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An Enumeration of Lichenized Fungi from Sikandra Dhar Region of District Mandi, Himachal Pradesh

Monika Thakur[1*] and Hem Chander[2]

[1 & 2] Division Botany, Department of Bio-Sciences, Career Point University, Hamirpur (H.P.), INDIA

[*] Correspondence: E-mail: thakurmonika382@gmail.com

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ABSTRACT: Floristic studies have been initiated to explore diversity of lichenized fungi in Sikandra dhar region of district Mandi, Himachal Pradesh (India). Sikandra dhar region is situated in Shivalik hills zone of North-West Himalaya. A total of three hundred specimens of lichenized fungi were collected from Sikandra dhar region. During the morpho-chemotaxonomic investigations, a total of twenty five species of lichens (*Aspicilia calcarea* (L.) Körb., *Brianaria bauschiana* (Körb.) S. Ekman & M. Svenss., *Candelaria concolor* (Dicks.) Arnold, *Canoparmelia pustulescens* (Kurok.) Elix, *Chrysothrix candelaris* (L.) J.R. Laundon, *C. chlorina* (Ach.) J.R. Laundon, *Cladonia coniocraea* (Flörke) Spreng, *Dermatocarpon vellereum* Zschacke, *Heterodermia pseudospeciosa* (Kurok.) W.L. Culb, *Hyperphyscia syncolla* (Tuck. ex Nyl.) Kalb, *Hypotrachyna masonhalei* Patw. & Prabhu, *Lecanora chlarotera* Nyl., *Parmotrema austrosinense* (Zahlbr.) Hale, *P. ravum* (Krog & Swinscow) Sérus, *P. tinctorum* (Despr. ex Nyl.) Hale, *Phaeophyscia ciliata* (Hoffm.) Moberg, *P. hispidula* (Ach.) Essl, *Physcia crispa* Nyl, *P. integrata* Nyl, *P. semipinnata* (Leers ex J.F. Gmel.) Moberg, *Punctelia neutralis* (Hale) Krog, *P. subrudecta* (Nyl.) Krog, *Pyxine asiatica* Vain, *P. isidiophora* (Müll. Arg.) Imshaug and *P. subcinerea* Stirt), belonging to fifteen genera (viz. *Aspicilia* A. Massal, *Brianaria* S. Ekman & M. Svenss, *Candelaria* A. Massal, *Canoparmelia* Elix & Hale, *Chrysothrix* Mont, *Cladonia* P. Browne, *Dermatocarpon* Eschw, *Heterodermia* Trevis, *Hyperphyscia* Müll. Arg, *Hypotrachyna* (Vain.) Hale, *Lecanora* Ach, *Parmotrema* A. Massal, *Phaeophyscia* Moberg, *Punctelia* Krog, *Pyxine* Fr.) of ten families (viz. Caliciaceae, Candelariaceae, Chrysotrichaceae, Cladoniaceae, Lecanoraceae, Megasporaceae, Parmeliaceae, Physciaceae, Psoraceae, Verrucariaceae) of lichenized fungi have been identified. Parmeliaceae and Physciaceae are the dominant families with six species each followed by Caliciaceae with three species. All these taxa have been recorded for the first time from Sikandra dhar region and deposited in CPUH ((The herbarium, Department of Bio-Sciences, Career Point University Hamirpur).

Keywords: Lichenized fungi; Mandi; North-Western Himalaya; Shivalik hills and Sikandra dhar.

INTRODUCTION: Lichens are fascinating dual organism entity, which are formed by the association of two or more entirely different types of organisms – a fungus (mycobiont) and an alga (phycobiont). Lichen thallus evolved through this symbiosis is unique as it appears and behaves quite differently from its component organisms. Lichens are the symbiotic organisms which not only play a major role in ecosystem but also in human welfare.[1] Mycobiont, forming the major component in lichen thalli is the basis of lichen taxonomy. Lichens are thus regarded as a specialized group of fungi under lichenized fungi.[2] Lichens contribute about 8% of life forms on the earth's surface.[3] Indian lichens are represented by 2450 species belonging to 305 genera and 74 families which is about 10% of the 20,000 lichen species reported from world over.[4]

Whereas, a lot of researchers have explored lichen diversity of Himachal Pradesh, however, Sikandra dhar of Mandi district still remained unexplored.[5-21] Owing to the ecological and economic importance and in contrast to the insufficient data available on the geographical distribution, the floristic investigations were initiated to describe and preserve lichen diversity of this area.

