



AMBIENT APPRAISAL

New Distributional Records of Lichens from Kokrajhar of Assam, India

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Study Area: Kokrajhar, Assam, India, India
Coordinates: N26°18'–26°54' and E89°46'–90°58'

Key words: Biomonitoring, Lichenized fungi, Graphidaceae, Pyrenula

Abstract

An enumeration of 87 species of epiphytic lichens under 14 genera and 10 families from the Kokrajhar district of Assam is provided. The present study highlights the 8 species of lichen viz., *Graphis brevicarpa*, *Graphis pavoniana*, *Lecanora pseudargentata*, *Pyrenula citrifomis*, *Plongislandica*, *P.subelliptica*, *P.subglabriuscula* and *P.wilmsianato* lichen biota of Assam. From the listed records crustose lichen (86%) showed the most frequent growth forms followed by foliose (14%), but no presence of fruticose lichen is recorded. The family graphidaceae with a number of 47 species exhibit their dominance in the area followed by pyrenulaceae and caliciaceae with 9 and 6 species respectively. The genus *graphis* revealed their luxuriant growth with 38 species of lichen followed by *pyrenula* with 9 species.

Introduction:

About 25000 lichen species have been reported throughout the world (Soundararajan *et al.*, 2019). Currently, India records 2963 lichen species belonging to 468 genera and 84 families (Sinha, 2021). Assam is one of the states contributing massively to lichens studies and reporting new species and records from India. The state at this time represents 525 species (Islary *et al.*, 2021) which added the number of 225 species just after two years of publication book 'Lichen flora of Assam' by Gupta & Sinha (2018). Earlier Gupta and Sinha, 2018 reported eight and Daimari *et al.*, 2021 reported 54 species of lichen from the Kokrajhar district of Assam.

Kokrajhar one of the districts of Assam is a plain area with different ecological surroundings and an elevation of 30-200 m altitude shares its boundary with Bongaigaon and Dhubri district and international borders i.e. West Bengal and Bhutan respectively. It is situated in northern bank of the Brahmaputra river. It occupies an area of 3169.22 km² and the majority of the area is covered by the agricultural fields and forest area. The forest area is the most prominent feature of the district is roughly 1719 sq. km i.e., 55% of the total geographical area is comprised of reserved forests viz. Kachugao, Ripu, Chirang, Guma, Bengtal respectively. The majority of the area is predominantly inhabited by the Bodo tribe. In spite of being floristically still a number of localities in the district have not yet been explored since in the present study a more intensive and systematic attempt has been made to record the diversity of lichen from the

unexplored localities of the district.

Survey and Collection:

A collection of lichen was made in the year of 2020-2021 as a part of the ongoing project 'Enumeration of lichen diversity and screening of lichen extracts for potential antimicrobial activity against phytopathogens: A study from Kokrajhar district of Assam'. The specimens were collected from various villages in the Kokrajhar district of Assam and were air-dried and placed in herbarium packets. The morphological characters were done by using a Leica EZ4W stereo-zoom microscope and the anatomical details of thin sections of apothecia and thallus were observed under Leica DM750 trinocular microscope using water and lactophenol cotton blue as mounting media. Spot tests and UV light were done for the chemistry using some reagents K (aqueous solution of potassium hydroxide), C (aqueous solution of calcium hypochlorite) and P (0.5 g of parphenylenediamine dissolved in 5 ml of ethanol). Thin-layer chromatography was used to identify the lichen substances in solvent system A, following Orange *et al.* (2010). Literature of (Awasthi, 1991; 2007; Upreti, 1994; 1998; Lücking *et al.*, 2009) was referred for confirmation of the identification and distribution of taxa. Indexfungorum.org was followed for the nomenclature of the lichen species and the classification was updated following the literature of Wijayawardene *et al.* (2020). A set of voucher specimens were deposited in the herbarium of the Department of Botany, Bodoland University BUBH, Kokrajhar, Assam.

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Table 1. List of the identified lichen taxa recorded from Kokrajhar district of Assam

