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Research Article

PRELIMINARY PHYTOCHEMICAL SCREENING AND SPECTROSCOPIC ANALYSIS OF *PHYMATOSORUS SCOLOPENDRIA* (BURM. F.) PIC. SERM.

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ABSTRACT

Phymatosorus scolopendria (Burm.F.) Pic. Serm. belongs to the family Polypodiaceae which is a medicinal fern. The present study aims at screening the phytochemical compounds present in 5 different solvent extracts such as Aqueous, Ethanol, Methanol, Acetone and Petroleum ether. Preliminary phytochemical analysis of the extracts revealed the presence of Phenol, terpenoid, cardioglycoside, tannin, alkaloid and steroid. Out of six compounds, Phenol and tannin found to be dominant. Steroid, alkaloid and glycoside were found to be present in moderate amounts. The ethanolic extract of whole plant of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm. was further analysed for UV and FTIR spectroscopic studies. The UV-VIS spectrum showed the peaks at 314.6, 416.2, 533.0, 657.0 & 996.9 nm with the absorption 1.845, 1.486, 0.120, 0.664 & 0.023 respectively. The FTIR profile peaks confirmed the presence of Amines, Alkanes, Alkynes, Alkenes, Ether and Alkyl halide.…

Keywords: *Phymatosorus scolopendria* (Burm.F.) Pic. Serm., Phytochemical analysis, secondary metabolites, UV, FT-IR

INTRODUCTION

Pteridophytes are the second largest group of vascular cryptogams, which do not produce seeds, they reproduce by means of spores. *Phymatosorus scolopendria* (Burm.f.) Pic. Serm. is commonly known as musk- fern or wart-fern[1]. The plant is widely distributed in Mauritius[2], Micronesia[3], Singapore[4], Ethiopia[5] and central Sulawesi[6]. In India the distribution of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm. is limited to Kerala, West Bengal[7], Sikkim[8] and Maharashtra.

This plant is traditionally used by people belonging to different countries for its medicinal uses. In Indo-China, the fronds of wart fern are pounded for use as treatment for boils and filariasis. Whole fronds are placed on beds so as to ward off bed bugs, the young fronds are used for curing chronic diarrheoa[9]. In Polynesia, the leaves are pounded and mixed with scrapings from *Atuna racemose* to make perfume and also the mashed fronds are wrapped with Lei (*Morinda citradolia*), cooked and used as medical bandage[10]. In Fiji, leaf juice is used for stomach ache, swollen breasts and boils[11]. The plants are used for the treatment of asthma, Cough and inflammatory diseases[12]. Owing to the above said ethanobotanical folklore importance and medicinal values, local usage of this plant finds important in curing diseases.

The phytochemical contents or secondary metabolites present in *Phymatosorus scolopendria* (Burm.F.) Pic. Serm. is less studied. The presence of Ecdysteroids[13] and coumarins[14] was found out by certain workers in this plant from crude drug. *In-vitro* spore culture was successfully carried out for mass multiplication through spores[15]. Based on the references it is known that, preliminary phytochemical analysis and purification of compounds were not carried out and thus the plant was selected for the present work. Hence our main objective of the present study is to identify the secondary metabolites found in this plant and to analyze the bioactive compound by UV-VIS & FTIR analysis.

MATERIALS AND METHODS

Collection of Plant material

The plants of *Phymatosorus scolopendria* (Burm.f.) Pic.Serm. were collected from Athma Nilayam Nursery (Kanyakumari District) and were grown in the garden at Holy Cross College (Autonomous). The plant was authenticated by Dr. Raju Antony, Jawaharlal Nehru Tropical Botanical Garden and Research Institute, Palode, Kerala.

Botanical Description

Phymatosorus scolopendria (Burm.F.) Pic. Serm. is an epiphyte, with wide, creeping and glabrescent rhizomes. It is found growing in the crown or trunks of trees and on rocks along streams, at low and medium altitudes. Stipes are scattered, 5 to 40 centimetres long. Fronds are variable in size, from simple lanceolate to deeply pinnatifid, 10 to 40 centimetres long. Costae are prominent but the venation is hardly visible. Sori are very large, shallowly immersed, and conspicuous on the upper surface, in single rows along the main veins, or scattered, but not numerous.

