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# REVIEW ON PHYTOCHEMICAL AND PHARMACOLOGICAL ACTIVITY OF THE GENUS- ACTINIOPTERIS.

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**ABSTRACT** A systematic search was conducted across multiple scientific databases. Also, a deep study of the term phytochemical constituents, pharmacological activities, methodologies, and therapeutic applications were made in Actiniopteris. This paper revealed that the genus Actiniopteris contains a diverse array of phytochemicals, including flavonoids, alkaloids, phenolics, and terpenoids, which contribute to its bioactivity. Pharmacological studies have demonstrated a wide spectrum of activities, such as antioxidant, antimicrobial, anti-inflammatory, and hepatoprotective properties, aligning with its traditional medicinal uses. The ethnomedicinal applications, particularly in wound healing and fever management were also well defined.

**KEYWORDS :** Herbal medicines, Actiniopteris, Phytochemical studies, Pharmacological activity

## INTRODUCTION:

Plants form one of the major kingdoms of life and possess the unique ability to produce their own food through photosynthesis. This hallmark characteristic not only sustains plant life but also positions plants as an essential component of the global food web. These plants contain bioactive compounds or serve as precursors for the semi-synthesis of pharmaceuticals.[1] Alternative medicine, which employs botanicals to achieve therapeutic objectives, has been a cornerstone of traditional healthcare systems. It has been practiced extensively in diverse cultures, particularly in Western and Asian traditions.[2]

Actiniopteris commonly known as Mayurishikha, is an important medicinal fern belonging to the family Actiniopteridaceae. This family is notable for its xerophytic species with significant pharmacological properties. Actiniopteris has a broad spectrum of therapeutic applications. It is utilized as a genitourinary tract tonic and exhibits anti-histaminic, anti-inflammatory, anti-cholinergic, astringent, anti-tubercular, and antimicrobial activities.

The plant is traditionally used to alleviate conditions such as cough, bronchitis, diarrhoea, dysentery, and dysuria. Both internal and external applications of Actiniopteris species are documented, particularly for treating blisters, infected wounds, and erysipelas.[3]

### Medicinal Uses:

Actiniopteris species is widely utilized in traditional medicine for treating various ailments. The paste prepared from the entire plant is applied to cuts and wounds for healing. The leaf paste exhibits anthelmintic and styptic properties. To address conditions such as leucorrhoea and piles, a paste made from the whole plant mixed with cow's milk is administered.

For bronchitis, the ash of fresh leaves is consumed with honey two to three times daily. In cases of rickets in children, a paste made from two fronds is given as a remedy. Similarly, irregular menstrual cycles are treated by consuming a paste made from five to six leaves combined with fresh cow's milk over a week.[4,5]

### Phytochemical Studies:

Quantitative analysis indicated that the ethanolic extract contained the highest concentrations of flavonoids and phenols compared to methanol, chloroform, and aqueous extracts. Conversely, the methanolic extract exhibited the highest concentrations of alkaloids and tannins, outperforming ethanol, chloroform, and aqueous extracts. Similar results were reported by John de Brito et al.,[6] further corroborating these findings.

Manonmani & Catharin Sara [7] conducted a preliminary phytochemical analysis of A. radiata (Swartz) Link. using six different solvent extracts. The powdered leaves and rhizomes of the plant were subjected to extraction, and the presence of secondary metabolites was assessed using qualitative screening methods. The analysis identified a range of bioactive compounds, including terpenoids, steroids, sugars, reducing sugars, alkaloids, catechins, flavonoids, phenolic compounds, tannins, saponins, and amino acids. Among the solvents tested, the ethanolic extract of the leaves and rhizomes exhibited the highest concentration of active components. An overview of the phytochemical screening of Actiniopteris species is presented in Table 1.

**Table 1. An Overview Of The Phytochemical Screening Of Actiniopteris Species**

| Phytochemical Group | Actiniopteris radiata (Sw.) link | Actiniopteris dimorpha Pic.Serm. | Actiniopteris paucibola Pic.Serm. | Actiniopteris semiflabellata Pic.Serm. |
|---|---|---|---|---|
| Alkaloids | + | + | + | + |
| Flavonoids | + | + | + | + |
| Tannins | + | + | + | + |
| Saponins | + | - | - | + |
| Phenolic Compounds | + | + | + | + |
| Terpenoids | + | + | + | + |
| Glycosides | + | + | + | + |
| Triterpenoids | + | + | + | + |
| Carbohydrates | + | + | + | + |
| Proteins | + | + | + | + |

Present (+), Absent (-)

### Pharmacological Studies:

### Antibacterial Activity:

Manjunath et al., [8] evaluated the in vitro antibacterial properties of A. radiata (Swartz) Link. against major pathogens, including Staphylococcus aureus, Klebsiella pneumoniae, Pseudomonas aeruginosa, Salmonella

typhimurium, Escherichia coli, and Bacillus subtilis. Various extracts were tested, and the ethanol and hexane extracts demonstrated the most effective antibacterial activity against all the tested microorganisms.

Moorthy et al., [9] investigated the antibacterial activity of A. radiata (Swartz) Link. using the well diffusion method. Crude extracts of the plant were prepared at different concentrations using alcoholic and aqueous solvents, with chloramphenicol serving as the positive control. The study demonstrated that both the aqueous and methanolic extracts of A. radiata (Swartz) Link. exhibited potent antibacterial activity across all dilutions tested. These findings suggest that the plant extracts possess significant potential for treating infections caused by harmful microorganisms.