#	Lichen taxa	GF	Location
Arthoniaceae			
1	<i>Arthonia dispersula</i>	Cr	Goramara
2	<i>A. inconspicua</i>	Cr	Dakhin-patgoan, Gambaribill, Siltoka
3	<i>A. tumidula</i>	Cr	Goramara, Hawriajhara, Paikandara, Siltoka
Caliciaceae			
4	<i>Dirinaria aegialita</i>	F	Bonshijhora
5	<i>D. applanata</i>	F	Bonshijhora, Hawriajhara,
6	<i>D. consimilis</i>	F	Barjan, Dakhin-patgoan, Hawriajhara, Tongaigoan, Kakurmari,
7	<i>D. picta</i>	F	Bangaljehara, Kakurmari, Tongaigoan, Uttar ramfalbill
8	<i>Pyxine cocoes</i>	F	Kakurmari, Paikandara, Uttar ramfalbill
9	<i>P. reticulata</i>	F	Kakurmari, Tongaigoan
Graphidaceae			
10	<i>Diorygma hieroglyphicum</i>	Cr	Dangaijehara
11	<i>D. junghuhnii</i>	Cr	Bonsijehara, Dangaijehara, Dangaigoan, Hawriajhara, Paikandara
12	<i>D. soozanum</i>	Cr	Hawriajhara, Dangaijehara, Modatipahar
13	<i>Glyphisci catricosa</i>	Cr	Barjan, Bangaljehara, Siltoka,
14	<i>G. confluens</i>	Cr	Kakurmari, Siltoka, Tongaigoan
15	<i>G. duriuscula</i>	Cr	Kakurmari, Dangaijehara, Modatipahar, Paikandara
16	<i>Graphis albo glaucescens</i>	Cr	Kayergutu-I
17	<i>G. alpestris</i>	Cr	Kayergutu-I
18	<i>G. anfractuosa</i>	Cr	Gambaribill
19	<i>G. aperiens</i>	Cr	Daolabari
20	<i>G. arecae</i>	Cr	Dangaijehara
21	<i>G. argentina</i>	Cr	Siltoka, Daolabari, Koraitola-muslimpara, khuksi, Goramara, Monipur
22	<i>G. asahinae</i>	Cr	Dangaijehara, Gomobill
23	<i>*G. brevicarpa</i>	Cr	Siltoka
24	<i>G. caesiella</i>	Cr	Dangaijehara
25	<i>G. capillacea</i>	Cr	Siltoka, Barjabill-I, Daolabari, Gomobill
26	<i>G. cervina</i>	Cr	Dakhin-patgoan, Hawriajhara
27	<i>G. cervinonigra</i>	Cr	Paikandara
28	<i>G. chlorotica</i>	Cr	Hawriajhara
29	<i>G. cincta</i>	Cr	Bangaljehara, Paikandara
30	<i>G. cinnamomea</i>	Cr	Koraitola-muslimpara
31	<i>G. crebra</i>	Cr	Dangaijehara, Chataguri, Daolabari, Gomobill
32	<i>G. dendrograma</i>	Cr	Hawriajhara
33	<i>G. distincta</i>	Cr	Koraitola-muslimpara
34	<i>G. elegantula</i>	Cr	Monipur
35	<i>G. epimelaena</i>	Cr	Kayergutu-I
36	<i>G. ficicola</i>	Cr	Hogmabill
37	<i>G. filiformis</i>	Cr	Siltoka, Goramara
38	<i>G. furcata</i>	Cr	Hawriajhara, Tongaigoan
39	<i>G. glaucescens</i>	Cr	Gomobill, Gambaribill
40	<i>G. handelii</i>	Cr	Tengaigaon, Chataguri, Gomobill
41	<i>G. librata</i>	Cr	Gambaribill
42	<i>G. malacodes</i>	Cr	Kakurmari
43	<i>*G. pavoniana</i>	Cr	Bongshijehara
44	<i>G. pinicola</i>	Cr	Chataguri
45	<i>G. pyrrhocheiloides</i>	Cr	Barjan, Chataguri, Monipur
46	<i>G. renschiana</i>	Cr	Barjan
47	<i>G. riopiedrensis</i>	Cr	Gomobill
48	<i>G. sayeri</i>	Cr	Dakhin-patgoan
49	<i>G. scripta</i>	Cr	Barjan
50	<i>G. subasahinae</i>	Cr	Siltoka
51	<i>G. submarginata</i>	Cr	Hawriajhara
52	<i>G. sundarbanensis</i>	Cr	Barjabill-I, Gambaribill, Koraitola-muslimpara
53	<i>G. xanthospora</i>	Cr	Modatipahar, Tongaigoan
54	<i>Sarcograph aglyphiza</i>	Cr	Kakurmari
55	<i>S. labyrinthica</i>	Cr	Chataguri, Kakurmari, Siltoka
56	<i>S. subtriosa</i>	Cr	Khuksi
Lecanoraceae			
57	<i>Lecanora helva</i>	Cr	Modatipahar
58	<i>L. leproplaca</i>	Cr	Goramara
59	<i>*L. pseudargentata</i>	Cr	Kakurmari
60	<i>L. tropica</i>	Cr	Kakurmari
Parmeliaceae			
61	<i>Parmotrema crinitoides</i>	F	Bonshijehara
62	<i>P. disparile</i>	F	Kakurmari
63	<i>P. saccatilobum</i>	F	Bonshijehara
64	<i>P. tinctorum</i>	F	Modatipahar
65	<i>P. tsavoense</i>	F	Bonsijehara
Physciaceae			
66	<i>Heterodermia diademata</i>	F	Siltoka
Pyrenulaceae			
67	<i>Pyrenula anomala</i>	Cr	Dangaijehara
68	<i>P. brunnea</i>	Cr	Bangaljehara, Modatipahar
69	<i>*P. citrififormis</i>	Cr	Dudumari
70	<i>*P. longislandica</i>	Cr	Goramara
71	<i>P. mastophoriza</i>	Cr	Chandamari, Daolabari-II
72	<i>P. pinguis</i>	Cr	Uttar ramfalbill
73	<i>*P. subelliptica</i>	Cr	Kayergutu-I
74	<i>*P. subglabriuscula</i>	Cr	Hogmabill
75	<i>*P. wilmsiana</i>	Cr	Kakurmari
Ramalinaceae			
76	<i>Bacidia convexula</i>	Cr	Barjan, Chataguri
77	<i>B. medialis</i>	Cr	Kakurmari
78	<i>B. millegrana</i>	Cr	kursamari
79	<i>B. rubella</i>	Cr	Hawriajhara
80	<i>B. submedialis</i>	Cr	Dakhin-patgoan, Hawriajhara, Siltoka
Trypetheliaceae			
81	<i>Trypethelium celatum</i>	Cr	Hogmabill
82	<i>T. eluteriae</i>	Cr	Modatipahar
Trichotheliaceae			
83	<i>Porinabela nospora</i>	Cr	Hogmabill
84	<i>P. interetes</i>	Cr	Kakurmari
85	<i>P. internigrans</i>	Cr	Hogmabill
86	<i>P. mastoidea</i>	Cr	Goramara
87	<i>P. subhibernica</i>	Cr	Goramara

