

# Comprehensive and multidisciplinary review on *Ficus racemosa* Linn

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## ABSTRACT

**Background:** -*Ficus racemosa* Linn. which is belonging to the family Moraceae, commonly known as Cluster fig, Gular fig, Gular, etc. is sacred and has golden coloured exudates and black bark. An organized summary of the morphology, histology, phytochemistry, and pharmacology of the *Ficus racemosa* plant was done to explore the future therapeutic and scientific potential of the herb.

**Main Body:** -*Ficus racemosa* Linn. is an evergreen large shrub belonging to the Moraceae family and throughout comprehensively utilized as a medicinal herb. Widely used in dysentery, jaundice, diabetes, inflammatory condition, diarrhoea, mental obsession, chemo-preventive material, etc. Various databases, such as PubMed, Google Scholar, Science Direct, and Scopus, were used to conduct a literature review. More than 50 *Ficus racemosa* (*F. racemosa*) records from ancient literature, printed books, libraries, and the internet were discovered. The database, "The Plant List" was used to confirm the plant taxonomy.

**Conclusion:** -Phytochemical assessment of different parts of the *Ficus racemosa* plant showed the presence of sterols, triterpenoids, flavonoids, glycosides, tannins, and carbohydrates; and demonstrated its antiseptic, hepatoprotective, chemo-preventive, anti-diabetic, anti-inflammatory, anti-pyretic, anti-tussive and antidiuretic properties.

**Keywords:** - *Ficus racemosa*, Umber, Gular, Antioxidant, Antimicrobial

immunity of human beings. But due to the tradition of oral and unwritten transfer of the knowledge about the use and health benefits of medicinal plants, there is worry about the indigenous medicine information is being threatened. Hence, it is necessary to protect and make proper documentation of the existing traditional and folk medicinal plant knowledge verified through various investigation and study protocols to make available to future researchers.

*Ficus* is a genus of about 850 species of various shrubs, woody trees and/or, epiphytes, and hemi-epiphytes; collectively known as fig trees or figs. They are native to mainly southwest Asia and the Mediterranean region. Most of the species' fruits of the plant are edible and are important food resources for wildlife. Figs are also of considerable cultural importance throughout the tropics, both as objects of worship and for their many practical uses. *Ficus racemosa* Linn. is an evergreen growing large shrub with large and very rough leaves native to Australia and tropical Asia.

Traditionally the plant was used in the management of dysentery, jaundice, diabetes, biliary disorders, inflammation, diarrhoea, etc. In this review, we attempt to collect and document the morphology, histology, phytochemistry, and pharmacology of the *Ficus racemosa* plant to explore the future therapeutic and scientific potential of the herb.

## II. MATERIAL AND METHODS-

Various databases, such as PubMed, Google Scholar, Science Direct, and Scopus, were used to conduct a literature review. More than 50 *Ficus racemosa* (*F. racemosa*) records were discovered. Various records were also considered from ancient literature, printed books, libraries, and the internet. Duplicates and records with comparable information were filtered out. These records were used to create a representation of all

## I. INTRODUCTION

In Ancient times natural materials were widely used as a primary source for medicinal preparation for the treatment of various diseases and ailments. According to a report by WHO, 80% of the world's population relies on the use of herbs for the same. Nowadays the popularity of these substances increased not only for the prevention and treatment of diseases but also to increase the

the data available on this herb. Propagation can have done in both ways by the vegetative method by cuttings of stems and root suckers and can also be done by a non-vegetative method by using seeds.

### III. MORPHOLOGY AND MICROSCOPY

*Ficus racemosa* Linn. which is belonging to the family Moraceae, is commonly known as *F. glomerata*, Cluster fig, Gular fig, Gular, and

Country fig, which is sacred and has golden coloured exudates and black bark<sup>1</sup>.

