PRELIMINARY PHYTOCHEMICAL ANALYSIS OF *ACTINIOPTERIS RADIATA* (SWARTZ) LINK.

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Article Received on: 07/03/13 Revised on: 01/04/13 Approved for publication: 19/05/13

DOI: 10.7897/2230-8407.04648

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ABSTRACT

The objective of the present study was to find out the presence of preliminary phytochemicals in six different solvent extracts of *Actiniopteris radiata* (Swartz) link. by qualitative screening methods. The solvent used for the extraction of leaf and rhizome powder were ethanol, petroleum ether, chloroform, acetone, DMSO and aqueous. The secondary metabolites such as steroids, triterpenoids, reducing sugars, sugars, alkaloids, phenolic compounds, catechins, flavonoids, saponins, tannins, anthroquinones and amino acids were screened by using standard methods. The phytochemical analysis of the ethanolic extract of both (leaf & rhizome) revealed the presence of most active constituents than the other solvents. The ethanolic rhizome extracts of *Actiniopteris radiata* showed higher amount of phytochemicals when compared with the ethanolic leaf extracts.

KEYWORDS: *Actiniopteris radiata*, peacock's tail, phytochemical analysis, ethno medicine, leaf, rhizome.

INTRODUCTION

Man has been using plants as a source of food, medicine and many other necessities of life, since time immemorial. Even now the primitive tribal societies depend largely on the plant life in their surroundings. Being the second largest group of vascular plants, they form a significant, dominant component of many plant communities. Moreover they contribute more to the earth's plant diversity. Many fern and fern allies growing luxuriantly on the Western Ghats slopes are threatened by continuous deforestation and frequent landslides. In various literatures of recent studies, medicinal uses of some ferns and pteridophytes of India have been described elaborately^{1,2}. India is a home to a variety of traditional medicine systems that relay to a very large extent on native plant species for their raw drug materials^{3,4}. Therefore, now there is a need to look backwards the traditional medicine which can serve as novel therapeutic agent.

Actiniopteris radiata (Swartz) Link. belongs to the family Actiniopteridaceae. It is commonly called Peacock's tail. In Tamil it is called as Mayilatum shikhai. *Actiniopteris radiata* is a terrestrial fern. The whole plant paste is applied on cuts and wounds. The paste of leaves are used as styptic and anthelmintic. The plant paste with sugar is given to kill intestinal worms twice for three days and also it is used as tonic to increase potency. The plant paste with candy is given as a cooling agent in case of syphilis. The whole plant paste mixed with cows' milk is given for the treatment of piles and leucorrhoea. The ash of the fresh leaves is taken with honey 2-3 times a day to get relief from bronchitis. Plants are soaked overnight in a glass of water and taken orally in the morning for control of blood pressure. The paste of two fronds is given two times a day to children to cure rickets. Similarly the paste of 5-6 leaves mixed with fresh cow milk (nearly 200ml) is taken for a week, to overcome irregularity in menstrual period. The powder of 8-10 leaves are mixed with curd is given for birth control. The decoction of leaves are also used in Tuberculosis^{5,6}.

During the field exploration of various parts of the country (Himalayas and Western Ghats), Pteridophytes yielded very interesting results. It has been observed that the Pteridophytes play a vital role in the life and economy of the tribal people

of our country. This is because of the fact, that they generally depend upon the forest flora for their livelihood and collect and utilize many plants including pteridophytes for food, fuel, fiber, oils, medicine and shelter. Thus the ethano botanical surveys and studies were conducted in the mountain regions of various parts of the country among the tribal community. The present work is a stepping stone on exploration of secondary metabolites or bioactive compounds from an important medicinal fern which have been used by the tribal people which leads to benefit of the human population as medicine. Hence, exploration on this area of research is worth and really fruitful in finding newer compounds and further studies⁷.

MATERIALS AND METHODS

Collection of Plant material

Actiniopteris radiata is commonly grown in hilly areas or Western Ghats. It was collected from the crevices of rock in Palani hills near Periyakulam at Sothuparai dam site. It is located at 10.12° N 77.55° E. It has an average elevation of 282 meters (925 feet). It is located at the foothills of the Western Ghats. It is one of the most fertile places in the state of Tamilnadu.

Botanical Description^{8,9}

The plants are 8-25cm height, rooting in the crevices of rock or moist and shady places. The rhizome is oblique to horizontal, 1.5 to 2.0cm in length, densely covered by scales and leaf bases. The young leaves (fronds) show circinate venation and lamina flabellate, semicircular or wedge-shaped. Fronds flabellate, dichotomously divided into linear segments, sometimes dimorphic with fertile and sterile

fronds. Usually fertile fronds are larger than the sterile fronds. Sori arranged in two rows on the lower side of the pinnae lobes. Sporangia borne in intra-marginal grooves throughout, protected by the reflexed margin of the segment. Voucher specimens are stored at Department of Botany, Holy Cross College(Autonomous), Tiruchirappalli for future reference.

Preparation of plant extracts

The collected plant materials (leaf and rhizome) were thoroughly washed, shade dried and then powdered with the help of a blender. 10 g of the powder was extracted through cold percolation method successively with 100ml of ethanol, petroleum ether, chloroform, acetone, DMSO and aqueous for 5days at room temperature. All the extracts were filtered through Whatmann no.1 filter paper and then concentrated. The solvent was evaporated to make the crude extract and preserved in airtight bottles until further use.

