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SHORT COMMUNICATION

Studies on Antibacterial Activity of *Ficus racemosa* Linn. Leaf Extract

Subhash C. Mandal,[1] B. P. Saha[2] and M. Pal[2]*

[1]Division of Pharmacognosy, Department of Pharmaceutical Technology, Faculty of Engineering and Technology, Jadavpur University, Calcutta - 700 032, India
[2]Division of Pharmaceutical Chemistry, Department of Pharmaceutical Technology, Faculty of Engineering and Technology, Jadavpur University, Calcutta - 700 032, India

Extracts of *Ficus racemosa* Linn. leaves were tested for antibacterial potential against *Escherichia coli* ATCC 10536, *Basillus pumilis* ATCC 14884, *Bacillus subtilis* ATCC 6633, *Pseudomonas aeruginosa* ATCC 25619 and *Staphylococcus aureus* ATCC 29737. The effects produced by the extracts were significant and were compared with chloramphenicol. The petroleum ether extract was the most effective against the tested organisms. Copyright © 2000 John Wiley & Sons, Ltd.

Keywords: Ficus racemosa; leaf extract; antibacterial activity.

INTRODUCTION

Ficus racemosa Linn. Syn. *Ficus glomerata* Roxb. (Moraceae) commonly known as 'Jagya-dumur' (Bengali), 'Gular' (Hindi) and 'Udumbara' (Sanskrit) is a well known moderate sized to large spreading tree with ovate, ovate-lanceolate leaves. Most parts of this plant are used in the Indian traditional system of medicine for the treatment of various diseases. The leaves are used in dysentery, diarrhoea, billious affection and in dysmenorrhoea; barks and fruits are also used in dysentery, diarrhoea and in diabetes (Anonymous, 1952; Chopra *et al.*, 1958; Kirtikar and Basu, 1975; Nadkarni *et al.*, 1976). The antidiarrhoeal evaluation (Mandal *et al.*, 1997a) and hypoglycaemic activity (Mandal *et al.*, 1997b), antiinflammatory activity (Mandal *et al.*, 1998a) and hepatoprotective activity (Mandal *et al.*, 1998b, 1999) of the leaf extract of *F. racemosa* has already been reported from our laboratory. Based on its use in dysentery and diarrhoea in traditional practice and its antidiarrhoeal effect, the present study was undertaken to evaluate the antimicrobial activity of the extracts of *F. racemosa* which is reported here.

MATERIALS AND METHODS

Plant material. The leaves of *Ficus racemosa* Linn. (Moraceae) were collected from Hetyasole, Bankura district of West Bengal (India) in August 1995. A voucher specimen was deposited in the Central National Herbarium, Botanical Survey of India, Shibpur, Howrah (CNH/7–3/(20) Tech.II/95/239), and was authenticated by Dr Mallick.

* Correspondence to: Dr M. Pal, Division of Pharmaceutical Chemistry, Department of Pharmaceutical Technology, Faculty of Engineering and Technology, Jadavpur University, Calcutta - 700 032, India.

Preparation of the plant extracts. The mature, dried leaves were powdered (500 g) and sequentially extracted using petroleum ether (60 °–80 ° C) (fraction I), benzene (fraction II), chloroform (fraction III), acetone (fraction IV), methanol (fraction V) and water (fraction VI). All the extract were evaporated to dryness at low temperature under reduced pressure in a rotavapor. The yield (with respect to dry powdered material) of different extracts were calculated I(6.43%), II (1.09%), III (1.77%), IV (8.45%), V (12.92%) and VI (10.13%).

Preparation of samples. The different semisolid fractions I –VI were dissolved in dimethyl formamide (DMF) for antibacterial tests. The corresponding concentrations are expressed in terms of mg and μg of the extract per mL of solvent (DMF), and the antibacterial efficacy was investigated. Chloramphenicol solution (mg%) was prepared in sterile distilled water and used as a standard.

Chemicals. All chemicals and solvents used in this experiment were of AR grade and obtained from BDH (Poole, UK).