#### Taxonomic classification -

Kingdom: Plantae

Division: Magnoliophyta

Class: Magnoliopsida

Order: Rosales

Family: Moraceae

Genus: *Ficus*

Species: *Ficus racemosa*

**Synonyms-** *Ficus*, Cluster fig

#### Vernacular names: -

Language	Name
Sanskrit	Sadaphala,
Marathi	Umber, Gular
Hindi	Gular, Gulara
English	Cluster fig, Country fig.
Gujrati	Umbro, Umerdo
Bengali	Jagnadumur, Yagnadumur,
Kashmiri	Rumbal
Assamese	Jangedumuru, Yagyadimru
Oriya	Jajnadimbri, Dimbiri
Punjabi	Kath Gular, Gular
Tamil	Atti
Telugu	Atti, Medi
Urdu	Gular

उदुम्बरं कषायं स्यात्पक्वन्तुमधुरं हिमम्।

किमिकृद्पित्तरतनम्मूर्च्छादाहत्षापहम्॥

It is kasaya; ripe fruit is madhura means sweet and sheetaveerya (foods which shows cool property), beneficial in deranged pitta; cures dyscrasia and mental obsession; allays burning sensation and thirst<sup>2</sup>.

*F. racemosa* can be found all over India and northern Australia from sea level to 1200 meters on a hilltop. It can reach a height of over 40 feet. Leaves are dark green, glabrous and shiny, 7-10 cm long with tapering ends, with three veins, ovate, ovate-lanceolate, or elliptic in shape, and petiolate with an entire edge, and rounded base.

(Fig -1 and 2) Fruits grow in bunches on woody stems and contain numerous small grains that contain seeds. When fruit is unripe it's green, and when it's ripe, it's red in colour. The fruit receptacles are pyriform and 2–5 cm in diameter, emerging from the main trunk or big branches in huge clusters. The bark is smoky, reddish grey or greyish-green, soft on the surface, light brown on the inside, irregular and frequently broken, the thickness was 0.5-1.8 cm, white papery flakes coming out from the outer surface when rubbed, fracture fibrous, taste mucilaginous without any distinctive odour<sup>3,4</sup>. The microscopy of *F. racemosa* given in table no 1.



