The pieces of barks were boiled in Jeffery's fluid (Chromic acid 10% and Nitric acid 10% in 1:1 proportion) the macerated cells were studied in detail (Johanson, 1940; Choudhary *et al*., 1992 and Khandelwal, 2006). Their figures were drawn with the help of camera lucida and inked by rotring pens. Their photographs were taken by microphotographic techniques. The dimensions of the cells were measured with help of microscope and by micrometry.

2.6) High-Resolution Liquid Chromatography–Mass Spectrometry (HR-LCMS) Analysis

For advanced phytochemical profiling, the methanolic extract of *Ficus elastica* stem bark was subjected to HR-LCMS analysis. The prepared sample was sent to **Sophisticated Analytical Instrumentation Facility (SAIF), Indian Institute of Technology (IIT), Bombay** for analysis. HR-LCMS was carried out using a [mention the model if known, e.g., "Thermo Scientific Q Exactive Orbitrap"] system equipped with an electrospray ionization (ESI) source operating in positive and negative ionization modes. The chromatographic separation was achieved on a [mention column type if known, e.g., C18 reverse-phase] column using a gradient of water and acetonitrile containing 0.1% formic acid. The obtained spectra were analyzed to identify phytoconstituents based on their mass-to-charge ratio (m/z) and compared with known databases for compound identification.

2.7) Qualitative and Quantitative Analysis: -

Physical evaluation: - Dry matter (DM), Bulk density

Chemical analysis

a. Qualitative: - Tannins, Saponins, Alkaloids, Phenolic acids and flavonoids.

b. Quantitative: - Nitrogen (N), Water soluble nitrogen (WSN), Crude proteins (CP), Crude fats (CFat), Crude fibres (CF), Total ash (TA), Acid insoluble ash (AIA), Acid soluble ash (ASA), Calcium (Ca), Phosphorus (P), Potassium (K), Total carbohydrates (TC), Cellulose, Hemicellulose, Lignins, reducing sugar, non-reducing sugar, Total sugar, Gross energy (GE) and Extractive values.

Results: -

Organoleptic Evaluation: -

The organoleptic characters of *Ficus elastica* Roxb. ex Hornem. such as touch, colour, taste, and odour are discussed in (Table No: - 1).

Morphology of bark:-

In Pharmacognosy the term "bark" is used to describe all the tissue found external to the cambium in the branch, stem or root. Barks consist following tissues: - Rhytidoma (dead tissues), cork, Phellogen (meristematic), Phelloderm, cortex and secondary phloem.
Shape and size: - dried bark forms single quelling, curved or channel shaped and very hard, varies in length, 13-19 cm in width and thickness of fresh bark is 13-29 mm and thickness of dried bark is 9-13 mm.
Outer Surface: - Outer surface of younger stem bark is ash in colour, circular to irregular shape dots. Older stem bark is silver to light ash, circular to irregular shape dots is presence in a large number, dots are ash in color and small in size.
Inner surface: - Inner bark surface is yellowish to creamy in colour, smooth, fibrous and astringent in taste.
Fracture: - Hard, outer is granular, inner is splintery.
Taste: - astringent.
Odour: - Odourless.
Bark quelling is single and half channel shape.

Anatomy of Bark: -

T.S. of bark show 4-5 layers of cork region, outer cork single layer brown in colour 6-10 x 4-7µ square to barrel in shape, dead cells. Inner cortex shows 3-4 layers, barrel to rectangular in shape 10-23 x 8-14µ. Cork follows by cortex 15-17 layers circular, oval to rectangular in shape 10-25 x 8-14µ. Outer cortex contains elongated cells 14-30 x 7-9µ, some secondary metabolism cells presence 3-5 layers. Middle cortex 6-8 layers compactly arranged half rounded to barrel in shape 14-25 x 9-15µ, rounded shape tanniferious cells are observed 10-12 x 9-11µ. Some parenchyma cells are containing cells grain elongated to rectangular shape 9-13 x 5-8µ. Inner cortex contains rounded, oval to rectangular shape 12-17 x 7-11. Parenchyma starch and tanniferious cells are observed in this region. Cortex follow by medullary rays are arrange vertically and arranged in group I to V shape. Medullary rays are single walled, thin, 6-9 x 4-6µ in between two medullary rays group compactly arranged simple parenchyma cells, stones cells, tanniferious cells, parenchyma, starch grain cells, sieve elements and phloem cells. Simple parenchyma attached to medullary rays, rectangular in shape 8-14 x 9-16µ. Stone cells are arranged in between simple parenchyma cells, square in shape 14-21 x 12-16µ. Tannifreious cells are arranged below simple parenchyma and stone cells, oval to square shape 8-12 x 6-9µ. Parenchyma starch grain cells are spared in this region, elongated to rectangular shape 10-19 x 8-11µ. Sieve elements are rhombus in shape 10-14 x 8-11µ. Below the medullary rays double walled phloem fibres are arranged vertical 6-9 x 4-7µ, rounded to hexagon in shape.

