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An Enumeration of Lichens from Bara Bhangal Region of Dhauladhar Wildlife Sanctuary

Hem Chander[1*] and V.C. Chandel[2]

[1]*Department of Botany, Career Point University, Hamirpur (H.P.)-176041, INDIA*

[2]*Department of Botany, SCVB Government College, Palampur (H.P.)-176061, INDIA*

[*] *Correspondence: E-mail: hemchander78@gmail.com*

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ABSTRACT: During the present study, Bara Bhangal region of Dhauldhar Wildlife Sanctuary was enumerated for lichen species diversity during the month of May in 2019. A total of sixteen species of lichens viz. *Caloplaca flavorubescens* (Huds.) Laundon, *Candelaria concolor* (Dicks.) Arnold, *Chrysothrix chlorina* (Ach.) Laundon, *Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng., *Cladonia coniocraea* (Flörke) Spreng., *Collema polycarpon* Hoffm., *Dermatocarpon miniatum* (L.) Mann, *Heterodermia diademata* (Taylor) Awasthi, *Heterodermia leucomelos* (L.) Poelt , *Lasallia pertusa* (Rass.) Llano, *Punctelia rudecta* (Ach.) Krog, *Ramalina sinensis* Jatta, *Rhizocarpon geographicum* (L.) DC., *Rhizoplaca chrysoleuca* (Sm.) Zopf, *Usnea longissima* Ach. and *Xanthoria parietina* (L.) Th. Fr. belonging two fourteen genera and spread over fourteen families of lichens have been enumerated. All the taxa have been reported for the first time from the study area (Bara Bhangal region).

Keywords: Bara Bhangal; Dhauladhar; Enumeration; Himalayas; Lichens.

INTRODUCTION: Lichens contribute about 8% of life forms on the earth's surface.[1] The diversity of lichens on earth accounts for 20,000 species.[2] It is estimated that Indian lichen flora comprises of 2532 species under 324 genera and 78 families including 541 endemic (21.3%) species.[3] Whereas, a lot of researchers have explored lichen diversity of Himachal Pradesh and North Western Himalaya, however, Bara Bhangal region of Dhauladhar mountains still remained underexplored.[4-29] Owing to the ecological and economic importance and in contrast to the insufficient data available on the geographical distribution, floristic and diversity of lichens in Bara Bhangal region of Dhauladhar mountains (Himachal Pradesh), the floristic investigations were initiated to document lichen diversity of this area.

MATERIALS AND METHODS:

Study area: Bara Bangahal is located in Dhauladhar Wildlife Sactuary. It is a remote region in Dhauladhar mountain range of the outer Himalayas. It is situated between 32°01′42″ E to 32°27′27″ N Latitude and 76°41′41″ to 77°01′42″ E Longitude. The area is mountainous and hilly with altitude varying between 2235m to 6089m.

Collection: The specimens were collected from various habitats and substrates. The field data such as texture, size, colour, macroscopic features and form have been noted in the field book during the excursions.[30] A hand lens (20X), knife, hammer, chisel and a saw were the tools used while collecting the specimens. The collected specimen were placed in polythene bags (in case of saxicolous lichens) and/or in paper packets of suitable size. A paper slip containing the field data (*viz.* collection number, details of locality, host/substrate, approximate altitude in meters and the date of collection) was placed in each paper packet or polythene bag. The fragile specimens were wrapped in cotton and/or placed in card boxes of suitable size. The fresh specimens were observed and sun dried at the camping site, placed in the paper/or polythene bags along with slip containing field data and naphthalene balls to avoid the insects and were brought to the Laboratory, Department of Bio-Sciences, Career Point University Hamirpur for further taxonomic studies and preservation/deposition in CPUH (The herbarium, Department of Bio-Sciences, Career Point University Hamirpur) after treating them taxonomically.

Identification: The collected lichen specimens were initially segregated according to their growth forms. Within the growth forms the specimens were further grouped according to the type of fruiting bodies (apothecia, perithecia, sterile). The lichens were identified by studying their morphology, anatomy and chemistry. Authenticated taxonomic keys were referred for identification of lichen specimens.[31-33] The chemicals used for the chemical spot tests of the lichens were prepared

using standard method after White & James, 1985. These included: 10% Potassium hydroxide (K), 10% aq. Calcium hypochlorite (C) and Stainer's stable solution of p-phenylenediamine (P) composing of p-phenylenediamine (1g), Sodium sulphite (10g) and Liquid detergent neutral solution in 100ml of distilled water (0.5ml).[34-35] The specimens were placed in Ultraviolet (UV) chamber at 350nm to observe their fluorescence.

