

Qualitative Phytochemical Profiling and Ecological Significance of *Adiantum edgeworthii* Hook. Collected from the Melghat Region of Amravati District, Maharashtra, India

Akash G. Dhotre¹, Dr. R. S. Dhande²

¹Research Scholar, Shri R. R. Lahoti Science College, Morshi, Dist. Amravati

²Professor at Department of Botany, Shri R. R. Lahoti Science College, Morshi, Dist. Amravati
doi.org/10.64643/IJIRT12I9-195653-459

Abstract—The present investigation was undertaken to evaluate the qualitative phytochemical composition and ecological significance of *Adiantum edgeworthii* Hook., a medicinal fern species collected from the Melghat region of Amravati district, Maharashtra, India. Leaves of the plant were subjected to Soxhlet extraction using solvents of varying polarity, namely acetone, petroleum ether, ethanol, and aqueous medium. Qualitative phytochemical screening was performed to detect the presence of major secondary metabolites following standard protocols. The results revealed the presence of proteins, alkaloids, phenolic compounds, terpenoids, glycosides, flavonoids, and saponins in different solvent extracts, while tannins, steroids, resins, and phenols were absent. Ethanol and aqueous extracts showed comparatively higher diversity of phytoconstituents, indicating their efficiency in extracting bioactive compounds. The presence of pharmacologically important secondary metabolites supports the traditional medicinal relevance of *A. edgeworthii*. Ecologically, the species plays a crucial role in forest floor stabilization, moisture retention, and biodiversity conservation in the Melghat ecosystem. The study highlights the therapeutic potential and ecological importance of *A. edgeworthii* and emphasizes the need for its conservation and sustainable utilization.

Index Terms—*Adiantum edgeworthii* Hook., qualitative phytochemical analysis, Melghat, medicinal fern, ecological significance, Soxhlet extraction

I. INTRODUCTION

India is one of the world's richest repositories of medicinal plant diversity, including a significant number of pteridophytes that have long been used in

traditional healthcare systems (Kumar & Kaushik, 2011). Ferns and fern allies are known to synthesize a wide range of secondary metabolites such as alkaloids, flavonoids, phenolics, terpenoids, and glycosides, which contribute to their therapeutic and ecological value (Singh et al., 2015).

The genus *Adiantum* (family: Pteridaceae), commonly known as maidenhair ferns, comprises several species widely distributed in tropical and subtropical regions. Many species of *Adiantum* are traditionally used for treating cough, fever, skin diseases, diabetes, and inflammatory disorders (Benjamin & Manickam, 2007; Parihar et al., 2014). *Adiantum edgeworthii* Hook. is a shade-loving fern found in moist forest habitats and rocky crevices, particularly in biodiversity-rich regions such as Melghat.

Melghat, located in the Satpura range of Maharashtra, is a protected forest ecosystem recognized for its high floristic diversity and ecological significance. Despite the medicinal relevance of *A. edgeworthii*, scientific data on its phytochemical composition from this region remain limited. Therefore, the present study aims to qualitatively analyze the phytochemical constituents of *A. edgeworthii* leaf extracts using different solvents and to highlight its ecological importance within the Melghat forest ecosystem.

II. MATERIALS AND METHODS

A. Study Area and Plant Collection

Fresh and healthy leaves of *Adiantum edgeworthii* Hook. were collected from the Melghat region of Amravati district, Maharashtra, India. The plant was identified using standard floras and authenticated from

Dr. Santosh N. Patole (Taxonomist) Professor, Department of Botany, Shri Shivaji Arts, Commerce and Science College, Akot. (Maharashtra).

B. Preparation of Plant Extracts

Sequential extraction was carried out using a Soxhlet extractor with solvents of increasing polarity, namely petroleum ether, acetone, ethanol, and distilled water. Approximately 50 g of powdered leaf material was extracted with each solvent for 6 - 8 hours until complete extraction. The extracts were filtered, concentrated and stored for further analysis.

C. Qualitative Phytochemical Screening

Qualitative phytochemical tests were performed on each extract using standard Methods (Mirge et al., 2023) for to detect the presence of Proteins, Amino acids, Reducing sugars, Alkaloids (Mayer's, Wagner's, and Hager's tests), Phenolic compounds, Tannins, Glycosides, Flavonoids, Terpenoids, Steroids, Resins and Saponins.

III. OBSERVATIONS & RESULTS

The qualitative phytochemical analysis of *Adiantum edgeworthii* Hook. leaf extracts revealed solvent-dependent distribution of secondary metabolites (Table No. 1).

