A REVIEW ARTICLE ON ADIANTUM INCISUM

Sapna Rai*, Dr. Sandeep Kumar Yadav, Dr. Kumkum Mathur, Dr. Manoj Goyal

Lachoo Memorial College of Science and Technology (Autonomous), Pharmacy Wing, Jodhpur, Rajasthan.

ABSTRACT

Since ancient time in India, Adiantum incisum is used as remedies in traditional therapy. The plant has an important role in medicine and public health. Adiantum incisum is an evergreen fern and mostly found in hilly areas, commonly called trailing maidenhair. Literature survey from books and journals of traditional Indian medicine revealed that Adiantum incisum has a lot of medicinal properties. Leaves, stems and whole plant have been reported for medicinal activity. It is used as a remedy to cure like Cough, Diabetes, Jaundice, Fever, Diarrhea, Skin diseases and Wounds. The plant has pharmacologically been studied for various activities like hepatoprotective, antioxidant, antimicrobial activity, In-vitro α-amylase and α-glucosidase inhibitore etc. However, too many scientific studies have been carried out on this plant for exploring these traditional uses. The present report is deals with traditional uses and pharmacological activity of Adiantum incisum in the treatment of various diseases.

KEYWORDS: Adiantum incisum, traditional uses and pharmacological activity.

INTRODUCTION

Adiantum species are large genus of about 200 species and It has been used in traditional medicine to cure human and animal diseases including relief of internal heat or fever, enhancement of urination, removal of urinary calculus, and sundry other curative claims\textsuperscript{[1]} elimination of stasis to resolve swelling, relief of cough, cure of diarrhea and stoppage of bleeding, as well as treatment of urinary tract infection, calculus, hepatitis, hemorrhage, fractures, snakebite, burns and scald.\textsuperscript{[2]} Adiantum incisum belong to the family Pteridaceae and have many medicinal properties as a remedy to cure like cough, diabetes, jaundice, fever, diarrhoea, skin diseases, wounds.\textsuperscript{[3-4]} The fern of A. incisum (Syn. A. Caudatum Forssk) has...
been found in hilly areas of Rajasthan, Panjab and Tamil nadu. The plant has been reported to contain terpenoids and flavonoids having anti-oxidant activity.

**Photograph of *Adiantum incisum***

**Synonym**[^6]

Botanical name: *Adiantum capillusgorgonits, Adiantum rhizophorum, Adiantum caudatum.*

Hindi name: Mayursikha, sumble, hansraj, raja hans.

English name: Maiden hair fern.

**Taxonomical classification**[^7]

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<th>Kingdom</th>
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<td>Species</td>
<td><em>Incisum</em></td>
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**Distribution**[^8]

India: Rajasthan, Gujarat, Punjab, Odisa, Tamil-nadu, Manipur and Himanchal Pradesh.

Other country: Bangladesh, Pakistan and Afghanistan.
Botanical description

Rhizome: *A. incisum* has a short and erect rhizome with linear scales at the base, 4 to 5 mm long over and 0.2 mm wide, blackish with a narrow margin pale.

Fronds: *A. incisum* fronds are erect or drooping they are pinnate and arranged in tufts. They are 10 to 40 cm long.

Stem: The rachis and stem are dark brown colour. The lower half of the stem is densely hairy, and sometimes wears narrow pale brown scales. Pinnae are 0.7 to 2.3 cm long and 4-11 mm wide, become smaller and smaller at the top. They are alternate, oblong to obliquely triangular, slightly too deeply incised or lobed at the outer and lower margins, entire at the lower margin.

Root: *A. incisum* root is cuneiform or rarely rounded, generally sparsely to densely cover with brown hairs. The sori are circular or oblong 1 to 3.5 mm wide *Adiantum incisum* usually grows on damp rocks and mountain sides in forest areas.

Phytoconstituents

The fern contains triterpenoids (including adiantone, isoadiantone) and flavonoids (including rutin and isoquercetin). Hentriacontane, 16-hentriacontanone, adiantone, isoadiantone, ß-sitosterol and fernene also present in the plant.

Basic structure of *Adiantum incisum*

C$_{29}$H$_{48}$O, is a triterpenoid isolated from *Adiantum incisum forssk*.

Photochemistry

Sengottuvel T., *et al.* (2015) isolated and analyse the phytochemical constituents of *Adiantum incisum* forks using GC-MS. The study was carried out for the preliminary phytochemical analysis of the ethanolic extract of *Adiantum incisum forks*. GC-MS analysis was performed on the ethanolic extract of *Adiantum incisum forks* to find out the bioactive
compounds. Phytochemical screening revealed the presence of alkaloids, carbohydrates, phenols, flavonoids, saponins where present. In the GC-MS analysis 26 no. of compounds were identified viz., 17-Pentatriacontene - (26.44%), Neophytadiene -(10.68%), Hexadecanoic acid –(10.07%), 2-Hexadecen-1-ol,3,7,11,15-tetramethyl-(6.08%), 2-[3-Carbethoxypropionamide]-3,4-dicarbethoxy-1-benzylxymethyl pyrrole (5.62%) etc.

Hussian A., et al. (2008)\(^9\) isolated 4-Hydroxy-4, 6a, 6b, 9, 9, 12a, 14b-heptamethylperhydropicen-3-one hemihydrate from Adiantum incisum. This compound, \(\text{C}_{29}\text{H}_{48}\text{O}_{5}\text{H}_2\text{O}\), is a triterpenoid isolated from the stems and rhizomes of Adiantum incisum. The basic skeleton of the molecule contains five six-membered rings, all adopting chair conformations, bearing a total of seven methyl, one hydroxyl and a keto group. There are two molecules of the triterpene and one water molecule of crystallization in the asymmetric unit. The two unique triterpenoid molecules hydrogen-bond directly via an \(\text{O-H} \cdot \cdot \cdot \text{O=C}\) interaction, and are also bridged by the water molecule.

