Trade Science Inc.

June 2008 *Volume 2 Issue 1*

Research & Reviews in

BioSciences

Regular Paper

RRBS, 2(1), 2008 [80-82]

Antimicrobial screening of rhizome extracts of *Cyperus pangorei Rottb*

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Received: 12th April, 2008 ; Accepted: 17th April, 2008

ABSTRACT

Cyperus pangorei Rottb. is a sedge, pantropical in distribution and the rhizomes of which provide a substitute for *C.rotundus* in Gujarat. The alcoholic rhizome extracts were prepared and used for the screening of the antibacterial and antifungal activities against eleven bacteria and five fungal species. The activity was compared with the activities of commercial antibiotics like ampicillin (amp), tetracycline (tet), kanamycin (kan) and nystatin (Nys) and the MIC's were determined. The extract exhibited potential activity against both Gram positive and Gram-negative bacteria (9 strains) and three fungal strains. Furthermore the extract showed potent activity against *Serattia marcesance*, *S. epidermis* and *S pyogenes*, while the antibiotics showed no activity against these microbes. The extract was also found to be fungicidal in case of *Candida albicans*, *Fusarium sp.* and *Exherholium sp.* The MIC varied between 5mg/ml to 20mg/ml.

KEYWORDS

Rhizome extract;
Antimicrobial;
MIC.

INTRODUCTION

Finding healing powers in plants is an ancient idea. Currently one quarter to one half of all pharmaceuticals in the US have higher plant origin. Mainstream medicine is increasing receptive to the use of antimicrobial and other drugs derived from plants, as traditional antibiotics become ineffective and as new, particularly viral diseases remain interactable to this type of drug. Another driving factor for renewed interest in plant antimicrobials in the past 25 years has been attributed to the rapid rate of plant species extinction[1]. *Cyperus* is one of the largest genera in Cyperaceae with 650-700 species spread all over the world of which 80 species occur in India. *Cyperus pangorei* Rottb. It is pantropical in distribution and is distributed all over India, Ceylon, Nepal and Burma[2]. Cauhan and coworkers[3] have reported the use of *C.pangorei* rhizomes as substitute for *C.rotundus*, which has been reported to be widely used in ethanomedicine in China, Egypt, India, Java, Sudan, Turkey and South East Asian countries. Several species of *Cyperus* possess medicinal values[4,5]. The antibacterial and antifungal activities of rhizome extracts of *C.rotundus* have been recorded[5] and also in other species like *C.corymbosus*, *C.malaccensis*, *C.monocephalus*[6] and *C.esculentus*[6].

Most of the useful antimicrobial phytochemicals are phenolics, polyphenols, quinines, flavones, flavonoids, tannins, coumarins, terpenoids, essential oils, alkaloids, lectins and polypeptides[1]. The presence of several sec-

ondary metabolites like sesquiterpenoids, coumarins, anthraquinones, flavonoids, terpenoids, cyperones, rotunols, limoneins and others has been reported from *Cyperus* sp.[7,8,9]. However, the present study is the first report on the biological screening for the antimicrobial activity of the rhizome extracts of *Cyperus pangorei* Rottb.

EXPERIMENTAL

Plants were collected along with rhizomes from river banks and streams near Alwarkurichi in Tirunelveli Dt., Tamil Nadu. The plant extract was prepared by the method used by Bashir and Erturk, 2003[10]. 10 gm of the sample was ground in 100 ml of ethanol and kept overnight in a shaker and then the extracts were filtered using muslin cloth. The solvent was evaporated to dryness to obtain dry residues. These residues were weighed and used to prepare extracts of different concentrations in 50% alcohol and stored at 40C for future use. Antimicrobial activity was measured using the standard method of well diffusion on agar[10]. 1 mg/ml alcoholic extract was used to determine the antimicrobial screening against a panel of microbes including *Salmonella* sp., *Pseudomonas* sp., *Micrococcus* sp., *Serattia marcesance*, *Bacillus cereus*, *Staphylococcus epidermis*, *Streptococcus pyogenes*, *E.coli*, *Alkaligens faecalis*, *Methylene resistant S.aureus* (MRSA), *methylene sensitive S.aureus* (MSSA) and five fungi viz., *Candida albicans*, *Fusarium sp*. *Exherholium* sp., *Aspergillus niger* and *Bipolaris* sp. Bacterial strains were cultured over night at 37^{0}C in Nutrient Broth and fungal strains in Czapek Dox medium at 37^{0}C for 24-48 hrs. Ampicillin, kanamycin and tetracycline were used as positive control for bacteria and nystatin for fungi, and alcohol was used in one well to test its impact. Top agar with inoculum was poured on to the medium and 6mm wells were made. To each well 0.1 ml of the rhizome extract, control and antibiotics were added. Different concentrations of the plant extracts (PE) (0.05, 0.1, 0.15, and 0.2 g/ml) were also used. The minimum inhibitory concentration (MIC) assay was also performed. A broth micro dilution susceptibility assay was used and recommended by the National Committee for Clinical Laboratory Standards (NCCLS, 1999) for determination of MIC's[11].