Table No. 1 - Qualitative Phytochemical Analysis of *Adiantum edgeworthii* Hook. Leaf Extracts in Different Solvents

Sr. No	Name of constituent test	Acetone	Petroleum ether	Ethanol	Aqueous
1	Protein	+	+	-	+
2	Amino acid	-	-	-	-
3	Reducing sugar	-	-	-	+
4	Alkaloids Mayer's Wagner's Hager's	+ + +	+ + +	+ + +	- + +
5	Phenolic compound Lead acetate	+	-	+	+
6	Tannins	-	-	-	-
7	Glycosides	-	-	+	+
8	Flavonoids	-	+	-	-
9	Phenol	-	-	-	-
10	Terpenoids	+	+	+	-
11	Steroid	-	-	-	-
12	Resins	-	-	-	-
13	Saponins	+	-	+	-

Proteins were detected in acetone, petroleum ether, and aqueous extracts, while amino acids were absent in all extracts. Reducing sugars were present only in the aqueous extract. Alkaloids showed positive reactions in acetone, petroleum ether, and ethanol extracts, with aqueous extract showing selective absence in Mayer's test. Phenolic compounds were present in acetone, ethanol, and aqueous extracts but absent in petroleum ether extract.

Glycosides were detected in ethanol and aqueous extracts, whereas flavonoids were observed only in petroleum ether extract. Terpenoids were present in acetone, petroleum ether, and ethanol extracts. Saponins were detected in acetone and ethanol

extracts. Tannins, phenols, steroids, and resins were absent in all solvent extracts.

Overall, ethanol and aqueous extracts exhibited a broader range of phytoconstituents, suggesting their suitability for extracting bioactive compounds from *A. edgeworthii*.

IV. DISCUSSION

The presence of alkaloids, flavonoids, phenolics, terpenoids, glycosides, and saponins corroborates earlier studies on medicinal ferns, which attribute antimicrobial, antioxidant, anti-inflammatory, and antidiabetic properties to these compounds (Benjamin

& Manickam, 2007; Singh et al., 2015). The absence of tannins and steroids aligns with observations reported in other *Adiantum* species (Parihar et al., 2014).

Ecologically, *A. edgeworthii* contributes to soil stabilization, nutrient cycling, and microhabitat formation in moist forest ecosystems. Its presence indicates undisturbed and humid forest conditions, making it an important ecological indicator species in the Melghat region.

V. CONCLUSION

The present study confirms that *Adiantum edgeworthii* from the Melghat region is rich in bioactive phytochemicals, particularly alkaloids, phenolic compounds, terpenoids, glycosides, and saponins. Ethanol and aqueous extracts proved most effective in extracting diverse phytoconstituents. The medicinal potential of the species, coupled with its ecological role in forest ecosystem stability and biodiversity conservation, highlights the need for its sustainable utilization and conservation. Further quantitative and pharmacological studies are recommended to validate its therapeutic applications.

REFERENCES

- [1] Beddome, R. H. (1883). Handbook to the ferns of British India, Ceylon and the Malay Peninsula. Thacker, Spink & Co.
- [2] Benjamin, A., & Manickam, V. S. (2007). Medicinal pteridophytes from the Western Ghats. *Indian Journal of Traditional Knowledge*, 6(4), 611–618.
- [3] Fraser-Jenkins, C. R. (2008). Taxonomic revision of three hundred Indian subcontinental pteridophytes. Bishen Singh Mahendra Pal Singh.
- [4] Harborne, J. B. (1998). *Phytochemical methods: A guide to modern techniques of plant analysis* (3rd ed.). Chapman & Hall.
- [5] Kumar, A., & Kaushik, P. (2011). Pteridophytes: An underutilized medicinal resource. *International Journal of Pharmaceutical Sciences and Research*, 2(9), 2276–2285.
- [6] Mr. Sumitkumar Laxmanrao Mirge, Dr. Santosh N. Patole, Bharat R. Nagare, Ganesh A. Padghan, & Vaishnavi R. Raut (December-2023).

Qualitative phytochemical and antibacterial screening of *annona squamosa* L. Of akot tehsil in akola district (m.s.). *International journal of novel research and development*, 8(12), d165-d170.

- [7] Parihar, P., Parihar, L., Bohra, A., & Sharma, R. (2014). Phytochemical analysis and antimicrobial activity of some medicinal ferns. *Journal of Pharmacy Research*, 8(7), 928–933.
- [8] Singh, M., Govindarajan, R., Nath, V., Rawat, A. K. S., & Mehrotra, S. (2015). Antimicrobial, antioxidant and phytochemical evaluation of medicinal ferns. *Journal of Ethnopharmacology*, 169, 328–338.
- [9] Sofowora, A. (2008). *Medicinal plants and traditional medicine in Africa* (3rd ed.). Spectrum Books Ltd.
- [10] Trease, G. E., & Evans, W. C. (2002). *Pharmacognosy* (15th ed.). Saunders.