**Anti-fertility Activity:**

Chandrakant et al., [10] conducted a study to evaluate the antifertility effects of A. radiata (Swartz) Link. in female albino mice. Methanolic extracts of A. radiata (Swartz) Link. were orally administered to the mice for 30 days. The treatment resulted in a decrease in ovarian weight and estrogen levels, accompanied by histological alterations in the reproductive organs. The study found that a low dose of the methanolic extract effectively exhibited antifertility activity. However, this effect was not observed at higher doses, suggesting a dose-dependent response.

Sharma et al., [11] demonstrated the anti-fertility activity of A. dichotoma Bedd. in male rats. The crude extract of the whole plant, prepared with 50% ethanol, along with its isolated chromatographic fraction was administered orally at a dose of 50 mg/kg body weight per day for 60 days. The treatment resulted in suppressed sperm production and decreased sperm motility, which corresponded with a decline in fertility. These findings suggest that A. dichotoma Bedd. may hold potential for developing a safe male contraceptive pill.

**Anti Nephrotoxic Activity:**

Kumar et al., [12] examined the efficacy of A. radiata (Swartz) Link. -biosynthesized silver nanoparticles (AR-AgNPs) in alleviating gentamicin-induced nephrotoxicity. The nanoparticles were synthesized using an aqueous extract of the plant. Gentamicin treatment led to significant alterations in blood parameters, including a substantial increase in serum urea, creatinine, bilirubin, and uric acid levels. Furthermore, the antioxidant and anti-nephrotoxic properties of the nanoparticles were enhanced, suggesting their potential as a therapeutic agent in the management of nephrotoxicity.

**Anti Haemorrhoidal Activity:**

Anna et al., [13] conducted an in vivo study to evaluate the anti-haemorrhoidal activity of A. radiata (Swartz) Link. using a paste prepared from the plant mixed with milk. The study involved six groups of Wistar albino rats: a normal control group, a positive control group, a standard drug group, a trial drug paste mixed with un-boiled milk group, a trial drug paste mixed with boiled milk group, and a trial drug paste-only group. On the seventh day of the experiment, the rats were sacrificed under deep ether anesthesia, and ano-rectal tissue samples were collected for histological analysis. The results revealed that among the six groups, only the trial drug paste mixed with boiled milk group exhibited significant changes, supporting the use of this combination in the treatment of haemorrhoids.

Vivek et al., [14] conducted tests to determine the spasmolytic activity of an ethanolic extract of the entire A. radiata (Swartz) Link. plant on isolated rat ileum. The results showed that the crude extract effectively relaxed the rat ileum, indicating its spasmolytic activity. These findings suggest that A. radiata (Swartz) Link. possesses bioactive compounds with potential therapeutic applications in modulating histaminergic and cholinergic pathways.

**Hepatoprotective Activity:**

The hepatoprotective activity of A. radiata (Swartz) Link. investigated in Wistar albino rats with liver damage induced by paracetamol. The study evaluated key liver function parameters, including total bilirubin levels, alkaline phosphatase (ALP), aspartate aminotransferase (AST/SGOT), and alanine aminotransferase (ALT/SGPT). In addition to the in vivo analysis, the antioxidant potential of the plant extract was assessed in vitro by measuring its ability to scavenge free radicals, including superoxide, hydroxyl, and 2,2-diphenyl-1-picrylhydrazyl (DPPH). These results suggest that A. radiata (Swartz) Link. may possess significant hepatoprotective and antioxidant properties [15].

Pharmacological research underscores the broad spectrum of bioactivities exhibited by Actiniopteris, which align with its diverse phytochemical composition (Table 2).

**Table 2. Pharmacological activity and their findings in actiniopteris species**

| Activity | Key Findings |
|---|---|
| **Antioxidant** | DPPH and ABTS radical scavenging assays confirmed potent antioxidant activity, with IC values comparable to standard antioxidants like ascorbic acid. |
| **Antimicrobial** | Extracts showed broad-spectrum antibacterial activity against *Staphylococcus aureus* and *Escherichia coli*, with MIC values ranging from 50-200 μg/mL. |
| **Anti-fertility** | Animal model studies showed reduced sperm count and motility, likely due to alkaloid-induced hormonal alterations. |
| **Anti-nephrotoxic** | Preclinical studies indicated nephroprotective effects in cisplatin-induced kidney toxicity models, attributed to phenolic antioxidants. |
| **Anti-haemorrhoidal** | Ethanolic extracts reduced inflammation and bleeding in induced haemorrhoidal rat models. |
| **Hepatoprotective** | Significant reduction in ALT, AST, and bilirubin levels in CCl -induced liver damage models. |

## CONCLUSION:

The genus Actiniopteris represents a promising yet underexplored source of bioactive compounds with significant pharmacological potential. This review consolidates current knowledge on its phytochemical constituents, including flavonoids, alkaloids, terpenoids, phenolic acids, and glycosides, which contribute to antioxidant, antimicrobial, anti-inflammatory, anticancer, and hepatoprotective activities.

Despite its potential, several limitations hinder the pharmacological validation of Actiniopteris, including insufficient phytochemical profiling, lack of standardized extraction protocols, and the scarcity of in vivo and clinical studies. To advance research, future studies should focus on comprehensive metabolomics profiling, bioactivity-driven fractionation, mechanistic investigations, and toxicity assessments. This review provides the first comparative analysis of Actiniopteris species, identifies key knowledge gaps, and outlines a structured roadmap for future studies, paving the way for its integration into modern drug discovery.

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