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Research Article

A FOURIER TRANSFORM INFRARED (FT-IR) SPECTROSCOPIC ANALYSIS OF *AZOLLA MICROPHYLLA.*

C.VEERABAHU,* G.THEIVANDRAN

PG and Research Department Of Zoology,V.O.C.College, Tuticorin-8. Email: vocinspire@gmail.com

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ABSTRACT

FT-IR spectra of *Azolla microphylla* have been recorded in the range between 4000–400 cm−1. The different frequency ranges and their different functional groups were analyzed. Standard methods were used to screen the phytochemical constitunents. *Azolla* was found to have essential phytochemical compounds like phenols, alkenes, aliphatic amines, aromatic amines. *Azolla* has potential benefits in the areas of biochemical, antioxidant anti-inflammatory protection, anticancer, in detoxification and probiotic effects.

Keywords: *Azollamicrophylla*, Phytochemical screening

INTRODUCTION

Azolla is known as ‘‘green gold mine”, a floating aquatic fern which grows in all kinds of freshwater and waste water and is traditionally used as a biofertilizer in paddy fields owing to its potential to fix atmospheric nitrogen (Lumpkin and Plucknett, 1980). It has the natural inherent capacity to synthesize several biologically active constituents. Plant phenolics are known to evoke host plant alteration and the flavonoids are reported to exhibit various biological activities, including antioxidative and free radical scavenging activities. The excessive use of pesticides and chemicals in agriculture and consequent adverse impact on the health has prompted, plant extracts to be used as natural pesticides. Research on the biopotential of *Azolla* in India is limited despite its antimicrobial potential and scant information is available on useful compounds. Therefore in the present study we made an attempt to study the phytochemical composition of *A. microphylla* cultured under *ex-situ* condition.

MATERIALS AND METHODS

Cultivation of *Azolla microphylla*

In the present study *Azolla microphylla* was cultured by the following method. A water body is made, under the shade of a tree, with the help of a silpauline sheet. A pit of 2 x 2 x 0.2 m is dug as a first step. All corners of the pit kept at the same level so that a uniform water level can be maintained. The pit is covered with plastic gunnies to prevent the roots of the nearby trees piercing the silpauline sheet, which is spread over the plastic gunnies. About 25 kg of sieved fertile soil is uniformly spread over the silpauline sheet. Slurry made of 2 kg cow dung and 30 g of Super Phosphate mixed in 10 litres of water, is poured onto the sheet. More water is poured on to raise the water level to about 10 cm. About 0.5 – 1 kg of fresh and pure culture of *Azolla microphylla* is placed in the water. This grew rapidly and fill the pit within 10 – 15 days. From then on, 500 – 600 g of *Azolla* was harvested daily. The harvested *Azolla* is shade dried. Shade dried *Azolla* was ground to fine powder using electric mixture grinder. The powdered samples were then stored in refrigerator for further use.

FTIR analysis

Infrared reflectance vibrational spectra were carried out on powdered samples using a spectrometer with instrument resolution of about (1 cm−1), in the wave number region (4000–400 cm−1) at room temperature (Oulahal *et al.*,2009).

FTIR Analysis

The FTIR spectrum was used to identify the functional group of the active components based on the peak value in the region of infrared radiation. The crude powder of *Azolla* was passed into the FTIR and the functional groups of the components were separated based on its peak ratio. The results of FTIR analysis showed different peaks at 520.94 the functional group is alkyl halides, 697.93 functional group is alkynes, 712.19 , 777.72, 873.18 functional group are aromatics, 1035.58 functional group is aliphatic amines, 1254.92 , 1321.08 functional group are aromatic amines, 1384.27 functional group is nitro, 1437.86 functional group is aromatics, 1636.86 functional group is primary amines, 2849.85 functional group is aldehydes, 2917.77 functional group is alkenes, 3417.03 functional group is alcohols and phenols, 3786.81, 3828.34 functional group are aldehyde and ketones

Table1: The FT-IR frequency range and the following functional groups are present in the *Azolla microphylla*

Sl. No	Frequency ranges (cm^{-1})	Functional groups	*Azolla microphylla*
1	2690-3840	C-H,C=O aldehyde , ketones	3828.34
2	2690-3840	C-H,C=O aldehyde , ketones	3786.81
3	3500–3200 (s,b)	O–H stretch, H–bonded alcohols, phenols	3417.03
4	3000–2850 (m)	C–H stretch alkenes	2917.77
5	2850-2800	C-H Stretch off C=O aldehydes	2849.85
6	1650–1580 (m)	N–H bend primary amines	1636.86
7	1500–1400 (m)	C–C stretch (in–ring) aromatics	1437.86
8	1400-1300	N=O Bend nitro	1384.27
9	1335–1250 (s)	C–N stretch aromatic amines	1321.08

10	1335–1250 (s)	C–N stretch aromatic amines	1254.92
11	1250–1020 (m)	C–N stretch aliphatic amines	1035.58
12	900–675 (s)	C–H "oop" aromatics	873.18
13	900–675 (s)	C–H "oop" aromatics	777.72
14	900–675 (s)	C–H "oop" aromatics	712.19
15	700–610 (b, s)	–C(triple bond)C–H: C–H bend alkynes	697.93
16	690–515 (m)	C–Br stretch alkyl halides	520.94

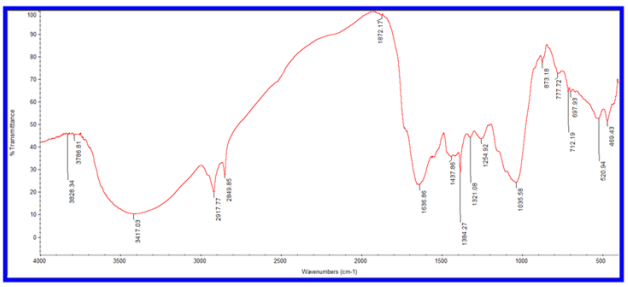

Fig 1: The FTIR Spectrum of *Azolla microphylla*

DISCUSSION

FT-IR is a valuable tool for measuring many chemical constituents in plants it is used to reveal some qualitative aspects regarding the organic compounds. (Kristin Lammers, 2009). In the present study FT-IR was used to identify the functional group in the *Azolla*. Alcohols are commonly found to have antimicrobial properties against both Gram-positive and Gram-negative bacteria (Cowan 1999). Phenolic compounds exhibited good antimicrobial activities (Barros *et al.*, 2007) (Kostic *et al.*, 2012). In the present study *Azolla* contained phenol and alcohol compounds which were responsible for the antibacterial activity.

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