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Article ID: jpr150617101

PTERIDOLOGICAL RESEARCH ISSN: 2319 - 1910 (Print)

Antibacterial activity of some pteridophytes

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Received: 12 March 2017 / Accepted: 30 March 2017/ Published Online:15 June 2017
http://www.gayathripublishers.com/jpr.htm

Citation: Maridass, M., Raju, G. and Mahesh, R.2017. Antibacterial activity of some pteridophytes. Pteridological Research, 6(1):1-3.

Abstract

The aim of the present study, antibacterial activity of some fern extract was studied active against Gram +ve and Gram -ve bacteria such as *Escherichia coli, Klebsiella pneumoniae, Proteus mirabilis, Pseudomonas aeruginosa, Salmonella typhi, Salmonella paratyphi A, Salmonella paratyphi B, Salmonella marscence, Staphylococcus aureus and Bacillus subtilis* were investigated by disc diffusion method. Collected plant materials are dried and extracted with 70% of ethanol. The results of observed that good antibacterial activity and greater the area of inhibition zone indicate the presence of good potentiality of antibacterial activity.

Key Words: pteridophytes, extract, bacteria, inhibition zone

Introduction

Pteridophytes are seedless vascular plants. About 400 million years ago dominating the vegetation on the earth's surface (Mehra, 1967; Bir,1976, Khare, 1996). The medicinal uses of pteridophytes in India have also been described (Caius, 1935; Nair, 1959; Dhiman,1998; Singh *et al*.,2001). Kirtikar *et al*., (1935) have described 27 species of ferns having varied medicinal uses. According to Nayar, (1959) reported that 29 medicinal ferns. Earlier report, ferns listed that 105 medicinal ferns (May, 1978). The antimicrobial potential of some ferns has also been reported (Kumar and Kaushik, 1999). Earlier studies, antimicrobial studies some ferns such as *Bolbitis virens, Osmunda hugeliana, Acrostichum aureum, Ophioglossum vulgatum, Lygodium flexuosum, Ceratopteris thalictroides* and *Drynaria quercifolia* which are used by various tribal communities of the Western Ghats to cure various diseases like hectic fever, dyspepsia and cough (Caius,1935), typhoid fever jaundice and it is also used as poultice, antifertility agents (Dixit and Vohra,1984). The antimicrobial properties of ferns are remarkable as compared to the higher plants may be because of the presence of a large number of defensive biochemical compounds (Bir,1987; Hansel and Lagare,2009). Active constituents of flavonoids, alkaloids, tannins, saponins, quinines, terpenoids, glycosides, polyphenols and fats and oils which are responsible for their antimicrobial and pharmacological activities. A large number of pteridophyte remain to be investigated till date, for their possible antimicrobial activity. The present study has been undertaken to assess the antibacterial properties and therapeutic value of some pteridophytes in South India.

Materials and Methods

Plant materials were collected from Southern Western Ghats, South India (Table-1). They were air-dried at room temperature for 15 days. The dried specimens are powdered. Powdered materials were extracted for 70% ethanol in soxhlet apparatus in 6 hrs.

Table-1: Name and family of antibacterial activity of selected plants

Pteridophytes	Family
Osmunda regalis L	*Osmundaceae*
Lygodium longifolium (Willd.) Sw.	Lygodiaceae
Lycodium flexuosum (L.,) Sw.	Lygodiaceae
Dicranoteris linearis Brum. f	Gleicheniaceae
Cerapteris thalictroides L.	Pteridaceae

In vitro antibacterial activity

All the extracts were prepared in various concentrations such as 100, 50 and 25 mg/mL respectively and used for antibacterial activity.

Test Microorganisms

The following bacterial strains were used for the study of antibacterial activity (Table-2). The microbial strains of human pathogens used were procured from IMTECH, Chandigarh.

Determination of antibacterial activity

Agar well diffusion method using for antibacterial activity was determined. Using a sterile Durham tube 7mm diameter, the wells were made according to the number of samples. Each bacterial overnight culture was homogeneous inoculated on the surface of nutrient agar in Petri dishes. The extracts were put into the wells, and positive and negative controls

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were used, too. The plates were incubated at 37ºC for 24 h. The antibacterial activity of the fern extracts was appreciated by measuring the diameter of inhibition growth zone (in millimeter), as a clear, and distinct zone of inhibition surrounding in the agar wells. The experiment was carried out three times.

Table-3: Identification of antibacterial activity of some pteridophytes

Bacteria	Pteridophytes				
	Osmunda regalis L	*Lygodium longifolium* (Willd.) Sw.	*Lycodium flexuosum* (L.,) Sw.	*Dicranoteris linearis* Brum. *f*	*Cerapteris thalictroides* L.
E. coli	12	16	11	8	11
K. pneumoniae	8	11	9	15	-
P. mirabilis	14	14	13	11	-
P aeruginosa	13	15	14	16	-
S. typhi	16	11	16	15	-
S. paratyphi A	13	13	11	12	-
S. paratyphi B	15	14	10	14	-
S. marscence	16	16	9	14	-
S. aureus	17	11	8	11	-
B. subtilis	15	17	11	14	12

Results and Discussion

In the present study, results of 70% of alcoholic extracts of all ferns were active against gram positive and gram-negative bacteria represented in the table-3. 70% ethanolic extract of leaves of *Osmunda regalis* L, *Lygodium longifolium* (Willd.) Sw., *Lycodium flexuosum* (L.,) Sw. *Dicranoteris linearis* Brum. F., and *Cerapteris thalictroides* L. were observed by significant activity of *staphylococcus aure*us and *Psuedomonas aurginosa*. According to Soare *et al*.,(2012) reported that crude methanolic extracts obtained from leaves of several Indian ferns observed by moderate activity against *Staphylococcus aureus*. *Athyrium pectinatum* and *Dryopteris cochleata* were observed by no activity against *Staphylococcus aureus* (Parihar *et al*.,2010). The alcoholic extract of rhizomes and roots of *Athyrium pectinatum* active against *Staphylococcus aureus* growth, while the extract obtained from leaves had no activity (Parihar *et al*., 2010). Earlier report, some fern extracts was found effective against several bacteria (Parihar *et al*., 2006). Earlier study, ferns of *Salvinia auriculata* extract active against *E.coli, S.typhi, P.vulgaris, P.aeuroginosa, B.subtilis* and *S.aureus* were reported (Devi *et al*.,2015). Previously, antibiotic activity of 114 species of pteridophytes were observed (Banerjee and Sen,1980). Our study, positive results of antibacterial activity of *Osmunda regalis* L, *Lygodium longifolium* (Willd.) Sw., *Lycodium flexuosum* (L.,) Sw. *Dicranoteris linearis* Brum. F., and *Cerapteris thalictroides* L. were active against *Klebsiella pneumoniae*. The best antibacterial effect of *Osmunda regalis* extract, which inhibited the growth of all pathogen. The antibacterial effect showed by the tested extracts is possibly the result of the flavonoids identified all plants in extracts. Conclusion of our study *Osmunda regalis* L, *Lygodium longifolium* (Willd.) Sw., *Lycodium flexuosum* (L.,) Sw. *Dicranoteris linearis* Brum. F., and *Cerapteris thalictroides* L., suitable for antibacterial activity of human pathogens. The present study confirmed the antibacterial activity some pteridophytes. Further study, isolation and purification of the active principles will be essential to give more insight into their mode of action.

Acknowledgements

The authors are thankful to UGC for the financial assistance.

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