MATERIALS AND METHODS: During the present study, lichen specimens were collected from in and around Sikandra dhar. Sikandra Dhar is situated in Shivalik hill zone of North Western Himalaya and is located in district Mandi of Himachal Pradesh (India). A total of three hundred specimens of lichenized fungi were collected from twenty one localities (viz. Gehayin Ka Galu, Ghaadi, Churain, Darba, Murari

Devi, Pandit Ka Naun, Sikandra, Chunathar, Jaba, Badi, Kashmali, Naina Devi, Kuntbhiyog, Doh, Bhauran, Chowk, Padhyan, Karni, Plasi, Matiyara and Samaila) of Sikandra Dhar region during February 2018 to July 2018. The field data such as texture, size, colour, macroscopic features and form have been noted in the field book during excursions.[22] Fresh specimens were observed and sun dried at the camping site. These were brought laboratory for further taxonomic studies and have been deposited in CPUH (The herbarium, Department of Bio-Sciences, Career Point University Hamirpur). The collected lichen specimens were initially segregated according to their growth forms and further grouped according to frutification type (apothecia, perithecia, sterile). Identity of specimens was confirmed by comparing their morphology, anatomy and chemistry with authenticated taxonomic keys.[23,24,25] The chemicals used for the chemical spot tests of the lichens were prepared using standard method.[26]

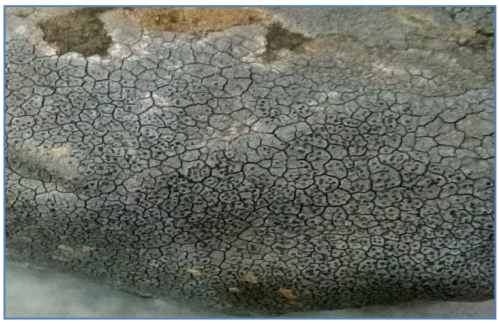
RESULTS AND DISCUSSION: During the present study, a total of twenty five species of lichenized fungi have been enumerated from twenty one localities of Sikandra Dhar region for the first time (Table 1 and Table 2). The morphological and chemotaxonomic details of these species are being provided below:

1. *Aspicilia calcarea* (L.) Körb.

Parerga lichenol. (Breslau) **1:** 94 (1859)

Synonyms: *Lecanora calcarea* (L.) Sommerf., *Lecanora calcarea* (L.) Sommerf., *Lecanora cinerea* var. *calcarea* (L.) Nyl., *Lecanora depressa* var. *calcarea* (L.) Nyl., *Lecanora lilliei* (B. de Lesd.) A.L. Sm., *Lecidea alboatra* f. *calcarea* (Ach.) Torss., *Lecidea alboatra* var. *calcarea* (Ach.) Malbr., *Lecidea amylacea* var. speirea Wahlenb., *Lecidea calcarea* (Ach.) Schaer., *Lecidea margaritacea* var. *calcarea* (Ach.) Ach., *Lecidea petraea* var. *calcarea* (Ach.) Nyl., *Lecidea platycarpa* var. *calcarea* (Ach.) Del Amo, *Lecidea speirea* (Wahlenb.) Gray, *Lecidea speirea* var. calcarea Ach., *Lichen calcareus* L., *Lichen calcareus* Weiss, *Lichen speireus* Sm. & Sowerby, *Psora calcarea* (L.) Hampe, *Rhizocarpon calcareum* (Ach.) Anzi, *Rhizocarpon calcareum* (Ach.) Anzi, *Siegertia calcarea* (Ach.) Körb., *Urceolaria calcarea* (L.) Ach., *Verrucaria calcarea* (L.) Humb., *Zeora calcarea* (L.) Flot.

Morpho-chemotaxonomic characters: Thallus saxicolous, crustose, chalky white, smooth to cracked-areolate crust, margin well-defined, usually with radial cracking. Apothecia immersed in the thallus, with black discs, or initially grey-pruinose, one or more per areole.

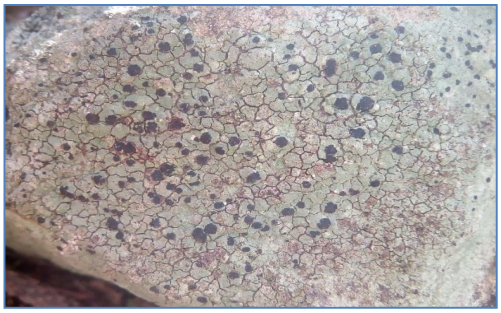


Specimen examined: CPUH 3054, on rock, Kunt bhiyog (H. P.), 1751m, March 18, 2018.

2. *Brianaria bauschiana* (Körb.) S. Ekman & M. Svenss.

Lichenologist **46(3)**: 292 (2014)

Synonym: *Biatora bauschiana* Körb., *Lecidea bauschiana* (Körb.) Lettau, *Micarea bauschiana* (Körb.) V. Wirth & Vězda



Morpho-chemotaxonomic characters: Thallus saxicolous, crustose. Apothecia convex, without an excipulum, an ascus of 'Psora-type', 0-1-septate ascospores, dimorphic paraphyses, and immersed pycnidia containing bacilliform conidia.

Specimens examined: CPUH 3002, on bark, Naina Devi (H. P.), 1911m, March 2, 2018; CPUH 3006, on bark, Naina Devi (H. P.), 1911m, March 2, 2018; CPUH 3009, on bark, Naina Devi (H. P.), 1911m, March 2, 2018; CPUH 3110, on bark, Naina Devi (H. P.), 1911m, March 2, 2018.

3. *Candelaria concolor* (Dicks.) Arnold

Flora Regensburg **62:** 364 (1879)

Synonym: *Lichen concolor* Dicks., *Lobaria concolor* (Dicks.) Hoffm., *Blasteniospora concolor* (Dicks.) Trevis., *Xanthoria concolor* (Dicks.) Th. Fr., *Lecanora concolor* (Dicks.) Lamy, *Physcia concolor* (Dicks.) Bagl. & Carestia, *Teloschistes concolor* (Dicks.) Tuck., *Caloplaca concolor* (Dicks.) Jatta.