Preparation of plant extract

The plant materials were washed, shade dried and then powdered with the help of blender. The powder was kept in air tight bottles. 5 g of the powder was extracted through cold percolation method with 50ml of the solvents such as aqueous, ethanol, methanol, acetone and petroleum ether. The extracts were filtered by using Whatmann no.1 filter paper and the solvents was evaporated to make the crude extract.

Preliminary phytochemical analysis[16]

Test for Alkaloid
0.355g of Mercuric chloride was dissolved in 60 ml of distilled water and 5 g of potassium iodide was dissolved in 20 ml of distilled water. Then the two solutions were made up to 100 ml with distilled water.
1 ml of the plant extract was mixed with 1 ml of 1% HCl, warmed and filtered. 2 ml of filtrate was treated with Mayer's reagent. Turbidity or precipitation, green colour indicates the presence of alkaloid.

Test for Anthocyanin and Betacyanin
To 2 ml of leaf extract, 1ml of 2N NaOH was added and heated for 5 min at 100°C. Formation of bluish green colour indicates the presence of anthocyanin and formation of yellow colour indicates the presence of betacyanin.

Test for Cardio glycoside
To 1 ml of extract, 2 ml of glacial acetic acid was added and few drops of 5% ferric chloride was also added. This was under layered with 1 ml of concentrated sulphuric acid. Formation of brown ring at interface indicates the presence of cardio glycoside.

Test for Flavonoid
To 3 ml of extract, 4 ml of 1 N NaOH was added. Formation of dark yellow colour indicates the presence of flavonoid.

Test for Glycoside
To 2 ml of extract, 3 ml of chloroform and 1 ml of 10% ammonium solution were added, formation of pink colour indicates the presence of glycoside.

Test for Phenol
To 1 ml of extract, 2 ml of distilled water and 0.5 ml of sodium carbonate and Folin ciocalteau's reagent were added. Formation of blue or green colour indicates the presence of Phenol.

Test for Quinone
To 1 ml of extract, l ml of concentrated sulphuric acid was added. Formation of red colour indicates the presence of quinone.

Test for Saponin
0.5 g of plant extract was dissolved in 2 ml of boiling water in a boiling tube, allowed to cool and shaken well to mix. The appearance of foam indicates the presence of saponin.

Test for Steroid
To 1 ml of plant extract, 2 ml of chloroform and 1 ml of sulphuric acid were added. Formation of reddish brown colour ring at interface indicates the presence of steroid.

Test for Tannin
About 0.5 g of plant extract was boiled in 20 ml of distilled water in a test tube and then filtered. 1 ml of the leaf extract was added with 1 ml of 5% ferric chloride. Appearance of brownish green colour indicates the presence of tannin.

Test for Terpenoid
To 1 ml of extract, 2 ml of chloroform and 1.5 ml of concentrated sulphuric acid were added carefully. Formation of reddish brown colour indicates the presence of terpenoid.

Spectroscopic analysis

Spectroscopic analysis such as UV-VIS and FT-IR was performed in the ethanol extract of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm.

UV-VIS analysis

UV-VIS Spectroscopy is used to find out the absorption maxima of compounds with a wide range of wavelength. To detect the UV-VIS spectrum profile, the extract was scanned with the wavelength ranging from 100 to 1100 nm by using lamda 35 model spectrum. The absorption values for wavelength of UV-VIS[17] spectrum was tabulated.

FT-IR analysis

FT-IR Spectroscopy is a technique for obtaining high quality infrared spectra by mathematical conversion of an inference pattern into spectrum. FT-IR analysis was also performed to detect the characteristic peaks and their functional groups using Perkin Elmer spectrophotometer system at range of 400 to 4000/cm. Peak values were recorded for FT-IR[17] and functional groups were analysed.

RESULTS

The whole plant samples of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm. subjected to preliminary phytochemical analysis showed the presence of secondary metabolites such as phenol, steroids, tannin and terpenoid (Table 1). Methanol and acetone yielded more secondary metabolites than aqueous, ethanol and petroleum ether. Methanol and acetone showed strongly positive results (+++) and moderately positive results (++) for phenol, steroid, tannin, terpenoid, alkaloid, anthocyanin and quinone. In all the extracts, phenol was found to be present in strongly and moderately positive manner. Next to phenol, tannin and terpenoid are present in all the solvent studied. Most of the phytoconstituents are absent in the solvent petroleum ether studied. Thus the qualitative analysis revealed the presence of the phytoconstituents such as phenol, steroid, tannin and terpenoid. (Fig 2 & Table 1)

UV-VIS spectrum of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm. whole plant ethanol extract resulted peaks at 314.6, 416.2, 533.0, 657.0 & 996.9 with the absorption 1.845, 1.486, 0.120, 0.664 & 0.023 respectively (Fig 3 & Table 2).