Fig 1- A. Leaves, B. Fruit, and C. Tree images of *F. racemosa*

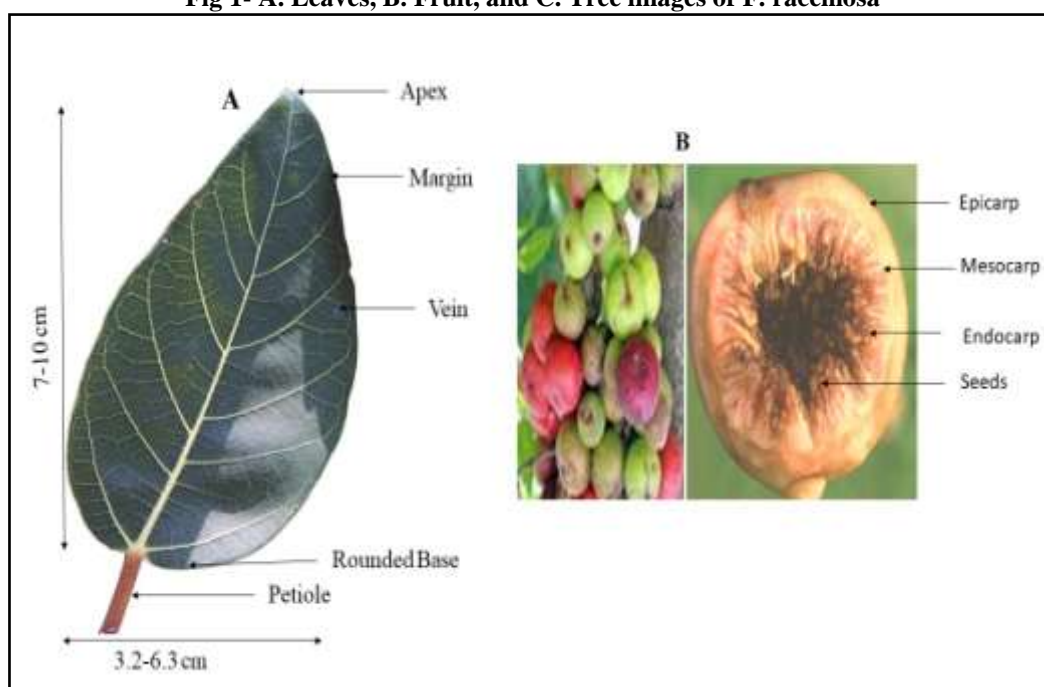
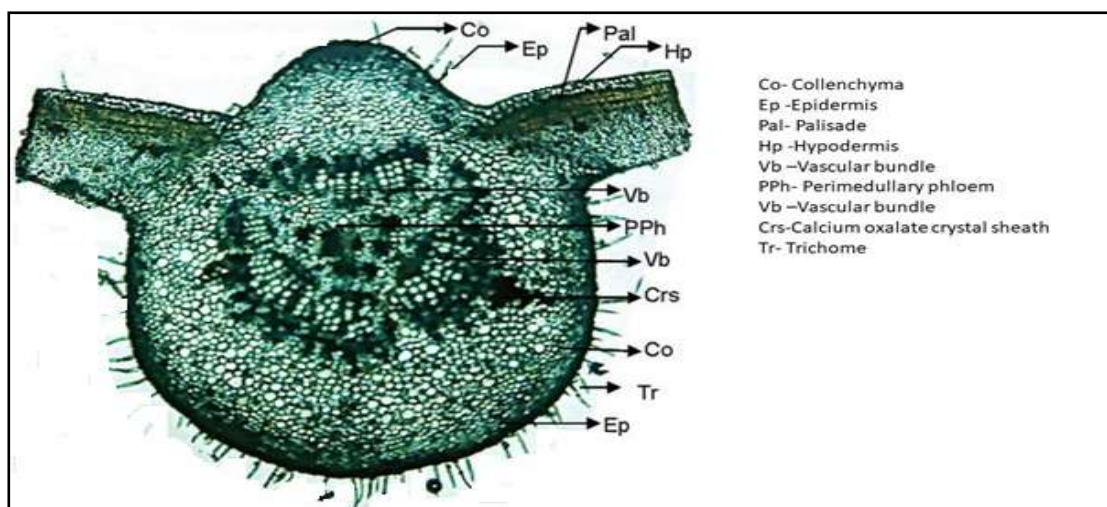


Fig 2- Morphology of *F. racemosa* A. Leaf and B. Fruit

**Table no. 1-Microscopy**

Part of plant used	Transverse section (T.S)	Powder characteristics
Leaves	Microscopically leaves are dorsiventral shows the presence of- The epidermis, hypodermis, palisade cells, spongy mesophyll, bicollateral vascular bundle, collenchyma, and covering trichomes(Fig. 3).	Straight wall epidermal cell, anomocytic stomata, xylem vessel, calcium oxalate cluster, crystal sheath, starch grain, covering, and hooked top trichome <sup>5</sup> .
Stem bark	The T.S shows periderm consisting of the outer layer of Cork; the middle layer is cork cambium, and the inner layer is the secondary cortex. The cortex region shows calcium oxalate crystals.After secondary xylem, primary xylem is present. Medullary rays are uniseriate to biseriate and get narrower at inner side (Fig. 4).	Calcium oxalate crystals of rhomboidal and prismatic <sup>6</sup> (Fig. 5).