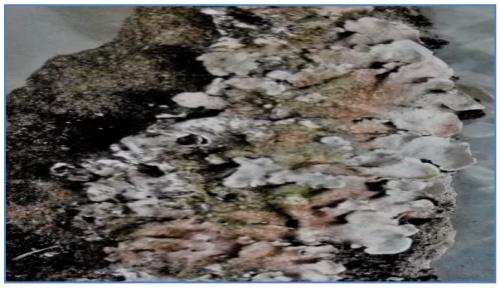
Morpho-chemotaxonomic characters: Thallus corticolous, foliose, in rosettes, upto 15 mm across, minutely lobate; lobes yellowish, upto 2mm long and 0.5 mm wide with granular soredia at lobe ends; Cortex and apothecia K-, C-, KC-, P-, Calycin and pulvinic acid present.

Specimen Examined: CPUH 3088, on bark, near Murari Devi temple, 1753m, Sikandra Dhar (H.P.), February 25, 2018.

4. *Canoparmelia pustulescens* (Kurok.) Elix

Mycotaxon **47:** 127 (1993)

Synonym: *Paraparmelia pustulescens* (Kurok.) Elix & J.Johnst., *Parmelia pustulescens* Kurok., *Pseudoparmelia pustulescens* (Kurok.) Hale.



Morpho-chemotaxonomic characters: Thallus saxicolous, foliose, upto 5cm across, closely adnate; lobes sublinear, to 1.2 mm wide, black rimmed near tips; upper side rugulose, isidiate; isidia, irregularly inflated bursting open apically to produce coarse soredia; lower side black sparsely rhizinate; medulla white. Medulla K-, C-, KC-, P-. Sekikaic, homosekikaic and fatty acids present.

Specimens examined: CPUH 3008, on rock, Gehayin ka galu, 1590m, Sikandra Dhar (H.P.), February 25, 2018; CPUH 3101, on rock, Gehayin ka galu, 1595m, Sikandra Dhar (H.P.), February 25, 2018.

5. *Chrysothrix candelaris* (L.) J.R. Laundon

Lichenologist **13(2)**: 110 (1981)

Synonym: *Byssus candelaris* L., *Lepra candelaris* (L.) F.H. Wigg., *Patellaria candelaris* (L.) DC., *Lepraria candelaris* (L.) Fr., *Lepraria candelaria* (L.) Fr., *Alysphaeria candelaris* (L.) Turpin.

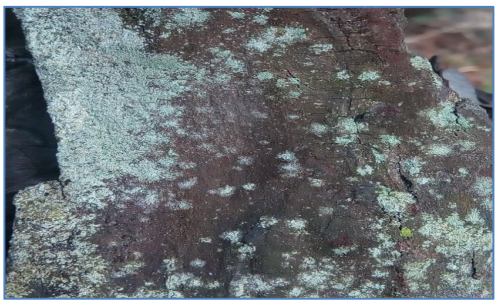
Morpho-chemotaxonomic characters: Thallus corticolous, crustose, leprose, forming scattered granules, bright yellow with greenish tinge, composed of a mass of fine soredia, 12-30(-40) µm in diam. K- or K+ orange, sometimes darkening to red-black, C-, KC-, P- or P+ orange; UV+ dull orange or UV-. Calycin and/or pinastric acid present.

Specimens examined: CPUH 3004, on bark, 1760m, Shikandra dhar (H. P.), February 25, 2018; CPUH 3083, on bark, 1760m, Shikandra dhar (H. P.), February 25, 2018.

6. *Chrysothrix chlorina* (Ach.) J.R. Laundon

Lichenologist **13(2)**: 106 (1981)

Synonym: *Lichen chlorinus* Ach., *Pulveraria chlorina* (Ach.) Ach., *Alysphaeria chlorina* (Ach.), *Trachylia chlorina* (Ach.) Rabenh., *Calicium chlorinum* (Ach.) Schaer., *Calicium chlorinum* subsp. chlorinum (Ach.) Schaer., *Cyphelium chlorinum* (Ach.) Kremp, *Coniocybe chlorina* (Ach.) Rabenh., *Crocynia chlorina* (Ach.) Hue, *Caliciella corynella* var. *chlorina* (Ach.) Räsänen.



Morpho-chemotaxonomic characters: Thallus corticolous, leprose, loosely attached, lacking well-defined lobes, forming extensive, irregularly spreading patches, consisting of greenish grey granules**, g**ranules variable, spherical or irregular, 40–75 µm across. K±, KC± reddish, C–, PD–, UV–; calycin and vulpinic acid present.

Specimens examined: CPUH 3097, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018; CPUH

3099, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018; CPUH 3100, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018, CPUH 3108, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018; CPUH 3053, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018; CPUH 3040, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018; CPUH 3031, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018; CPUH 3017, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018; CPUH 3014, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018; CPUH 3112, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018; CPUH 3109, on bark, 1760m, Shikandra dhar (H.P.), February 25, 2018.

