

Antibacterial Activity of the Leaf, Stem and Root Powders of *Gmelina asiatica* L.

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Plant are the basic source of knowledge of modern medicine. India is a varietal emporium of medicinal plants and is one of the richest countries in the world in regard to genetic resources of medicinal plants. The present study deals with the Antibacterial activity of *Gmelina asiatica* L. The stem, root, leaf are powdered and their extracts have been taken from Acetone, Benzene, Chloroform. It is found that the plant extracts have Antibacterial activity against the following nine microbes. *Bacillus subtilis*, *Micrococcus luteus*, *Staphylococcus aureus*, *Streptococcus pneumoniae*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Proteus mirabilis*, *Escherichia coli*.

Key words: Antibacterial activity, *Gmelina asiatica* L., Modern medicine.

Ayurveda is a traditional system of medicine using a wide range of modalities to create health and well being. The primary aim of Ayurveda health care is to restore the physical mental and emotional balance in patients, thereby improving health, preventing disease and also treating any current illness. Herbal medicine is still the mainstay of about 75-80% of the world population, mainly in the developing countries for primary healthcare. However among the estimated 250, 000-400,000 plant species, only 6% have been studied for biological activity, and about 15% have been investigated phytochemically. Therefore it seems necessary to evaluate the herbs properly (vandana, *et al.*, 2008).

Infectious diseases are the leading cause of death world-wide. Antibiotic resistance has become a global concern (Westh, *et al.*, 2004). The increasing failure of chemotherapeutics and antibiotic resistance exhibited by pathogenic microbial infectious agents has led to the screening of several medicinal plants for their potential antimicrobial activity (Colombo, *et al.*, 1996; Parekh and Chanda, 2007).

The plant is claimed to be useful in rheumatism, and also possess anti-inflammatory effect. The crude drug of *Gmelina asiatica* may exert anti-inflammatory activity by anti-proliferative, anti-oxidative and lysosomal membrane stabilization (Ismal, *et al.*, 1997). A bioguided extraction and fractionation of the alcoholic extract of the roots of *Gmelina asiatica* afforded a new flavones derivative named ovalifolin [3-(3-methyl-1-butenyl)-6-methoxy-5,7,4'-trihydroxy flavones] (+) pinoselinol (Satyanarayana, *et al.*, 2007).

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MATERIALS AND METHODS

The present investigation is intended to evaluate the preliminary phytochemical characters such as determination of pharmacognostic and fluorescence characters, screening of bioactive principles and antibacterial activity of an important medicinal plant, *Gmelina asiatica* L., Verbenaceae.

Plant description and medicinal use

Gmelina asiatica Linn (Syn. *Gmelina parvifolia*) is commonly known as “Nilakkumil” in Tamil and “Gopabhadra” in Sanskrit. A large straggling or scrambling deciduous bush or shrub, 3 m tall, petioles 0.5-3 cm long, slender; thin, smooth, leaves small, much-branched leaves small, petioles 0.5-3 cm long, slender, flowers large, yellow colour, calyx about 4 mm long, apically, corolla large, yellow 4-5 cm long, bilabiate, the tube narrow and curvate below 4-lobed, fertile stamens 2, staminodes 2 (Dassanayake, 1983).

Collection of materials

Material was collected at Perungudi village in Madurai district. The identification was carried out with the help of Flora of the Presidency of Madras.

Preparation of plant extracts

The plant materials were washed with water to remove the adhering dust particles and were shade dried at room – temperature. Extracts were prepared from shade-dried samples following the method of Audu *et al.* (2000). The dried plant materials were ground into a fine powder in an electric blender. Thereafter 5 g each of fine powdered sample was weighed and soaked separately in 15 ml of different solvents (Absolute alcohol, Benzene, Chloroform, Ether, and Water) in the ratio of 1:3 weights for volume (W/V). These were allowed to stand for 24 hrs at ambient room temperature. The soaked plant powder was filtered through filter paper (Whatman No.1) and the filtrate was used as crude extract.

