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Taxonomic Studies of some Epiphytic Ferns of Upper Brahmaputra Valley, Assam

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Abstract: ***Epiphytic ferns prefer habitats on tree trunks of large trees like Ficus sp., Mangifera sp. etc in common and forest areas of Upper Brahmaputra Valley, Assam. Species like Microsorum punctatum, Asplenium nidus, Pyrrosia lanceolata, Drymoglossum sp. are grown abundantly in common areas. Drynaria quercifolia is commonly known as oak leaf fern is spotted in some particular location in the study area and is not common. Out of 10 species of ferns recorded, 8 species belong to the family Polypodiaceae which is considered as one of the largest family in pteridophytes.***
Keywords: Asplenium, Drynaria, Epiphytic, Ferns, Upper Brahmaputra Valley.

I. INTRODUCTION

The ferns and fern-allies are primitive vascular cryptograms and found to occur in diverse habitats like moist or dry rocks, boulders, on tree trunks as epiphytes, as hydrophytes in different wetlands, ponds, swamp area, on forest floors and edges, along perennial streams, grasslands, tea and coffee estates etc. Most of the pteridophytes prefer to grow in terrestrial habitats and a few are climbers. The epiphytic species mostly prefer trees like *Ficus* sp., *Mangifera* sp. and other branches of large trees. The stems and branches of trees at high altitudes are usually roofed with leafy liverworts and humid mossy surface providing an ideal condition for the growth of pteridophytes.

The Indian sub-continent represents the Himalayan, Gangetic plain and Thar Desert as biodiversity centres due to variable climatic and altitudinal disparities. Most of the diversities of ferns and fern-allies are observed in Himalayan, Eastern and Western Ghats. The amount of rainfall decreases from Eastern Himalayan to Western hills which results lowering the pteridophytic vegetation. There are about 12000 species of pteridophytes occur in the world flora, of which about 1135 species including 42 exotics and 53 further subspecies (Fraser- Jenkins *et. al.* 2017) occur in the different parts of the present Indian political boundary. Keeping in view of large area of the country the present number of diversities is quite less. Region-wise studies reveals that about 700 species (58%) occur in Eastern Himalayan and contiguous states, 400 species in Southern India, 300 species in North-West India, 100 species in Central India and 125 species in Andaman and Nicobar Islands (Rawat and Satyanarayan 2015). Thus, Eastern Himalayan may be termed as one of the Biodiversity Hot-spot centres for pteridophytes. The maximum diversity has been observed between 1200-2800m altitude in Temperate Himalayan and adjoining forest areas. The eight states of North Eastern India are very adjacent to the Eastern Himalayan and known for Biodiversity richness. The abiotic factors of the Brahmaputra Valley are very suitable for growth and development of ferns and fern-allies.

Some remarkable works on Pteridophytes from Assam are Barua *et al.*, 1989; Bhattacharya (1990, 1994, 1999, 2009); Bhattacharya & Bora 1994; Bhattacharya *et.al.* (1995, 1998, 2003); Das & Bhattacharya 2002; Dutta Choudhury 1997; Handique & Konger 1986; Kachroo (1953, 1975); Kalita 2015; Borthakur *et al.* 2001; Sen & Bhattacharya 2006 etc.

II. MATERIALS AND METHODS

A number of field visits were done in different reserve forests and other localities of Upper Brahmaputra Valley to survey during 2018 to 2021. The collected specimens are dried, poisoned and preserved as herbarium. For enumeration of taxa, the system of classification proposed by Pichi-Sermolli (1977) was followed. The families are enumerated in text according to Fraser- Jenkins (2008). However, the genera and species within the families are listed alphabetically. The taxonomic quotation is based on published works like Baishya & Rao (1982), Borthakur *et al.* (2001, 2018), Fraser-Jenkins *et al.* (2017) etc. and Tropicos, IPNI and The Plant List.

III. RESULTS AND DISCUSSION

The periodical survey results 10 species of ferns and fern-allies occurring in the present study area. The taxonomic description of each species is provided below:

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A. POLYPODIACEAE J. Presl & C. Presl

1) Davallia divaricata Bl.