(Note: "Cr" = Crustose, F= Foliose, "*" = New records to Assam)

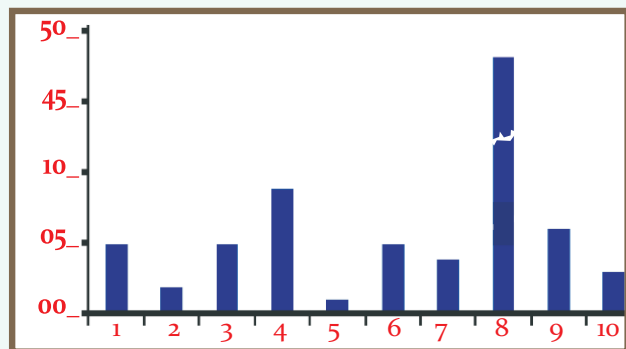


Figure-1: Representation of the number of lichen species within families. 1-Trichotheliaceae, 2-Trypetheliaceae, 3-Ramalinaceae, 4-Pyrenulaceae, 5-Physciaceae, 6-Parmeliaceae, 7-Lecanoraceae, 8-Graphidaceae, 9-Caliciaceae, 10-Arthoniaceae

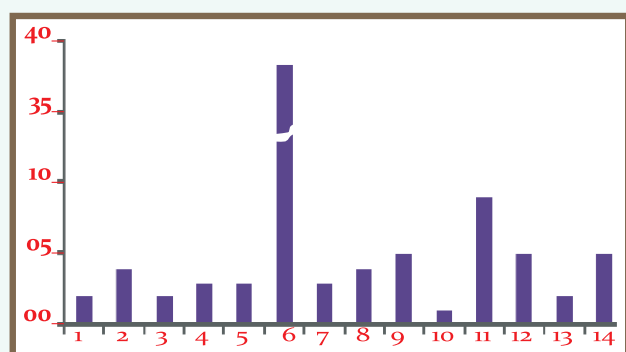


Figure-2: Representation of the number of lichen species within genus: 1) Arthonia, 2) Dirinaria, 3) Pyxine, 4) Diorygma, 5) Glyphis, 6) Graphis, 7) Sarcographa, 8) Lecanora, 9) Parmotrema, 10) Heterodermia, 11) Pyrenula, 12) Bacidia, 13) Trypethelium, 14) Porina

Our Survey Outputs:

The ongoing study has resulted in the number of 87 species belonging to 14 genera and 10 families from Kokrajhar district of Assam (Table-1). The eight species viz. *Graphis brevicarpa*, *Graphis pavoniana*, *Lecanora pseudargentata*, *Pyrenula citrififormis*, *P.longislandica*, *P.subelliptica*, *P.subglabriuscula* and *P.wilmsiana* are being reported for the first time to the lichen biota of Assam. All the species are crustose and corticolous.

The lichen biota of Kokrajhar district is dominated by crustose lichen (75 species) followed foliose lichen with 12 species. 86% of the lichen showing crustose while foliose is 14%. The family Graphidaceae is most diverse group and dominant family in the district with 47 species under 4 genera. The lichen community is also represented by a good diversity of *Arthonia*, *Bacidia*, *Dirinaria*, *Lecanora*, *Parmotrema*, *Porina* and *Pyrenula*. The species of *Arthonia tumidula*, *Dirinaria consimilis*, *Lecanora helva*, *Parmotrema tinctorum*, *Pyxine cocoes* and *Trypethelium eluteriae* are most commonly found in the area. Earlier the lichen biota of the state is recorded 525 species, but present study added eight species which are new to Assam [marked as asterisk (*) in the Table-1]

Conclusion:

The occurrence of 87 species of lichen taxa within the district clearly indicates the abundance of lichen and these findings highlight the inventory and distribution of lichen taxa in the studied area. Hence it is quite likely that more lichen taxa could be found in the region with further extensive surveys and may increase the number of lichen biota in Assam. Since lichen is also known for the biomonitoring tools in forest areas therefore documentation and conservation of lichen species diversity will be more beneficial for future bioprospection studies related to lichenological work.

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