Antibacterial assay and Collection of microorganisms

The microbes were *Bacillus subtilis*, *Escherichia coli*, *Klebsiella pneumoniae*, *Micrococcus luteus*, *Proteus vulgaris*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Streptococcus faecalis*. They were obtained from research laboratory, Department of

Table 1. Antibacterial activity of *Gmelina asiatica* L. against pathogenic bacteria

Microbes	Inhibitory Zone(cm)																		
	Leaf					Stem					Root								
	A	B	C	E	Aq	A	B	C	E	Aq	A	B	C	E	Aq				
<i>S.pneumoniae</i>	1.2	0.8	1.25	1.25	1.19	0.8	0.7	0.2	0.9	1.1	0.61	1.8	0.4	0.43	0.5	0.39	1.2	0.5	
<i>P.mirabilis</i>	1.0	0.9	1.2	1.21	0.9	0.77	1.0	0.8	0.6	0.98	1.2	0.98	1.0	0.48	0.6	1.26	0.58	1.23	
<i>K.pneumoniae</i>	1.2	1.0	1.1	1.42	1.3	1.21	0.9	0.72	1.2	0.39	1.1	0.78	0.9	1.1	1.3	1.24	1.21	1.22	
<i>M.luteus</i>	1.2	0.9	1.4	1.0	1.44	1.1	0.9	0.8	1.0	1.25	0.6	1.0	0.92	0.4	1.2	1.32	1.0	1.23	
<i>E.coli</i>	1.0	0.91	1.2	0.8	1.2	1.22	0.4	0.3	0.98	0.82	1.1	0.98	0.12	0.42	0.7	0.6	0.5	0.3	
<i>S.aureus</i>	0.7	0.5	1.0	1.2	0.52	1.2	0.8	0.4	0.8	0.57	0.62	0.39	2.0	1.0	0.92	0.8	0.6	0.62	
<i>B.subtilis</i>	1.0	1.1	0.8	0.76	1.3	0.9	0.9	0.81	1.1	1.1	1.2	0.62	1.2	1.1	1.0	1.0	1.23	1.3	
<i>P.aeruginosa</i>	0.9	0.6	1.1	0.76	1.2	1.9	0.2	0.43	0.7	0.57	0.5	0.5	0.41	0.3	0.6	0.58	0.9	0.5	
A-Acetone	B-Benzene	C-Chloroform	E-Ethanol	Et-Ether	Aq-Aqueous														

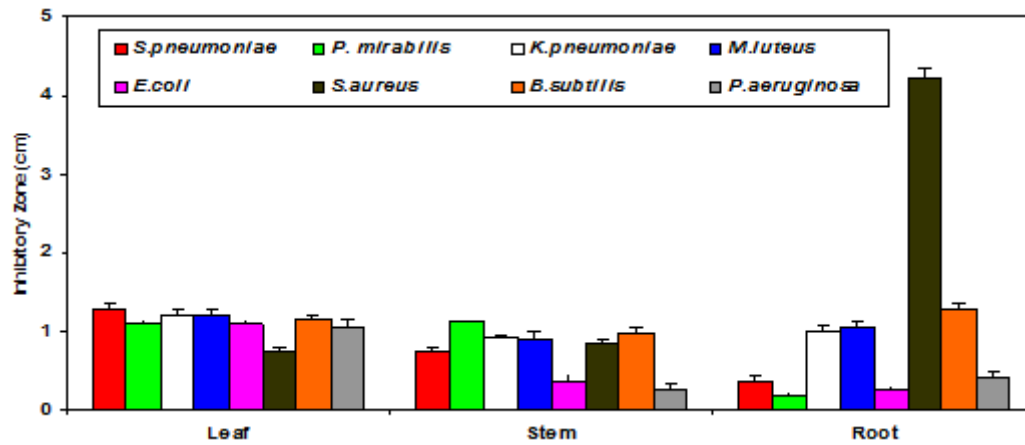


Fig. 2a. Antibacterial activity of acetone extracts of *Gmelina asiatica* L. against pathogenic bacteria.

