



Taxonomic and Ethnobotanical Notes on Some Ferns and Fern Allies of Hamirpur (H.P.), North-Western Himalaya

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ABSTRACT: Keeping in view the ecological and ethnobotanical importance and in contrast to the insufficient data available on the geographical distribution, floristics and diversity of pteridophytes in Hamirpur (H.P.), the floristic investigations were initiated to describe and preserve ferns and fern allies of this Himalayan region. The present investigations have revealed the occurrence of twelve species of ferns and fern allies viz. *Adiantum capillus-veneris* L., *Adiantum incisum* Forssk., *Asplenium dalhousiae* Hook, *Athyrium attenuatum* (Wall. ex Clarke) Tagawa, *Cheilanthes bicolor* (Roxb.) Fraser-Jenkins, *Equisetum ramosissimum* Desf., *Onychium contiguum* Wall. ex Hope, *Onychium plumosum* Ching, *Pteris cretica* L., *Pteris vittata* L., *Selaginella chrysochaulos* (Hook. & Grev.) Spring and *Thelypteris dentata* (Forssk.) John. All these taxa are of ethnobotanical importance.

Keywords: Ferns; Fern Allies; Shivalik Hills; Pteridophyte; Himalaya and Ethnobotany.

INTRODUCTION: Pteridophytes, consisting of ferns and fern allies are one of the oldest groups of plants on Earth. Their unique intermediate position between lower cryptogams (Algae and Bryophytes) and higher plants (Gymnosperms and Angiosperms) makes them special group of plants. These were the dominant flora of Earth's vegetation about 250 million years ago and gradually replaced by higher and seed producing plants. They are direct evidences of evolution of vasculature and precursors of seed habit in higher plants. They occur in abundance in the tropical, sub-tropical and moist deciduous forests all over India. Degradation of habitats has significantly affected their species diversity and bio-geographic distribution. They are very easily vulnerable to anthropogenic activities and climate change. Due to their susceptibility to slightest variations in climatic conditions, they act as ecological indicators of habitat quality. They are medicinal and ornamental, besides having vital ecological roles. The medicinal uses of some ferns and fern allies of India have been well documented by various researchers.^{1,2&3} About 12,000 species of pteridophytes have been documented all over the world, of which India accounts for about 1267 species under 204 genera.⁴ About 49 species of fern and fern allies are endemic to India and distributed in six of the twelve bio-geographic zones of India.⁵ A total of 265 species of ferns have been so far recorded from Hima-

chal Pradesh.^{6,7} Whereas, pteridophytes are the second largest component of the Himalayan flora after flowering plants, however certain areas of the Himalaya such as Hamirpur District of Himachal Pradesh remained unexplored for species diversity of pteridophytes.⁶⁻⁴⁷ Keeping in view the ecological and ethnobotanical importance and in contrast to the insufficient data available on the geographical distribution, floristic and diversity of ferns and fern allies in this area, the floristic investigations were initiated to describe and preserve the ferns and fern allies of this Himalayan region.

MATERIAL AND METHODS:

Study Area: Hamirpur District (H.P.): Hamirpur is the smallest (area wise) and one of the twelve districts of Himachal Pradesh. It occupies an area of 1,118 km² and is located in the Shivalik hills of North Western Himalaya. It is situated between 76°17'5" to 76°43'42"E longitude and 31°02'48" to 31°53'35"N latitude with altitude ranging between 450m to 1,100m and temperature varies seasonally between 2°C to 43°C.

Experimental: Specimens of pteridophytes were collected from nine localities viz. Bhoranj, Bassi, Bhareri, Neri, Kanjian, Bhota, Bhair, Kharwar and Jahu of Hamirpur district, Himachal Pradesh during

February-April, 2017. The field data was recorded in the field note book during the excursions. The collected specimens were pressed, sun dried and mounted on herbarium sheets. Field data such as collection number, details of locality, host/substrate, and date of collection was pasted on the herbarium sheets. The specimens were brought to the Botany Laboratory at Department of Bio-Sciences, Career Point University, Hamirpur for further taxonomic studies and preservation. The specimens were identified by consulting latest literature and comparing with authenticated specimens. The system of classification as proposed by Fraser-Jenkins has been followed with some modifications.⁴⁸ Following data have been presented in the text for each taxa:

- General description of family and genus
- Taxonomic keys to the species
- Description of species along with authority, citation, ecological notes, earlier records of distribution in Himachal Pradesh.
- Herbarium no. with locality and date of collection from Hamirpur district of Himachal Pradesh.
- Photographic image.

