



## ANTIMICROBIAL ACTIVITY OF *FICUS GLOMERATA* LINN. BARK

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### ABSTRACT

*Ficus glomerata* Linn. (Moraceae), commonly known as *Ficus racemosa*. A large deciduous tree distributed all over India and Ceylon, found throughout the year, grows in evergreen forest, moist localities, along the sides of ravines and banks of streams. Gular (*Ficus glomerata* Linn.) is well known, commonly used plant in various disorders. It has been traditionally claimed to be useful in asthmatic condition, as an antitussive and anti-inflammatory. Successive Soxhlet extractions of dried powdered bark were carried out using petroleum ether and methanol as a solvent. The antimicrobial activity of the extracts were tested *in vitro* against two different bacterial species *Bacillus subtilis* and *Escherichia coli* by cup plate diffusion method were used in this investigation. The results of antimicrobial activity revealed that methanolic extract showed good activity as compared to petroleum ether extract. Methanolic extract is more potent towards gram - positive bacteria. The antimicrobial activities of the extracts were compared with standard antibiotics.

**KEYWORDS:** *Ficus glomerata*, Antimicrobial activity.

### INTRODUCTION

*Ficus glomerata* is a species of plant in the Moraceae family. Popularly known as the Cluster Fig Tree or Goolar (Gular), this is native to Australia, South-East Asia and the Indian Subcontinent. It is unusual in that its figs grow on or close to the tree trunk. In India, the tree and its fruit are called *Gular* in the north and *Atti* in the south. The fruits are a favourite staple of the common Indian macaque. Medicinally it has been various pharmacological activities astringent, antidiabetic, refrigerant, antiasthmatic, anti-inflammatory, hepatoprotective, antioxidant, antiulcer, anti-pyretic, antidiuretic, antihyperglycemic, antidiarrhoeal.<sup>1,2,3</sup>

#### Plant Description

*Ficus glomerata* is evergreen tree 50-60 ft. high; young shoot glabrous, pubescent or scaberulous. Leaves 3-6 by 1.25-2.5 in. long, glabrous; stipules 0.75 in. long, ovate-lanceolate, scarious, pubescent. Peceptacle shortly pendunculate, on short leafless warted branches often only a few inches long which issue from the stem and larger branches, much contracted at the base when young, subglobes, pyriform or subturbinate, 1.5 in. across, smooth or pubescent, red when ripe, with depressed umbilicus; basal bracts 3, ovate triangular; male, female and gall flowers together in one receptacle, the male flower forming a zone near the mouth, the fertile female flowers forming a layers near the walls of the receptacle, and the gall flowers a more internal layer. Fruit ripe at different time of the year. Roots are useful in treating dysentery, diarrhoea, in hydrophobia and the sap of root used in diabetes. Leaves are used in bronchitis, bilious affection, haemorrhage. Bark is used as astringent, antidiabetic, refrigerant, also useful in asthma and piles. The unripe fruit is acrid, astringent to bowels, tonic, styptic, allays thirst, and blood diseases. Latex used in piles and diarrhoea, aphrodisiac and its administered in haemorrhoids. Extract of leaves when used locally is found efficacious in inflammation, lymphadenitis, in sprains and fibrositis. A decoction of leaves is a good wash for wound and ulcer.<sup>2,4,5</sup>

#### Agro climatic Requirements

This species grows in moist tropical and subtropical climate with annual rainfall from 500mm to 2000mm preferring warm and moist sites, avoiding dry cold places. The maximum temperature in its natural range of its distribution

touches about 45°C and minimum seldom drops below the freezing point. It is a light demander, but seedlings to some extent tolerate shade in early stages and are drought resistant and frost hardy. It grows on a variety of soils; good growth is seen on alluvial soils along ravines. Growth is stunted on rocky hill slopes. It can be propagated both by seeds as well as vegetative means.<sup>1</sup>

### MATERIALS & METHODS

#### Collection of plant material

*Ficus glomerata* bark was collected, authenticated and then air dried. The barks were collected from Raigad (Maharashtra), India. The herbarium of the plant specimen has been deposited at B.S.I. Pune, and the Voucher Specimen No. **FICGOL5** with reference number **BSI/WRC/Tech/2010**. Air dried bark were processed for size reduction by using cutter mill (Portable Mixer). Crushed material was passed through 40# sieve (Coarse powder) for uniform particle size, which gave efficient extraction & yield of extract.

#### Extraction of plant material

The powdered *Ficus glomerata* Linn. were successively extracted by Soxhlet extraction with solvents of increasing polarity beginning with Petroleum ether (60-80°C), Methanol (90-100°C). The solvents were removed under reduced pressure in rotary evaporator until it become completely dry. The percentage yields for each extracts were determined. All the crude extracts were subjected to antimicrobial assay.

#### Antimicrobial activity<sup>6</sup>

An anti-microbial is a substance that kills or inhibits the growth of microorganisms—such as bacteria, fungi or protozoans. Antimicrobial drugs either kill microbes (microbiocidal) or prevent the growth of microbes (microbiostatic).