Safdar H., et al. (2002)\(^{16}\) reported two New Triterpenes from Fern Adiantum incisum. Two new triterpenes, adininaneone (1) and adininaonol (2) were isolated from Adiantum incisum. Three known triterpenes, adiantone (3), isoadiantone (4) and 23-hydroxyfernene (5) were also isolated for the first time from the methanolic extracts of \(A.\) incicum. The structures were elucidated with the help of modern spectroscopic techniques.

**Traditional uses\(^{[2-5]}\)**

- **Diabetes**: The Whole and Juice of fronds are used to treat diabetes.
- **Hepatoprotective**: The leaves powder used in liver diseases
- **Skin disease**: Leaves are external remedy for skin disease.
- **Malaria**: The leaves are used in malaria treatment.
- **Emetic**: Large dose of this plant use in emetic.
- **Bronchial disease**: The leaves are used as a cure for cough and bronchial affection.
- **Bone fracture**: The roots are used in bone fracture.
- **Alopecia**: Fresh or dried leaves are crushed into paste. 50g paste is mixed in coconut oil 200 ml. The oil in appropriate amount is applied on hairs twice a day for 2 months to check falling hairs. Infusion of young fronds used as treatment against malaria and bronchial diseases. The leaf powder is mixed with butter.
Pharmacological activity

Adiantum incisum has not been extensively studied, despite of its vast medicinal properties. However In-vitro α-amylase and α-glucosidase inhibitory effects of Adiantum caudatum Linn. and Celosia argentea Linn., hepatoprotective activity of Adiantum caudatum Linn. were evaluated for their potential pharmacological effect as mentioned in the present study.\[12\]

In-vitro α-amylase and α-glucosidase inhibitory activity

Telagari M. and Hullati K. (2015)\[12\] conducted in-vitro α-amylase and α-glucosidase inhibitory activity of both Adiantum caudatum Linn. and Celosia argentea Linn. extracts. This study was to provide an in-vitro evidence for their potential role in Diabetes α-amylase and α-glucosidase enzymes. This study prove that the A. caudatum and C. argentea are effective α-amylase and α-glucosidase inhibitors, which may helpful to reduce the postprandial glucose levels. However, the principle compounds responsible for the inhibitory action of α-amylase and α-glucosidase. The presence of triterpenoids and phenolics of C. argentea have attributed to the highest enzyme inhibition activity compared to A. caudatum hence, the triterpenoids of these plant may be responsible for enzyme inhibitory activity. A. caudatum and C. argentea showed comparable results with that of acarbose.

Antioxidant and antimicrobial activity

Dildar A., et. al. (2015)\[14\] reported the antioxidant and antimicrobial of methanolic, hexanic, and aqueous extracts of Adiantum caudatum leaves. The plant was analyzed for phenolic, flavonoid contents and antioxidant and antimicrobial potential. The study define that Methanol is a better solvent to extract most of the antioxidant components from A. caudatum leaves. Antioxidant activities of the extracts in reducing power, FRAP (ferric reducing antioxidant power), phosphomolybdate and ABTS assays followed the same order of methanolic > aqueous > hexanic solvent. In the DPPH assay, however, the aqueous extract exhibited a slightly higher antioxidant activity than the methanolic. In lipid peroxidation inhibitory assay, the extracts showed almost similar behavior and their activity decreased gradually with time. The aqueous extract was the most potent and the hexanic the least. P. aeruginosa was the most susceptible strain, while the aqueous and methanolic extracts exhibited a slightly higher efficacy against this pathogen than the drug amoxicillin.

Hepatoprotective activity

Frank R. P., et al. (2012)\[11\] studied the hepatoprotective effect of Adiantum incisum forsk leaf extract against CCL4 induced hepatotoxicity in rats. In this study, the protectivity of
methanolic extract of leaves of *Adinatum incisum Forsk*, as an antioxidant to protect against CCL$_4$-induced oxidative stress and hepatotoxicityin albino wistar rats was investigated. Intraperitoneal inj. of CCL$_4$ produced a marked elevation in the serum levels of serum glutamic oxaloacetic transminase (SGOT), serum glutamic pyruvic transminase (SGPT), alkaline phosphatise (ALP) and total bilirubin and decrease in the total protein. Results of this study show that *Adiantum incisum* forsk can be proposed to protect the liver against CCL$_4$ induced liver damage in rats, and the hepatoprotective effect might be correlated with it’s antioxidant and free radical scavenger effects.

**CONCLUSION**

*Adiantum incisum* is a common fern and used as a medicinal plant in traditional remedies. Several secondary metabolites have been isolated from its leaves, roots, and rhizomes. Many of these secondary metabolites have also been found to possess interesting pharmacological activities and some have served as curves for human and live stock diseases. In addition, the various solvent extracts from plant have been reported to exhibit biological activities include hepatoprotective, antioxidant, antimicrobial activity, In-vitro $\alpha$-amylase and $\alpha$-glucosidase inhibitory activity etc. The biological activities and chemical constituents reported in present review confirm the therapeutic value of *Adiantum incisum*. Thus, wide utilization of this plant and the entire investigations done on this plant will possibly help to its effective remedies in traditional therapy and will be the window for its usage in discovery of new drugs.

**REFERENCE**