RESULTS AND DISCUSSION:

The detailed descriptions of the pteridophytes being recorded from the study area are as follows:

Family: ADIANTACEAE Ching

Sunyatsenia 5: 229 (1940)

Rhizome erect or creeping, scaly. Stipe dark-brown to black, scaly/hairy/glabrous, glossy. Rachis glabrous. Lamina pinnate to 3-pinnate, hairy or glabrous. Sori indusiate, pseudindusia bearing sporangia. Spores brown, tetrahedral, trilete, non-perinate, exine smooth or granulose. This family is represented by a single genus *Adiantum* L. in the North Western Himalaya which was recorded during the present study.³⁶

Adiantum L.

Sp. Pl. 2: 1094 (1753)

Fronds uniform, generally erect or pendent or spreading. Stipes proximate or distant, dark-brown to blackish, hairy or scaly or glabrous, generally glossy; rachis generally similar to stipe. Lamina 1-3-pinnate (or more), usually herbaceous or coriaceous, hairy or glabrous, rarely glossy; pinnae sessile or petiolate, veins usually free. Sori linear or globose, marginal, confluent or interrupted, short, absent at the sinus of the segment, present on the distal part of the veins, sometimes also between them on the lower side of the leaf-lobe which is exerted from the lamina margin and

is sharply reflexed onto the indusium; indusia glabrous, hairy. Rhizome erect, ascending, short or long-creeping, siphonostelic or dictyostelic, scaly; scales brown or black, concolorous, linear-lanceolate. Spores brownish, tetrahedral, trilete, non-perinate; exine smooth or granulose, sometimes rugulose. It is represented by seven species in the North Western Himalaya.³⁶ However, only two species (*Adiantum capillus-veneris* L. and *Adiantum incisum* Forssk.) were recorded during the present study.

Taxonomic key to species of *Adiantum* L.

- 1 Lamina pinnate, stipes, rachis and pinnae hairy
..... *Adiantum incisum* Forssk.
- 1' Lamina large, bipinnate or more.....
Adiantum capillus-veneris L.

1. *Adiantum capillus-veneris* L.

Sp. Pl. 2: 1096 (1753)

(PLATE I, Fig. A)

Lamina bi-pinnate in the lower part, progressively less pinnate, size variable, debate or ovate, light-green, herbaceous, glabrous; pinnae lower few pairs 1-2 pinnate, upper ones 3-4 pinnate or apical part simple, lowest pinnae the largest, petiolate, lower margin meeting at point at about right angles, distal part recurved, upper outer margin often irregularly lobed, in sterile parts it is finely serrate-dentate; terminal, ultimate lobe fan-shaped, base cuneate. Rhizome creeping, thin, scaly; scales dark-brown, linear, lanceolate, margin entire, apex acuminate. Stipes black, thin, glossy, base scaly, rest glabrous, rhizome scales slightly broader than those on other parts, rachis glabrous. Sori indusiate, elliptic, or linear. Spores dark-brown, tetrahedral, trilete, non-perinate, exine smooth.

Ecology: It is a very common fern and grows in shady and moist habitats such as walls, rocks, rock crevices, banks of streams and waterfalls.

Distribution in Himachal Pradesh: It is distributed upto 2700m altitude in H.P. It was earlier recorded from nine districts of Himachal Pradesh (Chamba, Kangra, Bilaspur, Mandi, Kullu, Kinnaur, Shimla, Solan and Sirmour).

Collection Examined: CPUH 1, locality: Bhoranj, date of collection: 5 March, 2017. CPUH 2, locality: Kharwar, date of collection: 7 March, 2017.