The result profile of FTIR spectrum analysis for *Phymatosorus scolopendria* (Burm.F.) Pic. Serm. revealed various active components in the whole plant ethanol extract. The profile showed the presence of amines, alkanes, alkynes, alkenes, ether and Alkyl halides at the peak value of 3411, 3950, 2867, 2843, 2076, 1647, 1455, 1397, 1110, 1016 and 618. (Fig 4 & Table 3)

Table 1: Preliminary phytochemical analysis of plant extract of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm.

Phytoconstituents	Aqueous	Ethanol	Methanol	Acetone	Petroleum ether
Alkaloids	-	+	++	++	-
Anthocyanin	-	-	+	++	-
Betacyanin	-	-	-	-	+
Cardio glycosides	+	-	++	++	+
Flavonoids	++	+	-	-	-
Glycosides	+	-	-	-	-
Phenols	++	++	+++	+++	+
Quinones	+	-	-	++	-
Saponins	+	-	-	-	-
Steroids	++	-	+	++	-
Tannins	-	+	++	+++	-
Terpenoids	++	-	+	+++	-

+++= strongly positive, ++=moderately positive, += positive, -= negative

Table 2: UV-VIS Spectrum of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm.

Wave length (nm)	Absorption
314.6	1.845246656
416.2	1.486668896
533.0	0.120395529
657.0	0.664696084
996.9	0.023490645

UV-VIS: Ultraviolet visible

Table 3: FT-IR Spectrum of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm.

Peak value	Functional group
3411	Amines
2950	Alkanes
2867	Alkanes
2843	Alkanes
2076	Alkynes
1647	Alkenes
1455	Alkanes
1397	Alkanes
1110	Ethers
1016	Ethers
618	Alkyl halides

FT-IR: Fourier transform- infrared

Figure 1: Experimental plant (a) Potted plant of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm. (b) Underside of the frond with sori of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm.

