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Effect of Phytochemical Constituents of Achyranthes Aspera Linn leaf and Stem Extracts in Anti-Microbial Activity

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Abstract: ***Achyranthes aspera*** **is a herb in amaranthaceae family, traditionally used in treatment of several diseases. The present study was carried out to investigate the antimicrobial activities of the glacial acetic acid extract of leaves and stem of** ***Achyranthes aspera*** **against two fungi** ***Fusarium oxysporum, Aspergillus niger*** **and two bacteria** ***Proteus Mirabilis and Staphylococcus aureus. The phytochemical screening of the aqueous extract indicates that the leaves contain alkaloid, tannin, terpenoid, flavonoid, glycoside, phenols, saponins, steroids and fats or fixed oils. Phytochemical screening of the aqueous extract indicates that the stem contain tannin, terpenoid, glycoside, phenols, saponins, and alkaloids.***
Keywords: Medicinal plants, Phytochemical screening, Antimicrobial, Antifungal

I. INTRODUCTION

Phytochemistry is the scientific study of the chemicals found in plants. Those studying phytochemistry strive to describe the structures of the large number of secondary metabolic compounds found in plants, the functions of these compounds in human and plant biology and the biosynthesis of these compounds. Plants synthesize phytochemicals for many reasons including to protect themselves against insect attacks and plant diseases. Phytochemicals in food plants are often active in human biology and in many cases have health benefits. The compounds found in plants are of many kinds but most are in four major biochemical classes the alkaloids, glycosides, polyphenols, and terpenes.[1]

Achyranthes aspera is a species of plant in the Amaranthaceae family. It is an important medicinal herb found as a weed throughout India. Though almost all of its parts are used in traditional systems of medicines. Seeds, roots and shoots are the most important parts which are used for their medicinal properties.[2]

II. MATERIALS AND METHODS

A. Collection of the Plant

The leaves and stems of Achyranthes aspera were collected from during the month of May-June 2019 from Immidipalayam village, Kinathukadavu (Tk), Coimbatore (Dt), Tamilnadu, India. Collected leaves and stem were thoroughly washed, shad dried, crushed and powdered.

Fig.1: Achyranthes aspera stem

Fig.2: Achyranthes aspera leaf

B. Preparation of Glacial Acetic Acid plant Extract

Accurately weighed 10g of the plant powder was taken in a conical flask and was soaked with 50% Glacial acetic acid. The flask was covered and then kept in a mechanical shaker for 48 hours. The solution then filtered and the filtrate is used for further analysis.

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C. *Phytochemical Qualitative Analysis*

Standard protocols were used for qualitative analysis of sample to check for the presence of alkaloids, carbohydrates, cardiac glycosides, flavonoids, phenols, saponins, tannins, terpinoides, quinones and proteins.[3]

D. *FT-IR*

FTIR may also refer to frustrated total internal reflection. Fourier-transform infrared spectroscopy is a technique used to obtain an infrared spectrum of absorption or emission of a solid, liquid or gas. An FTIR spectrometer simultaneously collects high-spectral-resolution data over a wide spectral range covered the wavelength range from 2.5 µm to 15 µm (wave number range 4000 cm^{-1} to 660 cm^{-1}).[4]

E. *Antibacterial Activity*

Antimicrobial activity of the sample was done by using standard agar well diffusion method. For the antibacterial activity Mueller Hinton Agar was prepared by dissolving 39 gm in 1000ml of distilled water and sterilised under autoclave at 121°C and the media were poured to petriplate and allowed for solidification. After solidification bacterial suspension of P. *Mirabilis* and *S.aureus* were swabbed. Cork borer was used to make well and each well sample was poured, DMSO was used as a negative control and levofloxacin (LE 5mg) was used as a positive control, after placing the samples plate were incubated at 37°C for 24 hrs and the zone of inhibition was measured.

F. *Antifungal Activity*

Potato Dextrose agar was prepared by dissolving 39gm in 1000ml of distilled water and sterilised. This was used for antifungal activity. *Fusarium oxysporum* and *Aspergillus niger* were swabbed and using above method sample added and incubated at 30°C for 5 -7 days and zone of inhibition was measured. Fluconazole were used as a positive control.

III. RESULTS AND DISCUSSION

A. *Qualitative Phytochemical Analysis*

The phytochemical screening of the leave extract contains tannin, terpenoid, flavonoid, glycoside, phenols, saponins, steroids and fats or fixed oils. Phytochemical screening of the aqueous extract indicates that the stem contain tannin, terpenoid, glycoside, phenols, saponins, alkaloids and fats and fixed oils are shown in fig 3&4.

