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Ethnolichenological Notes on Lichens of Sikandra Dhar Region of North-West Himalaya

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ABSTRACT: Presence of a wide range of secondary metabolites in lichen thallus is variously utilized as medicine, food, fodder, dye and spices. During the lichen floristic studies undertaken during January to September in 2018, three hundred specimens of lichens were collected from Sikandra dhar region of district Mandi (Himachal Pradesh). These specimens were then investigated morpho-chemo-taxonomically and identified. Out of these, seven species of lichens viz. *Aspicilia calcarea* (L.) Körb., *Cladonia coniocraea* (Flörke) Spreng., *Dermatocarpon vellereum* Zschacke, *Lecanora chlarotera* Nyl., *Parmotrema austrosinense* (Zahlbr.) Hale, *Parmotrema tinctorum* (Despr. ex Nyl.) Hale and *Punctelia borreri* (Turner) Krog are of ethnolichenological importance. *Aspicilia calcarea* is a source of nutrition for mites, snails and caterpillars. *Cladonia coniocraea* is a good source of carbohydrates and mixed with flour. *Dermatocarpon vellereum* has antimicrobial properties against human pathogens *viz. Staphylococcus aureus, S. faecalis* and *Pseudomonas aeruginosa. Parmotrema tinctorum* has a good food value as it contains high protein content (14%) along with amino acids, ergosterol, iron and calcium. It is also a source of brown dye for textile. *Parmotrema austrosinense* is antimicrobial and has antioxidant and anti-phytopathogenic effect. *Punctelia borreri* is medicinal and used to cure blurred vision, bleeding from uterus, bleeding from external injuries, sores, swelling, chronic dermatitis and localized swelling.

Keywords: Antimicrobial; Antioxidant; Antiphytopathogenic; Ethnolichnological and Secondary metabolites.

INTRODUCTION: The lichen thallus is a dual organism entity composed of symbiotic association between alga (photobiont) and fungi (mycobiont).[1] Lichens contain 400 secondary metabolites, of which 230 are unique and specifically found in this group of plants.[2] These secondary metabolites include depsides (e.g. olivetoric acid), depsidones (e.g. physodic acid), and dibenzonfuran derivatives (e.g. usnic acid). The unique biochemical compounds produced by lichens have made them useful to people in traditional culture as food, sources for dyes, fragrances and medicines.[3&4] Lichens are eaten by human in America, Europe, Asia, and Africa, and perhaps elsewhere.[4,5] A century ago it had been prophesized that lichens were to become the great popular food of the masses, because of their cheapness and nutritive properties. People have traditionally used various preparation methods to make lichens edible by removing the lichen secondary compounds and hydrolyzing the lichen polysaccharides.[6] The most frequently used preparation technique is boiling or steaming, used in North America, Europe, and India. Lichens may also provide some other nutrients to the diet. Calcium and iron levels have been found to be higher in some lichens than in cereals and thus comparable to green leafy material.[7]

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). The study area falls in Suket, Bhambla and Nagrota forests. The lichens were identified by studying their morphology, anatomy and chemistry. Authenticated taxonomic keys were referred for identification of lichen species.[8,9,10] The chemicals used for the chemical spot tests of the lichens were prepared using standard method.[11]

RESULTS AND DISCUSSION: During the morpho-chemotaxonomic investigations, a total of twenty five species of lichens were identified.[12] Out of these, seven species of lichens viz. *Aspicilia calcarea* (L.) Körb., *Cladonia coniocraea* (Flörke) Spreng., *Dermatocarpon vellereum* Zschacke, *Lecanora chlarotera* Nyl., *Parmotrema austrosinense* (Zahlbr.) Hale, *Parmotrema tinctorum* (Despr. ex Nyl.) Hale and *Punctelia borreri* (Turner) Krog are of ethnolichenological importance. The details are as follows:

1. *Aspicilia calcarea* (L.) Körb

Growth form is crustose, thallus chalky white, smooth to cracked-areolate, margin well-defined, usually with radial cracking. Apothecia embedded in the thallus, with black discs, or initially grey-pruinose, one or more per areole.

Distribution in Sikandra Dhar Region: Kuntbhiyog.