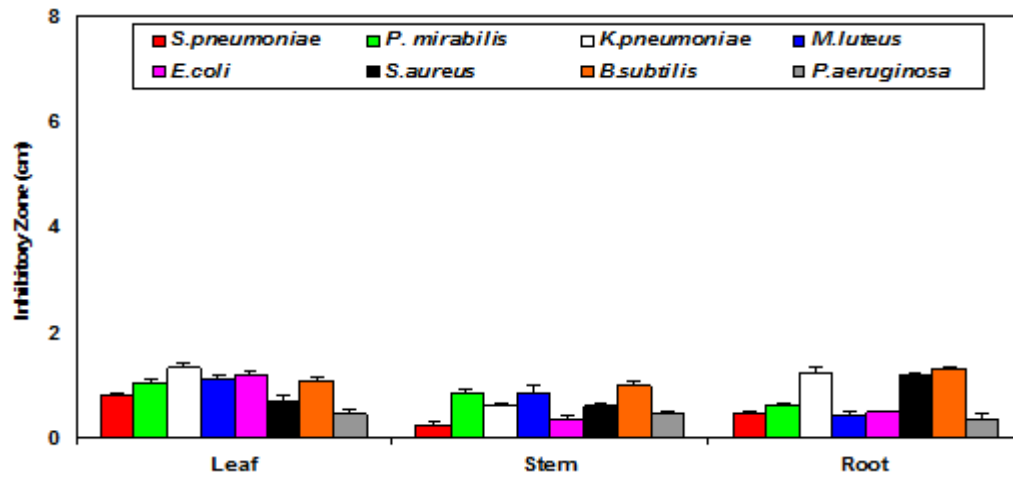


Fig. 2b. Antibacterial activity of benzene extracts of *Gmelina asiatica* L. against pathogenic bacteria.

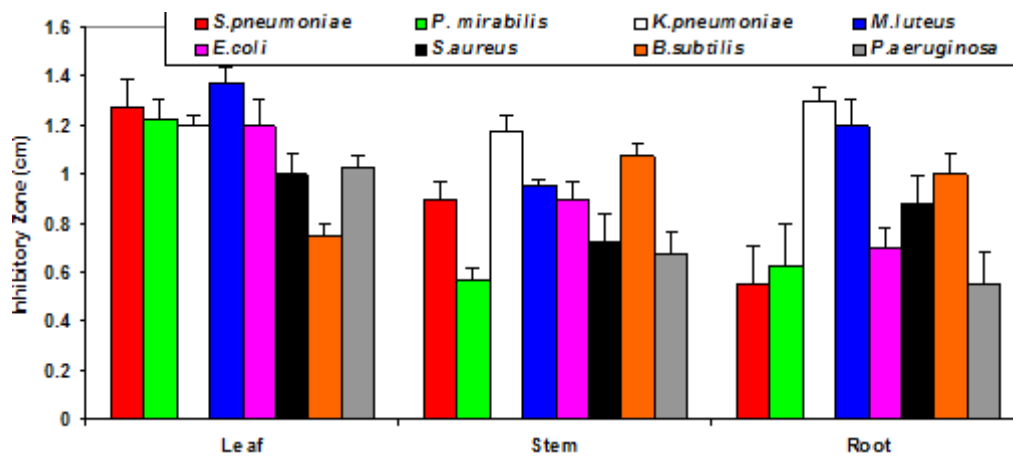


Fig. 2c. Antibacterial activity of chloroform extracts of *Gmelina asiatica* L. against pathogenic bacteria.

