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ARTICLE

Evaluation of antimicrobial potentiality of a moss– *Pogonatum microstomum* Schw.

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Abstract

Bryophytes the second largest group of plants comprises liverworts, hornworts and mosses. They are considered as remarkable reservoir of potentially useful compounds, such as sugars, sugar alcohols, aminoacids, fatty acids, aliphatic compounds, phenylquinones, flavonoids and phenolic substances, many of which have shown interesting biological activities. Therefore, the present investigation was undertaken to analyse the antimicrobial activities using aqueous, ethyl acetate and petroleum ether extracts of the moss Pogonatum microstomum. Varying levels of bactericidal potentialities was displayed by the three different extracts against Streptococcus haemolyticus, Staphylococcus aureus, Klebsiella pneumoniae, and Escherichia coli using disc diffusion method and the results were comparable with synthetic antibiotic.

Keywords: *Pogonatum microstomum, Klebsiella pneumoniae, Streptococcus haemolyticus, Escherichia coli*

Introduction

Bryophytes synthesize an array of phytochemicals to combat against the unhospitable environmental conditions including predation, UV radiation, high temperature, pest and pathogens. They are potential source of natural bioactive compounds such as secondary matabolites and are commercially used in many pharmaceutical preparations. Flavanoids and phenolic acids are the most important groups of secondary metabolites in bryophytes (Kim et al., 2003). Flavonoids are proven antioxidants constitute a wide range of molecules that play important role in protecting biological systems against the harmful effects of oxidative processes on macromolecules such as carbohydrates, proteins, lipids and DNA (Halliwell etal.,1988). The purpose of the present study was to evaluate the antibacterial activities of water, ethyl acetate and petroleum ether extracts of the moss Pogonatum microstomum.

Materials and Methods

Plant material

Fresh thallus of Pogonatum microstomum collected from Munnar hills of Kerala, India used for the study.

Preparation of extracts

Fresh thallus (50g) was chopped, air dried at room temperature, finely powdered and successively extracted with 100 ml of ethyl acetate, petroleum ether and water for 6 h using soxhlet hot continuous extraction method.

Antibacterial activity

The various extracts of *Pogonatum microstomum* at different concentration were subjected to explore its effects on bacteria. Disc diffusion method was performed to study the antibacterial activity. The study mainly focused on *Klebsiella pneumonia, Streptococcus haemolyticus, Escherichia coli* and *Staphylococcus aureus*.

Results and Discussion

Bactericidal activity

Bactericidal activity of the ethyl acetate, petroleum ether and aqueous extract of *P. microstomum* exhibited varied susceptibility against *Staphylococcus aureus, Klebsiella pneumoniae, Escherichia coli* and *Streptococcus haemolyticus* at different concentrations tested (Table 1 and Fig. 1). The microbicidal potential of the extract was visualized as inhibition zone by treating the pathogens with the extracts and then spreading the cells on agar plates by disc diffusion assay. Among the pathogens tested *K. pneumonia* and *Streptococcus haemolyticus* were the most resistant species with *P. microstomum*. On the other hand, water extract of P. microstomum showed highest antibacterial potential with all tested bacterial strains. The mechanism of antibiosis indicated by synthetic antibiotic ampicillin was comparable against the entire tested bacterial isolates. The effectiveness of an antibacterial agent is measured by its ability to inhibit and kill bacteria. At higher concentration of the

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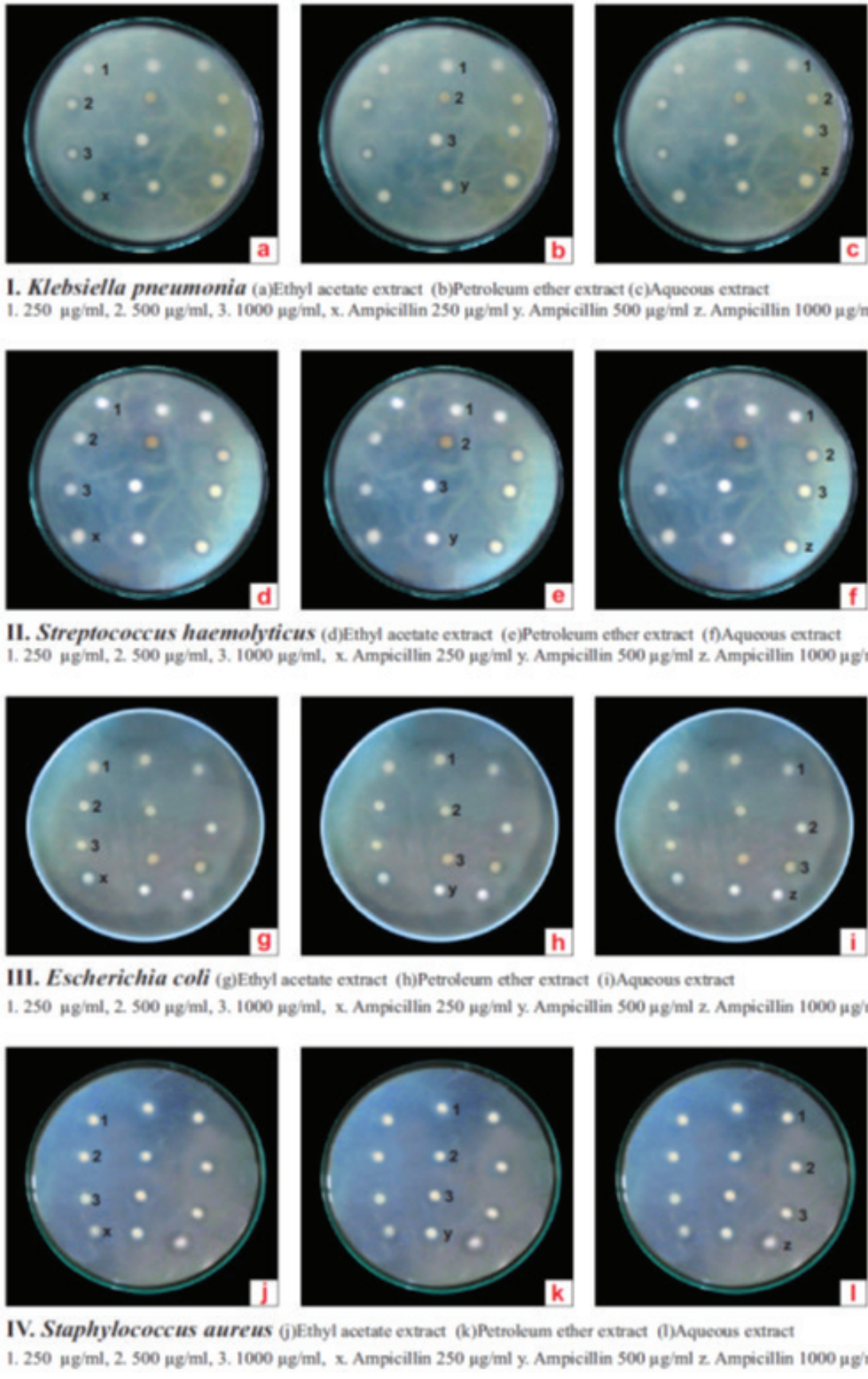

