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RESEARCH ARTICLE

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ANTIMICROBIAL POTENTIAL OF ROOTS OF *RICCINUS COMMUNIS* AGAINST PATHOGENIC MICROORGANISMS

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ABSTRACT

Antimicrobial activity of various extracts of roots (200mg/ml) of *Ricinus communis* were screened against pathogenic microorganisms such as *Escherichia coli, Staphylococcus aureus, Pseudomonas aeruginosa, Salmonella typhimurium, Proteus vulgaris, Bacillus subtilis, Candida albicans* and *Aspergillus niger* using well diffusion method. Aqueous extracts don't show any significant antimicrobial properties. The hexane and methanol extracts revealed maximum antimicrobial activity ($p<0.0001$). These findings established the potential of the roots of *Ricinus communis* as an effective antimicrobial agent. However, further studies are needed to evaluate active compounds and probable medicinal benefits in chemotherapy among humans.

KEYWORDS

Ricinus communis, pathogenic microorganisms, methanol extracts, hexane extracts and chemotherapy.

INTRODUCTION

A large portion of the world's population depends on the traditional system of medicine for a variety of diseases. Several genera are used medicinally mainly as herbal preparations in the indigenous system of medicine in different countries and are sources of very potent and powerful drugs. According to WHO (1993), 80% of the world's population is dependent on the traditional medicine and a major part of the traditional therapies involves the use of plant extracts or their active constituents. With the continuous use of antibiotics, microorganisms have become resistant. This has created immense clinical problem in the treatment of infections diseases [1]. Therefore there is a need to develop alternative antimicrobial drugs for the treatment of infectious diseases. One approach is to screen local medicinal plants for possible antimicrobial and antifungal properties.

Ricinus communis L. (Euphorbiceae) is a soft wooden small tree, wide spread throughout tropics and warm temperature regions of the world [2]. In the Indian system of medicine, the leaf, root and seed oil of this plant have been used for the treatment of the inflammation and liver disorders, hypoglycemic and laxative [3-5]. In the present study we have investigated antimicrobial potential of *Ricinus communis* root extracts against several pathogenic microorganisms.

MATERIALS AND METHODS

Collection and Identification of Plant:

The plants of *Ricinus communis* were collected in the month of September from local gardens of Dehradun (U.K). The plants were authenticated at Botanical Survey of India (BSI), Dehradun (U.K), India.

Preparation of Solvent extracts:

The method [6] was adopted for preparation of plant extracts with little modifications. Briefly four 20 g portions of the powdered plant material were soaked separately in 100 ml of water, hexane, methanol and petroleum ether for 72 h. Each mixture was stirred after every 24h using a sterile glass rod. At the end of extraction, each extract was passed through Whatman filter paper no. 1 (Whatman, England). The filtrate obtained were concentrated in vacuo using rotary evaporator at 30^{o}C.

Test organisms used:

The test organisms (*Bacillus subtilis* ATCC6051, *Proteus vulgaris* ATCC 6380, *Salmonella typhimurium* ATCC 23564, *Pseudomonas aeruginosa* ATCC 25619, *Escherichia coli* K-12 and *Staphylococcus aureus* were the bacterial strains obtained from Institute of Microbial Technology (IMTECH) Chandigarh, India. The fungal test organisms used for the study were *Candida albicans* and *Aspergillus niger.* These were obtained from pure lab cultures of Dept. of Microbiology, Sai Institute of Paramedical & Allied Sciences (SIPAS) Dehradun, India.

Determination of antibacterial and antifungal activity:

The agar well diffusion method [7] was modified. Soyabean casein digest agar (SCDA) was used for bacterial cultures. The culture medium was inoculated with the microorganism separately suspended in soyabean casein digest broth. Sabouraud's dextrose agar (SDA) was used for fungal cultures. The culture medium was inoculated with the fungal strains separately suspended in Sabouraud's dextrose

broth. A total of 8 mm diameter wells were punched into the agar and filled with plant extracts (200mg/ml) and solvent blanks (distilled water, hexane, methanol and petroleum ether as the case may be). Standard antibiotic (Chloramphenicol, concentration 1mg/ml) was simultaneously used as positive control. The bacterial plates were then incubated at 37°C for 18 h. The antibacterial activity was evaluated by measuring the diameter of zone of inhibition observed. The same procedure was done for determining antifungal activity but in this case standard antibiotic (Fucanazole, concentration 1 mg/ml) was used as positive control and fungal plates were incubated at 37°C for 72 h. Here also the diameter of zone of inhibition observed was measured.