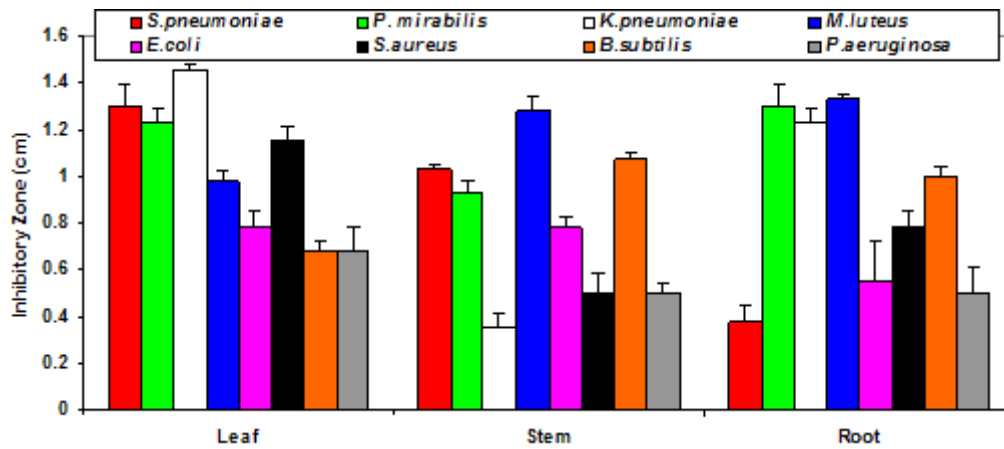


Fig. 2d. Antibacterial activity of ethanol extracts of *Gmelina asiatica* L. against pathogenic bacteria

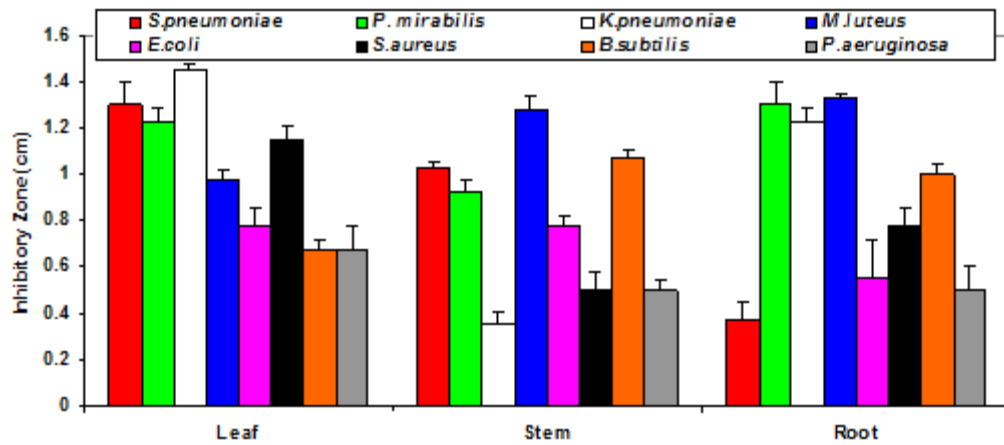


Fig. 2e. Antibacterial activity of ether extracts of *Gmelina asiatica* L. against pathogenic bacteria.

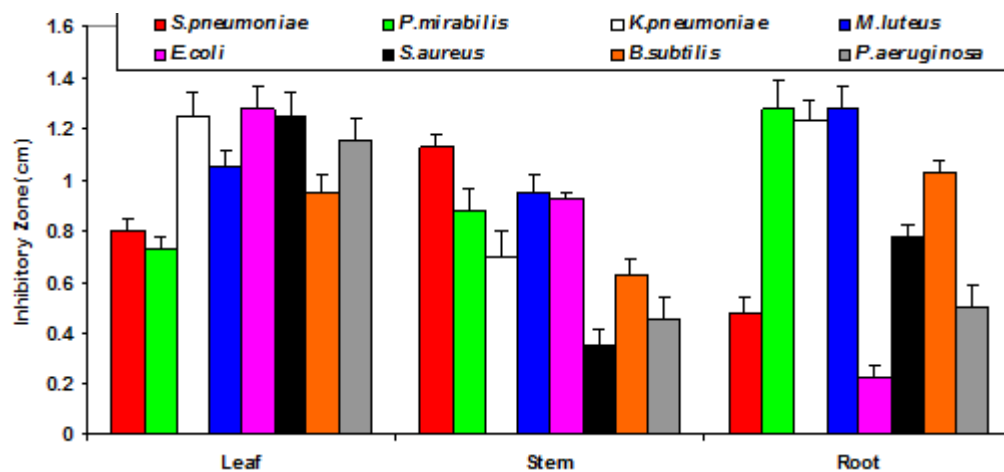


Fig. 2f. Antibacterial activity of aqueous extracts of *Gmelina asiatica* L. against pathogenic bacteria.