7. *Cladonia coniocraea* (Flörke) Spreng

Syst. Veg., Edn 16, **4(1)**: 273 (1827)

Synonym: *Cenomyce coniocraea* Flörke.

Morpho-chemotaxonomic characters: Thallus corticolous, strato-radiate, squamules of primary thallus small to medium sized, persistent. Podetia green, 5-15 mm tall, 0.5-1 mm thick at base, usually simple, sparingly branched, tapering, subulate, totally sorediate. Podetia K-, or K+ faintly brownish, KC-, P+ red. Fumarprotocetraic acid present.

Specimen examined: CPUH 3045 on bark, Murari Devi Temple, 1753m, Sikandra dhar (H.P.), February 25, 2018.

8. *Dermatocarpon vellereum* Zschacke

Rabenh. Krypt.-Fl., Edn 2 (Leipzig) 9, **1(1)**: 638 (1934)

Morpho-chemotaxonomic characters: Thallus saxicolous, foliose, usually monophyllous, upto 12 cm across, umbilicate, rather thick, leathery; upper side light brownish to brownish red, white to dark pruinose; lower side black, with dense, thick, stumpy, coralloid rhizinomorphs; thallus 200-450 µm thick in marginal area, 600-1000 µm thick in central part; upper cortex 18-35µm thick; lowesr cortex 35-100 µm thick. Perithecia pale red; ascospores ellipsoid, 9-12 X (-5) 6-9 µm.

Specimen examined: CPUH 3117, on rock, Ghaadi, 1667m, Sikandra Dhar (H.P.), February 25, 2018.

9. *Heterodermia pseudospeciosa* (Kurok.) W.L. Culb,

Bryologist **69**: 484 (1967)

Synonym: *Anaptychia pseudospeciosa* Kurok.

Morpho-chemotaxonomic characters: Thallus terricolous,foliose, rosettiform, upto 5cm across, branched; lobes short, flexuose, to 1.5 mm wide, corticated on both sides; upper side greyish white, sorediate on apices of lobules; lower side white to dark, with sparse rhizines. Medulla K+ yellow turning red, C-, P+ yellow. Zeorin, norstictic and salazinic acids present.

Specimen examined: CPUH 3042, on bark, near Murari Devi Temple, 2133m, Sikandra Dhar (H.P.), February 25, 2018.

10. *Hyperphyscia syncolla* (Tuck. ex Nyl.) Kalb

Lichenes Neotropici, Fascicle VI (nos 201-250) (Neumarkt): no. 230 (1983)

Synonym: *Physcia syncolla* Tuck. ex Nyl., *Physciopsis syncolla* (Tuck. ex Nyl.) Poelt.

Morpho-chemotaxonomic characters: Thallus corticolous, foiliose, firmly adnate, usually not sepa-

rable, upto 2 cm across: lobes upto 2 mm wide: upper side greyish brown to dark brown, pruinose or not, centrally often verrucose, lacking isidia and soredia; medulla white; lower side brown to black centrally. Apothecia to 2 mm in diameter; ascospores. Medulla K+ purple (skyrin).

Specimen examined: CPUH 3042, on bark, near Murari Devi Temple, 2133m, Sikandra Dhar (H.P.), February 25, 2018.

11. *Hypotrachyna masonhalei* Patw. & Prabhu

Bryologist **80(2)**: 348 (1977)

Synonym: *Parmelia mason-halei* (Patw. & Prabhu) Ajay Singh.

Morpho-chemotaxonomic characters: Thallus corticolous, foiliose, upto 7 cm across, lobate; lobes linear, upto 2 mm wide; upper surface grey, lacking isidia and soredia; lower side blackish with sparse, dichotomously branched rhizines; medulla white. Medulla K+ yellow turning red, C-, P+ orange. Norstictic and salazinic acid present.

Specimens examined: CPUH 3051, on bark, Kunth bhiyog (H. P.), March 18, 2018; CPUH 3052, on bark, Kunth Bhiyog (H. P.), March 18, 2018.

12. *Lecanora chlarotera* Nyl.

Soc. Linn. Normandie, Sér. 2 **6(2):** 274 (1872)

Synonyms: *Lecanora albella* f. *chlarona* (Ach.) Blomb. & Forssell, *Lecanora albella* var. *chlarona* (Ach.) Nyl., *Lecanora chlarona* (Ach.) Nyl., *Lecanora chlarona* (Ach.) Nyl., *Lecanora chlarona* (Ach.) Nyl., *Lecanora chlarona* var. *chlarotera* (Nyl.) H. Olivier, *Lecanora chlarotera* f. *crassula* (H. Magn.) Poelt, Lecanora coilocarpa var. chlarona (Ach.) Elenkin, *Lecanora crassula* H. Magn., *Lecanora distincta* var. *chlarona* Ach., *Lecanora rugosa* Nyl., *Lecanora subfusca* f. *chlarona* (Ach.) Körb., *Lecanora subfusca* f. *chlarotera* (Nyl.) H. Olivier, *Lecanora subfusca* var. *chlarona* (Ach.) Ach., *Lecanora subfusca* var. *chlarotera* (Nyl.) Harm.

