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Floristic Studies on Cryptogams of Sarkaghat region in Himachal Pradesh, India

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ABSTRACT: Floristic studies were conducted in the Sarkaghat region of Mandi district, Himachal Pradesh (India) during July 2019 to August 2020 to explore the diversity of cryptogams including algae, bryophytes, lichens and pteridophytes. Specimens of cryptogams were collected from various localities (Gadyahra, Gadohal, Bidi, Parchu, Balh, Ratkel, Tasli nala, Sarkaghat, Barchwar, Longani and Dhagwani) of Sarkaghat region with the help of equipments like knife, spatula, trowel, forceps and also by hands. The specimens were initially stored in containers, plastic bags and paper packets. Field data was recorded in field note book including locality name, collection date and substratum. The specimens were pressed, dried and identified with the help of identification keys and latest literature. During the present investigations, a total of 63 species of cryptogams of families Zygnemataceae, Ulothriaceae, Hydrodictyaceae, Cladophoraceae, Tabellariaceae, Marchantiaceae, Aytoniaceae, Bryaceae, Anthocerotaceae, Funariaceae, Hypnaceae, Polytrichaceae, Fissidentaceae, Candelariaceae, Verrucariaceae, Cladoniaceae, Parmeliaceae, Physciaceae, Calicariaceae, Graphidaceae, Lecanoraceae, Pteridaceae, Aspleniaceae, Dryopteridaceae, Equisetaceae, Athyriaceae, Marseliaceae, Selaginellaceae, Thelypteridaceae, Cheilanthaceae, Lygodiaceae and Polypodiaceae had been identified.

Keywords: Cryptogams; Sarkaghat; algae; bryophytes; lichens and pteridophytes.

INTRODUCTION: Cryptogams are the spore producing plants which grows on moist and shady areas.[1] Cryptogams are non vascular plants divided into four groups such as algae, bryophytes, lichens and pteridophytes which are able to fix atmospheric nitrogen and carbon dioxide.[2] However, it also includes non – photosynthetic organisms traditionally classified as plants such as Fungi, Slime mould and Bacteria.[3] Algae are thallophytes that lack roots, stems, leaves and contain Chl 'a' as primary photosynthetic pigment. They are found in fresh and marine habitats and show a great diversity in morphology, pigments and metabolic products. The ninety percent of the atmospheric oxygen is evolved by the algae mainly found in lakes, rivers and oceans.[4] Bryophytes are the distinct group of primitive plants found in moist and shady places and are considered as the second largest group of the land plants.[5] These are the first colonized green plants which show a great advancement in morphology and reproduction.[6-7] Bryophytes are divided into four classes, the two classes of liverworts (Marchantiopsida and Jungermanniales), hornworts (Antheropsida) and the mosses (Bryopsida).[8] These are non flowering plants having gametophytic plant body with haploid and diploid structures.[9] Lichens are thallophytes characterized by the symbiotic association between the fungus and algal group.[10] The algal component is termed as phycobiont while the fungal component is known as mycobiont. Lichens show great distribution from arctic to tropical and plains to mountains. India has rich pteridophytic flora because of variant micro-climatic conditions.[11] Pteridophytes are spore producing lower vascular plants which are intermediate between bryophytes and spermatophytes (Gymnosperm and Angiosperm). Beside food values, these also have medicinal (Homeopathic and Ayuevedic medicines) and aesthetic values.[12-13] Cryptogams are the lower plants which are used for the treatment of various diseases by the people of tribal areas. For present and past generation, a greater effort should be given to conserve and cultivate the cryptogams. The detailed review of published record of distribution and diversity of cryptogams revealed that Sarkaghat region remained unexplored for the floristic diversity of cryptogams.[14-44] Therefore, studies were initiated for floristic enumeration of cryptogams in-

cluding algae, lichens, bryophytes and pteridophytes from Sarkaghat region in Mandi district of Himachal Pradesh.

MATERIALS AND METHODS: Sarkaghat is a town, a nagar panchayat and a tehsil in Mandi district in the Indian state of H.P. The state of Himachal Pradesh is divided into twelve districts and Mandi is one of the district with its headquarter at mandi. Sarkaghat town is located at 60km away from the district headquarter. The town has sub tropical climate. The temperature varies from 10°C to 45°C with June as the hottest and the January as the coldest month. Specimens of cryptogams including algae, bryophytes, pteridophytes & lichens were collected from different region in and around sarkaghat region from various localities.

During specimen collection, hammer, knife, spatula, polythene bag, bottles were used. These specimens were preserved as herbarium. The specimens were recorded, photographed and identified on the basis of morphological, anatomical and micro-chemical characteristics after consulting latest literature.[45-50] A total of 192 specimens were collected from twelve localities (Gadyahra, Gadohal, Bharari, Bidi, Longani, Parchu, Sarkaghat, Barchwar, Pipli, Ratkel, Tasli nala and Dhagwani) of the Sarkaghat region, All these specimens have been identified and deposited in CPUH (The Herbarium, Department of Biosciences, CPU Hamirpur).