**Fig 3- Microscopy of F. racemosa leaf**

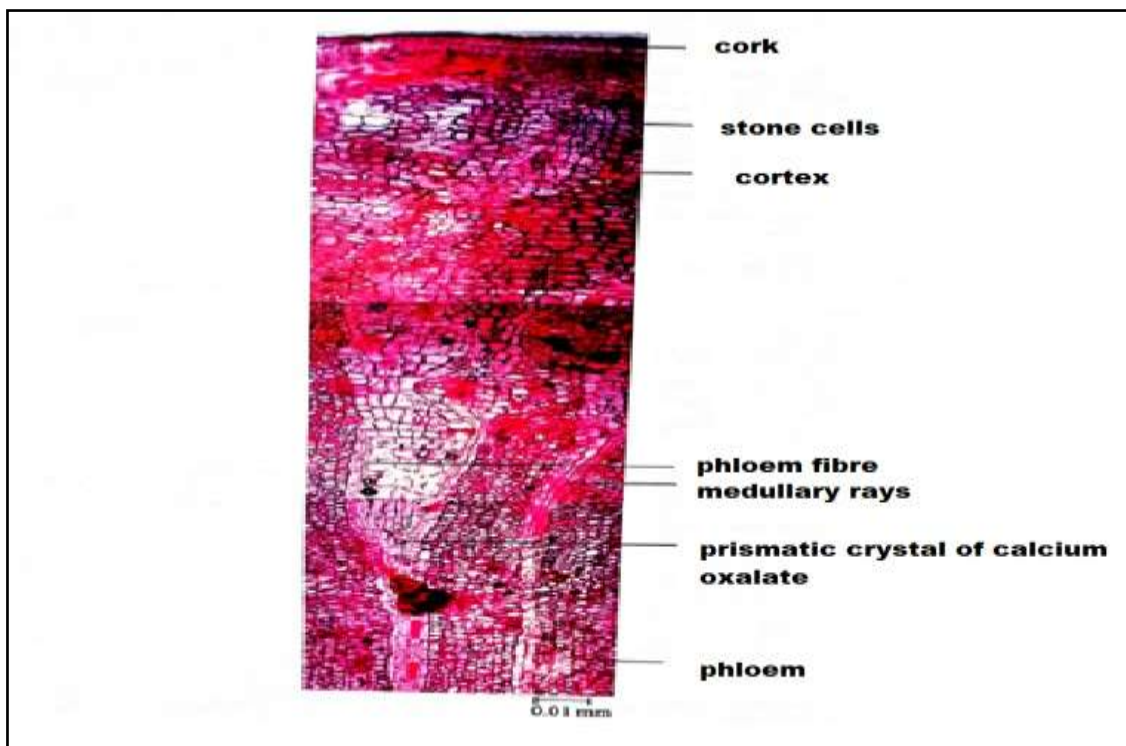


Fig 4- Microscopy of stem bark

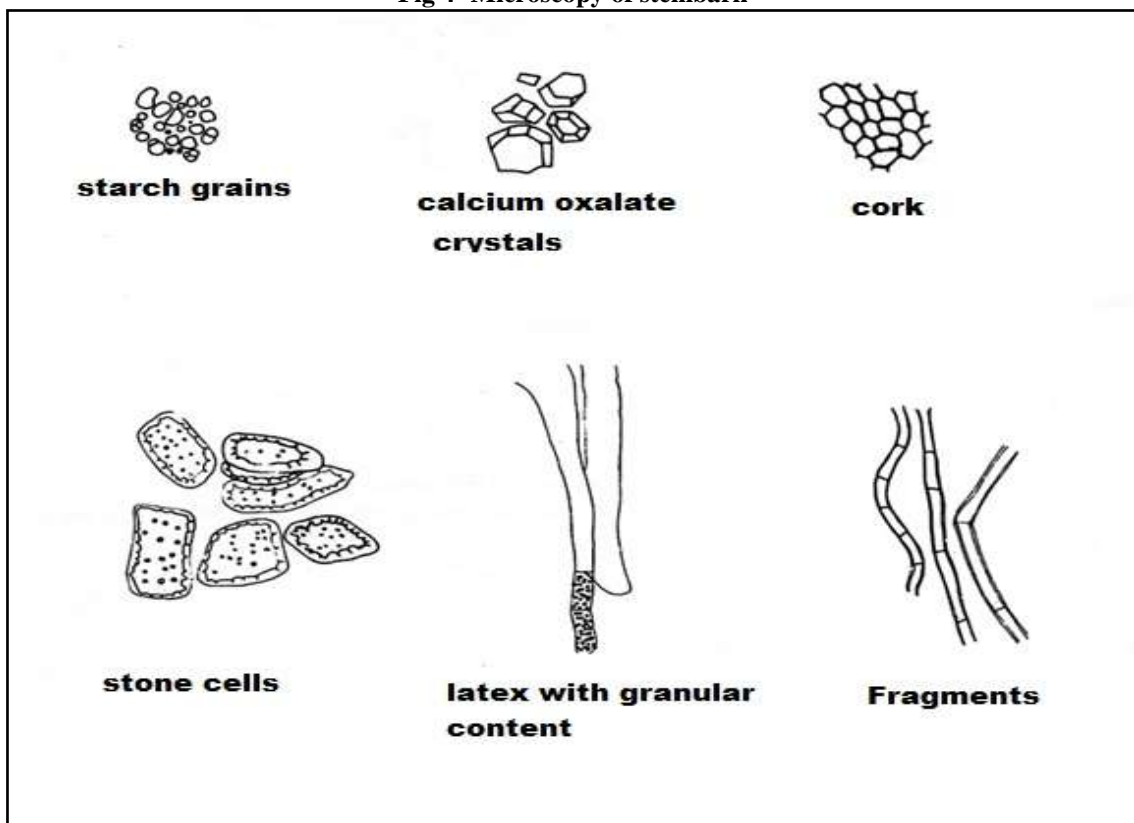


Fig 5 –Powder microscopy of stem bark

#### IV. TRADITIONAL USES -

All parts of the *F. racemosa* plant are considered medicinally important in Ayurveda, and it has been used extensively in the treatment of biliary disorders, dysentery, jaundice, diabetes, diarrhoea, and inflammatory conditions. Several species of the *Ficus* genus (family: Moraceae) have been employed in a range of ethnomedical cures for centuries<sup>7</sup>.

One of them, *F. racemosa* (Gular), is found in India. In India's traditional system of medicine, all parts are medicinally significant and have long been utilized to cure a variety of ailments.

Roots and bark are said to be beneficial in the treatment of asthma, diarrhoea, and diabetes. The bark was also used in dysentery<sup>8</sup>.

The stem bark is antiseptic and antipyretic, and it is used to treat skin conditions including ulcers, piles, asthma, gonorrhoea, menorrhagia, leucorrhoea, haemoptysis, and urinary infections. Hepatoprotective, chemo preventive, anti-diabetic, anti-inflammatory, anti-pyretic, anti-tussive and anti-diuretic properties were shown by the *F. racemosa* bark<sup>9-11</sup>.

In India, it is commonly used in Ayurvedic medicine. As a fruit and bark decoction was used for the treatment of uncontrolled diabetes, hyperlipidaemia, and inflammatory joint diseases<sup>12,13</sup>.