Fig.3: A.aspera leaf Extract

Fig.4: A.aspera stem Extract

B. *FT-IR*

In FT-IR spectra the leaf and stem extracts of A.aspera showed the functional groups like O-H, C-F, C-O, C-BR, C=O etc are given in table 1 & fig 6 & 7.

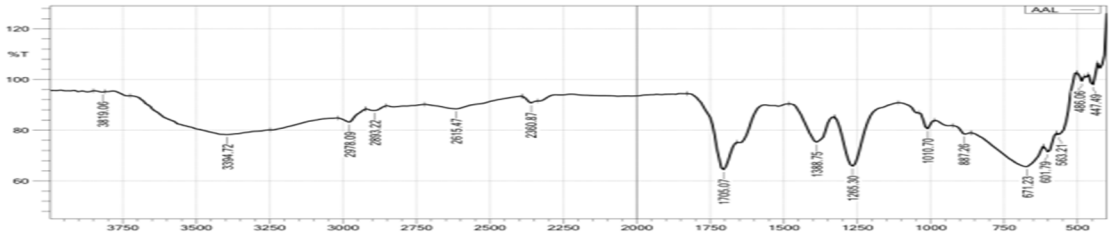

Fig.5: FT-IR spectra for A.aspera leaf extract

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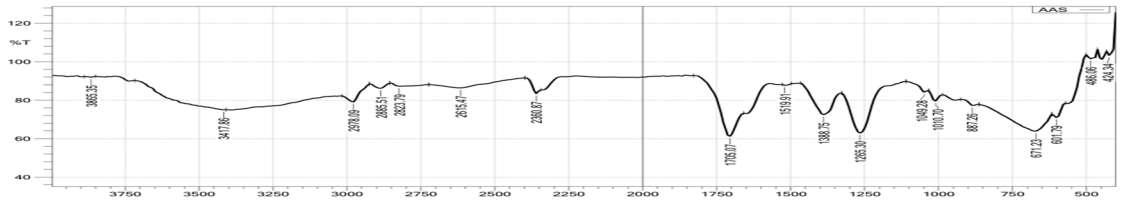

Fig.6: FT-IR spectra for A.aspera stem extract

Table: 1 FT-IR Peak Values

S.no	Reference peak(cm)	Observed peak(cm)		Group	Compound class
		Leaf extract	Stem extract		
1.	3550-3200	3394.72	3417.86	O-H stretching	Alcohol
2.	3300-2500	2978.09	2978.09	O-H stretching	Carboxylic acid
4.	3300-2500	2615.47	2615.47	O-H stretching	Carboxylic acid
5.	1710-1685	1705.07	1705.07	C=O stretching	Conjucated aldehyde
6.	1390-1380	1388.75	1388.75	C-H stretching	Aldehyde
7.	1275-1200	1265.30	1265.30	C-O stretching	Alkyl aryl ether
8.	1400-1000	1010.70	1049.28	C-F stretching	Fluoro compound
10.	690-515	671.23	671.23	C-Br stretching	Halo compound
11.	690-515	601.79	601.79	C-Br stretching	Halo compound
12.	500-600	563.21	-	C-X stretching	Bromo alkanes

C. Antimicrobial Activity

The stem extract has more inhibition than leaf extract is shown in table 2 & fig.7 &8. The result showed maximum inhibition of 7mm & 9mm of stem extract for antibacterial activity against *P. mirabilis* and *S.aureus.* Leaf extract posses 12mm & 14 mm of maximum inhibition for antifungal activity against *F. oxysporum* and *A. niger.*

Table: 2 Microbial Activity

Microbial activity	Organisms	Stem	Leaf	Standard
Antibacterial	P. mirabilis	7 mm	6 mm	2 mm
	S. aureus	9 mm	7 mm	2 mm
Antifungal	F.oxyporum	13 mm	12 mm	5 mm
	A.niger	13 mm	14 mm	5 mm