Rhizome creeping, densely scaly all over; scales deltoid to ovate-lanceolate, apex long acuminate, base broad, thin, transparent, brown. Stipes firm, erect and scaly at base, glabrous above, chestnut brown. Lamina tripinnate, deltoid-lanceolate, apex acute or acuminate; primary pinnae numerous, alternate, basal pinnae stalked, upper ones sessile; largest basal pinnae, deltoid-lanceolate, apex acuminate, base cuneate; secondary pinnae up to 12 pairs, alternate, sessile or shortly stalked, largest one deltoid, apex acute, acroscopic base truncate, basiscopic base cuneate, margin deeply cut down to lobe nearly to the costules; oblong, apex rounded, margin sharply toothed or crenate: veins not conspicuous, uniform, free, not reaching the margin; costae and costules slightly winged; texture sub-coriaceous; lamina dark reddish-brown when dry, glabrous. Sori half cup-shaped, obliquely placed as regards the central veins in the tooth, submarginal, brownish; indusia tubular or half cup-shaped, as long as broad.

Fertile: Nov. - Jan.

2) Drymoglossum heterophyllum (L.) Trimen

Rhizome long creeping, thickly covered by scales; scales adpressed, peltate, ovate to round, apex acuminate, centre dark-brown, pale-brown in the rest, margin laciniate on both ends. Stipes of fronds terete, articulate, covered with scales similar to rhizome. Lamina dimorphous, simple; sterile lamina orbicular, ovate or elliptic, apex rounded, base cuneate, margin entire; costa and veins indistinct, immersed, areoles with copious free veinlets; texture thick, fleshy, more or less covered by stellate hairs when young, sparsely or rarely when matured, lamina pale or dark-green; fertile lamina linear oblong, apex rounded, one-fifth to two-fifth of the basal part narrowed gradually, margin entire, texture and hairs similar to that of sterile lamina. Sori confluent along the tip of lamina, linear; sporangia oval, short stalked, intermingled with stellate hairs, dark-brown. Spores' oval to elliptic, hyaline, light-brown.

Fertile: Oct. - Feb.

3) Drymoglossum piloselloides (L.) Presl

Rhizome long creeping, covered by scales; scales adpressed, diamond-shaped, acuminate, sometimes hair-pointed, peltate, laciniate; lamina dimorphic and simple; sterile lamina sessile or shortly stalked, roundish or obovate, base cuneate, margin entire; texture thick and fleshy; young one covered by stellate hairs; fertile lamina linear to oblong, apex round, base decurrent, margin entire; stipe of fertile frond scaly at base, grooved adaxially, straw-coloured; veins indistinct, acrolects copious, with free, forked or simple veinlets; sori marginal and linear, constant along the tip of lamina; sporangia oval, short stalked, with a few stellate paraphyses, dark-brown. Spores' oval to elliptic, light-brown.

Fertile: Nov. - Mar.

4) Drynaria quercifolia (L.) J. Sm.

Rhizome, long creeping, stout, densely scaly; scales linear-lanceolate, apex acuminate hair tipped, base broad peltate, margin dentate-ciliate. Nest leaves sessile, crowded, ovate-cordate, dry, hard, pale-green when young, dull-brown at maturity, glossy, margin lobate-pinnatifid more or less half-way down to the costa; lobes entire, glabrous; the lobes towards the base less prominent; midrib and primary veins distinctly raised above and below, secondary and tertiary veins slightly raised above and below; veins interconnected; fertile lamina with the stipe grey-brown, abaxially rounded, adaxially grooved, narrowly winged on either side, glabrous; lamina ovate to oblanceolate, deeply pinnatifid nearly to the midrib, terminated by a pinnule similar to the lateral one, base decurrent; lobes up to 15 pairs, alternate, largest lobe oblanceolate, acuminate or acute apex, base decurrent, margin entire, wavy; venation distinct on both surfaces, interconnected by veinlets, areoles free from included veinlets; texture coriaceous; pinnae pale-green, glabrous. Sori seated at the juncture of the veins, more or less in a regular row on either side of the main lateral veins of the lobes, orbicular, ex-indusiate; sporangia round, slender stalked. Spores' oval, hyaline, light-brown.

Fertile: Oct. - June.

5) Goniophlebium amoenunt (Wall. ex Mett.) J. Sm.