2. *Adiantum incisum* Forssk.

Fl. Aeg. Ar., 187 (1775)

(PLATE I, Fig. B)

Lamina pinnate, texture herbaceous, slightly striate, upper surface glabrous or scantily hairy, lower hairy, pinnae varying in size and shape, alternate, shortly

petiolate, dimidiate, base cuneate-rostriform, lower margin abruptly falcate towards base, straight or slightly concave, entire, upper margin almost parallel to the rachis the outer margin often convex, shallowly or deeply lobed base into 3-5 narrow truncate primary closely placed lobes with wide sinuses; primary lobes again shallowly lobed; basal pinnae generally reduced and distant; pinnae on extended rachis variable in number and much smaller than the rest; veins numerous, forked, free, hairy. Rhizome short, thin, densely scaly; scales brown, concolorous, linear lanceolate, margin entire, apex acuminate. Stipes proximate, brown hairy, scaly, scales as on rhizome but narrower and dense becoming narrower higher up; rachis hairy, hairs as on stipes, sometimes

rachis extended and bearing a proliferous vegetative bud. Sori indusiate, indusia light-brown, broader than long, hairy, margin almost entire. Spores light-brown, non perinate, smooth.

Ecology: It grows in humid and shady habitats in open rock-crevices, slopes and walls

Distribution in Himachal Pradesh: It is one of the most common fern and is distributed upto 1300m altitude in H.P. It was earlier recorded from eight districts of Himachal Pradesh (Chamba, Kangra, Una, Mandi, Kullu, Shimla, Solan and Sirmaur).

Collection Examined: CPUH 3, locality: Bhoranj, Date of collection: 7 March, 2017. CPUH 4, locality: Kanjian, Date of collection: 10 March, 2017.

FAMILY ASPLENIACEAE Mettenius *ex* Frank
Syn. Pflanz. ed. 2, 3: 1465 (1877)

Rhizome erect or creeping, long or short, covered by narrow, uniformly dark brown or pale brown, rarely bicolorous, entire or toothed or fimbriate, clathrate scales. Stipes with 2-vascular bundles, pale brown to dark castaneous or black, rarely grey-green, often polished, usually glabrous, rarely covered by scales. Lamina simple to 3-4-pinnate; veins generally free or a few anastomosing towards the lamina margin. Sori indusiate, linear, simple, elongated along one side of veinlets only; indusia persistent or rudimentary, glabrous, entire or fimbriate. Spores monolete, perinate. This family is represented by single genus *Asplenium* L. in North Western Himalaya, which was recorded from the study area during the present study.³⁶

Asplenium L.

Sp. Pl. 2: 1078 (1753)

Rhizome erect or long or short-creeping, scaly or glabrous; scales clathrate. Lamina simple or 3-4-pinnate, herbaceous or subcoriaceous, glabrous or under surface densely scaly; veins usually free, sometimes few towards lamina margin anastomosing. Sori linear,

oblique, borne on one side of the vein; indusia absent or rudimentary or well developed, persistent, linear, usually curling back at maturity, opening towards costa. Spores brown or densely granulose, wrinkled with irregular folds. It is represented by thirty species in the North Western Himalaya.³⁶ However, only one species (*Asplenium dalhousiae* Hook) was recorded during the present study.

3. *Asplenium dalhousiae* Hook

Sp. Pl., 2: 1078 (1753)

(PLATE I, Fig. C)

Lamina simple and entire, narrow oblong, lower part of lamina narrowed gradually into the stipe, apex acuminate, margin entire, texture leathery, stiff, subcoriaceous, glabrous; veins immersed, obscure, simple or forked, free, glabrous. Rhizome short suberect, apex scaly, scales, dark-brown, linear lanceolate, attenuate, margin entire. Stipes short, brown, thin, scaly, scales as on rhizome, deciduous; rachis lower surface sparsely scaly, scales deciduous, confined to the lower half of rachis, distal part of rachis glabrous. Sori indusiate, almost reaching the margin; indusia light-brown membranaceous, margin entire or irregularly lobed, persistent. Spores dark-brown, perinate, perine broad, loose, smooth, sparsely but prominently wrinkled into a few short ridges.

