

Pharmacognostic and Preliminary Phytochemical Analysis of *Actinopteris dichotoma* Bedd.**Research Article****Harjeet Singh^{1*}, Murali Krishna C¹, Sanjiv Kumar¹, Anupam K Mangal²**

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Abstract

The rhizome and fronds of *Actinopteris dichotoma* Bedd. has been reported to treat worm infestations, skin diseases, antifertility, diarrhoea and dysentery in Ayurveda. The present investigation involves the macroscopy, microscopy, physicochemical evaluation and preliminary phytochemical studies of *Actinopteris dichotoma* Bedd. These observations will help in carrying out further research on this plant.

Keywords: Ayurveda, Pharmacognosy, *Actinopteris dichotoma*, microscopy, phytochemical.

Introduction

Traditional medicines play a key role in human health care. India is a native to a variety of traditional medicinal systems like Ayurveda, Unani and Siddha. Majority of the drugs used in these systems are plant based crude drugs or otherwise finished products in the form of polyherbal formulations. About 80% of the world population relies on the use of traditional medicine, which is predominantly based on plant material (WHO, 1993). Scientific studies available on medicinal plants indicate that promising phytochemicals can be developed for many health problems. For example, the vinca alkaloids (vincristine, vinblastine and vindesine), derived from *Catharanthus roseus*, *Vinca rosea*, *Lochnera rosea* and *Ammocallis rosea* have been employed for their anti-cancer properties. Modern pharmaceuticals still contain at least 25% drugs derived from plants. To preserve the traditional heritage and rationalize the use of natural products in healthcare the safety, efficacy and quality of ASU drugs have to be ascertained.(1, 2)

The process of evaluating the quality and purity of crude drugs by means of various parameters like morphological, microscopical, physical, chemical and biological observation is called standardization. Standardization is essential for herbal drugs in order to assess the quality of the drugs based on pharmacognostical, phytochemical and biological principles. Traditional remedies have always played an important role in Indian societies. However, among more than 250,000 species of higher plants, only about 10% have been scientifically investigated. Therefore it becomes necessary to design proper quality control methods for herbal/ASU drugs.(3)

Pharmacognostic studies help in identification and authentication of the plant material. Appropriate identification and quality assurance of the starting materials is an essential prerequisite to ensure reproducible quality of herbal medicines which will contribute to their safety and efficacy. Simple pharmacognostic techniques used in standardization of plant material include its morphological, anatomical and biochemical characteristics.(4)

Actinopteris dichotoma (Syn. *Actinopteris radiata*; *Actinopteris australis*) is a true fern belonging to family Actinopteridaceae. The plant holds a reputed position in Ayurveda but listed among endangered species. It has been used in Ayurveda as an anthelmintic and styptic drug. But these pharmacological activities were contradicted in mice. The sugary paste of the plant is administered to kill the worms in the intestine two times for three consecutive days. The drug is also used as a tonic to increase potency. The plant paste along with candy is administered as a cooling agent in case of syphilis. The whole plant paste mixed with cow's milk is given for the treatment of leucorrhoea and piles. The ash made out of the fresh leaves is taken with honey 2-3 times a day to get relief from bronchitis. Plants are soaked overnight in water and taken orally in the morning for control of blood pressure. The paste prepared from two fronds is given twice a day to children to cure rickets. The paste of 5-6 fronds prepared in the similar way mixed with fresh cow's milk (nearly 200 ml) is taken for a week, to treat irregular menstrual periods. The powder of 8-10 leaves are mixed with curd is given for birth control. The decoction of leaves is also used in Tuberculosis.

(Mayursikha) *Actinopteris dichotoma* Bedd.

The drug consists of dried rhizome and fronds of *Actinopteris dichotoma* Bedd. (Fam. Polypodiaceae). The plant is indigenous, found in dry rocky places throughout India, common in Kumaon Hills and Neelgiris below an altitude of 1200 m and seen on old buildings.

Though the plant holds a reputed position in Ayurveda but no systematic studies have been

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established. Hence an effort has been made to lay down the Pharmacognostical and phytochemical standards of *Actiniopteris dichotoma* Bedd.