Collection examined: CPUH 3054.

Ethnolichenological Notes: It is a source of nutrition for mites, snails and caterpillars.

2. *Cladonia coniocraea* (Flörke) Spreng

Growth form is fruticose, 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, escyphose or sometimes scyphose; scyphi infrequent, 1-2 mm wide, totally sorediate. Podetial surface corticated near base, with or without squamules, major upper part decorticated, farinose–sorediate. Hymenial discs brown at tips of podetia. Podetia K-, or K+ faintly brownish, KC-, P+red. Fumarprotocetraic acid present.

Distribution in Sikandra Dhar Region: Murari Devi Temple.

Specimen examined: CPUH 3045.

Ethnolichenological Notes: It is a good source of carbohydrates and mixed with flour.

3. *Dermatocarpon vellereum* Zschacke

Growth form is foliose, thallus saxicolous, usually monophyllous, to 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 × (-5) 6-9 µm.

Distribution in Sikandra Dhar Region: Ghaadi.

Collection Examined: CPUH 3117.

Ethnolichnological Note: It has antimicrobial properties against human pathogens viz. *Staphylococcus aureus, S. faecalis* and *Pseudomonas aeruginosa.*

4. *Lecanora chlarotera* Nyl Bull.

Growth form is crustose, thallus cream to pale grey, almost smooth to strongly warted (like lumpy porridge), often forming distinct, rounded colonies but not bounded by a prothallus. Apothecia with thick, thalline, crenulated or contorted margins, discs buff to chestnut brown, not or only slightly pruinose.

Distribution in Sikandra Dhar Region: Murari Devi Temple.

Specimen examined: CPUH 3011, CPUH 3049, CPUH 3104.

Ethnolichenological note: It is found in various parts of the world covering the soil. Its powere and flour is used to prepare earth bread.

5. *Parmotrema austrosinense* (Zahlbr.) Hale

Growth form is foliose, thallus corticolous, saxicolous, to 10 cm across; lobes rotund, to 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. Apothecia rare, to 5 mm in diam., perforate; ascospores 10-16 × 6-10 µm; epispore 1.5 µm thick. Pycnoconidia 10-14 µm long. Medulla K-, C+ red, KC+ red, P Lecanoric acid present.

Distribution in Sikandra Dhar Region: Chowk.

Collection examined: CPUH 3091.

Ethnolichnological Notes: Its extracts have antioxidant and antiphytopathogenic effect on pathogenic microorganisms.

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

Growth form is crustose, thallus corticolous or saxicolous, usually 8-20 cm across, lobes 10-20 (-30) mm wide, 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. Apothecia rare, to 10 mm in diam., imperforate; ascospores (13-) 15-18 × 6-9 (-10) µm, epispore 1.5 µm thick. Medulla K-, C+ red, P-. Lecanoric acid and traces of orsellinic acid present.

Distriution in Sikandra Dhar Region: Murari Devi Temple.

Collection examined: CPUH 3087.

Ethnolichnological Notes: It has high protein content and interesting amino acid composition together with ergosterol and inorganic constituent of iron and calcium (14% crude protein). It is also used for production of brown colour dye.

7. *Punctelia borreri* (Sm.) Krog

Growth form is foliose, thallus corticolous or saxicolous, 6-8 cm across; lobes (2-) 4-6 mm wide, rounded; upper side grey to bluish grey, pseudocyphellae punctiform, eventually becoming sorediate; normal soralia capitates; lower side black, marginal area pale brown with rhizinal papillate or nude. Medulla K-, C- red, KC+ red, P-. Gyrophoric acid present.

Distribution in Sikandra Dhar Region: Sikandra Dhar.

Collection Examined: CPUH 3047.

Ethnolichnological Notes: Used for curing blurred vision, bleeding from uterus, bleaching from external injuries, sores and swelling, chronic dermatitis, and localized swelling.

CONCLUSION: During the present study, thirty species of lichen have been recorded from Skindra dhar of district Mandi (Himachal Pradesh). Out of these seven species of lichens are of ethnolichenological importance. These lichen species have nutritional value and can be used as food, fodder, medicine, dyes and spices.

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