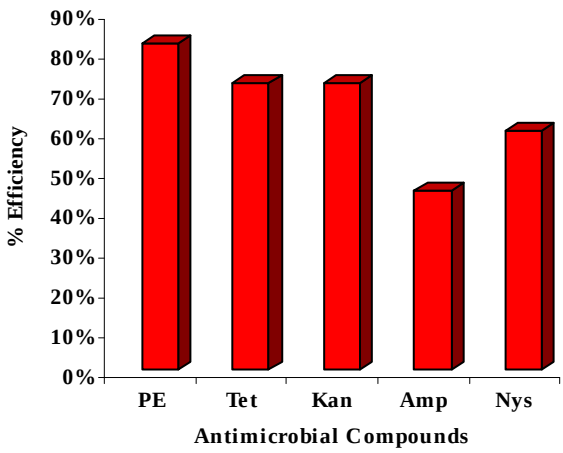

Figure 1 : Antimicrobial activity of plant extract and antibiotics

RESULTS AND DISCUSSION

Crude extracts obtained from rhizomes appeared reddish brown in color when extracted with ethanol. The extract inhibited the growth of both Gram positive and Gram-negative bacteria and was active against *Salmonella* sp., *Micrococcus* sp., *Serattia marcesance*, *Bacillus cereus*, *Staphylococcus epidermis*, *Streptococcus pyogenes*, *Alkaligens faecalis*, *Methylene resistant S.aureus* (MRSA), M*ethylene sensitive S.aureus* (MSSA) and no activity against *Pseudomonas* sp. and *E.coli*. It was interesting to note that the crude extract showed extensive activity against *S.epidermis*, *S.pyogenes*, *A.faecalis*, MSSA and *Micrococcus* sp., while the antibiotics did not show any activity against these microbes. *S.epidermis* was not acted upon by Kan and Amp. No activity was observed with Kan and Tet for *S.pyogenes* and *Salmonella* sp., *Micrococcus* sp., MSSA and *A.faecalis* remained resistant to Amp. Moreover, the crude extract showed highest activity against *Salmonella* sp., *S.marcesance* and *A.faecalis*, when compared to the three antibiotics. However, no inhibition was found when ethanol alone was used. It was also found that the lowest concentration of the alcoholic extract also exhibited antimicrobial activity and the extent of inhibition increased proportionately with increase in the concentration. The extract was found to be more potent 82% activity when compared to antibiotics Tet. and Kan. 72% activity, NyS.60% and Amp. being the least with 45% activity (TABLE 2, Figure 1). The MIC for the bacterial strains ranged between 5mg/ml to 20mg/ml,

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TABLE 1: Antimicrobial properties of Rhizome extracts of *C.pangorei*

S.no	Test organism	Plant extract	Tet	Kan	Amp	Nys
1.	*Salmonella sp.*	17mm	14mm	3mm	NI	-
2.	*Pseudomonas sp.*	NI	10mm	10mm	NI	-
3.	*S.marcesance*	18mm	12mm	10mm	37mm	-
4.	*B cereus*	8mm	8.5mm	9.5mm	9.5mm	-
5.	*Micrococcus sp.*	7mm	20mm	12mm	NI	-
6.	*S.epidermis*	14mm	NI	NI	NI	-
7.	*MRSA*	10mm	16mm	13mm	5mm	-
8.	*MSSA*	13mm	21mm	3mm	NI	-
9.	*S.pyogenes*	6.5mm	NI	NI	7.5mm	-
10.	*A. faecalis*	15mm	1mm	9mm	NI	-
11.	*E.coli*	NI	NI	NI	NI	-
12.	*C.albicans*	6mm	-	-	-	NI
13.	*Fusarium sp.*	9.5mm	-	-	-	
14.	*Exherholium sp.*	9.5mm	-	-	-	3mm
15.	*A. niger*	NI	-	-	-	14mm
16.	*Bipolaris sp.*	NI	-	-	-	8mm

NI - no inhibition

TABLE 2: Comparison of plant extract and antibiotics against microbes

Organism	Plant extract (PE)	Tet	Kan	Amp	Nys
Bacteria	82%	72%	72%	45%	NA
Fungi	60%	NA	NA	NA	60%

NA - not applicable

the least being for *S.marcesance* (<5mg/ml) and maximum for *A.faecalis* (15-20mg/ml). The alcoholic extract also possessed remarkable antifungal activities against *Candida albicans*, *Fusarium* sp. and *Exherholium* sp., while nystatin showed little inhibition (TABLE 1). However Nystatin showed activity against *A.niger* and *Bipolaris* sp., while the plant extract showed no activity.

The screening of bioactive agents from plants is one of the most intensive areas of natural product research today, yet the field is far from exhausted. The broad range antimicrobial activities of the rhizome extract of *C.pangorei* may be attributed to the presence of a higher concentration of phytoactive components like phenols, tannins, alkaloids and others that probably gave the reddish brown colour to the extract[12,13,14]. The organisms *S.marcesance, S.epidermis, S.pyogenes*, *C.albicans* and *Exherholium sp*. Have probably developed resistance to antibiotics and thus the extract proves to be very efficient. It is not possible however to isolate the bioactive agent from a plant. It has been demonstrated that crude extracts (mixtures) are more effective when compared to individual components against certain pathogens and in the case of *Propolis* plant. However mixtures are more likely to contain toxic constituents and must be thoroughly investigated and standardized before approval for large-scale use. The above results provide a preliminary knowledge of the antimicrobial properties of rhizome extracts of *C.pangorei*. Such an understanding would thus form the basis for screening the suitability of this plant for incorporation into the pharmacological and modern health care system.

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