#### Antimicrobial Activity Investigation Methods<sup>6,7</sup>

There are three types of method for Investigation of antimicrobial activity.

- 1) Broth Dilution technique
- 2) Cup-plate Diffusion Method
- 3) Turbidimetric assay

Cup plate Diffusion methods are mostly used for investigation of antimicrobial activity of plant extracts. Cup plate method is easy to note the result and need small amount of extract.

**Cup Plate Diffusion Method**

All the glassware and the petri plates were sterilized by dry heat in an oven at 160<sup>0</sup>C for one hour. Nutrient agar was prepared in distilled water. The Nutrient agar was poured in sterile petri plates aseptically and allowed to solidify at room temperature. All the petri plates were aseptically flooded with 0.1ml of the standardized culture. The holes of 7mm were bored aseptically using sterile cork borer. The agar plugs were taken out carefully so as not to disturb the surrounding medium. The holes were filled completely with desired extract and kept in incubator at 30<sup>0</sup>C for 48 hours. After this the petri plates were observed for the antimicrobial activity and zone of inhibition was measured. The solvent effect was neutralized.

**Preparation of inoculums**

The suspension of all organisms were prepared by inoculating one colony of nutrient broth in colony of strain in 15ml of nutrient broth in conical flask and incubated at 37<sup>0</sup>C for 24 hours to activate the strain

**Bacterial Culture:** *Bacilli subtilis* (ATCC 441) Gram-positive

*Escherichia coli* (ATCC 25922) Gram-negative

**Composition of nutrient agar media**

Yeast/meat/beef extract - 10 gm  
 Peptone - 10 gm  
 Sodium chloride - 5 gm  
 Agar - 20 gm  
 Distilled water - 1000 ml

**Procedure for performing the Cup Plate Diffusion Method**

Plates are prepared with nutrient agar media medium of about 4mm layer. Different dilution of petroleum ether extract (25mg/ml - 200mg/ml) and methanolic extract (25mg/ml - 250mg/ml) were carried out. Blank readings of both the extracts were taken.

Sterile non-toxic cotton swab on a wooden applicator dipped in prepared inoculum and rotated soaked swab firmly against the upper inside wall of the test tube. Streak the entire agar surface of the plate with the swab two to three times, turning plate at 60<sup>0</sup> angle between each streaking. The inoculum allowed drying for 5-15 minutes with lid in place. Properly bored the plate with borer and disc is applied for standard drug. Cloramphenicol (30mcg/disc) was used for standard antibiotics for activity being most resistance in both gram-positive and gram-negative species and inhibits bacterial protein synthesis by binding to the subunit of the ribosome. The antimicrobial activity was recorded by measuring the width of the clear inhibition zone around the disc using zone reader (Zone Size Interpretative Scale).

**RESULT & DISCUSSION**

The use of medicinal plants and plant products as medicines could be traced as far back as the beginning of human civilization and are widely used in ethnomedicine around the world. Antimicrobials of plant origin have enormous

therapeutic potential. They are effective in the treatment of infectious diseases while simultaneously mitigating many of the side effects that are often associated with synthetic antimicrobials. Medicinal plants represent a rich source of antimicrobial agents. Plants are used medicinally in different countries and are a source of many potent and powerful drugs. A wide range of medicinal plant parts is used for extract as raw drugs and they possess varied medicinal properties. The different parts used include root, stem, bark flower, fruit, twigs exudates and modified plant organs.

The present work was carried out on bark of *Ficus glomerata* family Moraceae. The emphasis was given on *in-vitro* antimicrobial studies on bark of *Ficus glomerata* to find out their usefulness to human being. This plant was collected from Raigad, Maharashtra. Herbarium of the plant specimen was deposited at Botanical Survey of India, Pune.

Antimicrobial activity was performed of two strains of microorganisms in which *Bacilli subtilis* (Gram - positive) and *Escherichia coli* (Gram- negative) strains are studied. Antimicrobial activity was performed by Cup Plate diffusion technique and different concentrations of petroleum ether extract (25 to 200 mg/ml) and methanolic extract (25 to 250 mg/ml) were prepared. Methanolic extract shows good antimicrobial activity at 100 mg/ml concentration where Chloramphenicol was used for standard antibiotics for activity. Methanolic extract is more potent towards gram-positive bacteria.

