CHAPTER-19

MEDICINAL BRYOPHYTES FROM MAHARASHTRA: A MINI REVIEW

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Summary

Bryophytes are the oldest, primitive land plants, which have been survived and maintained their place in present flora due to their biologically active compounds. They are also one of the most significant and promising source of biologically active compounds in nature. Bryophytes including mosses, liverworts, and hornworts, are non-vascular, herbaceous green with plants with unique aromatic fragrance. In Maharashtra, a state in Western India with rich biodiversity, bryophytes hold significant ethnobotanical and medicinal importance. They have been traditionally used for a variety of ailments, including wound healing, respiratory disorders, and anti-inflammatory conditions. This research paper provides a comprehensive review of medicinal bryophytes found in Maharashtra, explores their pharmacological properties, traditional uses, and conservation status, and outlines the potential for future research into their bioactive compounds.

Keyword: Bryophytes, ethnomedicine, pharmacological properties, bioactive compounds.

Introduction

India is sitting on a gold mine of well-recorded and traditional well practiced acquaintance of herbal medicine. It deals with plant and plant extracts in treating diseases. Bryophytes, one of the earliest forms of land plants, exhibit a range of medicinal properties that have long been utilized in traditional medicine. In

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Maharashtra, the diverse climatic conditions, including the tropical climate, coastal areas, and the Western Ghats' mountainous terrain, contribute to the flourishing of bryophyte species. These plants have not only ecological significance but also provide numerous therapeutic compounds that are being increasingly recognized in modern pharmacology (Agrawal et al., 2007).

Maharashtra, home to a rich variety of medicinal plants, hosts a substantial number of bryophyte species, many of which have therapeutic uses in local folklore medicine. The state's diverse landscapes offer suitable habitats for a wide range of bryophyte species, many of which are endemic to the region (Gokhale and Puranik, 2015). This paper highlights the medicinal properties of bryophytes found in Maharashtra, reviews their ethnopharmacological significance, and proposes directions for future research.

Diversity of Bryophytes in Maharashtra

Maharashtra has a vast ecological diversity that supports various types of bryophytes. The state's vegetation is characterized by a mix of tropical forests, dry deciduous forests, and alpine regions. The Western Ghats, a biodiversity hotspot, host the highest number of bryophytes in Maharashtra. Various genera of bryophytes such as *Marchantia*, *Riccia*, *Porella*, *Bryum*, *Funaria*, and *Polytrichum* are frequently encountered in Maharashtra. A few of the common species include the work of Gokhale and Puranik (2015), and Yadav and Yadav (2014):

- Marchantia palmata
- Riccia fluitans
- Bryum argenteum
- Porella platyphylla
- Funaria hygrometrica

Bryophytes are mainly found growing in moist, shaded environments like the forest floor, on rocks, tree trunks, and sometimes in marshy areas. The Western Ghats, particularly the Sahyadri mountain range, have the most concentrated bryophyte species due to their high humidity and forest cover.

Ethnobotanical and Medicinal Uses of Bryophytes in Maharashtra

Various indigenous communities in Maharashtra, particularly tribal groups, have used bryophytes for their medicinal properties for generations. The medicinal use of bryophytes is still prevalent in some rural areas where they are applied in the treatment of numerous ailments. Some notable medicinal uses of bryophytes reported by various workers (Yadav and Yadav, 2014; Biswas and Bhattacharya, 2016 and Sharma et al., 2019) include:

Wound Healing: Species such as *Riccia fluitans* and *Marchantia palmata* are used to treat minor cuts, burns, and wounds. These bryophytes are applied as poultices or extracts, believed to promote faster healing and prevent infections due to their antimicrobial properties.

Respiratory Ailments: Mosses like *Bryum argenteum* and *Funaria hygrometrica* are traditionally used to treat coughs, colds, asthma, and bronchitis. They are believed to soothe the respiratory system, often in the form of teas or decoctions. These species are known for their anti-inflammatory and expectorant effects.

Anti-inflammatory and Analgesic: Certain bryophytes such as *Porella platyphylla* and *Polytrichum commune* are employed as natural remedies for arthritis and joint pain. These species are applied externally as poultices or used in baths to alleviate pain and inflammation in muscles and joints.

