SHORT COMMUNICATION

EVALUATION OF ANTIMICROBIAL ACTIVITY OF THE AQUEOUS EXTRACT OF LEMON GRASS AGAINST SELECTED PATHOGENIC BACTERIA

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Abstract: In the present study, an antimicrobial activity of the aqueous extract of lemongrass species was assessed using both well diffusion and micro-dilution method in multi-well micro-titer plates. Lemongrass extract investigated for its antibacterial activity against four selected pathogenic bacteria: *Staphylococcus aureus*, *Escherichia coli*, *Salmonella choleraesuis* and *Proteus vulgaris*. Lemongrass extract at different concentrations (1:1, 1:5, 1:10, and 1:20) was active against all tested bacteria and the highest inhibitory effect was observed against *S. aureus* using the well diffusion method. Antibacterial activity of Aqueous extracts of selected commonly used lemongrass were screened against multi drug resistant bacteria, which concludes that their extracts can be used against multi drug resistance bacteria capable of causing both nosocomial and community acquired infections.

Keywords: Antimicrobial activity, Extract, Bacteria, Lemon grass

INTRODUCTION

Nature has been a resource of therapeutic agents for thousands of years and a remarkable number of contemporary drugs have been isolated from natural sources. The use of whole herbs and extractives has remained the main approach of folk medicine practitioners in the cure of ailments and debilitating diseases. They generally claimed that such whole herbs and extractives are effective against a number of ailments and diseases without recourse to scientific proofs. Increased cases of opportunistic diseases emanating from side effects associated with synthetic drugs continue to necessitate incremental efforts in searching for effective biological substitutes with little or no side effects. Therefore, efforts are being directed towards elucidating potential sources such as ethnomedicinal plants (Patil, 2010).

Lemon grass is a native aromatic tall sedge / grass. It is belong to Poaceae family with diverse medicinal value and grow in many parts of tropical and subtropical south East Asia and Africa (Rangari, 2009; Srivastava et al., 2013). It was grown in India a century back and is now commercially cultivated in different parts of India. Lemon grass is tall, perennial grass about 1m in height. The culm is stout, erect, up to 1.8 m height. Leaves are long, green, glaucous, linear tapering upwards and along the margins; ligule very short, sheaths terete, those of the barren shoots widened and tightly elapsing at the base, other narrow and separating (Srivastava et al., 2013). The crop flowers during November – December and seeds mature in next two months viz; February – March. For collection of seeds, the plants are maintained in good health, as the yield of seeds from plants subjected to regular harvest is low (Gupta and Sharma 2009).

MATERIAL AND METHOD

Plant Material

Lemongrass leaves were collected from Shushila Tiwari Harbal Garden, village Dhalwala, Rishikesh, Uttarakhand, India. The leaves were washed first under running tap water, followed by sterilized distilled water and dried at room temperature in dark then grinded to powder using an electrical blender.

Preparation of Extracts

The leaves of the plants were air dried at room temperature for 3 weeks and grounded to coarse powder. 15g of the powder was placed in 100ml of distilled water (cold water extract) in conical flask and the crude preparation was left overnight in the shaker at 35°C and then centrifuged at 2500 rpm for 10 mins. The supernatant containing the plant extract was then transferred to a preweighed beaker and the extract was concentrated by evaporating the solvent at 60°C. The crude extract was weighed and dissolved in a known volume of dimethyl sulphoxide, to obtain a final concentration of 200mg / ml and sterilized by filtration through (0.45 μm) millipore filters. The aqueous extracts were stored in sample bottles at 4°C prior to use (De and Ifoema, 2002).

Microbial Cultures

Four strains of bacteria were used as test microorganisms. All microbial strains were obtained from the Microbial Type Culture Collection (MTCC), Institute of Microbial Technology (IMTECH), Chandigarh, India.

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Standardization of Inoculum
Exactly 0.2ml of 24/hours old culture of each microorganism was dispensed into 20ml of sterile nutrient broth and was incubated for 3-5/hours to standardize the culture to 106cfu/ml (Collins et al, 1995).

Antibacterial Testing
This was done using the agar wells diffusion method of (Odeyemi and Fagboun, 2005). 0.5ml of overnight broth culture of each clinical isolates containing 106 cfu/ml was gently transferred to the solidified nutrient agar and spread uniformly on the agar surface using a sterile glass spreader. Four 6mm wells were bored unto the agar and filled with the aqueous extracts (cold water extract) while the distill water serves as the control. The Petri dishes were incubated at 37°C for 18-24/hr and the inhibition zones were measured (mm).

Minimum Inhibition Concentration (MIC) of the Extract
The (MIC) was defined as the lowest concentration that completely incubated the growth of microorganisms for 24 hours (Thongson et al, 2004). The MIC of the extracts was also done using the agar well diffusion technique. Two fold dilution series was prepared to get a decreasing concentration range of 200 to 15% (V/V). A 0.5ml volume of each solution was added gently into the wells of Mueller Hinton agar plates that were already seeded with standardized inoculum (106 cfu/ml) of the bacterial isolates. The plates were incubated at 37°C for 24/hr. The lowest concentration of the extracts showing a clear zone of inhibition was considered as the MIC.

RESULT
The results of the antimicrobial activity of aqueous extract of lemon grass are presented in Table 1 and 2. The highest inhibitory effect was observed against Staphylococcus aureus (zone of inhibition: 10 mm) while the weakest activity was demonstrated against Escherichia coli, Staphylococcus typhi and Proteus vulgaris (zone of inhibition: 9, 8 and 2 mm respectively) (Table 1). In view of the result obtained by the well diffusion method, the minimum inhibitory concentration (MIC) of lemon leaf extract was determined by broth microdilution assay (Table 2). The highest MIC value (40, 50, 80 and 100 µg/ml) was observed against Staphylococcus aureus, Escherichia coli, Staphylococcus typhi and Proteus vulgaris respectively. The standard drug Ampicillin was active against all reference bacteria (zone of inhibition: 7-8 mm; MIC range 60-256 µg/ml), Tetracycline was active against all reference bacteria (zone of inhibition: 12-18 mm; MIC range 32-128 µg/ml) and Chloramphenicol was active against all reference bacteria (zone of inhibition: 11-19 mm; MIC range 2-125 µg/ml).

<table>
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<th>S.No.</th>
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<tr>
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<td>S. typhi</td>
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<td>7</td>
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<tr>
<td>4</td>
<td>P. vulgaris</td>
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<td>P. vulgaris</td>
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DISCUSSION
Plants have formed the basis of sophisticated traditional medicine system and natural products make excellent leads for new drug development (Newman et al, 2007). In this study, it was found that the aqueous extract of lemon grass plant is concentration around 40 to 100 µg/ml showing better antimicrobial activity against common pathogenic bacterial species. The minimum inhibitory concentration of aqueous extract are 40 µg/ml, 50 µg/ml, 80 µg/ml and 100 µg/ml for Staphylococcus aureus, Escherichia coli, Staphylococcus typhi and Proteus vulgaris respectively. Therefore, the aqueous extract are more effective in killing Staphylococcus aureus (at lower dose).

Based on the obtained results, lemongrass has demonstrated varying degree of antibacterial activity against Staphylococcus aureus, Escherichia coli, and Salmonella typhi. Therefore, this signifies that some bacteria that have not been tested with
lemongrass extract in this research may also be susceptible to the antibacterial effect of lemongrass.

CONCLUSION

In the present study, Lemongrass has demonstrated antimicrobial properties which could be harnessed for the expansion of alternative means of therapeutic control of bacterial pathogens.

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REFERENCES