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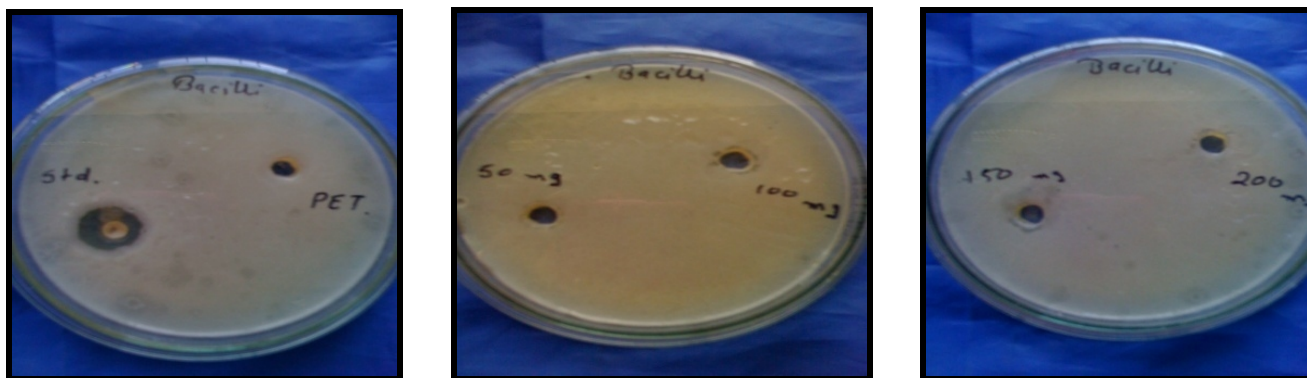
**Table -1: Amount and appearance of different of *Ficus glomerata* bark**

Extract	% (w/w) of extract obtained	Odour of Extract	Colour of Extract	Consistency
Petroleum ether	1.95 %	Characteristic	Greenish yellow	Sticky
Methanol	8.96 %	Characteristic	Reddish	Sticky

Table -2: Zone of inhibition of Pet.ether extract of *Ficus glomerata* bark and standard against bacteria

Extract (mg/ml)		Zone of inhibition (mm of Diameter)	
		<i>B. subtilis</i>	<i>E.coli</i>
Petroleum ether extract	Blank	---	---
	25	---	---
	50	10	---
	100	11	10
	150	11	11
	200	11	11
Chloramphenicol (Standard)		15	20

A. Zone of inhibition of Petroleum Ether extract on *Bacilli subtilis*.



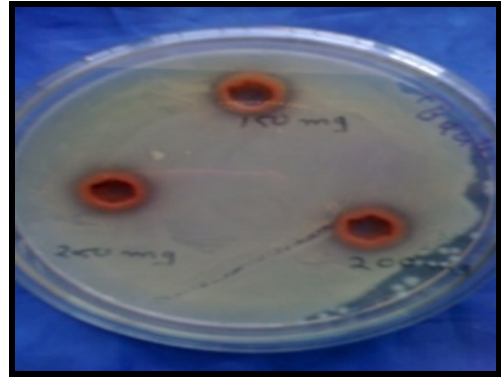
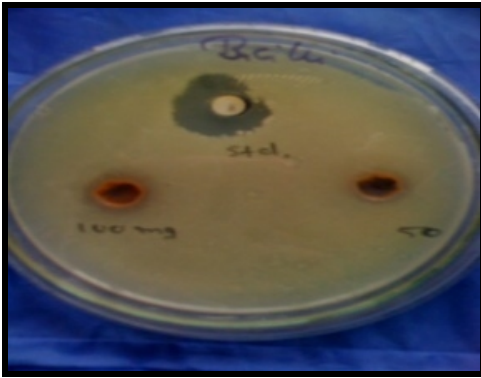
B. Zone of inhibition of Petroleum Ether extract on *E.coli*.



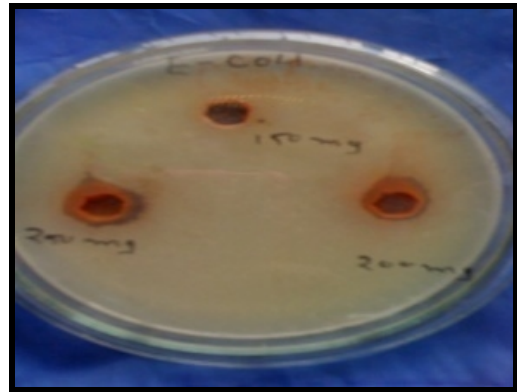
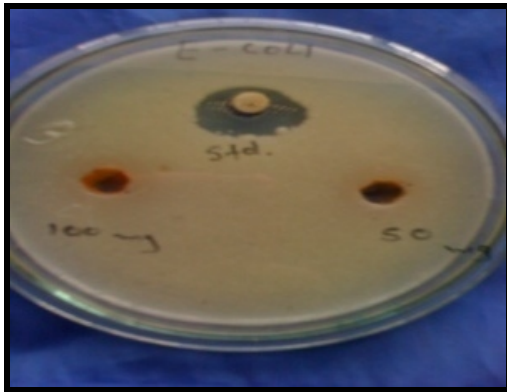
Table -3: Zone of inhibition of Methanol extract of *Ficus glomerata* bark and standard against bacteria

Extract(mg/ml)		Zone of inhibition (mm of Diameter)	
		<i>B. subtilis</i>	<i>E.coli</i>
Methanolic extract	Blank	---	---
	25	---	---
	50	12	---
	100	13	---
	150	14	---
	200	14	13
	250	15	15
Chloramphenicol (Standard)		15	20

C. Zone of inhibition of Methanolic extract on *Bacilli subtilis*.



D. Zone of inhibition of Methanolic extract on *E.coli*.



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