Morpho-chemotaxonomic characters: Thallus corticolous, crustose, pale grey, strongly warted, forming distinct, rounded colonies but not bounded by a prothallus. Apothecia with thick, thalline, crenulated or contorted margins, discs buff to chestnut brown.

Specimens examined: CPUH 3011, on bark, near Murari Devi Temple, 2133m, Sikandra Dhar (H.P.), February 25, 2018; CPUH 3049, on bark, near Murari Devi Temple, 2133m, Sikandra Dhar (H.P.), February 25, 2018; CPUH 3104 on bark, near Murari Devi Temple, 2133m, Sikandar Dhar (H.P.), February 25, 2018.

13. *Parmotrema austrosinense* (Zahlbr.) Hale

Phytologia **28**: 335 (1974)

Synonym: *Parmelia austrosinensis* Zahlbr.

Morpho-chemotaxonomic characters: Thallus corticolous, foliose, upto 10 cm across; lobes rotund, upto 15 (-20) mm wide, eciliate upper side glaucous to pale grey, faintly white-maculate, soralia marginal, linear; soredia farinose to granular; lower side centrally black, wide marginal zone ivory, yellow-brown mottled, nude; medulla white. Medulla K-,C+ red, KC+ red, P Lecanoric acid present.

Specimen examined: CPUH 3091, on twig, Chowk, 1133m, Sikandra Dhar (H.P.), February 25, 2018.

14. *Parmotrema ravum* (Krog & Swinscow) Sérus

In: *Vězda, Lichenes Selecti Exsiccati, Fascicle* **75** *(Průhonice)*: 3 (1983)

Synonym: *Parmelia rava* Krog & Swinscow

Morpho-chemotaxonomic characters: Thallus corticolous, foliose, adnate, upto 10cm across; lobes 5-12

mm wide, eciliate; upper side pale yellow grey, faintly white maculate or emaculate, soralia marginal, linear to subcapitate on peripheral lobes; soredia granular; lower side centrally black, marginal zone tan, nude; medulla white. Cortex K+ yellow; medulla K-, C-, KC-, P+ orange- red. Atranorin and usnic acid in cortex; protocetraric acid in medulla.

Specimen examined: CPUH 3096, on bark, Sikandra, 1540m, Sikandra Dhar (H.P.), February 25, 2018.

15. *Parmotrema tinctorum* (Despr. ex Nyl.) Hale

Phytologia **28:** 339 (1974)

Synonym: *Parmelia tinctoria* Despr. ex Nyl., *Parmelia tinctorum* Despr. ex Nyl., *Parmotrema tinctorium* (Despr. ex Nyl.) Hale.

Morpho-chemotaxonomic characters: Thallus corticolous, foiliose, usually 8-20 cm across, eciliate; upper side grey to darker, emaculate; isidia granular to filiform becoming coralloid or rarely flattened; lower side centrally black, wide marginal zone tan to brown, nude; medulla white. Medulla K-, C+ red, P-. Lecanoric acid and traces of orsellinic acid present.

Specimen examined: CPUH 3087, on bark, near Murari Devi Temple, 2133m, Sikandra Dhar (H.P.), February 25, 2018.

16. *Phaeophyscia ciliata* (Hoffm.) Moberg

Symb. Bot. Upsal. **22(1)**: 30 (1977)

Synonym: *Lichen ciliatus* Hoffm., *Physcia ciliata* (Hoffm.) Du Rietz

Morpho-chemotaxonomic characters: Thallus corticolous, up to 5 cm across; lobes upto 1.5 mm wide; upper side grey-brown to brown-black, lacking isidia and soredia; lower side black, rhizinate; photobiont layer irregularly thick; medulla white, thinApothecia to 3 mm in diam., coronate; ascospores Physcia-type, (18-) 20-26 (-28) X 8-12 µm.

Specimens examined: CPUH 3048, on bark, near Murari Devi Temple, 2133m, Sikandra dhar, February 25, 2018; CPUH 3062, on bark, near Murari Devi Temple, 2133m, Sikandra dhar, February 25, 2018.

17. *Phaeophyscia hispidula* (Ach.) Essl.

Mycotaxon **7(2)**: 305 (1978)

Synonym: *Parmelia hispidula* Ach., *Physcia hispidula* (Ach.) Frey, *Phaeophyscia hispidula* (Ach.) Essl.

Morpho-chemotaxonomic characters: Thallus corticolous, foliose, upto 8 cm across; lobes 2-3 (-5) mm wide, with rounded apices; upper side grey-brown; soralia laminal, capitate, often extending up to margin; soredia rarely becoming granular; lower side black, rhizines long, black, projecting beyond the lobes; medulla white. Apothecia to 3 mm in diam., coronate; ascospores Physcia-to Pachysporaria-type, 18-27 (-30) X 9-12 (-15) µm.