Synonyms	: Mayursikha
Other/Regional Language Names	
English	: Peacock's tail
Hindi	: Morpankhi, Mayursiha,
Malayalam	: Mauilatumsikha, Mayurasikha, Nanmukappullu
Marathi	: Mayursikha
Punjabi	: Morpankhi
Tamil	: Mayilatam shikhai, Mayircikai
Telugu	: Nemali adugu

Botanical Description

Actiniopteris dichotoma Bedd. comes under the family Polypodiaceae subfamily Actiniopteridaceae. Similar to other ferns of Pteridophyta, life cycle of the fern also shows alternation of generations of separate sporophyte and gametophyte. Sporophyte generation pre-dominates the gametophyte generation.

A herbaceous miniature palm like plant, height up to 1m with densely tufted stipe. Fronds fan-like 2.5-3.8cm deep with numerous dichotomous segments which are rush like in texture, veins few, sub parallel with distinct mid rib, segment of fertile frond longer than those of the barren one, sore linear, elongate, sub margin.

Materials and Methods

Collection of plant material

The dried sample of *Actiniopteris dichotoma* Bedd. was procured from NADRI, Bangalore (a unit of CCRAS) and voucher specimens are deposited at Museum of NIAPR, Patiala.

Macroscopic

The macroscopic characters such as size, shape, margin, nature, texture, apex, surface, colour, odour, taste were studied for morphological investigation.

Microscopic

For microscopy, free hand section of rhizome of the drug were cut and stained according to the prescribed method.^{5,6} TS shows epidermis as the outermost layer, followed by sclerenchymatous layer, cortex, phloem, xylem and pith in the centre. Dictyostele is present which is dissected type of stele derived from the siphonostele. This is the most advance type of stele (fig 1,2).

Powder microscopy:

A judicious quantity of powder was taken on a glass slide to which was added a few drops of chloral hydrate and was heated for 1-2 minutes after placing a cover slip, care should be taken to avoid air bubbles and to see that there was sufficient chloral hydrate under the cover slip. Excess of chloral hydrate outside the cover slip is to be withdrawn using a blotting paper.

Physicochemical Evaluation

The extractive values, ash values and loss on

drying were performed according to the official methods prescribed in Ayurvedic Pharmacopoeia of India and WHO guidelines on quality control for medicinal plant materials.(7)

Phytochemical screening

The preliminary phytochemical screening for stem, leaves and root were carried out as per WHO Guidelines on quality control for medicinal plant materials.(7)

Flourescence Analysis

Most of the crude drugs fluorescence when their powder is exposed to UV radiation. The fluorescence characteristics of powdered drug were studied under ultraviolet radiation after treating with different chemical reagents. The drugs show characteristic behaviour with different chemical reagents.

Conclusion

Actiniopteris dichotoma has numerous uses in traditional system of medicine to treat several ailments like worm infestations, skin diseases, antifertility, diarrhoea and dysentery in Ayurveda. Due to its significance in traditional system it becomes necessary to standardize it for use as a drug. No pharmacognostical and phytochemical work on this plant has been reported so far. The present study is undertaken to lay down these standards. The work reveals standardization profile of drug *Actiniopteris dichotoma* which would be very useful in botanical identification and authentication of plant drug and may help in preventing its adulteration. Present work will be helpful in doing further investigation on the plant.

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Table No 1: Phytochemical constituents in different Extraction mediums

Phytoconstituents	Petroleum Ether extract	Chloroform extract	Methanolic extract	Aqueous extract
Saponins:				
Foam test	-ve	-ve	-ve	-ve
Haemolytic test	-ve	-ve	-ve	-ve
Shinoda test	-ve	-ve	+ve	+ve
Carbohydrates :				
Molish's test	+ve	+ve	+ve	+ve
Fehling's test	-ve	+ve	+ve	+ve
Benedict test	+ve	+ve	+ve	+ve
Phenols and Tannins :				
Ferric chloride test	-ve	-ve	+ve	-ve
Gelatin test			+ve	-ve
Lead acetate test	+ve	+ve	+ve	-ve
Sterols :				
Salkowoski's test	+ve	+ve	+ve	+ve
Liebermann Buchard test	+ve	+ve	+ve	+ve
Alkaloids :				
Dragendroff's test	+ve	+ve	+ve	+ve
Hager's test			+ve	+ve
Mayer's test	-ve	-ve	-ve	-ve
Wagner's test	+ve	+ve	+ve	+ve
Glycosides :				
Borntranger test	-ve	-ve	+ve	+ve
Legal's test	-ve	-ve	-ve	-ve
Keller killani test	+ve	-ve	+ve	+ve
Proteins :				
Biuret test	-ve	-ve	-ve	-ve
Miller's test	-ve	-ve	-ve	-ve
Ninhydrin test	-ve	-ve	-ve	-ve