Antimicrobial and Antifungal: *Riccia* species have been used in traditional medicine for their antifungal and antimicrobial properties. Extracts from these bryophytes are believed to be effective against fungal infections and skin diseases. *Marchantia palmata* also exhibits antibacterial properties, making it useful for treating infections.

Antioxidant Properties: *Funaria hygrometrica* has demonstrated antioxidant potential, which is believed to help prevent cellular damage caused by oxidative stress, potentially slowing down the aging process and reducing the risk of chronic diseases such as cancer.

Phytochemical Properties of Medicinal Bryophytes

Bryophytes are rich in various bioactive compounds, including flavonoids, terpenoids, alkaloids, phenolic acids, and lipids, which contribute to their medicinal properties. Some of the major reports (Porembeski and Barthlot, 2010; Khatri and Verma, 2018 and Sharma et al., 2019) significant compounds found in medicinal bryophytes from Maharashtra include:

Flavonoids: Known for their antioxidant and anti-inflammatory effects, flavonoids are found in a variety of bryophytes. *Riccia fluitans* has been shown to contain flavonoids that contribute to its antifungal and antimicrobial activities.

Terpenoids: *Marchantia palmata* and *Porella platyphylla* contain terpenoids, compounds that are known to exhibit antimicrobial and anti-inflammatory effects. Terpenoids also contribute to the overall medicinal efficacy of bryophytes used in treating infections and pain.

Alkaloids: Alkaloids found in *Bryum argenteum* are responsible for their analgesic and anti-inflammatory properties. These compounds have also been linked to antitumor activity in some bryophytes.

Phenolic Compounds: The phenolic compounds present in bryophytes, especially in *Porella platyphylla* and *Polytrichum commune*, have strong antioxidant properties. These compounds play a role in reducing oxidative damage in the body and help in fighting age-related diseases and cancer.

Research on these bioactive compounds is still ongoing. Shete et al., (2024) has presented a comprehensive review of bioactive compounds of bryophytes and medicinal potential. But at large their potential therapeutic uses need to be explored further to validate the traditional claims.

Conservation Status of Medicinal Bryophytes in Maharashtra

Bryophytes in Maharashtra, like many other plants, face numerous conservation challenges. The destruction of natural habitats due to deforestation, urbanization, mining, and agricultural expansion has significantly affected the diversity and population of bryophytes. Additionally, climate change and pollution are emerging threats to bryophyte habitats (Patil and Deshmukh, 2017).

The Western Ghats, which are rich in endemic bryophyte species, are particularly vulnerable to human activities. As bryophytes grow in delicate ecosystems, any disturbance can severely affect their survival.

Efforts to conserve these plants include

- **Protected Areas**: Establishing protected areas like the Western Ghats Biosphere Reserve and encouraging sustainable land use practices in the region.
- **Ex-Situ Conservation**: Initiating efforts to grow medicinal bryophytes in botanical gardens or nurseries to preserve their genetic material.
- **In-Situ Conservation**: Promoting the conservation of bryophytes in their natural habitats, protecting sensitive areas, and reducing human encroachment.

Future Research Directions

There is a need for continued research to fully explore the therapeutic potential of bryophytes in Maharashtra. Future research areas could include:

Phytochemical Screening: Systematic studies on the isolation and characterization of bioactive compounds in medicinal bryophytes.

Pharmacological Testing: Conducting in vitro and in vivo studies to evaluate the efficacy and safety of bryophyte-based compounds in treating diseases.

Ethnobotanical Surveys: Conducting surveys to document traditional knowledge regarding the use of bryophytes in indigenous medicine, and understanding the cultural significance of these plants.

Conservation Research: Investigating the conservation status of bryophytes, including assessing the impact of human activities and climate change, and developing sustainable harvesting practices.

Formulation of Herbal Products: Developing herbal formulations and pharmaceutical products using bryophytes, incorporating modern technologies such as nano-formulations for enhanced bioavailability and efficacy.

Conclusion

Medicinal bryophytes found in Maharashtra are a valuable yet underexplored resource in traditional medicine. With properties such as antimicrobial, anti-inflammatory, antioxidant, and wound-healing, these plants offer potential for

novel therapeutic agents. However, challenges related to conservation and the need for scientific validation of their medicinal properties must be addressed. Collaborative efforts between ethnobotanists, conservationists, and pharmacologists are needed to ensure the preservation and sustainable use of bryophytes in Maharashtra.

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