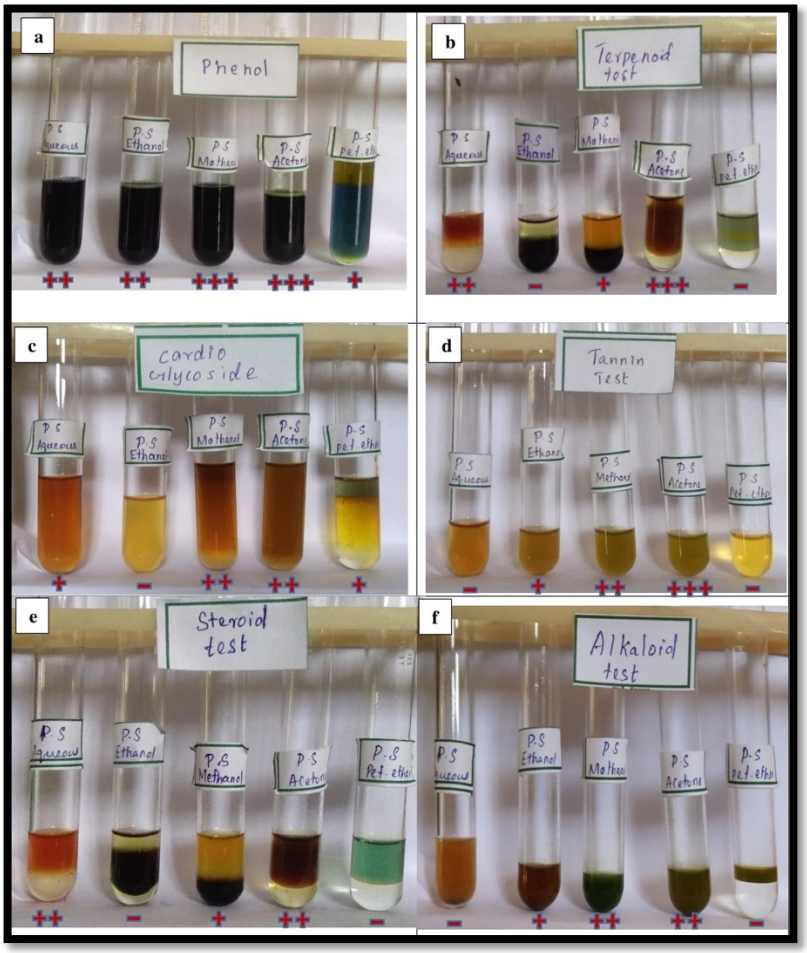

Figure 2. Preliminary phytochemical analysis of *Phymatosours scolopendria* (Burm.F.) Pic. Serm. a) phenol test b) terpenoid test c) cardio glycoside test d) tannin test e) steroid test f) alkaloid test
+++= strongly positive, ++=moderately positive, +=positive, - =Negative

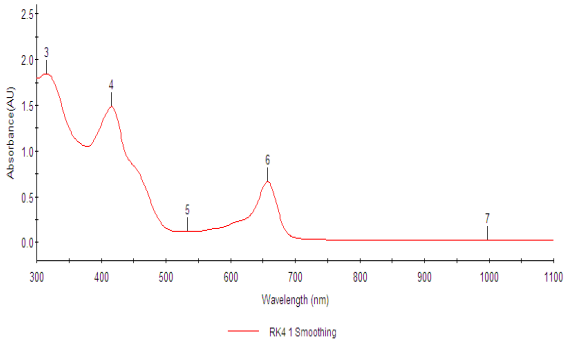

Figure 3: Ultraviolet-visible spectrum of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm.

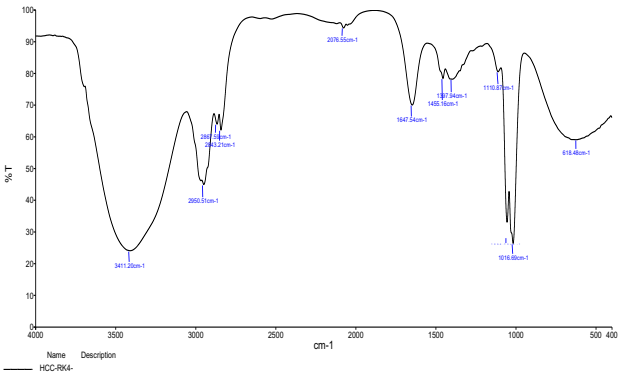

Figure 4: Fourier transform- infrared spectrum of *Phymatosorus scolopendria* (Burm.F.) Pic. Serm.

DISCUSSION

From the present study it is concluded that the experimental plant contains important secondary metabolites. Phenol, steroid, terpenoid, cardioglycoside and tannin are the predominant secondary metabolite found in this plant. Our results coincide with various references already worked out in this plant and it indicates the presence of steroid called phytoecdysteroids[14] as well as coumarin[15].. The results of the above mentioned authors explains ecdysteroid as steroid hormones of arthropods of invertebrates and also explains phytoecdysteroid as analogues of invertebrate steroid hormones (zooecdysteroids) that occur in wide variety of plant species. Phytoecdysteroids are apparently non-toxic to mammals and may even have a number of beneficial pharmacological and medicinal applications[18].

Regarding coumarin, the results of Ramanitrahasimbola *et al*., proves that the bioactive compound from *Phymatosorus scolopendria* such as coumarin showed bronchodilator activity, which was effective on guinea pig trachea[15]. Hence the plant is believed to be a treasure house of various drugs related to lung disease and arthritis. The novel phytochemical compounds from

this experimental plant could be elucidated and identified using advanced analytical techniques in future for the betterment and lifesaving medicines for mankind.

CONCLUSION

The experimental plant *Phymatosorus scolopendria* is an important unexplored medicinal plant. The preliminary phytochemical experiments strongly reveals that the plant contains phenol, steroid and terpenoid content sufficiently through its colour intensity. In UV and FTIR also, the peak values and chemical groups indicates the presence of phytochemicals like amines, alkanes, alkynes, alkenes, ether and Alkyl halides and these results indicate that the phytochemicals from this plant and in future the useful drug content could be separated for further use.

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