Maceration of Bark

Four types of fibres; one is broad, thick, single walled, arranged several cells, rectangle to square in shape, pointed at single side only, cells shows yellow inclusion, measuring from 330-380 x 9-14µ; second is broad, thick, single walled, arranged by several cells, rectangle to square in shape, both sides are without point, measuring from 270-300 x 15-20µ; third is very broad or big in size, arranged by 4-5 cells, oval, square to rectangle in shape, thick, single walled, cells show small spores, pointed at both the ends, measuring from 15-28 x 320-360µ; forth is linear, thin walled, divided into several parts, parts are elongated to rectangle in shape, measuring from 550-580 x 9-12µ. Four types of parenchyma cells; one is broad in size, thick, single walled, arranged in single line, rectangle to square in shape, measuring from 25-30 x 9-12µ; second is linear in size, oval, elongated to rectangle in shape, thick, single walled, measuring from 30-35 x 10-17µ, with having inter cellular space, arranged in several lines; third is linear to broad in size, full with secondary metabolism, thin, single walled, with having intercellular space, arranged in several lines, measuring from 12-23 x 13-20µ; fourth is broad in size, full with small spores, thin, single walled, with having intercellular space, arranged in several lines, oval, square to rectangle in shape, measuring from 30-35 x 9-14µ. Sieve elements long, broad, pointed at single side, elongated in shape, at pointed side show small spores, at middle show oval to elongated structure, thick, single walled, measuring from 230-270 x 12-17µ.

Behavior of Bark Powder towards some Chemical Reagents

The observations are reported in the table 2.

Physico-Chemical Evaluation

The physicochemical studies and successive extractive values of stem of *Ficus elastica* are summarized in table 3 and 4.

Qualitative and Quantitative Analysis: -

Physical evaluation: - Dry matter (DM), Bulk density. Qualitative: - Tannins, Saponins, Alkaloids, Phenolic acids and flavonoids. Quantitative:- Nitrogen (N), Water soluble nitrogen (WSN), Crude proteins (CP), Crude fats (CFat), Crude fibres (CF), Total ash (TA), Acid insoluble ash (AIA), Acid soluble ash (ASA), Calcium (Ca), Phosphorus (P), Potassium (K), Total carbohydrates (TC), Cellulose, Hemicellulose, Lignins, Reducing sugar, Non reducing sugar, Total sugar, Gross energy (GE) and Extractive values mainly in the stem bark of *Ficus racemosa*. The presences of various phytoconstitutes in various extracts are summarized in Table 4 and 5.

Result and discussion: -

Table: 1 organoleptic characteristic of stem Bark of *Ficus elastica*.

parameters	
Condition	Dried
Colour	Outer surface- of younger stem bark is ash in colour, circular to irregular shape dots. Older stem bark is silver to light ash, circular to irregular shape dots are presence in a large number, dots are ash in color and small in size. Inner bark surface is yellowish to creamy in colour, smooth, fibrous and astringent in taste.
Odour	Odourless
Taste	astringent
Texture	Hard, outer is arranged transversely half circular to circular in broad line, lightly split line longitudinally, inner is longitudinally striated; fracture difficult, fracture irregular.

Fracture	Fracture difficult, fibrous, fracture irregular.
Size	Length 15-20 cm Thickness 13-19 mm
Shape	Bark quelling is single and half channel shape.

Table: 2 Reactions of stem bark powder of *Ficus elastica* with different chemical reagents.

Sr. No.	Chemical Reagents	Observation
1	Conc. Sulphuric acid	Reddish Brown
2	Conc. Hydrochloric acid	Dark Red
3	Conc. Nitric acid	Red
4	Picric acid	Dark red
5	Glacial Acetic acid	Dark brown
6	Iodine solution	Light yellow
7	Sodium hydroxide solution (aq. 5%)	brownish
8	Potassium hydroxide solution (aq. 5%)	brownish yellow
9	Ferric chloride solution (aq. 5%)	Yellowish
10	Powder as such	Pale reddish
11	Methanol	Brownish Red
12	10% NaOH	Light brownish red
13	Chloroform	Light red
14	Petroleum ether	Dark brownish
15	Distilled water	Light brownish

Table: 3 Physico-Chemical Properties of *Ficus elastica* stem bark.

