

## Additions to the Lichen Biota of undivided Nagaon District with special reference to *Tylophoron protrudens* Nyl., a new record to Assam State of India

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### ABSTRACT

An enumerative account of 31 lichen species new to undivided Nagaon district of Assam, species under 21 genera and 14 families is provided. Among the 31 species 27 are crustose, two are leprose and species each of, foliose and squamulose. *Tylophoron protrudens* Nyl. is recorded for the first time to the lichen flora of Assam and its brief description is provided. The species were collected from seven localities and maximum number of lichen species has been recorded from Suang Forest area. A detailed exploratory work on lichens will definitely contribute to the lichen biota of India as well as Assam as most of the forests of erstwhile Nagaon district has not been explored yet.

### INTRODUCTION

Assam is one of the richest lichen diversity states within the North Eastern region of India. It is represented by 657 species belonging to 146 genera and 41 families (Gogoi et al. 2022). The lichenological studies, especially on lichen diversity in Assam have been gaining importance since last few years. The cursory studies on lichens have been conducted in most of the districts of Assam. The present study aims to study and document the lichen diversity of unexplored localities of undivided Nagaon district. Previously, Gupta and Sinha (2018) have reported 104 and 24 species of lichen from Nagaon district. Gogoi et al. (2019) reported 25 lichens new to the lichen biota of Assam collected from Nagaon district. Behera et al. (2021) reported 76 species of lichen from Nagaon district. Ngangom et al. (2020) described *Cratiria rubrum* R. Ngangom, Nayaka and R. Gogoi, as new species and *Hafellia reagens* Pusswald as new distributional record to India from Hojai sub-division of Nagaon district. The present study is a continuation of our effort to understanding the lichen diversity in Nagaon district.

Nagaon district is situated in the middle of Assam state and on the south bank and flood plains of the mighty river Brahmaputra, between 25°45" and 26°45" North Latitudes and 91°50" and 93°20" East Latitude. The district consists

of three sub-divisions viz., Nagaon, Kaliabor and Hojai. In the year 2015, Hojai was established as a separate district. As our study also included specimens from Hojai, the whole study area is referred as undivided Nagaon district. The district has a good number of forest areas which are still unexplored. Due to various anthropogenic activities like encroachment, quarrying of stones in different hills, deforestation, urbanization, highway construction has resulted in gradual decreasing the forest cover of the district. Therefore, it is necessary to prioritize the conservation of biodiversity of the area by all stakeholders.

### MATERIALS AND METHODS

The specimens collected by two of the authors (RG and FY) from undivided Nagaon district between 2015 and 2019. A set of voucher specimens has been deposited in the herbarium of CSIR – National Botanical Research Institute, Lucknow (LWG) and Department of Botany, Nowgong College (Autonomous) temporarily acronymed as NCLH. The external morphological features were observed with a Leica S9i trinocular stereomicroscope. Thin hand-cut sections of thalli and ascomata were mounted in water, 10% KOH and Lugol's iodine and examined with a Leica DM 2500 compound trinocular light transmission microscope. The colour spot tests were carried out by 10% aqueous potassium hydroxide solution (K), aqueous calcium

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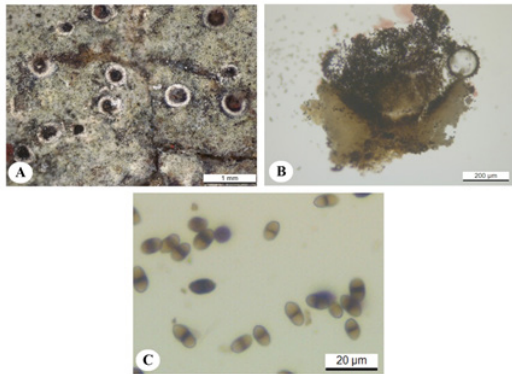