I. *Klebsiella pneumonia* (a)Ethyl acetate extract (b)Petroleum ether extract (c)Aqueous extract
1. 250 µg/ml, 2. 500 µg/ml, 3. 1000 µg/ml, x. Ampicillin 250 µg/ml y. Ampicillin 500 µg/ml z. Ampicillin 1000 µg/ml

II. *Streptococcus haemolyticus* (d)Ethyl acetate extract (e)Petroleum ether extract (f)Aqueous extract
1. 250 µg/ml, 2. 500 µg/ml, 3. 1000 µg/ml, x. Ampicillin 250 µg/ml y. Ampicillin 500 µg/ml z. Ampicillin 1000 µg/ml

III. *Escherichia coli* (g)Ethyl acetate extract (h)Petroleum ether extract (i)Aqueous extract
1. 250 µg/ml, 2. 500 µg/ml, 3. 1000 µg/ml, x. Ampicillin 250 µg/ml y. Ampicillin 500 µg/ml z. Ampicillin 1000 µg/ml

IV. *Staphylococcus aureus* (j)Ethyl acetate extract (k)Petroleum ether extract (l)Aqueous extract
1. 250 µg/ml, 2. 500 µg/ml, 3. 1000 µg/ml, x. Ampicillin 250 µg/ml y. Ampicillin 500 µg/ml z. Ampicillin 1000 µg/ml

Figure 1. Antibacterial activity by disc diffusion assay of *Pogonatum microstomum* against *Klebsiella pneumonia, Streptococcus haemolyticus, Escherichia coli* and *Staphylococcus aureus.*

Table 1. Antibacterial activity of *P. microstomum* ethyl acetate, petroleum ether and water extracts against selected bacteria

Microorganism	Extract	Concentration of the extract (µg/ml)		
		250	500	1000
Klebsiella pneumoniae	Ethyl acetate	0	1	2
	Petroleum ether	0	3	4
	Water	0	4	5.2
	Ampicilin	3	5	6.1
Streptococcus haemolyticus	Ethyl acetate	0	3	3
	Petroleum ether	0	4	4
	Water	0	4	5
	Ampicilin	4	5	6
Escherichia coli	Ethyl acetate	0	0	1
	Petroleum ether	0	1	3
	Water	0	2	4
	Ampicilin	4	5	5.2
Staphylococcus aureus	Ethyl acetate	0	0	1
	Petroleum ether	0	2	2
	Water	0	2	3
	Ampicilin	4	4.8	5

Values of zone of inhibition in mm are mean of three replicates; 0 = No zone of inhibition

of the extract more bacteria were killed. The antibacterial activity revealed by the extracts might be due to presence of flavonoids, terpenoids and other polyphenolic compounds (Boudet, 2007). Due to the variation in composition of active compounds in various extract of Pogonatum species resulted in significant difference on the level of bactericidal activity (inhibitory zone) against the tested bacterial strains.

References

1. Boudet, A.M. (2007). Evolution and Current Status of Research in Phenolic Compounds, Phytochem68: 2722-2735.
2. Halliwell, B.,Gutteridge, J.M.,,Grootveld, M. (1988). Methods for the Measurements of Hydroxyl Radicals In Biomedical Systems, Deoxyribose Degradation and Aromatic Hydroxylation, Meth Biochem Anal 3359-3390.
3. Kim, D., Jeond, S., Lee, C. (2003). Antioxidant Capacity of Phenolic Phytochemicals from Various Cultivars of Plums, Food Chem 81: 321-326.