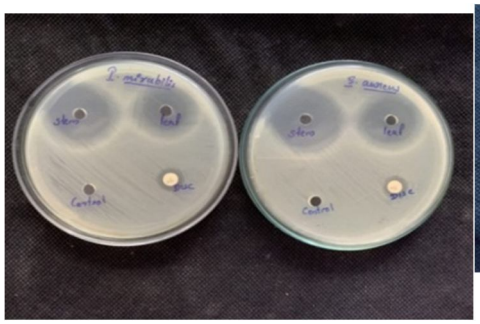

Fig.7: Antibacterial activity

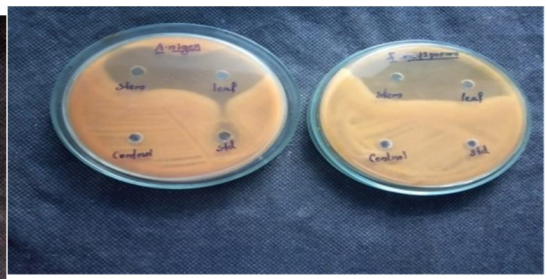

Fig.8: Antifungal activity

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IV. CONCLUSION

The study reveals that wide numbers of phytochemical constituents are present in this plant like alkaloid, tannin, terpenoid, flavonoid, glycoside, phenols, saponins, steroids and Fats or fixed oils. In FI-IR studies shows the functional groups like O-H, N-O, C-F, C-Br, C=O etc. The glacial acetic acid extract of leaves and stems of A. aspera has shows maximum antimicrobial activities against the selected antibacterial and antifungal organisms. InS antibacterial activity the stem extract have more inhibition than leaf extract of 7mm and 9mm. In antifungal activity the leaf extract have more inhibition than stem extract of 13mm and 14mm. So the plant could serve as an easily accessible item of natural antimicrobial agent even as a pharmaceutical agent.

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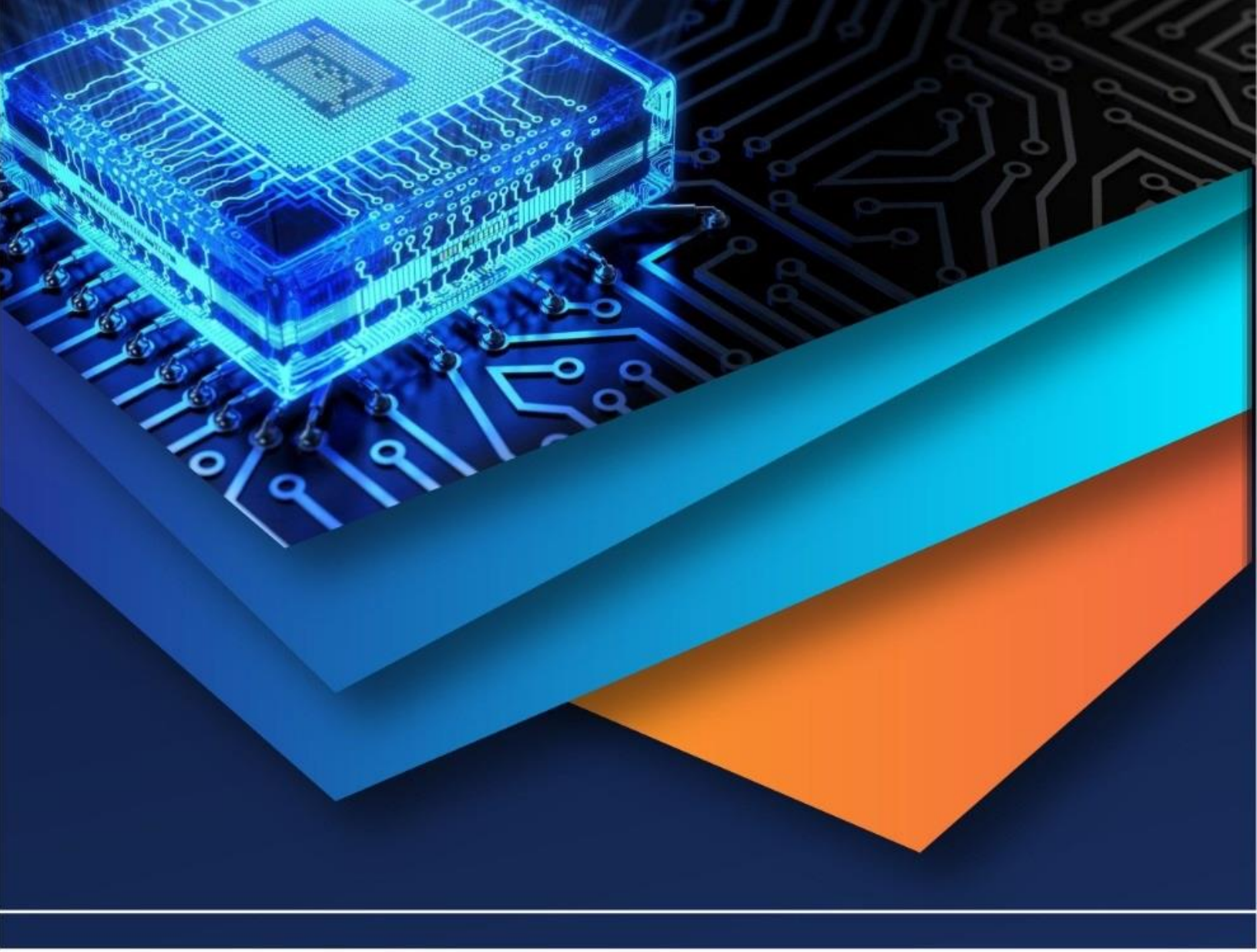

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