Specimens examined: CPUH 3050, on bark, Pandit ka naun, 1745m, Sikandra dhar, February 25, 2018; CPUH 3068, on bark, Pandit ka naun, 1745m, Sikandra dhar, February 25, 2018; CPUH 3069, on bark, Pandit ka naun, 1745m, Sikandra dhar, February 25, 2018; CPUH 3070, on bark, Pandit ka naun, 1745m, Sikandra dhar, February 25, 2018; CPUH 3071, on bark, Pandit ka naun, 1745m, Sikandra dhar,

February 25, 2018; CPUH 3075, on bark, Pandit ka naun, 1745m, Sikandra dhar, February 25, 2018; CPUH 3103, on bark, Pandit ka naun, 1745m, Sikandra dhar, February 25, 2018; CPUH 3105, on bark, Pandit ka naun, 1745m, Sikandra dhar, February 25, 2018; CPUH 3106, on bark, Pandit ka naun, 1745m, Sikandra dhar, February 25, 2018.

18. *Physcia crispa* Nyl.

Syn. Meth. Lich. (Parisiis) **1(2)**: 423 (1860)

Synonym: *Dimelaena crispa* (Nyl.) Trevis.

Morpho-chemotaxonomic characters: Thallus corticolous, foliose, upto 3 cm across; lobes 1 mm wide, crenulated, with small protrusions becoming isidia-like and breaking into soredia; upper side grey to bluish grey; lower side whitish; rhizines pale; lower cortex paraplectenchymatous. Medulla K-.

Specimens examined: CPUH 3001, on bark, Gehayin ka galu, 1590 m, Sikandra Dhar (H.P.), February 25, 2018; CPUH 3003, on bark, Gehayin ka galu, 1590 m, Sikandra Dhar (H.P.), February 25, 2018; CPUH 3085, on bark, Gehayin ka galu, 1590 m, Sikandra Dhar (H.P.), February 25, 2018.

19. *Physcia integrata* Nyl.

Syn. Meth. Lich. (Parisiis) **1(2)**: 424 (1860)

Morpho-chemotaxonomic characters: Thallus corticolous, foliose, upto 5 cm across; lobes 1-2 mm wide, rarely minutely lobulate in central part; upper side greyish, lacking isidia and soredia; lower side black; lower cortex paraplectenchymatous. Apothecia to 2 mm in diam.; ascospores Pachysporaria-type, 18-28 X 8-12 µm. Medulla K+ yellow, leucotylin and zeorin present.

Specimens examined: CPUH 3024, on bark, near forest rest house, Murari Devi, 2061m, Sikandra Dhar, February 25, 2018; CPUH 3056, on bark, near forest rest house, Murari Devi, 2061m, Sikandra Dhar, February 25, 2018.

20. *Physcia semipinnata* (Leers ex J.F. Gmel.) Moberg

Symb. Bot. Upsal. **22(1)**: 56 (1977)

Morpho-chemotaxonomic characters: Thallus corticolous, loosely adnate, orbicular, upto 3cm across; thalli often confluent covering larger areas; lobes long, narrow, upto 1mm wide; ascending; marginal cilia long with darker tips; upper side whitish grey to darker, white-maculate, lacking isidia and soredia; lower side pale grey to brown; rhizines few, slightly darker, blackened at tips. Apothecia upto 3 mm in diam; ascospores 17-22(-24) X 7.5-10 µm. Medulla K-.

Specimens examined: CPUH 3085, on bark, Doh (H.P.), 1250m, March 18, 2018.

21. *Punctelia neutralis* (Hale) Krog

Nordic J. Bot. **2(3)**: 291 (1982)

Synonym: *Parmelia neutralis* Hale

Morpho-chemotaxonomic characters: Thallus corticolous, to 5cm across; lobes to 5mm wide, grey to brownish grey; pseudocyphellae laminal, becoming sorediate; medulla white; lower side pale brown. Chemistry: Medulla K-, C-, P-. Caperatic acid present.

Specimens examined: CPUH 3072, on bark, Shikandra, 1540m, Sikandra Dhar (H.P.), February 25, 2018; CPUH 3077, on bark, Shikandra, 1540m, Sikandra Dhar (H.P.), February 25, 2018; CPUH 3080, on bark, Shikandra, 1540m, Sikandra Dhar (H.P.), February 25, 2018.

22. *Punctelia subrudecta* (Nyl.) Krog

Nordic J. Bot. **2(3)**: 291 (1982)

Synonym: *Parmelia subrudecta* Nyl., *Parmelia borreri* var. *subrudecta* (Nyl.) Clauzade & Cl. Roux.

Morpho-chemotaxonomic characters: Thalllus corticolous, 4-6 cm across; lobes 1-3 mm wide; upper side grey to bluish grey, pseudocyphellae punctiform, becoming sorediate; laminal and marginal soralia also present; lower side pale brown. Pycnoconidia unciform, 5-7 µm long. Medulla K-,C+ red, KC+ red, P-. Lecanoric acid present.

Specimen examined: CPUH 3089, on bark, Shikandra, 1540m, Sikandra Dhar (H.P.), February 25, 2018.

23. *Pyxine asiatica* Vain

Hedwigia **46**: 171 (1907)

Morpho-chemotaxonomic characters: Thallus corticolous, foliose, upto 3 cm across; lobes 0.8-1.5 mm wide at periphery; upper side grey to greenish grey, white- maculate, maculae later fissured into pseudocyphellae; soralia laminal, orbicular; soredia farinose; medulla white. Medulla K+ yellowish, C-, P+ yellow to orange, triterpenes present.