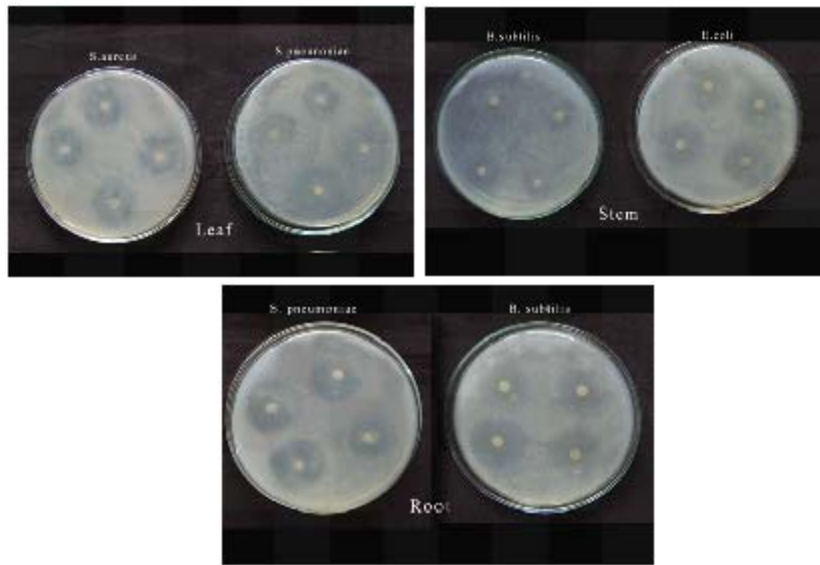


Fig. A. Antibacterial activity of acetone extract of *Gmelina asiatica* L.

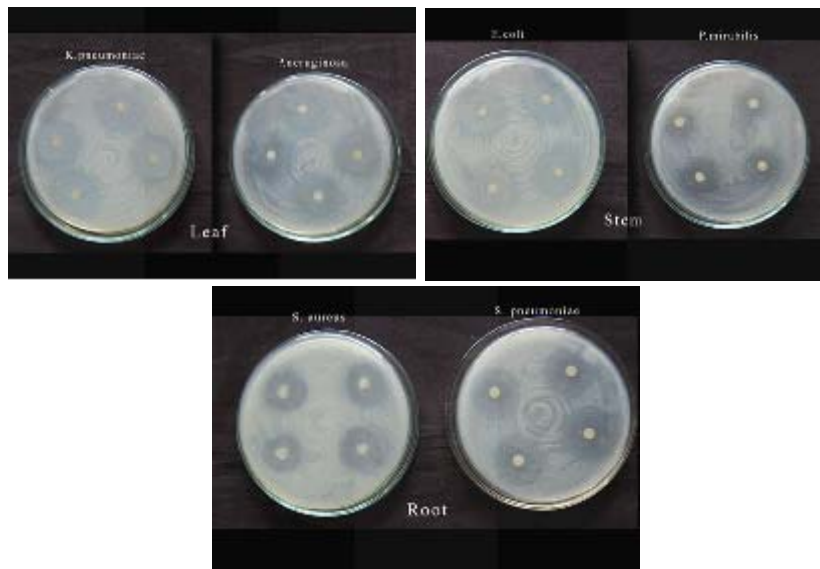


Fig. B. Antibacterial activity of benzene extract of *Gmelina asiatica* L.



Fig. C. Antibacterial activity of chloroform extract of *Gmelina asiatica* L.



Fig. D. Antibacterial activity of ethanol extract of *Gmelina asiatica* L



Fig. E. Antibacterial activity of ether extract of *Gmelina asiatica* L.

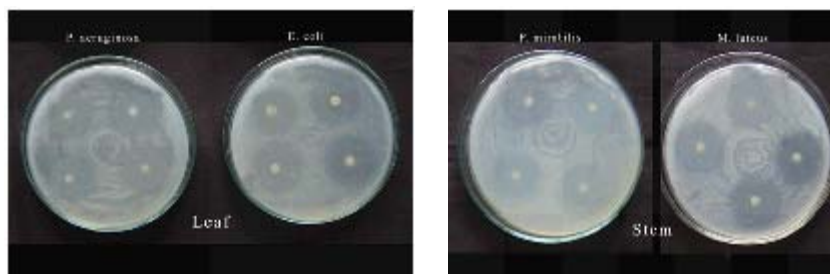


Fig. F. Antibacterial activity of aqueous extract of *Gmelina asiatica* L.