Ecology: It grows in shady places in rock crevices and moist walls.

Distribution in Himachal Pradesh: It is distributed upto 2000m in H.P. It was earlier recorded from eight districts of Himachal Pradesh (Chamba, Kangra, Mandi, Kullu, Kinnaur, Shimla, Solan and Sirmaur).

Collection Examined: CPUH 5, locality: Kharwar, Date of collection: 17 March, 2017. CPUH 6, locality: Kanjian, Date of collection: 18 March, 2017.

FAMILY ATHYRIACEAE Alston

Taxon 5: 25 (1956)

Rhizome short-creeping or suberect or erect, thick or thin, scaly; scales brown, non clathrate, margin entire or toothed. Stipes scaly at base, higher up stipe sparsely scaly or glabrous, sometimes hairy, an axial groove often present, usually with two strap-shaped bundles which unite upwards into a single U or V-shaped strand; rachis grooved on upper side, groove open or closed to admit grooves of secondary rachises. Lamina 1-3 pinnate to decompose, size and shape variable, glabrous or hairy; hairs articulated; veins generally free, simple or forked. Sori indusiate or exindusiate, short, oblique, single or double, shape very variable, straight or hippocrepiform or J-shaped or round, often on acroscopic side of the veinlet; indusia of the shape of the sorus, thin, membranaceous, caducous or persis-

tent. Spores bilateral, monolete; perinate or non-perinate. This family is represented by six genera.³⁵ However, only one genera (*Athyrium* Roth) was recorded during the present study.

Athyrium Roth

Rom. Mag. 2: 105 (1799)

Rhizome long-creeping or short and erect, thick or thin, glabrous or scaly. Stipe size, colour, thickness and strength variable, flattened at base, with 2-strands of vascular bundles, usually densely scaly at base, articulated hairs absent; rachis round, usually grooved on the upper side and the groove opens to admit the grooves of the secondary rachises, sparsely scaly or glabrous. Lamina usually 1-2 pinnate; size and cutting: variable, lanceolate to triangular: texture usually herbaceous, upper surface usually glabrous or with long or short setae; veins free: costae and costules grooved on the upper surface, the edges of groove often strongly winged and the wing interrupted and enlarged at the junction of the costa of pinnule with pinna rachis or sometimes excurrent to form more or less prominent setae. Sori indusiate (or exindusiate) generally only on acroscopic side of the vein, never double, shape variable, indusia of the same shape as sorus. Spores brown, bilateral, monolete, perinate or non-perinate. This genus is represented by twenty four species in North Western Himalaya.³⁵ However, only one species (*Athyrium attenuatum* (Wall. ex Clarke) Tagawa) was recorded during the present study.

4. *Athyrium attenuatum* (Wall. ex Clarke) Tagawa

Acta. Phytotax. Geobot. 16: 177 (1956)

(PLATE I, Fig. D)

Rhizome short, erect to suberect, scaly, covered with persistent leaf bases. Stipes short, light-brown to stramineous, base densely scaly, higher up sparsely scaly; scales brown, lanceolate, entire, acuminate; rachis brown or stramineous, grooved, very sparsely scaly; scales as on stipe. Lamina 2-pinnate, broadly lanceolate, tapering at both the ends, texture herbaceous; pinnae up to 20 pairs, alternate, shortly petiolate, lower pinnae reduced sometimes to mere auricles; pinnules up to 20 pairs, alternate, sessile, oblong, symmetrical, margin serrate; veins up to 7 pairs in a pinnule; costae sparsely scaly; scales as on stipe; costules glabrous. Sori indusiate, small in a single row on either side of the costule, almost entirely occupying the lower surface; indusia light brown, generally 'J'-shaped or straight, persistent, curls back at maturity, margin fimbriate. Spores yellowish-brown, non-perinate, exine smooth.

Ecology: It inhabits exposed rocky forest margins.

Distribution in Himachal Pradesh: It is distributed upto 3500m in H.P. It was earlier recorded from six districts of Himachal Pradesh (Chamba, Kangra, Mandi, Kullu, Kinnaur and Shimla).