Specimens examined: CPUH 3113, on rock, Shikandra, 1540m, Sikandra dhar (H.P.), February 25, 2018; CPUH 3064, on rock, Shikandra, 1540m, Sikandra dhar (H.P.), February 25, 2018.

24. *Pyxine isidiophora* (Müll. Arg.) Imshaug

Lamb's Index nom. Lich.: 612

Morpho-chemotaxonomic characters: Thallus corticolous; foliose, lobes convex; upper side whitish grey, isidiate; isidia globose to cylindrical, simple to branched; medulla white. Apothecia to 2.4 mm in diam.; margins pseudothalline; ascospores 13-17 (-19) X 5-8 µm.

Specimens examined: CPUH 3067, on bark, Shikandra, 1540m, Sikandra dhar (H.P.), February 25, 2018.

25. *Pyxine subcinerea* Stirt

Trans. Proc. N.Z. Inst. **30**: 397 (1898)

Morpho-chemotaxonomic characters: Thallus corticolous, foliose, upto 7 cm across; lobes 1-2 mm wide; upper side greyish; margins intermittently pseudocyphellate; pseudocyphellate developing into soralia and spreading on to lamina; soredia white to stramineous; medulla yellow. Apothecia 1-2 mm in diameter; exciple pseudothalline in young stages, later black; ascospores 12-20 (22) X 6-8 µm. Upper cortex UV+ yellow; medulla K-, C-, P-, lichexanthone in cortex and triterpenes in medulla present.

Specimens examined: CPUH 3073, on bark, Shikandra, 1540m, Sikander Dhar (H.P.), February 25, 2018; CPUH 3074, on bark, Shikandra, 1540m, Sikander Dhar (H.P.), February 25, 2018; CPUH 3079, on bark, Shikandra, 1540m, Sikander Dhar (H.P.), February 25, 2018.

Table 1: Number of specimens collected and identified lichenized fungi from twenty one localities of Shikndra region.

Localities	No. of specimens	Identified species
Murari Devi	4	*Cladonia coniocraea* *Heterodermia pseudospeciosa* *Physcia crispa* *Physcia integrata*
Gehayin ka Galu	5	*Brianaria bauschiana* *Canoparmelia pustulescens* *Chrysothrix candelaris* *Parmotrema austrosinense* *Physcia crispa*
Ghaadi	2	*Chrysothrix chlorina* *Lecanora chlarotera*
Churain	3	*Chrysothrix chlorina* *Cladonia coniocraea* *Physcia integrata*
Darba	1	*Chrysothrix chlorina*
Pandit ka Naun	4	*Aspicilia calcarea* *Hypotrachyna masonhalei* *Lecanora chlarotera* *Phaeophyscia ciliata*
Sikandra	4	*Phaeophyscia ciliata* *Physcia crispa* *Physcia integrata* *Pyxine asiatica*
Chunathar	2	*Phaeophyscia hispidula* *Pyxine isidiophora*
Jaba	3	*Phaeophyscia hispidula* *Punctelia neutralis* *Pyxine subcinerea*
Badi	3	*Phaeophyscia hispidula* *Punctelia neutralis* *Pyxine subcinerea*
Kashmali	3	*Phaeophyscia hispidula* *Physcia crispa* *Physcia semipinnata*
Naina devi	3	*Chysothrix candalensis* *Parmotrema tinctorum* *Physcia crispa*
Kuntbhiyog	5	*Chrysothrix chlorina,* *Hyperphyscia syncolla* *Parmotrema ravum* *Physcia integrata* *Punctelia subrudecta*
Doh	5	*Chrysothrix chlorina,* *Lecanora chlarotera* *Hyperphyscia syncolla* *Phaeophyscia hispidula* *Physcia crispa*
Bhauran	2	*Brianaria bauschiana* *Pyxine asiatica*
Chowk	2	*Dermatocarpon vellereum* *Phaeophyscia hispidula*
Padhyan	3	*Lecanora chlarotera* *Phaeophyscia hispidula* *Physcia crispa*

Karni	3	*Chrysothrix chlorine* *Phaeophyscia hispidula* *Physcia crispa*
Plasi	3	*Chrysothrix chlorine* *Lecanora chlarotera* *Physcia integrata*
Matiyara	4	*Dermatocarpon vellereum* *Lecanora chlarotera,* *Phaeophyscia hispidula* *Physcia crispa*
Samaila	1	*Chrysothrix chlorina*

Total 2: Lichenized fungi of Shikndra dhar region.

