

HIDDEN GREENS- A PRELIMINARY CHECKLIST OF BRYOPHYTES FROM ADAMPUR FOREST, SYLHET



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ABSTRACT

Bryophytes, though ecologically important, remain underrepresented in biodiversity research across South Asia. This study documents the bryophyte diversity of Adampur Forest in Moulvibazar, Sylhet, an area rich in microhabitats but previously unexplored for non-vascular flora. A field survey yielded more than 20 specimens, of which 20 species were identified and recorded with photographic documentation. These results constitute the first documented photographic record of bryophytes from this forest and provide a dependable baseline for future taxonomic and ecological research. Beyond contributing to species identification, the work highlights the ecological significance of bryophytes and underscores the need for broader surveys across seasons and regions. By raising awareness of overlooked components of forest ecosystems, this study supports biodiversity monitoring and conservation efforts in Bangladesh.

KEYWORDS: Checklists, Bryophytes, Non-vascular plants, Adampur Forest, Bangladesh

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Introduction

Maintenance of ecosystem functioning and productivity depends heavily on biodiversity, where every species contributes to the resilience and sustainability of ecological processes (Truchy *et al.*, 2015; Brockerhoff *et al.*, 2017; Correia and Lopes, 2023). Among the earliest diverging land plants, bryophytes (mosses, liverworts, and hornworts) represent a critical component of terrestrial ecosystems (Donoghue *et al.*, 2021; Harris *et al.*, 2022). They act as pioneers in colonizing substrates, facilitating soil formation, regulating hydrological cycles, and providing microhabitats for a variety of organisms, especially in extreme or disturbed conditions (Gairola *et al.*, 2013; Glime, 2024). Due to their high sensitivity to environmental variation, bryophytes are also recognized as reliable bioindicators of habitat health and climate change (Oishi and Hiura, 2017; Printarakul and Meeinkuirt, 2022). Globally, bryophyte diversity is disproportionately high in alpine, temperate, and moist tropical ecosystems, often exceeding the richness of vascular plants in extreme habitats (Ingerpuu *et al.*, 2001; Alegro *et al.*, 2023; Slate *et al.*, 2024). South and Southeast Asia harbor considerable bryophyte diversity due to diverse topography and humid climates, yet their distribution and taxonomy remain inadequately documented across many landscapes (Corrales *et al.*, 2010; Alegro *et al.*, 2023; Ahmad *et al.*, 2025). In Bangladesh, bryophytes are widespread from the eastern hill tracts to the northern floodplains. Early compilations reported more than

200 species (Siddiqui *et al.*, 2007), and subsequent studies have added new national records such as *Funaria hygrometrica*, *Distichophyllum schmidii* Broth., and *Marchantia polymorpha* var. *aquatica* (Banu-Fattah K., 2005b, 2005a; Alfasane, Ullah and Khondker, 2013). Despite these contributions, systematic inventories remain scarce, and large areas of the country remain unexplored (Banu-Fattah K., Sujan and Sarker, 2007, 2010). The northeastern region of Bangladesh, particularly Sylhet Division, is distinguished by its humid subtropical to monsoonal climate and forested hill ecosystems. With annual precipitation ranging from 3,300 to 4,200 mm (mean 4,038 mm between 1981 and 2015) and relative humidity often exceeding 90% during the monsoon season (Tabassum, 2018; Islam *et al.*, 2019; Babu *et al.*, 2024; Wikipedia, 2025), Sylhet provides one of the most favorable environments for bryophyte proliferation in the country. As poikilohydric organisms, bryophytes rely heavily on ambient moisture for growth, reproduction, and dispersal (Marschall, 2017) and they thrive in shaded, humid microhabitats such as those found in the hill forests of Sylhet. Adampur Forest in Sylhet, located within the Rajkandi Reserve of Kamalganj Upazila, offers a distinctive ecological setting composed of natural and semi-natural forest blocks interlaced with perennial hill streams ((Tabassum, 2018; Babu *et al.*, 2024). These habitats provide diverse substrates, including soil, rocks, tree trunks, and stream banks, that are highly suitable for bryophyte colonization. Although *Jungermannia exertifolia*

was recently reported from shaded rock surfaces in Adampur (Tabassum, Begum and Rahman, 2020), no systematic survey of the bryophyte flora of this forest has been reported. This study addresses this gap by presenting the first systematic survey of bryophytes in Adampur Forest. Fieldwork in the Daluachara block involved the collection and identification of specimens using classical morphological and microscopic taxonomic approaches. To ensure better documentation, most recorded species are accompanied by photographed images alongside their checklists. The resulting preliminary inventory provides baseline information on bryophyte diversity in this forest, establishing a foundation for future ecological, taxonomic, and conservation research in northeastern Bangladesh.

Materials and Methods

This study was conducted in the Adampur Forest, which is part of the Rajkandi Reserve Forest in Kamalganj Upazila, Moulvibazar District, northeastern Bangladesh. The forest lies approximately between 24°12'–24°17' N latitude and 91°51'–91°55' E longitude, occupying the southeastern extension of the Lawachara National Park and bordered by the Dhalai River (Haque *et al.*, 2017; Tabassum, 2018). The reserve forest covers approximately 13,080 acres and is characterized by a tropical evergreen forest, with rolling hills and seasonal streams (charas). Within the Rajkandi Forest Range, Adampur consists of three principal forest blocks-Lewachara, Daluachara, and Baghachara, of which Daluachara retains much of its natural vegetation, while the others include both natural and plantation areas. The region experiences an average annual rainfall of approximately 3,931 mm, with nearly 90% of the precipitation occurring between June and September, and relative humidity

ranging from 69% to 95% throughout the year (Haque *et al.*, 2017; Tabassum, 2018).