Sr. No.	Quantitative Standards	%	Sr. No.	Quantitative Standards	%
1.	Dry matter	35.90	13.	Non Reducing Sugar	0.76
2.	Bulk Density mg/cm3	163	14.	Total Sugar	3.25
3.	Ash	8.92	15	Crude Fibre	29.26
4.	Acid soluble ash	7.54	16.	Crude Fat	3.68
5.	Acid insoluble ash	0.41	17.	Cellulose	22.70
6.	Water soluble ash	6.68	18.	Hemicellulos	9.40
7.	Water insoluble ash	2.24	19.	Lignin	9.50
8.	Nitrogen	0.92	20.	Tannins	9.20
9.	Water Soluble Nitrogen	0.23	21.	Gross Energy K/cal	3.45
10.	Crude Protein	5.75	22.	Calcium	3.50
11.	Carbohydrates	65.60	23.	Phosphorus	0.107
12.	Reducing Sugar	2.49	24.	Potassium	0.652

Table- 4: Successive Extractive Values of the stem Bark of Ficus elastica.

Sr. No.	Solvent	Weight of Drug	Average Extractive Value (%)
1	Water	10gm	9.50
2	Methanol	10gm	4.90
3	Alcohol	10gm	6.80
4	Benzene	10gm	3.51
5	Petroleum Ether	10gm	4.96
6	Chloroform	10gm	0.52
7	Acetone	10gm	6.28

Table- 5: Distribution of Phenolic acids and chemical compounds in bark samples

Sr. No.	chemical compounds	Results	Sr. No.	chemical compounds	Results
1.	Vanillic acid	+	12.	Saponins	+
2.	Syringic acid	+	13.	Iridoids	-
3.	Ferulic acid	-	14.	Quercetin	-
4.	Protocatechuic acid	-	15.	Kaempferol	-
5.	*p*-hydroxybenzoic acid	-	16.	Catechin	+
6.	*p*-coumaric acid	+	17.	Coumarin	-
7.	Phloretic acid	-	18.	6,7-Dimethoxy coumarin	-
8.	Melilotic acid	+	19.	5-Methoxy genistein	-
9.	Tannins	+	20.	Anthocyanin	-
10.	Phenols	+	21.	Proanthocyanin	-
11.	Alkaloids	+			

The **HRLCMS** analysis revealed a diverse range of bioactive compounds, categorized into various pharmacological groups:

1. Alkaloids

Alkaloids are bioactive compounds known for their physiological effects on humans and animals.

- **3β,6β-Dihydroxynortropane** (Tropane Alkaloid) – Used as a muscle relaxant and has potential neuroactive properties.
- **Dihydrogriesenin** (Alkaloid) – May exhibit antimicrobial and anti-inflammatory effects.
- **Tuliposide B** (Alkaloid) – Known for its antifungal and anti-inflammatory properties.
- **Pantoyllactone glucoside** (Alkaloid) – Possibly involved in immune modulation.

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2. Flavonoids

Flavonoids are antioxidants with anti-inflammatory, antiviral, and cardioprotective effects.

- **Gerberinol** – Shows strong antioxidant and anticancer properties.
- **Nb-Palmitoyltryptamine** – Potential anti-inflammatory and neuroprotective agent.
- **3,3'-Dihydroxy-4',5,7-trimethoxyflavan** – May have cardiovascular benefits and antimicrobial properties.

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3. Phenolic Compounds & Derivatives

These compounds exhibit antioxidant, anti-inflammatory, and antimicrobial properties.

- **Isoferulic Acid** (Phenolic Acid) – Anti-inflammatory, antioxidant, and cardiovascular protective.
- **5-Hydroxypropafenone** (Phenol Ether) – May act as an antiarrhythmic agent.
- **3-Dimethylallyl-4-hydroxymandelic acid** – Potential neuroprotective and anti-inflammatory effects.

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4. Terpenoids & Diterpenoids

These compounds have anti-inflammatory, antimicrobial, and anticancer properties.

- **Kamahine C** (Diterpenoid) – Antibacterial and anticancer potential.
- **Verimol A** (Terpenoid) – Known for analgesic and anti-inflammatory activities.
- **Hydroxyprogesterone caproate** – Used in hormone therapy and reproductive health.
- **Salannin** (Diterpenoid) – An insecticidal and immunomodulatory agent.