Statistical Analysis:

All the results were expressed as mean ± SEM. The significance of difference was evaluated by ANOVA. The significance of probability was considered $p < 0.001$ by using software Origin 8.

RESULTS

The hexane and methanol extracts (200mg/ml) of roots of *Ricinus communis* showed good activity against pathogenic bacterial and fungal strains. Aqueous extracts showed no antimicrobial activity against any of the pathogens. Hexane extracts (200mg/ml) showed prominent antimicrobial activity against *Candida albicans* and *Aspergillus niger* fungal strains. Methanol extracts (200mg/ml) were found to be prominent against *E.coli* and *Aspergillus niger*. The experiments were performed in triplicates. The results are indicated in **Table 1**.

Table 1
Antimicrobial activity of various solvent extracts of roots of Riccinus communis

Pathogens	Diameter of Zone of Inhibition(mm) ± S.D					
	Chloramphenicol (1mg/ml)	Fucanazole (1mg/ml)	H	P	A	M
Bacillus subtilis	17.0 ±1.7	-----	5.0±0.7	6.0±0.6	NA	7.0±0.56(in single line)
E. coli	16.0±1.2	-----	6.0±0.7	5.0±0.5	NA	18±0.52(in single line
Proteus vulgaris	18.0±1.4	-----	7.0±1.3	5.0±0.4	NA	8.0±0.45(in single line
Salmonella typhimurtium	15.0±1.2	------	6.0±1.8	5.0±0.5	NA	9.0±0.56(in single line
Pseudomonas aeruginosa	12.0±1.4	------	7.0±1.0	8.0±0.6	NA	8.0±0.56(in single line
Staphylococcus aureus	12.0±1.4	------	8.0±1.2	6.0±0.7	NA	9.0±0.42(in single line
Candida albicans	----	18.0±0.7	18±1.5	6.0±0.8	NA	7.0±0.53(in single line
Aspergillus niger	----	17.0±0.5	19±0.6	NA	NA	19±1.7(in single line

H: Hexane, P: Petroleum ether, A: Aqueous, M: Methanol (each 200 mg/ml); NA: No Activity; ----: Not tested.

DISCUSSION AND CONCLUSION

The susceptibility pattern exhibited by the tested organisms to these root extracts could be exploited for probably medicinal purposes in chemotherapy among humans. The findings from this study partly agree with the earlier report conducted on leaves extract of *Riccinus communis* against dermatophytic and pathogenic bacteria [8]. Further work is needed to locate the active principle from the various extracts and their phyto- pharmaceutical studies. Research into the effects of local medicinal plants is expected to boost the use of the roots of this plant in the therapy against disease caused by bacterial and fungal species and other microorganisms.

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REFERENCES

1. Davis J, Inactivation of the antibiotics and the dissemination of resistance genes. Science, 264: 375-382, (1994).
2. Ivan A, Chemical constituents, traditional and modern uses: Medicine plants of the world. Ross Humana Press Inc., Totowa, NJ: 375-395, (1998).
3. K.R Kirtikar and Basu BA. Indian Medicinal Plants, 3 rd edition: 2274-2277, (1991).
4. Dhar ML, Dhar MM, Dhawan BN, Mehrotra BN, Ray C. Screening of Indian plants for biological activity. Part I. Indian Journal of Experimental Biology, 6: 232-247, (1998).
5. Capasso F, Mascolo N, Izzo AA, Gaginella TS. Dissociation of castor oil induced diarrhea and intestinal mucosal injury in rat: effect of NG-nitro-L- arginine methyl ester. British Journal of Pharmacology, 113: 1127-1130, (1994).
6. Alade PI, Irobi ON. Antimicrobial activities of crude leaf extracts of *Acalypha wilkensiana.* Journal of Ethnopharmacology, 39:171-174, (1993).
7. Perez C, Anesini C. *In vitro* antimicrobial activity of Argentine folk medicinal plants against *Salmonella typhi.* Journal of Ethnopharmacology, 44: 41-46, (1993).
8. Islam T, Bakshi H, Gupta A, Sharma M. Assessment of antibacterial potential of leaves of *Riccinus communis* against pathogenic and dermatophytic bacteria. International Journal of Pharma Research and Development, 1(12): 1-7, (2010).