Figure. 1: A. *T. proteudens* Nyl. (Habit), B. V.S. of apothecium, C. Ascospores

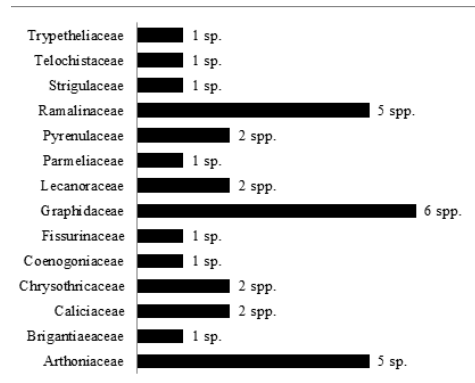


Figure 3: Graph representing the number of species in each family

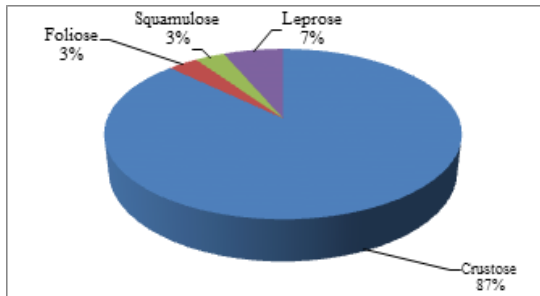


Figure 2: Percentage of lichens with different growth forms

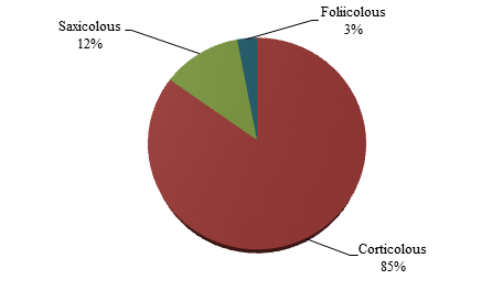


Figure 4: Substrate-wise representation of lichen taxa

Table 1: List of newly added taxa to the lichen biota of undivided Nagaon district with their families, growth form, substrata, and localities.

S. No.	Name of the species	GF	Substratum	Localities						
				1	2	3	4	5	6	7
<b>Arthoniaceae</b>										
1.	<i>Arthonia antillarum</i> (Fée) Nyl.	Cr	Bark	+	-	-	-	+	-	-
2.	<i>A. recedens</i> Stirt.	Cr	Bark	+	-	-	-	-	-	-
3.	<i>Arthothelium abnorme</i> (Ach.) Müll. Arg.	Cr	Bark	+	+	-	-	-	-	-
4.	<i>Cryptothecia subtectata</i> Stirt.	Cr	Bark	-	-	-	-	+	-	-
5.	<i>Tylophoron protrudens</i> Nyl.	Cr	Bark	+	-	-	-	-	-	-
<b>Brigantiaeaceae</b>										
6.	<i>Letrouitia flavocrocea</i> (Nyl.) Hafellner & Bellem	Cr	Bark	-	+	-	-	-	-	-
<b>Caliciaceae</b>										
7.	<i>Cratiria lauricassiae</i> (Fée) Marbach	Cr	Bark, rock	+	-	+	-	-	-	-
8.	<i>C. obscurior</i> (Stirt.) Marbach & Kalb	Cr	Rock	-	-	+	-	-	-	-
<b>Chrysothricaceae</b>										
9.	<i>Chrysothrix candelaris</i> (L.) J.R. Laundon	Le	Bark	+	-	-	-	-	-	-

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10.	<i>C. chlorina</i> (Ach.) J.R. Laundon	Le	Bark	+		+	+	+	+	+
Coenogoniaceae										
11.	<i>Coenogonium dilucidum</i> (Kremp.) Kalb. & Lücking	Cr	Leaf	+	-	-	-	-	-	+
Fissurinaceae										
12.	<i>Fissurina incrustans</i> Fée	Cr	Bark	-	-	-	-	-	-	+
Graphidaceae										
13.	<i>Glyphis scyphulifera</i> (Ach.) Staiger	Cr	Bark	+	-	-	-	-	-	-
14.	<i>Graphis capillacea</i> Stirt.	Cr	Bark	-	-	-	-	-	-	+
15.	<i>G. cincta</i> (Pers.) Aptroot	Cr	Bark	-	-	-	-	-	+	-
16.	<i>G. dendrogramma</i> Nyl.	Cr	Bark	-	-	-	-	-	-	+
17.	<i>G. intricata</i> Eschw.	Cr	Bark	+	-	-	-	-	-	-
18.	<i>G. pyrrocheiloides</i> Zahlbr.	Cr	Bark	+	-	-	-	-	-	-
Lecanoraceae										
19.	<i>Lecanora helva</i> Stizenb.	Cr	Bark	+	-	-	-	+	+	-
20.	<i>L. subimmersa</i> (Fée) Vain.	Cr	Rock	-	-	+	-	-	-	-
Parmeliaceae										
21.	<i>Bulbothrix isidiza</i> (Nyl.) Hale	Fo	Bark	+	-	-	-	-	-	-
Pyrenulaceae										
22.	<i>Anthracotheceum prasinum</i> (Eschw.) R.C. Harris.	Cr	Bark	+	-	-	-	-	-	-
23.	<i>Pyrenula acutalis</i> R.C. Harris	Cr	Bark	+	-	-	-	-	-	-
Ramalinaceae										
24.	<i>Bacidia convexula</i> (Müll. Arg.) Zahlbr.	Cr	Bark	-	+	-	-	-	-	-
25.	<i>B. nigrosticta</i> Zahlbr.	Cr	Bark	+	-	-	-	-	-	-
26.	<i>B. rubella</i> (Hoffm.) A. Massal.	Cr	Bark	+	-	-	-	-	-	-
27.	<i>B. submedialis</i> (Nyl.) Zahlbr.	Cr	Bark	-	-	-	+	-	-	-
28.	<i>Phyllopsora himalayansis</i> G.K. Mishra, Upreti & Nayaka	Sq	Bark	-	+	-	-	-	-	-
Strigulaceae										
29.	<i>Racoplaca maculata</i> (Cooke and Masee) S.H. Jiang, Lücking & J.C. Wei	Cr	Leaf	+	-	-	-	-	-	-
Telochistaceae										
30.	<i>Oxneriopsis bassiae</i> (Ach.) S.Y. Kondr., Upreti & Hur	Cr	Bark, rock	-	-	+	-	-	-	+
Trypetheliaceae										
31.	<i>Trypethelium eluteriae</i> Spreng.	Cr	Bark	+	-	-	-	-	-	+