RESULTS AND DISCUSSION: A total of sixteen species of lichens viz. *Caloplaca flavorubescens* (Huds.) Laundon, *Candelaria concolor* (Dicks.) Arnold, *Chrysothrix chlorina* (Ach.) Laundon, *Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng., *Cladonia coniocraea* (Flörke) Spreng., *Collema polycarpon* Hoffm., *Dermatocarpon miniatum* (L.) Mann, *Heterodermia diademata* (Taylor) Awasthi, *Heterodermia leucomelos* (L.) Poelt , *Lasallia pertusa* (Rass.) Llano, *Punctelia rudecta* (Ach.) Krog, *Ramalina sinensis* Jatta, *Rhizocarpon geographicum* (L.) DC., *Rhizoplaca chrysoleuca* (Sm.) Zopf, *Usnea longissima* Ach. and *Xanthoria parietina* (L.) Th. Fr. belonging two fourteen genera and spread over fourteen families of lichens have been enumerated (Table 1). All the taxa have been reported for the first time from the study area (Plate 1& Plate 2).

Table 1: Checklist of Lichens enumerated from the study area.

S. No.	Species	Family
1.	*Caloplaca flavorubescens* (Huds.) Laundon	Teloschistaceae
2.	*Candelaria concolor* (Dicks.) Arnold	Candelariaceae
3.	*Chrysothrix chlorina* (Ach.) Laundon	Chrysothricaceae
4.	*Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng.	Cladoniaceae
5.	*Cladonia coniocraea* (Flörke) Spreng.	Cladoniaceae
6.	*Collema polycarpon* Hoffm.	Collemataceae
7.	*Dermatocarpon miniatum* (L.) Mann	Verrucariaceae
8.	*Heterodermia diademata* (Taylor) Awasthi	Physciaceae
9.	*Heterodermia leucomelos* (L.) Poelt	Physciaceae
10.	*Lasallia pertusa* (Rass.) Llano	Umbilicariaceae
11.	*Punctelia rudecta* (Ach.) Krog	Parmeliaceae
12.	*Ramalina sinensis* Jatta	Ramalinaceae
13.	*Rhizocarpon geographicum* (L.) DC.	Rhizocarpaceae
14.	*Rhizoplaca chrysoleuca* (Sm.) Zopf	Lecanoraceae
15.	*Usnea longissima* Ach.	Parmeliaceae
16.	*Xanthoria parietina* (L.) Th. Fr.	Teloschistaceae

Figure 1: *Caloplaca flavorubescens* (Huds.) Laundon.

Figure 2: *Candelaria concolor* (Dicks.) Arnold.

Figure 3: *Chrysothrix chlorina* (Ach.) Laundon.

Figure 4: *Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng.

Figure 5: *Cladonia coniocraea* (Flörke) Spreng.

Figure 6: *Collema polycarpon* Hoffm.

Figure 7: *Dermatocarpon miniatum* (L.) Mann.

Figure 8: *Heterodermia diademata* (Taylor) Awasthi.

Figure 9: *Heterodermia leucomelos* (L.) Poelt.

Figure 10: *Lasallia pertusa* (Rass.) Llano.

Figure 11: *Punctelia rudecta* (Ach.) Krog.

Figure 12: *Ramalina sinensis* Jatta.

Figure 13: *Rhizocarpon geographicum* (L.) DC.

Figure 14: *Rhizoplaca chrysoleuca* (Sm.) Zopf.

Figure 15: *Usnea longissima* Ach.

Figure 16: *Xanthoria parietina* (L.) Th. Fr.

CONCLUSION: A total of sixteen species of lichens viz. *Caloplaca flavorubescens* (Huds.) Laundon, *Candelaria concolor* (Dicks.) Arnold, *Chrysothrix chlorina* (Ach.) Laundon, *Cladonia chlorophaea* (Flörke ex Sommerf.) Spreng., *Cladonia coniocraea* (Flörke) Spreng., *Collema polycarpon* Hoffm., *Dermatocarpon miniatum* (L.) Mann, *Heterodermia diademata* (Taylor) Awasthi, *Heterodermia leucomelos* (L.) Poelt , *Lasallia pertusa* (Rass.) Llano, *Punctelia rudecta* (Ach.) Krog, *Ramalina sinensis* Jatta, *Rhizocarpon geographicum* (L.) DC., *Rhizoplaca chrysoleuca* (Sm.) Zopf, *Usnea longissima* Ach. and *Xanthoria parietina* (L.) Th. Fr. belonging two fourteen genera and spread over fourteen families of lichens have been enumerated. All the taxa have been reported for the first time from the study area (Bara Bhangal region).

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