Rhizome long creeping, solid, fleshy, covered by scales; scales lanceolate-subulate, apex acuminate, base broad, adpressed, grey-brown. Stipes glabrous, shining, stramineous or brown. Lamina simple, deeply pinnatifid, ovate, terminating in a lanceolate, acuminate, subentire segment similar to lateral ones; lateral segments numerous, alternate or opposite; lanceolate, apex acuminate, base broad, margin entire or dentate-serrate, lowest pair deflexed; costa slightly raised; veins prominent, reticulate, forming one

series of areoles with single included veinlets, sometimes forming two series; marginal veins free. Sori large, round, terminal on included veinlets of the areoles. Spores' oval to bean-shaped, hyaline, yellow.
Fertile: May - Dec.

6) Humata griffilhiana (Hook.) C. Chr.
Rhizome long creeping, fleshy, densely covered by scales all over; scales linear-lanceolate, apex acuminate, hair-tipped, caudate, margin with long hairs, white or yellowish. Stipes erect, fleshy, scattered, rounded below, grooved above, glabrous. Lamina tripinnate, apex acuminate; primary pinnae numerous, alternate or subopposite, stalked, basal one largest, apex blunt or acute; secondary pinnae up to 12 pairs, alternate, shortly stalked; pinnules alternate, sessile, ovate-lanceolate, lobed nearly to costae, margin toothed, apex obtuse, base obliquely cuneate; veins obscure, free, simple or forked; texture coriaceous; lamina pale-green, glabrous when mature. Sori large, glabrous, submarginal or marginal; indusia cup-shaped, glabrous, attached at base and sides.
Fertile: June-Oct.

7) Microsorum punctatum (L.) Copel.
Rhizome short creeping, stout densely scaly; scales ovate or ovate-lanceolate, acuminate, margin toothed, thick, peltate, blackish-brown.
Fronds without distinct stipe, simple, sessile, lanceolate or elliptic, apex blunt or acute, base decurrent, margin entire, rounded below, grooved above; veins visible but not prominent, areoles copious, including smaller areoles, in which are free simple or forked veinlets with clavate apices; texture coriaceous; pinnae glabrous above and below, dark-green when fresh, blackish when dry. Sori small, round and numerous, irregularly scattered on upper half of the frond; sporangia oval, short-stalked. Spores yellowish green, exine finely granulose.
Fertile: May - Feb.

8) Pyrrosia lanceolata (L.) Farewell
Rhizome wide creeping, slender, clothed with scales which are lanceolate, apex acuminates, base rounded, margin profusely hairy, entire. Stipes distantly placed, flattened, winged along margin, grooved, pale-brown, covered by stellate hairs. Lamina simple, lanceolate, acute apex, base decurrent, entire or wavy, green and glossy above, brownish below, upper surface glabrous, lower surface densely covered by stellate hairs, texture coriaceous, midrib marked by a prominent median groove on the upper surface and raised on the lower; veins immersed; lamina wrinkle up on drying. Sori irregularly distributed on the anterior half of lamina; sporangia orbicular, dark-brown, naked. Spores greenish-yellow, reniform or plan convex, exine with tubercles
Fertile: June - Jan.

B. PTERIDACEAE E.D.M. Kirchn.
1) Vittaria elongata Sw.
Rhizome short creeping, slender, branched, densely scaly; scales lanceolate, apex acuminate, margin sparsely dentate, blackish, stipe flattened. Lamina simple, linear, lanceolate, gradually tapering towards both ends, apex acuminate, margin entire; midrib distinct, slightly raised below; veins slightly distinct above and below, simple immersed and parallel, oblique to costa; texture coriaceous; lamina dark green, glabrous. Sori sunk in marginal groove, linear, confluent; sporangia short stalked. Spores monolete, ellipsoid, pale yellowish green.
Fertile: Feb.- Dec.

C. ASPLENIACEAE Newman
1) Asplenium nidus L.
Rhizome erect, short, stout, apex clothed with scales; scales thin, broad-acuminate, black, margin bearing numerous hair-like appendages. Stipe's stout, dark to pale-brown, glabrous above, scaly at base; lamina simple, lanceolate, gradually narrowed at both ends, glabrous; midrib strongly raised on the upper surface, shining, dark-brown, texture coriaceous, veins nearly simple or 2 - forked; almost parallel. Sori linear, borne along each veinlet on upper half of the lamina, nearly reaching margin from the midrib; indusia linear, narrow, superficially attached at base, slightly curved, greenish-grey. Spores light-brown, translucent when fresh, opaque when old.
Fertile: July - Oct.