The fruits are used to cure dysentery, diarrhoea, and diabetes as well as, as a stomachic and carminative. Fruits can help with visceral blockage and can also help in diarrhoea and constipation. A uterine tonic made from aqueous fruit extract was discovered to have an effect like oxytocin. Fruits have been shown to have antiulcer, hypoglycaemic, and antioxidant properties. The leaves were tested for antioxidant, anti-inflammatory, antifungal, analgesic, antipyretic, antibacterial, antidiarrheal, hepatoprotective, hypotensive, and other actions. The leaves are used to treat diarrhoea, bilious condition, and spongy gums as a mouthwash<sup>8</sup>. In traditional medicinal system milky juice obtained from the plant was used as an anti-inflammatory remedy for mumps and other inflammatory enlargements. It has been used in the treatment of skeletal fractures in Sri Lanka's indigenous system of medicine. This has a high tannin content, and there have been a few claims that it possesses anti-cancer, gastroprotective, anti-inflammatory, and free radical scavenging properties. *F. racemosa* plant used by the locals to treat ulcers, abortion, urological issues, diabetes, dysentery, leucorrhoea, a blood disorder, burning feeling, piles and weariness because of the high source of phytochemicals<sup>14</sup>.

Some of the reported and documented traditional uses of the different parts of the *F. racemosa* werelisted in table no. 2.

