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In vitro Antimicrobial Efficacy of *Lagerstroemia parviflora* Roxb. Flowers

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Abstract: The antimicrobial potentiality of the methanolic extract of flowers of *Lagerstroemia parviflora* Roxb. (Family: Lythraceae) was studied against some pathogenic bacterial strains by disc diffusion and agar dilution method. The extract showed significant concentration dependent antibacterial activity particularly against gram-negative microbes. The study illustrates the claim of the usefulness of the plant in dysenteric and diarrhoeal infection and also suggests its use in fever. The antibacterial action was mainly due to the isolated triterpenoid, lageflorin.

Key words: Lagerstroemia parviflora, lythraceae, flowers, antimicrobial

INTRODUCTION

Lagerstroemia parviflora Roxb. is a medium sized deciduous plant cultivated throughout India available even up to a height of 900 m in the Himalayas. It has been found that the local tribes of Chotonagpur region of India use the leaves of this plant as an antitussive and astringent. The plant is also considered to be used by the tribals of India for treatment of sores, fever, strangulation of intestine, syphilis and carbuncles[1]. The plant was reported to have antiasthmatic[2]. The leaves are found to possess antitussive activity[3] and antipyretic activity[4]. The flowers have been found to be very effective in control of various bacterial infections in the traditional system of Indian medicine. The present investigation was undertaken to evaluate the antibacterial efficacy of flowers of *Lagerstroemia parviflora* Roxb on some microbes.

MATERIALS AND METHODS

Plant material and extraction: The flowers of *L. parviflora* Roxb. (Lythraceae) were collected in April from Ranchi district of Jharkhand, India. The plant was identified by Scientist-in-charge, Central National Herbarium, Botanical Survey of India, Shibpur, Howrah (CNH/I-J(ii)2001-Tech.II/321) and a voucher specimen is also retained by our laboratory for future reference. The flowers were air dried after washing and then pulverized in a mechanical grinder. The dried powdered flowers of *Lagerstroemia parviflora* were extracted with methanol in a soxhlet apparatus (yield 5.28% w/w with respect to dried powdered extract).

Test microorganisms: The nutrient broth culture of *Shigella dysenteriae* 1, *Shigella dysenteriae* 2, *Shigella boydii* 8, *Staphylococcus aureus* ML267, *Staphylococcus aureus* NCTC 7447, *Escherichia coli* ROW 7/12, *Bacillus subtilis* CD/99/1, *Salmonella typhimurium* ATCC 6539, *Vibrio cholerae* 8531 and *Pseudomonas aeruginosa* 1 were used in present study.

Determination of antimicrobial activity: One loopful (loop diameter: 3 mm) of an overnight grown nutrient broth culture of the test organisms were added by checker board technique to the marked quadrant of the sterile 100 mm petri dishes containing various concentrations of the extract in nutrient agar (5, 10, 25, 50, 100, 200, 400, 800 and 1000 μg mL^{-1}). The spot inoculated plates were incubated at 37°C for 24 h to determine MIC of the extract against the microorganisms[5].

Antibacterial activity was also tested by the disc diffusion method. The sterile nutrient agar cooled to 48-50°C seeded with the test organisms were poured in presterilized petridishes. When the agar solidified, the total surface of the agar was divided into six quadrant and six filter paper discs (diameter: 6 mm) containing from different concentrations of the extract, standard drug

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(Ciprofloxacin) and one control (10% Dimethyl sulfoxide) were placed in the middle of each zone. All the plates were incubated at 37°C for 48 h. The zone of inhibition was calculated by measuring the diameter of zone of no bacterial growth around filter paper disc. For each set of data, the average of three independent determinations was recorded[6,7].

Phytochemical studies: The extract was tested by preliminary phytochemical screening for the detection of the phytoconstituents[8].

RESULTS AND DISCUSSION

The preliminary phytochemical studies revealed the presence of tannin, triterpenoid, steroid and flavonoids in the methanolic extract. *Shigella boydii* was found to be inhibited at the least concentration (50 μg mL^{-1}) and found to show the maximum diameter of zone of inhibition at the largest tested concentration of 1000 μg mL^{-1} comparable with ciprofloxacin. *Vibrio cholerae* was the next highly sensitive culture as it is inhibited at a slightly higher concentration of the extract (100 μg mL^{-1}) and showed a zone of inhibition slightly smaller than that produced by *Shigella boydii*. *E.coli* was the next susceptible strain as the extract had a MIC of 200 μg mL^{-1} with a greater zone of inhibition as compared to that produced by *Staphylococcus aureus* though having the same MIC as the former. Similar sort of results were obtained with all the remaining microbes. Thus it was seen that methanol extract posses significant antimicrobial activity against all the tested strains; maximum inhibitory effect was noted against *Shigella boydii*, *Vibrio cholerae*, *Escherichia coli*, *Shigella* sp. and *Staphylococcus aureus* (Table 1). The extract was found to be moderately active against *Pseudomonas* aeruginosa, *Salmonella typhimurium* and *Bacillus subtilis*. The study justified the use of the flowers of the plant in dysenteric and diarrhoeal infections by the tribals. The activity of the extract against *S. aureus* supported the use of the plant against fever (Table 2). However the exact mechanism of action is yet to be determined.

Table 1: Determination of MIC of extract against various microorganisms

	Inhibitory effect at concentrations of extract (μg mL^{-1})									
Name of organisms	0*	5	10	25	50	100	200	400	800	1000
Bacillus subtilis CD/99/1	+	+	+	+	+	+	+	+	+	-
Staphylococcus aureus ML267	+	+	+	+	+	±	-	-	-	-
Staphylococcus aureus NCTC 7447	+	+	+	+	+	±	±	-	-	-
Shigella dysenteriae 1	+	+	+	+	+	+	+	-	-	-
Shigella dysenteriae 2	+	+	+	+	+	+	-	-	-	-
Shigella boydii 8	+	+	+	+	-	-	-	-	-	-
Escherichia coli ROW 7/12	+	+	+	+	+	±	-	-	-	-
Vibrio cholerae 8531	+	+	+	+	+	-	-	-	-	-
Pseudomonas aeruginosa 1	+	+	+	+	+	+	+	-	-	-
Salmonella typhimurium ATCC 6539	+	+	+	+	+	+	+	-	-	-

(0*: Control without any extract, +: Growth, -: No growth, ±: Inhibited growth)

Table 2: Antibacterial activity of methanol extract of flowers of *Lagerstroemia parviflora*

	Diameter of zone of inhibition (mm)[a]				
	Concentration of extract (μg mL^{-1})				Ciprofloxacin
Bacteria	200	400	800	1000	10 μg mL^{-1}
Gram positive					
Bacillus subtilis CD/99/1	6.0	6.5	7.5	8.0	27.0
Staphylococcus aureus ML267	8.0	8.5	9.5	11.0	25.0
Staphylococcus aureus NCTC 7447	8.0	9.0	10.0	11.0	25.5
Gram negative					
Shigella dysenteriae 1	8.5	9.5	11.0	13.0	22.5
Shigella dysenteriae 2	8.5	9.0	10.5	12.0	23.0
Shigella boydii 8	12.0	14.0	18.0	20.0	22.0
Escherichia coli ROW 7/12	10.0	12.0	13.0	15.0	28.0
Vibrio cholerae 8531	11.0	14.0	16.0	18.5	29.5
Pseudomonas aeruginosa 1	7.0	7.5	8.0	8.5	25.0
Salmonella typhimurium ATCC 6539	8.5	9.0	10.5	11.0	26.0

[a]Each value is the average of three values, Solvent used is dimethyl sulfoxide

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