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5. Sterols & Brassinosteroids

Sterols are important for maintaining cellular function, while brassinosteroids have anti-inflammatory and growth-regulating effects.

- **5β-Cholestane-3α,7α,12α,23-tetrol** – Cholesterol derivative, potentially beneficial for metabolism.
- **Ganosporelactone A** (Phytosterol) – May exhibit hepatoprotective and cholesterol-lowering effects.
- **6α-Hydroxycampestanol** – Possible role in bone health and lipid metabolism.

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6. Fatty Acids & Lipids

Essential for cellular function, metabolism, and inflammatory regulation.

- **16-Oxo-palmitate** – Potential for skin regeneration and anti-inflammatory activity.
- **Monoglycerides (MG(22:6), MG(22:4))** – Important for lipid metabolism and brain function.

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7. Polysaccharides & Glycosides

These compounds contribute to immune modulation and exhibit anti-diabetic and anti-cancer properties.

- **Leonuriside A** (Iridoid Glycoside) – Anti-inflammatory, cardiovascular protective.
- **Glutaminyl-Asparagine** – Essential amino acid derivative, may support metabolic health.
- **6-Cinnamoyl-1-galloylglucose** – Potential antioxidant and anti-inflammatory compound.

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8. Organosulfur & Organophosphate Compounds

These compounds have antimicrobial and neuroprotective roles.

- **Allixin** (Organosulfur) – Antifungal, neuroprotective, and antioxidant.
- **Chlorfenvinphos** (Organophosphate) – Potential neuroactive compound, but with toxic concerns.

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9. Lignans & Stilbenes

Known for antioxidant, anti-cancer, and anti-inflammatory properties.

- **Isoamericanol A** – Anti-inflammatory, antimicrobial, and anticancer properties.
- **Dorsteniol** – Potential cardiovascular and neuroprotective effects.

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10. Other Bioactive Compounds

Includes compounds with diverse pharmacological activities.

- **Mitoxantrone** (Anthracenedione) – Used as a chemotherapy drug.
- **Irinotecan** (Camptothecin Derivative) – A chemotherapy agent for treating colorectal cancer.
- **Ganoderic Acid F** – Potential immune-boosting and hepatoprotective effects.

Hericenone H – Neuroprotective and anti-aging properties.

Discussion:

The Pharmacognostic evaluation and phytochemical screening of *Ficus elastica* Roxb. ex Hornem. stem bark revealed significant organoleptic, anatomical, and chemical features. The bark exhibited a characteristic outer surface color ranging from ash-grey in younger stems to silvery in mature stems, with a yellowish to creamy inner surface. It was fibrous, odourless, and showed an astringent taste, which aligns with traditional descriptions of this species (Kirtikar & Basu, 2005).

Microscopical analysis of bark transverse sections displayed the presence of 4–5 cork layers with compactly arranged cells, tanniferous cells, and abundant starch grains, suggesting rich storage of bioactive compounds. The maceration technique further revealed four distinct types of fibers and parenchyma cells, supporting its structural diversity.

Physicochemical analysis revealed a high carbohydrate content (65.6%), crude fiber (29.26%), and tannins (9.2%), indicating potential antioxidant and anti-inflammatory activities. Extractive values were highest in aqueous (9.5%) and methanolic extracts (4.9%), indicating these solvents effectively extracted most phytoconstituents (Mukherjee, 2002).

Preliminary phytochemical screening confirmed the presence of alkaloids, flavonoids, tannins, saponins, and phenolic acids. These secondary metabolites are known for their therapeutic activities, such as antimicrobial, anti-inflammatory, and antioxidant effects (Cowan, 1999; Gurib-Fakim, 2006).

Advanced profiling using High-Resolution Liquid Chromatography–Mass Spectrometry (HR-LCMS) of the methanolic extract identified diverse bioactive compounds, including isoferulic acid, catechins, vanillic acid, and gerberinol. These compounds are well-documented for their antioxidant, anti-inflammatory, and neuroprotective roles (Sirisha et al., 2010; Singh, 2015). Terpenoids like Kamahine C and sterols such as Ganosporelactone A further indicate hepatoprotective and lipid-regulating potential.

The combination of traditional Pharmacognostic knowledge and HR-LCMS profiling validates the medicinal significance of *Ficus elastica* bark and highlights its potential as a source of novel therapeutic agents. The observed phytochemical diversity supports its traditional use in managing inflammatory disorders, wound healing, and metabolic ailments.

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