Table no. 2-Traditional uses

Part of herb	Method of preparation	Uses
Bark	Aqueous extract	Hepatoprotective, Chemoprotective Antidiabetic, Anti-inflammatory, Antipyretic, Antitussive, Larvicidal Dysentery
Fruit and bark	Decoction	Uncontrolled diabetes, Hyperlipidaemia, Inflammatory joint disease
Fruit	Aqueous extract	Visceral obstruction, Constipation Uterine tonic, Anti-ulcer, Hypoglycemic
Leaves	Aqueous extract	Anti-bacterial, Hepatoprotective, Anti-fungal, Analgesic, Anti-inflammatory, Skeletal fracture
Stem	Pet. ether extract	Anti-bacterial
Stem bark	Aqueous extract	Antibacterial, Anti-septic, skin disease, ulcers, piles, dysentery

### V. PHYTOCHEMISTRY OF DIFFERENT PARTS OF FICUS RACEMOSA-

The leaves of *F. racemosa* was found to content triterpenoids<sup>15</sup>, tannins, rutin (flavonoid), kaempferol, arabinose, ficusin, bergapten, coumarin, phenolic glycosides<sup>16,17</sup> & saponins<sup>18</sup>. The stem of *F. racemosa* found to contains steroids, alkaloids, tannins<sup>19</sup>, leucopelargonidin-3-O-β-D-glucopyranoside, gluanol acetate, leucocyanidin-3-O-β-D-glucopyranoside, lupeol acetate leucopelargonidin-3-O-α-L-rhamnopyranoside, ceryl behenate, α-amyrin acetate, lupeol, friedelin, behenate, stigmasterol, β-sitosterol-D-glucoside,

gluanol acetate<sup>20</sup> and quercetin<sup>21</sup>. From the *F. racemosa* stem bark friedelin, racemosic acid, bergenin, β-amyrin, β-sitosterol, and lupeol acetate have been isolated. Fruits are reported to contain sterols, triterpenoids, flavonoids, glycosides, tannins, carbohydrates, β-sitosterol, gluanol acetate, hentriacontane, tiglic acid of taraxa sterol and lupeol acetate<sup>22</sup>. Phytoconstituents isolated from various parts of *Ficus racemosa* was listed in table no. 4. The structures of some phytoconstituents are shown in Fig.6. The detailed analytical profile of the major chemical constituents-Friedelin was explained in table no.3.

Table no. 3- Analytical profile

PARAMETERS	TLC	HPTLC
Standard	10 mg Friedelin in 10 ml alcohol	10 mg Friedelin in 10 ml alcohol
Solvent	Toluene: Ethyl acetate (12:1)	Toluene: Ethyl acetate (12:1)
Plate	Silica gel 60F <sub>254</sub>	Silica gel 60F <sub>254</sub>
Visualization	Vanillin sulphuric acid reagent	625 nm
Evaluation	0.093 (Violet)	0.867-0.951

