JOURNAL OF PURE AND APPLIED MICROBIOLOGY, October 2008. Vol. **2**(2), p. 579-582

Antimicrobial Activity of Leaf and Root Ethanol Extracts of Selected Indian Medicinal Plants Against Lower Respiratory Tract Human Pathogenic Microorganisms

S. Madhavan[1]* and K. Saritha[2]

[1]PG & Research Department of Microbiology,
Sengamala Thayaar Educational Trust Women's College, Mannargudi - 614 001, India.
[2]Department of Microbiology, Sri Venkateshwara College of Arts and Science,
Peravurani - 614 804, India.

(Received: 09 July 2008; accepted: 12 September 2008)

Antimicrobial activity of the leaf and root extracts of *Indigofera tinctoria* Linn., *Wrightia tinctoria* Br. and *Rungia repens* Nees. against human pathogenic bacteria and fungi were evaluated. The ethanol extracts of these plants were evaluated for antimicrobial activity against human pathogenic bacteria such as *Escherichia coli, Pseudomonas aeruginosa*, *Proteus mirabilis* and pathogenic fungi such as *Aspergillus niger, Aspergillus flavus* and *Aspergillus fumigatus*. Ethanolic leaf and root extracts were prepared and based on the susceptibility of the test organisms were determined. It was found that ethanolic extracts showed high inhibition zone than control experiments.

Key words: Antimicrobial activity, medicinal plants, ethanol extract, human pathogens.

India is profusely rich in the history of medicinal plants and its 75 % folk population is still using herbal preparations in the form of powder, extracts and decoction because these are easily available in nature and the natives have stronger faith on traditional plants. Ministry of Health and Family Welfare Centre and state governments are conducting high-level research programmes to manufacture drugs. These drugs of medicinal value are competing today in markets. Various plants exhibit various types of antimicrobial activities (Parihar & Bohra, 2006). Infectious diseases account for high proportion of health problems in the developing countries like India. Microorganisms have developed resistance to many antibiotics and this has created immense clinical problem in the treatment of infectious diseases. The resistance of the organisms increased due to indiscriminate use of commercial antimicrobial drugs commonly used for the treatment of infectious diseases. This situation forced the scientists to search for new antimicrobial substances from various sources including medicinal plants (Rao *et al*., 2006).

* To whom all correspondence should be addressed.

The tea of the *Indigofera tinctoria* and *Wrightia tinctoria* leaves in the treatment of epilepsy, hydrophobia, sores, old ulcers, haemorrhoids, bronchitis and nervous disorders. The tea of the *Indigofera tinctoria* and *Wrightia tinctoria* roots, in the treatment of hepatitis. In Cambodia, the leaves of *W. tinctoria* are given in decoction for blennarrhagia and the Mundas of Chota Nagpur use its roots for urinary complaints. Fresh, bruised leaves of *R. repens* are mixed with caster oil, in the treatment of tinea captitis (Kirtikar and Basu, 1975; Chopra *et al.,* 2002). *I. tinctoria* contains alkaloids, glucosides and oleoresin (Hoffmann, 1996). The chloroform, ethanol and aqueous extracts of *W. tinctoria* leaves also endowed with strong antimicrobial activity (Anbuganapathi *et al*., 2002). No reports in leaves and roots of *R. repens* can be found. So in the present study an attempt has been made to investigate *in vitro* antimicrobial activity of three medicinal plants *viz., Indigofera tinctoria* (STET-325) *Wrightia tinctoria* (STET-326) and *Rungia repens* (STET-327) against human pathogenic microbes.

MATERIAL AND METHODS

Collection and identification of plants

I. tinctoria (Fabaceae), *W. tinctoria* (Apocyanaceae) and *R. repens* (Acanthaceae) (Gamble, 1998) leaves and roots harvested in the area of the garden of the Sengamala Thayaar Educational Trust Women's College, Mannargudi, Tamil Nadu, India. A voucher specimen was deposited in the Herbarium of the STET Women's College, Department of Botany and Microbiology, Mannargudi, Tamil Nadu.

Preparation of plant extracts

5 gms of fresh leaves and roots of each plant species 2-3 times washed with tap water and distilled water separately and then surface sterilized with 90 % alcohol. Subsequently, plant materials were grounded in 50 ml of ethanol. The ethanolic macerates were kept for 24 hours at room temperature. Macerates were squeezed through double-layered muslin cloth and filtered through filter paper. After filtration, aliquot was centrifuged at 10,000 rpm for 20 minutes. The supernatant were filtered through Whatmann No.1 filter paper and then sterilized by passing through 0.2 micron disposable filters. The extracts (50 %) thus obtained were used for the *in vitro* studies (Parihar & Bohra, 2002).

Antibacterial activity of plant part extracts

The bacterial cultures were obtained from the Institute of Microbial Technology (IMTECH), Chandigarh, India and maintain on a nutrient agar. The disc diffusion method was used for testing antimicrobial activity (Bauer *et al*., 1966). The bacteria (24 hours) and fungi (48 hours) cultures were diluted with sterile water and mixed thoroughly to get a clear homogeneous suspension and this suspension uniformly spread on solidified agar (Nutrient agar and potato dextrose agar) medium. A sterile filter paper No.1 discs were soaked in different plant 50 % extracts by inserting the filter paper into the extract and shaking by holding it with forceps. The filter paper discs were allowed to dry and immersed again in the different plant 50 % extracts. The filter paper discs prepared were carefully over the spread cultures and incubated at 37°C for 24 hours for bacteria and 28-30°C for 48 hrs for fungi. Paper discs treated with distilled water alone served as control. Six plates were employed per treatment and the average zone of inhibition was recorded.