Table No 2: Powder Analysis with different chemical reagents:

S. No.	Reagent	Colour
1	Powder as such	Brown
2	Powder+ conc. H ₂ SO ₄	Brownish black
3	Powder+ GAA	Dark brown
4	Powder +conc. HCl	Brown
5	Powder+ conc.HNO ₃	Brown
6	Powder+5% KOH soln	Dark brown
7	Powder+FeCl ₃	Brown
8	Powder+1N NaOH	Dark brown
9	Powder+Ammonia	Light brown

Table No 3: Fluorescence Analysis of Powdered drug of *Actinopteris dichotoma* Bedd.

S. No.	Reagents	UV (Short) 254nm	UV(long) 366nm
1	Powder as such	Brown	Brown
2	Powder+1N NaOH in water	Fluorescent green	Black
3	Powder+50%HCl	Light green	Brown
4	Powder+50%H ₂ SO ₄	Fluorescent green	Brown
5	Powder+50%HNO ₃	Light green	Brown
6	Powder + Pet. ether	Light green	Black
7	Powder+NH ₃	Fluorescent green	Dark brown
8	Powder+CH ₃ OH	Light green	Black
9	Powder+ CHCl ₃	Green	Black
10	Powder+Iodine Soln	Green	Black
11	Powder+FeCl ₃ Soln	Fluorescent green	Black

Table No 4: Physicochemical parameters

S. No.	Parameter	Value(Mean)
1.	Loss on Drying	4.22%
2.	Foreign Matter	Nil
3.	Ash value	5.13%
4.	Alcohol soluble extractive	4.02%
5.	Water soluble extractive	9.23%

Figure No. 1: TS of *Actinopteris dichotoma* Bedd. rhizome x100

Figure No. 2: TS of *Actinopteris dichotoma* Bedd. rhizome x400

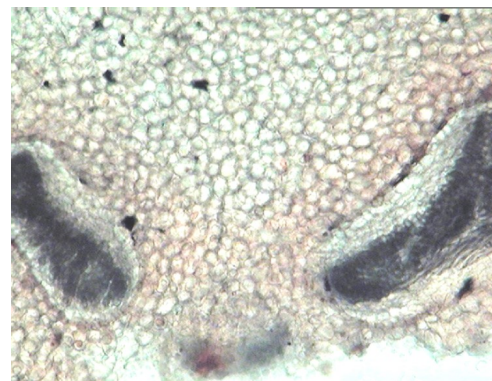
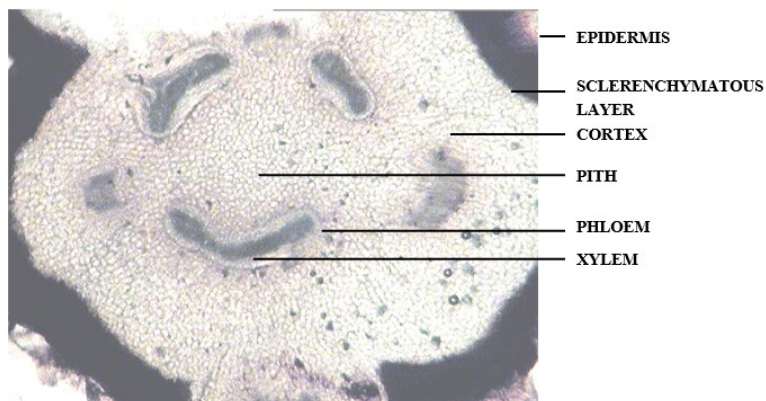


Figure No 3: Powder drug analysis of *Actinopteris dichotoma* Bedd.