Sr. No.	Family	Genera	Species
1	Caliciaceae	*Pyxine*	*Pyxine asiatica*
			Pyxine isidiophora
			Pyxine subcinerea
2	Candelariaceae	*Candelaria*	*Candelaria concolor*
3	Chrysotrichaceae	*Chrysothrix*	*Chrysothrix candelaris*
			Chrysothrix chlorina
4	Cladoniaceae	*Cladonia*	*Cladonia coniocraea*
5	Lecanoraceae	*Lecanora*	*Lecanora chlarotera*
6	Megasporaceae	*Aspicilia*	*Aspicilia calcarea*
7	Parmeliaceae	*Canoparmelia*	*Canoparmelia pustulescens*
		Hypotrachyna	*Hypotrachyna masonhalei*
		Parmotrema	*Parmotrema austrosinense*
			Parmotrema ravum
			Parmotrema tinctorum
		Punctelia	*Punctelia neutralis*
			Punctelia subrudecta
8	Physciaceae	*Heterodermia*	*Heterodermia pseudospeciosa*
		Hyperphyscia	*Hyperphyscia syncolla*
		Phaeophyscia	*Phaeophyscia ciliata*
			Phaeophyscia hispidula
			Physcia crispa
			Physcia integrata
			Physcia semipinnata
9	Psoraceae	*Brianaria*	*Brianaria bauschiana*
10	Verrucariaceae	*Dermatocarpon*	*Dermatocarpon vellereum*

Table 3: Species already documented from Mandi district of Himachal Pradesh[19].

Sr. No.	Family	Species
1	Collemataceae	*Collema rugosum*
2	Lecanoraceae	*Aspicilia caesiocinerea*
3	Lecanoraceae	*Aspicilia calcarea*
4	Parmeliaceae	*Parmotrema nilgherrense*
5	Parmeliaceae	*Punctelia rudecta*
6	Peltigeraceae	*Peltigera dolichorhiza*
7	Physciaceae	*Heterodermia diademata*
8	Caliciaceae	*Pyxine petricola*

9	Pyrenulaceae	*Anthracothecium assamiense*
10	Pyrenulaceae	*Anthracothecium oculatum*
11	Pyrenulaceae	*Anthracothecium platystomum*
12	Pyrenulaceae	*Pyrenula immersa*
13	Pyrenulaceae	*Pyrenula introducta*
14	Pyrenulaceae	*Pyrenula oculata*
15	Ramalinaceae	*Ramalina sinensis*
16	Verrucariaceae	*Dermatocarpon vellereum*
17	Verrucariaceae	*Staurothele clopima*

CONCLUSION: During the present study, twenty five species of lichenized fungi have been recorded from Skindra dhar reion of district mandi. Earlier researchers have reported seventeen species of lichens from the entire district except from the present study area (Table 3).[19] The analysis of the baseline data with the current findings has revealed that out of the twenty five species recorded during the present study, two species are same (*Aspicilia calcarea* (L.) Körb, *Dermatocarpon vellereum* Zschacke) other twenty three species are new record for the district Mandi of Himachal Pradesh. It is being concluded that with the addition of these twenty three species, the species diversity of lichenized fungi of district Mandi (Himachal Pradesh) accounts for forty species (Table 4).

Table 4: Ckecklist of species of lichenized fungi in district Mandi (Himachal Pradesh).

Sr. No.	Family	Species
1.	Caliciaceae	*Pyxine asiatica*
2.	Caliciaceae	*Pyxine isidiophora*
3.	Caliciaceae	*Pyxine petricola*
4.	Caliciaceae	*Pyxine subcinerea*
5.	Candelariaceae	*Candelaria concolor*
6.	Chrysotrichaceae	*Chrysothrix candelaris*
7.	Chrysotrichaceae	*Chrysothrix chlorina*
8.	Cladoniaceae	*Cladonia coniocraea*
9.	Collemataceae	*Collema rugosum*
10.	Lecanoraceae	*Aspicilia caesiocinerea*
11.	Lecanoraceae	*Lecanora chlarotera*
12.	Megasporaceae	*Aspicilia calcarea*
13.	Parmeliaceae	*Canoparmelia pustulescens*
14.	Parmeliaceae	*Hypotrachyna masonhalei*
15.	Parmeliaceae	*Parmotrema austrosinense*
16.	Parmeliaceae	*Parmotrema nilgherrense*
17.	Parmeliaceae	*Parmotrema ravum*
18.	Parmeliaceae	*Parmotrema tinctorum*
19.	Parmeliaceae	*Punctelia neutralis*
20.	Parmeliaceae	*Punctelia rudecta*
21.	Parmeliaceae	*Punctelia subrudecta*
22.	Peltigeraceae	*Peltigera dolichorhiza*
23.	Parmeliaceae	*Heterodermia pseudospeciosa*
24.	Parmeliaceae	*Heterodermia diademata*
25.	Parmeliaceae	*Hyperphyscia syncolla*
26.	Parmeliaceae	*Phaeophyscia ciliata*
27.	Parmeliaceae	*Phaeophyscia hispidula*
28.	Parmeliaceae	*Physcia crispa*

29.	Parmeliaceae	*Physcia integrata*
30.	Parmeliaceae	*Physcia semipinnata*
31.	Psoraceae	*Brianaria bauschiana*
32.	Pyrenulaceae	*Anthracothecium assamiense*
33.	Pyrenulaceae	*Anthracothecium oculatum*
34.	Pyrenulaceae	*Anthracothecium platystomum*
35.	Pyrenulaceae	*Pyrenula immersa*
36.	Pyrenulaceae	*Pyrenula introducta*
37.	Pyrenulaceae	*Pyrenula oculata*
38.	Ramalinaceae	*Ramalina sinensis*
39.	Verrucariaceae	*Dermatocarpon vellereum*
40.	Verrucariaceae	*Staurothele clopima*

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