1=Suang Forest, 2=Lumding Forest, 3=Jugijan, 4=Lanka, 5=Nagaon Town, 6=Kathiatoli, 7=Jamunamukh; GF= Growth form

hypochlorite solution (C), and Steiner's stable solution (P). UV fluorescence test of lichen thalli was examined by exposing the lichen thalli to UV radiation with a UV cabinet. The lichen substances were identified by thin layer chromatography (TLC) using solvents A and C (Orange et al. 2001). The identification of the lichen taxa was done by following relevant literatures (Awasthi 1991; Nayaka 2004; Lücking et al. 2009; Aptroot 2012; Mishra et al. 2011, 2020; Jagadeesh Ram and Sinha 2016). The classification mentioned by Wijayawardene et al. (2020) was followed to arrange the species within families.

## RESULTS AND DISCUSSION

The study resulted in occurrence of 31 additional lichen taxa under 21 genera and 14 families in undivided Nagaon district of Assam state (Table 1). Among these, one species under the family Arthoniaceae, i.e., *Tylophoron protrudens* Nyl. is described for the first time from Assam.

### Addition to lichen mycota of Assam

*T. protrudens* Nyl., Bot. Ztg. 20: 279. 1862.

It is characterized by C+ red thallus, mazediate apothecia of 0.5–1.0 mm diam., uniseptate dark brown ascospores.

### Distribution

India (Kerala, Odisha, Uttarakhand and West Bengal) and Nepal. Pantropical (Singh and Sinha, 2010).

### Specimen Examined

Chapanala, Suang Forest, 26°19'13"N, 92°54'16"E, alt. 119 m, 18-02-2018, R. Gogoi and F. Yasmin (LWG63457). P

Out of the newly added lichen taxa to the district, majority of the species are crustose (87%) and a small fraction is represented by leprose (7%), foliose and squamulose (3% each).

Familywise, Graphidaceae is represented by 6 species followed by Arthoniaceae and Ramalinaceae (5 species each), Caliciaceae, Chrysothricaceae, Lecanoraceae and Pyrenulaceae (2 species each), and rest of the seven families are represented by one species each. Substrate-wise, majority of the lichen species are corticolous (85%) followed by saxicolous (12%) and foliicolous (3%).

In the present this study, Suang forest area exhibits majority of the newly added lichen taxa to the undivided Nagaon district. It clearly indicates that more extensive exploratory work in the forest areas not only of Nagaon district, but also forest areas of all the districts of Assam add several interesting findings.

## CONCLUSION

Recently, Gogoi et al. (2022) listed 657 species of lichen from Assam. Subsequently, Islary et al. (2022) reported *Ocellularia calvescens* (Fée) Müll. Arg. and *Rhabdodiscus subcavatus* (Nyl.) Rivas Plata, Lücking and Lumbsch as new record to India. The present study has also resulted in one addition to lichen biota of Assam. Detailed exploratory work on lichens needs to be carried out to document the complete lichen biota of Assam.

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