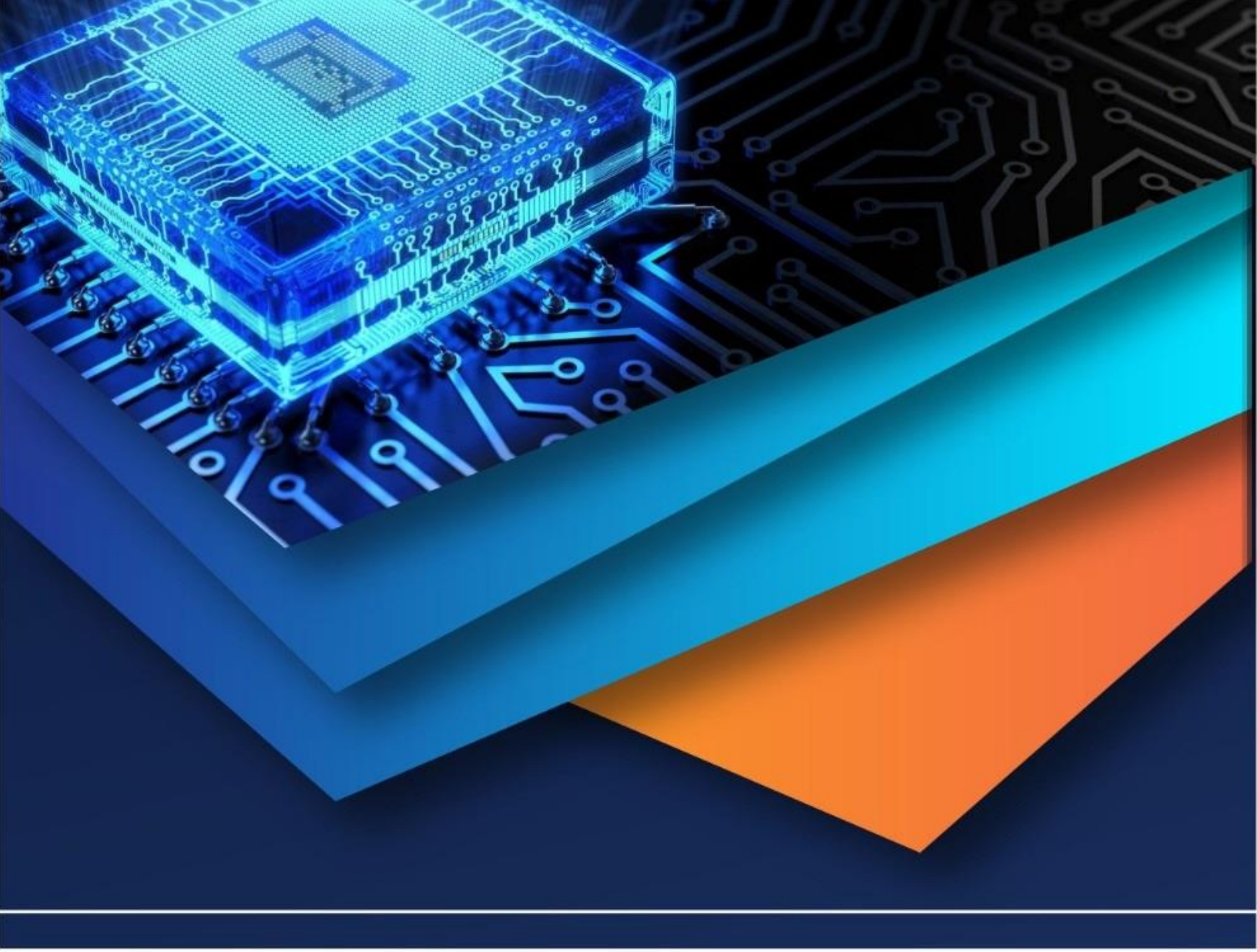
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IV. CONCLUSION

The anthropogenic activities like habitat destruction, urbanization, pollution and also the disturbance in their natural habitat due to tourism and pilgrimage are the major concern to this group of plants. The habitat requirement of pteridophytes is highly limited because of their dependency on external supply of water for fertilization. Even different communities of fern have their own specific preferences. So, this group of plants need special attention for conservation.

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