Diversity of Bryophytes Observed at the Narmada College Campus, Narmadapuram. Madhya Pradesh

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***Abstract*: Bryophytes comprising mosses, liverworts, and hornworts are small, non-vascular land plants recognized as critical components of terrestrial ecosystems. They actively contribute to soil formation, moisture retention, nutrient cycling, and microhabitat development. The present study documents the bryophyte diversity observed on the Narmada College campus in Narmadapuram, Madhya Pradesh, situating local observations within the broader bryological context of Central India. Field surveys conducted across old walls, garden patches, shaded tree bases, damp soil, and semi-open habitats yielded ten bryophyte taxa. These include common mosses (Tortula muralis, Fissidens dubius, and Funaria hygrometrica), liverworts (Riccia crystallina, R. gangetica, R. glauca, R. attenuata, and Cyathodium cavernarum), and hornworts (Anthoceros punctatus and Notothylas sp.). This study highlights that even relatively small urban educational campuses can function as valuable refugia for cryptogamic diversity, provided that microhabitats remain undisturbed and sufficiently moist.**

***Keywords*: bryophytes, campus biodiversity, hornworts, mosses, liverworts, urban ecology, Narmadapuram.**

1. Introduction

Urban campuses frequently preserve remnant microhabitats that support overlooked groups of plants, particularly bryophytes. Although often ignored due to their diminutive size, bryophytes are ecologically indispensable as pioneer colonizers, moisture regulators, substrate stabilizers, and sensitive indicators of environmental and habitat quality (Vanderpoorten & Goffinet, 2009; Glime, 2017). In India, bryophyte diversity is substantial; foundational estimates document approximately 1,786 species of mosses, 675 species of liverworts, and 25 species of hornworts across various biogeographical zones (Singh, 2001; Dandotiya et al., 2011).

Compared to the globally recognized biodiversity hotspots of the Himalayas and the Western Ghats, Madhya Pradesh has received notably less bryological attention. Nevertheless, available literature indicates that the state supports a rich, albeit underexplored, bryoflora. Recent reviews of bryophyte studies in Madhya Pradesh report 83 taxa across 56 genera and 32 families, with documented records concentrated in specific districts such as Hoshangabad (now Narmadapuram) and Pachmarhi (Mahajan et al., 2022; Nath et al., 2007). Central India has specifically been recognized for its notable moss diversity, with published syntheses identifying Pottiaceae as a prominent family and Fissidens as a highly represented genus in the region (Sodamade et al., 2014). Against this background, documenting bryophytes from the Narmada College campus serves both as an essential local biodiversity inventory and as a valuable contribution to the evolving bryological record of Central India.

2. Study Area

The Narmada College campus is located in Narmadapuram in central Madhya Pradesh. It is situated within an urban setting that retains vital patches of vegetation, shaded boundary walls, garden soils, and semi-natural moist niches. Urban microhabitats such as these are highly favorable for bryophyte establishment, as they provide periodic moisture, rough substrata, reduced competition from vascular plants, and protected microsites (Bates, 2000). The specific combination of aging masonry, canopy shade, open lawns, and regularly watered garden spaces creates a mosaic of microhabitats that successfully supports both terricolous (soil-dwelling) and saxicolous (rock-dwelling) bryophytes.

3. Materials and Methods

The current study relies on repeated field excursions across accessible microhabitats within the campus premises. Systematic surveys were conducted targeting old walls, the botanical garden, shaded tree bases, moist soil patches, wooded corners, and open, grass-dominated areas. Bryophyte patches were examined in situ, and representative specimens were carefully recorded from each habitat type.

Identification was carried out utilizing standard taxonomic references and regional bryological literature (Gangulee, 1969-1980 for mosses; Bapna & Kachroo, 2000 for liverworts). Attention was given to growth form, thallus or leafy shoot morphology, sporophyte characteristics (where available), and substrate preference. For each observation site, detailed field notes were taken regarding habitat type, moisture condition, light exposure, and visible abundance. Taxa were broadly categorized into mosses, liverworts, and hornworts to facilitate

a clearer interpretation of campus-level diversity. As this work is designed as an awareness-oriented baseline inventory, emphasis was placed on non-destructive observation and habitat association rather than exhaustive laboratory sampling.