Preliminary phytochemical analysis¹⁰

The screening of qualitative phytochemical constituents of six solvent extracts of leaf and rhizome of *Actiniopteris radiata* was carried out according to the standard methods.

Test for Steroids: To 2ml test solution, added minimum quantity of chloroform. Then 3-4 drops of anhydride and 3 drops of concentrated sulphuric acid were added. The test result was observed.

Test for Triterpenoids: To 2ml of test solution, added pieces of tin and 2 drops of thionyl chloride. The test result was observed.

Test for Reducing sugars: To 2ml of test solution, added 2ml of Fehling's reagent and 3ml of water. The test result was observed.

Test for sugar: To 2ml of test solution, added very small quantity of anthrone and few drops of concentrated H₂SO₄ and boiled. The test result was observed.

Test for Alkaloids: To 2ml of test solution, added 2N HCL, aqueous layer formed was decanted and to that added few drops of Mayer's reagent. The test result was observed.

Test for Phenolic compounds: To 2ml of test solution, added alcohol and then few drops of neutral ferric chloride solution was added. The test result was observed.

Test for Catechins: To 2ml of test solution in alcohol added Erlich's reagent and few drops of concentrated HCL. The test result was observed.

Test for Flavonoids: To 2ml of test solution, added alcohol and a bit of magnesium. Then few drops of concentrated hydrochloric acid was added and boiled. The test result was observed.

Test for Saponins: To 2ml of test solution, added 2ml of water and shake well. The test result was observed.

Test for Tannins: To 2ml of test solution, added 2ml of water and lead acetate solution. The test result was observed.

Test for Anthroquinone: To 2ml of test solution, added magnesium acetate solution. The test result was observed.

Test for Amino acid: To 2ml of test solution, added 1% of ninhydrin in alcohol. The test result was observed.

RESULTS AND DISCUSSION

Nature has been a source of medicinal agent for thousands of years and an impressive number of modern drugs have been isolated from natural sources⁸. Plants have the ability to produce a large variety of secondary metabolites such as saponins, tannins, phenols, alkaloids, triterpenoids and phytoosterols. In recent years, secondary plant metabolites are extensively investigated as a source of medicinal agents. The plant products over synthetic compound in the treatment of diseases are needed, because it does not have a deleterious effect in higher plants and animals including man. The urge in research on new drugs from natural sources is now moving out of the herbalists shop, away from the core texts into the drug research laboratories¹¹.

In the present preliminary phytochemical analysis, all the leaf and rhizome solvent extracts of *Actiniopteris radiata* showed the presence of phytoconstituents such as sugar, alkaloids, phenolic compounds, flavonoids, anthroquinones and amino acids (Table 1 & Figure 1). The leaf and rhizome solvent extracts showed the presence of phenolic compounds. The petroleum ether, DMSO and ethanolic extracts showed the presence of alkaloids. Likewise, chloroform, DMSO and ethanolic extracts showed the presence of flavonoids. Petroleum ether and ethanolic rhizome extracts as well as leaf and rhizome acetone extracts showed the presence of amino acids.

Table 1. Preliminary phytochemical analysis of leaf and rhizome solvent extracts of *Actiniopteris radiata* (Swartz) Link.

Phytoconstituents	Ethanol		Petroleum Ether		Chloroform		Acetone		DMSO		Aqueous	
	1	2	1	2	1	2	1	2	1	2	1	2
Steroids	-	-	-	-	-	-	-	-	-	-	-	-
Triterpenoids	-	-	-	-	-	-	-	-	-	-	-	-
Reducing sugar	-	-	-	-	-	-	-	-	-	-	-	-
Sugar	+	+	-	-	-	-	-	-	-	-	-	-
Alkaloids	+	+	+	+	-	-	-	-	+	+	-	-
Phenolic compounds	+	+	+	+	+	+	+	+	+	+	+	+
Catechins	-	-	-	-	-	-	-	-	-	-	-	-
Flavonoids	+	+	-	-	+	+	-	-	+	+	-	-
Saponins	-	-	-	-	-	-	-	-	-	-	-	-
Tannins	-	-	-	-	-	-	-	-	-	-	-	-
Anthroquinones	-	+	-	-	-	-	-	-	-	-	-	-
Amino acids	-	+	-	+	-	-	+	+	-	-	-	-

1- Leaf, 2- Rhizome; + = Positive result, - = Negative result

Figure 1: Preliminary Phytochemical analysis of *Actiniopteris radiata* (Swartz) Link.

Among the 12 phytoconstituents, anthroquinone present only in the ethanolic rhizome extract. From the above results, the ethanolic rhizome extracts of *Actiniopteris radiata* showed highest amount of phytoconstituents (sugar, alkaloids, phenolic compounds, flavonoids, anthroquinones and amino acids) when compared with ethanolic leaf extracts. The qualitative analysis revealed the presence of the phytoconstituents such as sugar, alkaloids, phenolic compounds, flavonoids, anthroquinones and amino acids respectively in the present experimental plant.

CONCLUSION

From the above study, it is evident that the secondary metabolites found in this plant is equivalent to the secondary metabolites found in the flowering plants, especially phenol, alkaloid and flavanoids. And it is concluded that, the pteridophytic plant such as *Actiniopteris radiata* (Swartz) Link. contains some valuable secondary metabolites and it increases the value of plant in the case of medicinal drugs.

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Cite this article as:

R. Manonmani and S. Catharin Sara. Preliminary phytochemical analysis of *Actiniopteris radiata* (Swartz) Link. Int. Res. J. Pharm. 2013; 4(6):214-216