Microorganisms. The following strains were used as test organisms obtained from Central Drug Laboratory, Calcutta, India. *Escherichia coli* ATCC 10536, *Bacillus pumilis* ATCC 14884, *Bacillus subtilis* ATCC 6633, *Pseudomonas aeruginosa* ATCC 25619 and *Staphylococcus aureus* ATCC 29737.

Antimicrobial assay. The antimicrobial activity was evaluated by an agar diffusion method employing 24 h cultures of five different test organisms. The test organisms were inoculated into sterile nutrient agar medium by uniformly mixing 1 mL of inoculum with 20 mL sterile melted nutrient agar cooled to 48 °–50 ° C, in a sterile Petri dish. When the agar solidified, eight holes of uniform diameter (6 mm) were made by using a sterile borer. Two volumes of each of the test solutions as

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Table 1. *In vitro* antibacterial activity of *F. racemosa leaf* extract (mean ± standard error)

Treatment	Conc. (mg%)	Diameter of zone of inhibition (mm) EC	BP	BS	PA	SA
Pet. ether (60°–80°C)	25	19 ± 2	16 ± 2	15 ± 3	16 ± 2	20 ± 3
Benzene	25	14 ± 1	13 ± 3	13 ± 4	11 ± 2	16 ± 2
Chloroform	25	13 ± 3	12 ± 2	12 ± 2	11 ± 3	14 ± 4
Acetone	25	11 ± 2	12 ± 2	11 ± 4	10 ± 1	12 ± 1
Methanol	25	08 ± 2	10 ± 1	09 ± 2	09 ± 2	11 ± 1
Water	25	09 ± 1	10 ± 2	09 ± 3	10 ± 1	10 ± 2
Standard (Chloramphenicol)	10	30 ± 2	25 ± 3	26 ± 4	20 ± 1	28 ± 1
Blank (DMF)	0	0	0	0	0	0

EC, *Escherichia coli* ATCC 10536; BP, *Bacillus pumilis* ATCC 14884; BS, *Bacillus subtilis* ATCC 6633; PA, *Pseudomonas aeruginosa* ATCC 25619; SA *Staphylococcus aureus* ATCC 29737; DMF, dimethyl formamide.

Table 2. *In vitro* antibacterial activity of a petroleum ether extract of *F. racemosa* leaves

Treatment	Conc. (μg/mL %)	Diameter of zone of inhibition (mm) EC	BP	BS	PA	SA
Extract (Pet. ether)	150	14 ± 3	10 ± 3	9 ± 2	11 ± 1	15 ± 2
Extract	200	20 ± 2	16 ± 2	14 ± 2	13 ± 2	22 ± 3
Extract	250	22 ± 2	18 ± 1	17 ± 4	15 ± 1	25 ± 1
Extract	300	24 ± 3	19 ± 2	19 ± 2	17 ± 2	27 ± 1
Extract	350	26 ± 4	20 ± 2	21 ± 3	23 ± 3	28 ± 3
Standard (Chloramphenicol)	100	31 ± 4	29 ± 2	27 ± 3	25 ± 3	30 ± 3
Blank (DMF)	0	0	0	0	0	0

EC, *Escherichia coli* ATCC 10536; BP, *Bacillus pumilis* ATCC 14884; BS, *Bacillus subtilis* ATCC 6633; PA, *Pseudomonas aeruginosa* ATCC 25619; SA *Staphylococcus aureus* ATCC 29737; DMF, dimethyl formamide.

well as standard solution (Chloramphenicol) and the blank (DMF) were placed in each hole separately under specific condition and the plates were then maintained at room temperature for 2 h to allow the diffusion of the solution into the medium. All the plates were then incubated at 37 ° C for 24 h and the zone of inhibition was measured (Mariam *et al.*, 1993).