RESULTS AND DISCUSSION

It was found that ethanolic extracts of leaves and roots of *I. tinctoria, W. tinctoria* and *R. repens* have shown inhibition against the bacterial stain of *Escherichia coli, Pseudomonas aeruginosa, Proteus vulgaris* and fungal stain *Aspergillus niger, Aspergillus flavus* and *Aspergillus fumigatus*. Based on these comparisons the susceptibility of the test organisms against ethanol plant extracts was determined. The results obtained in the present study revealed that the ethanolic extracts of plant leaves and roots like *I. tinctoria, W. tinctoria* and *R. repens* were showed high inhibitory activity against the growth of three bacterial and fungal species than control (Table 1). Similar results were obtained by Adelakun *et al*. (2001) in *Boswellia dalzielli* stem bark showed broad spectrum inhibitory activity against bacteria and fungi. Such antibacterial activity in crude extracts of seven

Table 1. Antimicrobial activity of 50 % ethanol extracts of leaves and roots of selected medicinal plants against human pathogenic micro organisms (Mean ± S.E. of six replicates)

S. No.	Microorganisms	Zone of inhibition (in mm)					
		Indigofera tinctoria		*Wrightia tinctoria*		*Rungia repens*	
		Leaves	Root	Leaves	Root	Leaves	Root
1.	*Escherichia coli*	32.00±1.73	27.66±1.72	24.00±0.01	20.66±1.15	26.00±0.03	24.00±0.03
2.	*Pseudomonas aeruginosa*	27.00±1.00	25.00±0.08	22.66±0.05	30.00±0.05	30.00±0.05	27.33±1.15
3.	*Proteus vulgaris*	26.66±1.15	10.66±1.15	20.33±1.52	19.33±1.52	25.00±0.03	16.66±1.15
4.	*A. niger*	26.33±1.15	24.00±0.53	24.00±1.52	23.66±1.52	29.66±0.58	28.00±0.01
5.	*A. flavus*	26.66±1.15	25.00±0.62	30.00±0.57	28.66±0.57	24.66±0.58	10.00±0.01
6.	*A. fumigatus*	10.66±1.15	9.33±0.62	27.33±1.20	26.00±0.02	28.66±0.58	27.00±0.02

Ehiopian medicinal plants has been reported by Asres *et al*., (2001). *Borreia verticillata* roots methanolic extract exhibited a broad antibacterial activity against multi-resistant strains of *Pseudomonas aeruginosa* has been reported by Neto *et al*. (2002).

ACKNOWLEDGEMENTS

Authors are thankful to Dr. V. Dhivaharan, Correspondent, Sengamala Thayaar Educational Trust Women's College, Mannargudi for providing laboratory facility and to Curator, IMTECH Chandigarh for supplying bacterial culture. We sincerely express our thanks to Editor-in-Chief and an anonymous referee's for their valuable comments on the manuscript.

REFERENCES

1. Adelakun, E. A., Finbar, E.A.V., Agina, S.E. and Makinde, A.A. Antimicrobial activity of *Boswellia dalzielli* stems bark. *Fitoterapia*. 2001; **72**(7): 822-824.
2. Anbuganapathi, G., Ponneelam, K.T.P.B. and Suchitra, R. Antibacterial and antifungal effect of leaves of *Wrightia tinctoria*. *J. Ecotoxicol. & Environmental Monitoring.* 2002; **12**(4): 299-304.
3. Asres, K., Bucar, F., Edelsbrunner, S., Karting, T., Hoger, G. and Thiel, W. Investigations on antimycobacterial activity of some Ethiopian medicinal plants. *Phytotherapy Research*. 2001; **15**(4): 323-326.
4. Bauer, A.W., Kirby, M.D.K., Sherris, J.C. and Trick, M. Antibiotic susceptibility testing by standard single disc diffusion method. *American Journal of Clinical Pathology*. 1966; **45**: 493-496.
5. Chopra, R.N., Nayar, S.L. and Chopra, I.C. Glossary of Indian Medicinal plants. National Institute of Science Communication and Information Resources (CSIR), New Delhi. 2002.
6. De Sa Peixoto Neto, P.A., Silva, M., Campos, N.V.C., Porfirio, Z. and Caetano, L.C. Antibacterial activity of *Borrieria verticillata* roots. *Fitoterapia*. 2002; 73(6): 529-531.
7. Gamble, J.S. Flora of the Presidency of Madras, Bighen Singh Mahendra Pal Singh, New Connaught Place, Dehradun – 248 001. (India) 1998; Vol. I, II & III.
8. Hoffmann, D. The complete illustrated holistic herbal- a safe and practical guide to making and using herbal remedies. Element books, Shaftesbury, Dorssset. 1996.
9. Kirtikar, K.R. and Basu, B.D. Indian Medicinal plants. Bishen Singh Mahendra Pal Singh, New Delhi, Vol. I, II & III. 1975.
10. Nene, Y.L. and Thapliyal, P.N. Fungicides in plant disease control. 2nd edition, Oxford and

UVG Publishing Co., New Delhi. 1979; 415-416.

11. Parihar L. and Bohra, A. Antimicrobial activity of stem extracts of some spices plants. *Ad. Plant Sci.* 2006; **19**(11): 391-395.
12. Parihar, P and Bhora, A. Screening of some ferns for their antimicrobial activity against *Salmonella typhi*. *Ad. Plant Sci.* 2002; **15**(2): 365-367.
13. Rao, M.R., Reddy, I.B. and Ramana, T. Antimicrobial activity of some Indian Medicinal plants. *Ind. J. of Microbiol.* 2006; **46**(3): 259-262.