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Preparation of inoculum

Each organism was recovered for testing by sub-culturing on fresh media. A loopful inoculum of each bacterium was suspended in 5 ml of nutrient broth and incubated overnight at 37°C. Preparation of media.

Nutrient agar is composed of Beef extract-3.0, Peptone-5.0 g, Agar-15.0 g, Distilled water-1000 ml.

The medium was adjusted to pH 7.4 and sterilized by autoclaving at 15 lbs pressure (121°C) for 15 minutes.

RESULTS AND DISCUSSION

Acetone extract of the leaf of *Gmelina asiatica* showed a well profound, inhibitory activity against *Streptococcus pneumoniae*, *Klebsiella pneumoniae* and *Micrococcus luteus* while stem extract showed a maximum inhibitory activity against *Proteus mirabilis* and *Klebsiella pneumonia* (Fig 2a & Fig. A). However, acetone extract of root powder showed a maximum inhibitory activity against *Staphylococcus aureus*, *Bacillus subtilis* and *Micrococcus luteus*. In general, root extract showed significantly greater inhibitory activity compared to other parts against *Staphylococcus aureus*.

Benzene extract of the leaf of *Gmelina asiatica* showed a well profound inhibitory activity against *Klebsiella pneumoniae*, *Micrococcus luteus* and *Escherichia coli*, while stem extract showed a maximum inhibitory activity against *Bacillus subtilis*, *Micrococcus luteus* and *Proteus mirabilis* (Fig 2b & Fig. B). However, benzene extract of root powder showed a maximum inhibitory activity against *Klebsiella pneumoniae* and *Staphylococcus aureus*. Benzene extract of root powder showed significantly greater inhibitory action than that of other plant parts.

Chloroform extract of the leaf of *Gmelina asiatica* showed a well profound inhibitory activity against *Micrococcus luteus*, *Streptococcus pneumoniae* and *Proteus mirabilis*, while stem extract showed a maximum inhibitory activity against *Klebsiella pneumoniae* and *Bacillus subtilis* (Fig. 2c. & Fig. C). However, chloroform extract of root powder showed a maximum inhibitory activity against *Klebsiella pneumoniae*, *Micrococcus luteus* and *Bacillus subtilis*.

Ethanol extract of leaf of *Gmelina asiatica* showed a well profound inhibitory activity against *Klebsiella pneumoniae*, *Streptococcus pneumoniae* and *Proteus mirabilis*, while stem extract showed a maximum inhibitory activity against *Micrococcus luteus*, *Bacillus subtilis* and *Streptococcus pneumoniae* (Fig. 2d. & Fig. D.). Similarly, ethanol extract of root powder showed a maximum inhibitory activity against *Micrococcus luteus* followed by *Proteus mirabilis* and *Klebsiella pneumoniae*.

Ether extract of the leaf of *Gmelina asiatica* showed a well profound inhibitory activity against *Micrococcus luteus*, *Bacillus subtilis* and *Pseudomonas aeruginosa*, while stem extract showed a maximum inhibitory activity against *Proteus mirabilis* followed by *Bacillus subtilis* and *Escherichia coli* (Fig. 2e. & Fig. E). Similarly, ether extract root powder showed a maximum inhibitory activity against *Bacillus subtilis*, *Klebsiella pneumoniae* and *Streptococcus pneumoniae*.

Aquous extract of the leaf of *Gmelina asiatica* showed a well profound inhibitory activity against *Escherichia coli* followed by *Klebsiella pneumoniae*, *Staphylococcus aureus* and *Pseudomonas aeruginosa*, while stem extract showed a maximum inhibitory activity against

Streptococcus pneumoniae (Fig. 2f. & Fig. F.). However, aqueous extract of root powder showed a maximum inhibitory activity against *Proteus mirabilis* and *Micrococcus luteus*.

CONCLUSION

In the present plant, “*Gmelina asiatica*.L” of Verbenaceae family, the powder extract of leaf, stem and root have been taken. In that, the inhibitory activity of the extracts against different bacteria have been noted and tabulated. Of which, the highest inhibitory activity is seen in ethanol and ether extracts of leaf against the two bacteriae (i) *Klebsilla Pneumoniae* (ii) *Micrococcus luteus*.

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