Field explorations were carried out to document bryophyte diversity, with specimens collected from various habitats, including forest trails, hillocks, and stream banks. Collections were made by manually sampling bryophytes from different substrates, such as soil, rocks, and tree trunks. High-resolution field photographs were taken using a Canon DSLR 600D camera to capture detailed morphological characteristics. The collected bryophyte specimens were preserved in both dry form and in preservative solutions to maintain structural integrity for further examination. Specimens were analyzed using a fluorescent microscope (Nikon H600L) and Axio Vision Rel 4.8 microscope to observe detailed external features. Identification was conducted by consulting relevant taxonomic literature along with online databases and reference books. Bryophyte specimens were preserved either as air-dried samples in labeled jars or fixed in FAA solution (Formalin–Acetic acid–Alcohol) to maintain tissue structure. The FAA mixture consisted of 5 mL formalin, 5 mL glacial acetic acid, and 90 mL 70% ethanol. All identified specimens were preserved at the Higher Cryptogams Laboratory, Department of Botany, University of Dhaka, serving as reference material for future taxonomic and ecological research.

Results

A total of 20 bryophyte species, belonging to 16 genera and 15 families, were recorded from Adampur Forest (Daluachara block). The collection comprised 11 mosses and 9 liverworts. Species were identified based on morphological and microscopic characteristics, and most are documented with photographed images (Figure 1) for reliable reference.

Sl. No.	Scientific Name	Family	Habitat/Substrate	Remarks
1	<i>Barbula convoluta</i>	Pottiaceae	Moist soil, rocky substrate	Common, tuft-forming moss
2	<i>Barbula leucodontoides</i>	Pottiaceae	Moist, shaded rocks and soils	Small cushions like moss
3	<i>Bryum argenteum</i>	Bryaceae	Exposed soil, disturbed areas	Silver-green appearance common moss
4	<i>Calymperes punctulatum</i>	Calymperaceae	Tree bark, shaded habitats	Tufted moss
5	<i>Cyathodium tuberosum</i>	Cyathodiaceae	Damp soils, shaded areas	Thin thalloid liverwort
6	<i>Dumortiera hirsuta</i>	Dumortieraceae	Shaded moist habitats, stream banks	Large, robust thalli liverwort
7	<i>Fissidens virens</i>	Fissidentaceae	Moist, shaded habitats	Common moss
8	<i>Funaria hygrometrica</i>	Funariaceae	Disturbed habitats, moist soils	Pioneer moss species
9	<i>Grackea phascoides</i>	Hypnaceae	Shaded moist soil, rocks	Forms compact patches of mosses
10	<i>Lejeunea cavifolia</i>	Lejeuneaceae	Tree trunks, shaded habitats	Common epiphytic liverwort
11	<i>Marchantia palmata</i>	Marchantiaceae	Damp soil, moist habitats	Dichotomously branched liverwort with dark midrib
12	<i>Physcomitrium pyreiforme</i>	Funariaceae	Moist and hilly areas	Tufted moss

13	<i>Plagiochasma appendiculatum</i>	Aytoniaceae	Moist shaded soils, rocky areas	Thalloid liverwort
14	<i>Pogonatum microstomum</i>	Polytrichaceae	Moist soils, shaded hill sides	Erect moss with distinct capsules
15	<i>Riccia bengalensis</i>	Ricciaceae	Moist soils, on hillsides	Small, thalloid, aquatic
16	<i>Riccia cavernosa</i>	Ricciaceae	Moist soils	Rosette forming liverworts
17	<i>Riccia discolor</i>	Ricciaceae	Damp shaded soils	Found as scattered colonies, liverworts
18	<i>Riccia vulgaris</i>	Ricciaceae	Moist hills and soils	Thin overlapping thallus, liverworts
19	<i>Symphydion erraticus</i>	Symphyodontaceae	Epiphytic	Found as growing on tree, moss
20	<i>Taxithelium nepalense</i>	Sematophyllaceae	Tree bark, moist shaded forest	Epiphytic, thread-like appearance, moss



Bryophyte species collected from Adampur Forest, Moulvibazar, Sylhet. (A–F) Microscopic views: (A) *Barbula leucodontoides*; (B) *Bryum argenteum*; (C) *Grimmia phascoidea*; (D) *Barbula convoluta*; (E) *Taxithelium nepalense*; (F) *Sympydon erraticus*. (G–L) Field habitat views: (G) *Riccia cavernosa*; (H) *Riccia bengalensis*; (I) *Riccia discolor*; (J) *Riccia vulgaris*; (K) *Cyathodium tuberosum*; (L) *Polytrichum* sp.

The documented species highlight the potential of bryophyte diversity and the varied microhabitats within Adampur Forest. These findings reflect the ecological complexity of the area and underscore the importance of maintaining habitat integrity for bryophyte conservation. Several specimens remain unidentified, emphasizing the need for continued research and extensive bryological exploration in the region. Photographic documentation serves as an important tool for conservation strategies, providing an accessible reference for future research and educational initiatives. Future studies incorporating anatomical, molecular, and DNA barcoding approaches will be instrumental in achieving more precise identification and a deeper understanding of bryophyte taxonomy, phylogeny, and conservation needs. Continued research and conservation efforts are essential to protect these ecologically vital yet understudied organisms.

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