Collection Examined: CPUH 7, locality: Kharwar, Date of collection: 10 March, 2017. CPUH 8, locality: Kanjian, Date of collection: 12 March, 2017.

FAMILY: CRYPTOGRAMMACEAE Sermolli

Webbia 17: 299 (1963)

Rhizome short, erect, ascending or long-creeping, scaly. Stipes clustered or distant on rhizome, green, or stramineous or brown, base sometimes dark-brown. Lamina up to 4- pinnate, fertile ultimate lobes narrow; veins anadromous, secondary veins of fertile lobes diverge from the costa at an acute angle. Sori indusiate, oblong or elongate, sporangia borne either at ends of veins or along them or on the connecting vein; indusia false, formed by the reflexed modified leaf margin to form pod- like structure, continuous. Spores brown, tetrahedral to globose, trilete, non-perinate. This family is represented by two genera *Onychium* and *Cryptogramma* in the North Western Himalaya.³⁶ However, only one genus (*Onychium* Kaulfuss) was recorded during the present study from the area.

Onychium Kaulfuss

Jahrb. Pharm. Berlin 21: 45 (1820)

Rhizome short or long-creeping, dictyostelic or solenostelic, scaly; scales brown, concolorous, linear-lanceolate, subulate, margin entire. Fronds large, dimorphic or isomorphic. Stipes rather long, stout. Lamina 4-5-pinnate, finely dissected; fertile ultimate segment pod-like; secondary veins of the fertile lobes diverge from the costa at an acute angle and connect to form an intra-marginal fertile commissure, which runs parallel to an intra-marginal position and joins at its apex and base, the corresponding part of adjacent vein so as to form an intra-marginal commissure; indusial flaps neither overlapping or just reaching the costule from the sides. Spores tetrahedral or globose, non-perinate, reticulate or tuberculate. This genus is represented by four species in West Himalaya.³⁶ However, only two species (*Onychium contiguum* Wall. ex Hope and *Onychium plumosum* Ching) were recorded from the study area.

Key to species of *Onychium* Kaulfuss

- 1 Stipes brown throughout; lamina coriaceous...
Onychium contiguum Wall. ex Hope
- 1' Stipes black at base, lamina herbaceous.....
Onychium plumosum Ching

5. *Onychium contiguum* Wall. ex Hope
J. Bombay Nat. Hist. Soc. 13: 444 (1901)

(PLATE I, Fig. E)

Rhizome long-creeping, apex densely scaly, scales light-brown, lanceolate, nearly entire, apex acute. Stipes as long as lamina, stramineous, base invariably black, extreme base scaly, higher up stipe glabrous; scales brown, ovate-lanceolate, nearly entire, smaller and narrower than those on rhizome; rachis stramineous glabrous. Lamina pinnate, large ovate, pentagonal or spreading, very finely dissected, texture herbaceous, glabrous, pinnae alternate, shortly petiolate; lowest pair the largest, debate; linear, apex acute, margin entire; fertile ultimate lobes of same size sterile but broader, infertile apex apiculate; vein-ends clavate. Sori indusiate, linear, grey at maturity, indusi-

al flaps overlap on the costule, do not open out at maturity, margin almost entire. Spores light-brown, tetrahedral, exine tuberculate or with ridge like elongate projections giving a rugose appearance, reticulations sparse to nil.

Ecology: It grows on the forest floor and open places forming colonies.

Distribution in Himachal Pradesh: It is distributed upto 2200m in H.P. It was earlier recorded from eight districts of Himachal Pradesh (Chamba, Kangra, Bilaspur, Mandi, Kullu, Kinnaur, Solan and Shimla).

Collection Examined: CPUH 9, locality: Neri, Date of collection: 11 April, 2017. CPUH 10, locality: Kanjian, Date of collection: 12 April, 2017.

PLATE I



Fig. A: *Adiantum capillus-veneris* L.