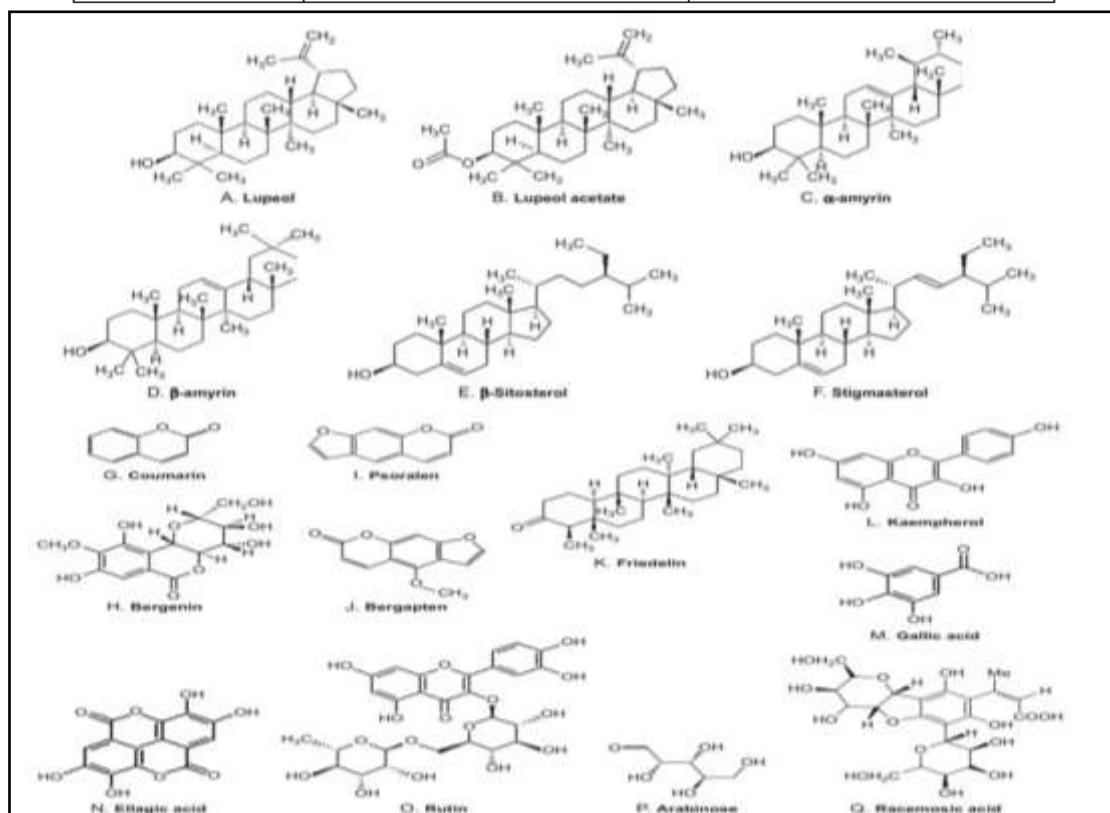


Fig 6- Structures of phytochemicals identified and isolated from various parts of *F. racemosa*.

**Table no.- 4 -Phytoconstituents isolated from various parts of *Ficus racemosa*<sup>23</sup>**

Sr.no	Parts of plant	Phytochemical's name
1.	Stem	<ul style="list-style-type: none"> <li>• Friedelin</li> <li>• Campesterol, Stigmasterol (steroid)</li> <li>• Hentriacontane</li> <li>• <math>\alpha</math>-Amyrin acetate</li> <li>• Hentriacontanol</li> <li>• Kaempferol (flavonoid)</li> <li>• Lupeol acetate</li> <li>• Methyl ellagic acid (tannin)</li> <li>• Glauanol acetate</li> </ul>
2.	Fruit	<ul style="list-style-type: none"> <li>• Glauanol</li> <li>• Alkaloids</li> <li>• Hentriacontane</li> <li>• <math>\beta</math> sitosterol,</li> <li>• Phytosterol (Steroids)</li> <li>• Glauanolacetate</li> <li>• Tiglic acid</li> <li>• Esters of Taraxasterol</li> <li>• Lupeolacetate</li> <li>• Friedelin</li> <li>• Tannins</li> <li>• Flavonoids</li> </ul>
3.	Root	<ul style="list-style-type: none"> <li>• Alkaloids</li> <li>• Cycloartenol</li> <li>• Steroids</li> <li>• Euphorbol</li> <li>• Taraxerone</li> <li>• Flavonoids</li> <li>• Tannins</li> <li>• Tinyatoxin</li> <li>• Saponins</li> </ul>
4.	Leaves	<ul style="list-style-type: none"> <li>• Triterpenoids (Lanosterol)</li> <li>• Saponins</li> <li>• Glauanol acetate</li> <li>• Alkaloids</li> <li>• Phenolic</li> <li>• Glycosides</li> <li>• Flavonoids</li> <li>• Tannins</li> <li>• Racemosic acid</li> </ul>
5.	Bark Latex	<ul style="list-style-type: none"> <li>• <math>\alpha</math>-Amyrin</li> <li>• Euphorbinol</li> <li>• <math>\beta</math>-Sitosterol</li> <li>• Cycloartenol,</li> <li>• Cycloeuphordenol</li> <li>• Taraxerol</li> <li>• Isoeuphorbol</li> <li>• Palmitic acid</li> <li>• Tinyatoxin,</li> <li>• 4-Deoxyphorbol and its esters</li> </ul>



	• Trimethylelagic acid (tannin)
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**VI. BIOLOGICAL ACTIVITY-**

The various biological activities of various parts and different extracts of *Ficus racemosa* plant

was explained in detail below and briefly in table no 5.