4. Results

The survey successfully documented ten distinct bryophyte taxa on the campus, indicating that the site supports a modest but ecologically significant cryptogamic assemblage. Mosses were represented by Tortula muralis, Fissidens dubius, and Funaria hygrometrica, all of which are recognized as efficient colonizers of exposed walls, disturbed soils, and damp shaded surfaces. Liverwort diversity was notable, represented by Riccia crystallina, R. gangetica, R. glauca, R. attenuata, and Cyathodium cavernarum. These predominantly occurred on moist soil or rock surfaces in protected, low-light locations. Hornworts included Anthoceros punctatus and a Notothylas species found in secluded, moisture-retentive sites. This is a particularly noteworthy observation, as hornworts are highly sensitive to desiccation and are strictly restricted to seasonally wet habitats (Asthana & Srivastava, 1991).

1.Liverworts (Riccia sps.) 2.Hornorts (Anthoceros sps.) 3. Moss (Funaria sps.)

Fig.1. Bryophytes in Campus

A. Observed Taxa and Habitat Associations

Group	Taxon Observed	Typical Campus Habitat	Remarks
Moss	*Tortula muralis*	Old walls, shaded masonry	Common on exposed or semi-shaded hard substrata.
Moss	*Funaria hygrometrica*	Damp soil, wall bases	Frequent colonizer of moist, disturbed ground.
Moss	*Fissidens dubius*	Old walls and bricks	Frequent on moist walls and masonry crevices.
Liverwort	*Riccia crystallina*	Moist soil patches	Thalloid liverwort typical of seasonally wet soils.
Liverwort	*Riccia gangetica*	Damp exposed soil	Endemic regional presence; previously reported in M.P.
Liverwort	*Riccia glauca*	Moist open ground	Favors fine-textured, persistently moist soil.
Liverwort	*Riccia attenuata*	Damp soil near shaded patches	Seasonal terrestrial liverwort.
Liverwort	*Cyathodium cavernarum*	Moist rocks, sheltered crevices	Shade- and humidity-loving thalloid liverwort.
Hornwort	*Anthoceros punctatus*	Moist secluded soil patches	Indicator of high microhabitat moisture.
Hornwort	*Notothylas* sp.	Seasonally wet sheltered ground	Important bio-indicator record for local inventory.

Group	Taxon Observed	Typical Campus Habitat	Remarks
Mixed	Unresolved juvenile mats	Soil, brick joints, tree bases	Require seasonal recollection for definitive identification.

5. Discussion

The bryophyte assemblage recorded at the Narmada College campus clearly demonstrates that urban educational spaces can effectively conserve cryptogamic diversity when they harbor persistent moisture, experience low-intensity disturbance, and offer a variety of microhabitats. This finding aligns with regional bryological literature, which notes that central Indian bryophytes heavily rely on damp soil, shaded rock, tree bark, and aging masonry to escape prolonged dry periods (Sodamade et al., 2014). The co-occurrence of Funaria, Riccia, Anthoceros, and Notothylas within a single campus is ecologically meaningful, representing all three major evolutionary lineages of bryophytes.

From a conservation standpoint, bryophytes warrant significantly greater attention. They are integral to early-stage pedogenesis (soil formation), nutrient retention, and microsite stabilization. Furthermore, their rapid physiological response to fluctuations in moisture and air quality makes them excellent bioindicators for urban environmental health (Glime, 2017). Recent reviews emphasize that bryological exploration in Madhya Pradesh remains geographically uneven, with numerous districts entirely un-surveyed (Mahajan et al., 2022). Consequently, localized inventories like this campus study are highly valuable for filling distribution gaps and establishing a baseline for long-term ecological monitoring.

The campus flora mirrors the broader ecological character of Central India. Published works from biodiversity-rich areas like Amarkantak and Pachmarhi demonstrate that shaded, humid landscapes in the region support robust bryophyte communities (Singh & Nath, 2007). Although Narmadapuram is highly urbanized and climatically warmer than these montane sites, the survival of these ten taxa suggests that campus micro-refugia can successfully buffer harsh external macroclimates, allowing sensitive species to persist seasonally.

6. Conclusion

Despite being embedded within a highly modified urban matrix; the Narmada College campus supports a noteworthy diversity of bryophytes. The documented flora confirms that institutional landscapes can function as critical, albeit small, reservoirs for lower plant diversity in Central India. Active protection of these microhabitats—specifically shaded boundary walls, moist soil depressions, garden margins, and minimally disturbed green zones—is recommended to maintain and potentially enhance this biodiversity over time.

Future research should prioritize seasonal sampling, the preparation of herbarium voucher specimens, microscopic taxonomic confirmation, and the continuous monitoring of these microhabitats post-monsoon. Expanding this research will not only refine the species checklist for Narmadapuram but will also provide vital data to the currently fragmentary understanding of bryophyte biogeography in Madhya Pradesh.

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