RESULTS AND DISCUSSION: In the present investigation, an attempt has been made for the collection, identification and preservation of cryptogams from the different sites of Sarkaghat region. Out of total 182 specimens, sixty three species of cryptogams have been identified (Table 1). Bryophytes play important role in ecosystem functioning such as soil development, water retention and nitrogen fixation. Lichens are used as a source of dye, fragrances, medicines whereas some provide nutrients to the diet due to high concentration of calcium and iron. Ferns are used by local people in the form of vegetable, powder, decoction, extracts and ornamental purposes.

The cryptogams of Sarkaghat region still remain unexplored and therefore, there is a need to explore the status and indigenous uses of cryptogams. The documentation and preservation of medicinally important cryptogams of the Sarkaghat region should be necessary step for future research.

Table 1: List of cryptogams of Sarkaghat region in Himachal Pradesh.

Sr. No.	Cryptogram Group	Species
1.	Algae	*Cladophora glomerata*
2.	Algae	*Hydrodictyon reticulatum*
3.	Algae	*Spirogyra porticalis*
4.	Algae	*Spirogyra varians*
5.	Algae	*Tabellaria flocculosa*
6.	Algae	*Ulothrix zonata*
7.	Bryophyte	*Anthoceros erectus*
8.	Bryophyte	*Asterella californica*
9.	Bryophyte	*Atrichum undulatum*
10.	Bryophyte	*Bryum argenatum*
11.	Bryophyte	*Fissidens adianthoides*
12.	Bryophyte	*Funaria hygrometrica*
13.	Bryophyte	*Hypnum cupressiforme*
14.	Bryophyte	*Marchantia polymorpha*
15.	Bryophyte	*Plagiochasma appendiculatum*
16.	Bryophyte	*Polytrichum commune*
17.	Bryophyte	*Polytrichum juniperinum*
18.	Bryophyte	*Polytrichum juniperinum*
19.	Bryophyte	*Ptilium crista-castrensis*
20.	Lichen	*Buellia disciformis*
21.	Lichen	*Candelaria concolor*
22.	Lichen	*Chrysothrix candelaris*
23.	Lichen	*Chrysothrix chlorina*
24.	Lichen	*Cladonia coniocraea*
25.	Lichen	*Dermatocarpon vellereum*
26.	Lichen	*Graphis scripta*
27.	Lichen	*Lecanora chlarotera*
28.	Lichen	*Parmotrema andinum*
29.	Lichen	*Parmotrema austrosinense*
30.	Lichen	*Parmotrema mesotropum*
31.	Lichen	*Parmotrema praesorediosum*
32.	Lichen	*Phaeophyscia hispidula*
33.	Lichen	*Phaeophyscia orbicularis*
34.	Lichen	*Physcia crispa*
35.	Lichen	*Physcia dubia*
36.	Lichen	*Physcia integrata*
37.	Pteridophyte	*Adiantum capillus-veneris*
38.	Pteridophyte	*Adiantum incisum*
39.	Pteridophyte	*Adiantum phillipense*
40.	Pteridophyte	*Adiantum poireti*
41.	Pteridophyte	*Ampelopteris prolifera*
42.	Pteridophyte	*Asplenium dalhousiae*
43.	Pteridophyte	*Athyrium schimperi*

44.	Pteridophyte	*Cheilanthes albomarginata*
45.	Pteridophyte	*Cheilanthes anceps*
46.	Pteridophyte	*Cheilanthes bicolor*
47.	Pteridophyte	*Christella parasitica*
48.	Pteridophyte	*Diplazium maximum*
49.	Pteridophyte	*Dryopteris cochleata*
50.	Pteridophyte	*Dryopteris wallichiana*
51.	Pteridophyte	*Equisetum diffusum*
52.	Pteridophyte	*Equisetum ramosissimum*
53.	Pteridophyte	*Lygodium japonicum*
54.	Pteridophyte	*Marselia minuta*
55.	Pteridophyte	*Polystichum discretum*
56.	Pteridophyte	*Polystichum squarrosum*
57.	Pteridophyte	*Pteris cretica*
58.	Pteridophyte	*Pteris vittata*
59.	Pteridophyte	*Pyrrosia flocculosa*
60.	Pteridophyte	*Selaginella bryopteris*
61.	Pteridophyte	*Selaginella chrysocaulos*
62.	Pteridophyte	*Tectaria confluens*
63.	Pteridophyte	*Thelypteris dentata*

CONCLUSION: A total of sixty three species of cryptogams have been identified. Algae include families Zygnemataceae (2), Ulothriaceae (1), Hydrodictyaceae (1), Cladophoraceae (1) and Tabellariaceae (1). Bryophytes include families Marchantiaceae (1), Aytoniaceae (2), Bryaceae (1), Anthocerotaceae (1), Funariaceae (2), Hypnaceae (2), Polytrichaceae (3) and Fissidentaceae (1). Lichens include families Candelariaceae (3), Verrucariaceae (1), Cladoniaceae (1), Parmeliaceae (4), Physciaceae (5), Calicaceae (1), Graphidaceae (1) and Lecanoraceae (1). Pteridophytes includes families Pteridaceae (6), Aspleniaceae (1), Dryopteridaceae (6), Equisetaceae (2), Athyriceae (1), Marseliaceae (1), Selaginellaceae (2), Thelypteridaceae (3), Cheilanthaceae (3), Lygodiaceae (1) and Polypodiaceae (1).

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