The petroleum ether extract was further tested against *E. coli* ATCC 10536, *B. pumilis* ATCC 14884, *B. subtilis* ATCC 10536, *P. aeruginosa* ATCC 25619 and *S. aureus* ATCC 29737 for evaluation of antibacterial activity at different concentrations (150, 200, 250, 300 and 350 μg/mL) by using the filter paper disc diffusion method (Pelczar *et al.*, 1993). The zone of inhibition was calculated by measuring the minimum dimension of the zone of no bacterial growth around the filter paper disc. For each zone an average of three independent determinations were made.

RESULTS AND DISCUSSION

Antimicrobial activity of the extracts of *F. racemosa* are represented in Table 1. This shows that all the extracts possessed some antimicrobial activity against all the tested organisms.

In the preliminary screen, the petroleum ether extract was found to be more active than the others. So it was subjected to further testing using different concentrations 150, 200, 250, 300 and 350 μg/mL. It showed significant inhibitory effect against *E. coli* ATCC 10536, *B. pumilis* ATCC 14884, *B. subtilis* ATCC 6633, *P. aeruginosa* ATCC 25619 and *S. aureus* ATCC 29737 (Table 2). Further work is currently being undertaken to isolate the active constituents.

So it can be concluded from this preliminary screen that the antibacterial potential of petroleum ether extract of the leaves of *F. racemosa* may contribute to its use in the Indian traditional system of medicine, particularly to its use in the treatment of dysentery and diarrhoea (Chopra *et al.*, 1958; Kirtikar and Basu, 1975; Nadkarni *et al.*, 1976) and the evaluation of antidiarrhoea activity (Mandal *et al.*, 1997a).

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REFERENCES

Anonymous (1952). The Wealth of India, Raw Materials, Vol. IV, pp. 35–36, Publication and Information Directorate, CSIR, New Delhi.

Chopra, R. N., Chopra, I. C., Handa, K. L., and Kapur, L. D. (1958). *Indigenous Drugs of India*, 2nd edn pp. 508, 674, Academic Publishers, Calcutta.

Kirtikar, K. R., and Basu, B. D. (1975). *Indian Medicinal Plants*, 2nd edn, vol. **III**, pp. 2327, 2329, Bishen Singh and Mahendra Pal Singh, Dehradun.

Mandal, S. C., Mukherjee, P. K., Saha, K., Pal, M., and Saha, B. P. (1997a). Antidiarrhoeal evaluation of *Ficus racemosa* Linn. Leaf Extract. *Nat. Prod. Sci.* **3**, 100–103.

Mandal, S. C., Mukherjee, P. K., Saha, K., Das, J., Pal, M., and Saha, B. P. (1997b). Hypoglycaemic activity of *Ficus racemosa* L. (Moraceae) leaves in stretozotocin-induced diabetic Rats. *Nat. Prod. Sci.* **3**, 38–41.

Mandal, S. C., Maity, T. K., Das, J., Saha, B. P., and Pal, M. (1998a). *Ficus racemosa* affords antihepatotoxic activity against paracetamol-induced acute liver damage in rats. *Nat. Prod. Sci.* **4**, 174–179.

Mandal, S. C., Maity, T. K., Das, J., Saha, B. P., and Pal, M. (1998b). Anti-inflammatory evaluation of *Ficus racemosa* L. leaf extract. *J. Ethnopharmacol.* (in press).

Mandal, S. C., Maity, T. K., Das, J., Pal, M., and Saha, B. P. (1999). Hepatoprotective activity of *Ficus racemosa* leaf extract on liver damage caused by carbon tetrachloride in rats. *Phytother. Res.* **13**, 430–432.

Mariam, T. G., Murty, P. N., Ranganathan, P., Hymete, A., and Daka, K. (1993). Antimicrobial screening of *Rumex abyssinicus* and *Rumex nervosus. The Eastern Pharmacist* **36**, 33, 131–133.

Nadkarni, K. M., Nadkarni, A. K., and Chopra, R. N. (1976). Indian Materia Medica, Vol. I, pp. 548–550, Popular Prakashan, Bombay.

Pelczar, M. J., Chan, E. C. S., and Krieg, N. R. (1993). *Microbiology—Concepts and Application*, Int. edn. pp. 578–581, McGraw Hill, New York.