**Table no.5-Biological activity of different extracts obtained from different parts of *Ficus racemosa***<sup>24,35</sup>

Sr.no.	Activity	Parts of plant	Animals / Species	Model	Dose
1.	Hypercholesterolemia	Bark	Wister rat	Diabetes model	200 mg/kg oral
2.	Antibacterial	Stem bark	S. aureus, B. cereus, pseudo aeruginosa, E.coli, B. subtilis	Disc diffusion method, Agar diffusion method	10mg/ml
3.	Anti-inflammatory	Leaf, Fruit	Albino Wistar rat, Swiss albino mice	Carrageenin histamine, serotonin, Dextran induced rat hind paw edema model	200-400 mg/kg
4.	Antipyretic	Bark Stem	Albino Wistar rat	Yeast induced pyrexia	100-300mg/kg Oral
5.	Anti-microbial (in Vitro)	Seeds & leaves	S. aureus, B. megaterium, B. subtilis, Sarcina lutea, S. typhi, E. coli. etc	Disc diffusion method	4 mg
6.	Cytotoxic	Seed, leaves Fruit	Brine shrimp nauplii	Brine shrimp lethality bioassay	2 mg, 400 µg/ml
7.	Antifungal	Leaf Fruit	Cladsporium curavularia, fusarium Candida albicans, A.niger	Agar plate method, Broath dilution, Well diffusion method	20mg/ml
8.	Analgesic	Fruit	Swiss albino mice	Formalin induced paw licking test, Eddy's hot plate	500mg/kg
9.	Hypoglycemic	Fruit	Swiss albino mice	Alloxan induced diabetic mice	150mg/kg oral
10.	Antitussive	Stem bark	Albino mice	Sulfur dioxide induced cough method	100-200mg/kg
11.	Antibacterial	Fruit	Micrococcus lutea, B. cereus, S.aureus, E.coli, S. aureus, S. typhi	Broath dilution, Well diffusion method	-
12.	Larvicidal	Bark	Cx. quinquefasciatus, Cx. gelidus	-	20-100 µg/ml
13.	Antidiuretic	Bark	Albino rat	-	250-

14.	Antioxidant	Stem Bark	-	ABTS, DPPH, TAC,	1000mg/kg
		Root	-	DPPH, FRAP total reduction capability	

## VII. CONCLUSION

In the present review, we tried to record the diversity, phytochemical, therapeutic potential, pharmacological profile and traditional uses and toxicology of the different parts of *Ficus racemosa* plant. The major therapeutic potential of *Ficus racemosa* was due to the presence of the various secondary metabolites including kaempferol, arabinose, ficusin, bergapten, coumarin, gallic acid, ellagic acid,  $\beta$ -sitosterol, gluanol acetate etc. from the different parts of the plants.

Despite this exhaustive reported data few gaps exist in its past studies as, in the most of reported biological activities only polar solvents like water, methanol and ethanol extracts of different parts of plants were reported so further pharmacological studies should also be planned for the non-polar solvents and for a combination of different parts of the plants.

### Abbreviations –

F. racemosa - *Ficus racemosa*

T.S - Transverse section

TF - Tannin fraction

STZ -Streptozotocin

MIC - Minimum inhibitory concentration

MEFR - Methanol extract of *F. racemosa*

AIDM - Alloxan-induced diabetic mice

DPPH - 2,2-diphenyl -1-picryl -hydrazyl -hydrate

ABTS - 2, 2'-azino-bis -3-ethylbenzothiazoline -6-sulfonic acid

FRAP - Ferric reducing ability of plasma

TAC - Total antioxidant capacity

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