Fig. B: *Adiantum incisum* Forskal

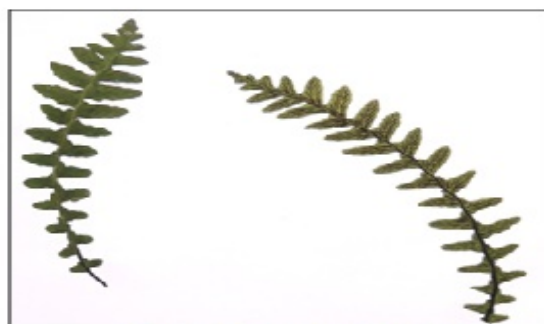


Fig. C: *Asplenium dalhousiae* Hook



Fig. D: *Athyrium attenuatum* (Wall, ex Clarke) Tagawa



Fig. E: *Onychium contiguum* Wall. ex Hope



Fig. F: *Onychium plumosum* Ching

PLATE II



Fig. A: *Equisetum ramosissimum* Desf.



Fig. B: *Pteris cretica* L.



Fig. C: *Pteris vittata* L.



Fig. D: *Selaginella chrysocephala* (Hook. & Grev.) Spring



Fig. E: *Cheilanthes bicolor* (Roxb.) Fraser-Jenkins



Fig. F: *Thelypteris dentata* (Forsk.) John

6. *Onychium plumosum* Ching

Lingnam Sci. J. 13: 499 (1934)

(PLATE I, Fig. F)

Rhizome short-creeping, thick, densely scaly, scales light-brown, lanceolate, Fronds dimorphic, sterile fronds finely dissected, with narrower ultimate lobes compared to the fertile ones, in fertile fronds all lobes fertile or fronds with a few sterile and terminal fertile lobes. Stipes light brown, thick, extreme base scaly, upwards glabrous, scales brown, lanceolate; rachis glabrous. Lamina pinnate, ovate, texture rigid, coriaceous; pinnae 10-12 pairs, alternate, petiolate, patent; sterile ultimate lobes fine, small, obovate, cuneate, apex trifid, margin entire; ultimate fertile lobe linear, pod-like; infertile apex small, mucronate, coated with

a dense bright waxy powder; vein-ends clavate. Sori indusiate, indusia brown, indusial flaps do not overlap on the costule, half-open at maturity, margin very finely crenulate to almost smooth. Spores light brown, tetrahedral, sparsely reticulate.

Ecology: It is very rare in occurrence and grows in shady rock crevices.

Distribution in Himachal Pradesh: It is distributed upto 2000m in H.P. It was earlier recorded from three districts of Himachal Pradesh (Kangra, Mandi and Kullu).

Collection Examined: CPUH 11, locality: Neri, Date of collection: 11 April, 2017. CPUH 12, locality: Kanjian, Date of collection: 12 April, 2017.

FAMILY: EQUISETACEAE Richard *ex* Condolle

Fl. Franc. ed. 3, 2: 580 (1805)

Rhizome wide-creeping, hypogeous, articulated, often branched, prominent sheath at the node; cluster of roots also at the nodes; stems homo or heteromorphic erect, cylindrical, hollow in the internodal region, distinctly marked with ridges and grooves; whorls of extra axillary branches at the nodes; leaves scaly, fused together forming a sheath at the node; spikes or strobili terminating from main or lateral branches of the stem. Spores with four long elaters. This family is represented by a single genus *Equisetum* L. in the North Western Himalaya, which was recorded from the study area during the present study.¹⁶

Equisetum L.

Sp. Pl. 2: 1061 (1753)

Plants perennial, herbaceous, 1-2 m tall with no secondary growth, aerial stems arise from the underground rhizome. In some species on the advent of the growing season, the plants give out non-green, fertile aerial branches, which lie down after the spores are shed, sterile shoots arising later. In other species plants put forth green shoots that become fertile towards the end of the growing season, or in others the shoots are first fertile and later, after the spores are shed, they turn green. In cross-section the stem is variable in morphology, with a large central canal and external ridges and grooves; stomata lie on the sides of the ridges, the epidermal cells are heavily impregnated with silica particles, sclerenchymatous cells are present below the ridges and chlorenchymatous cells lie below the grooves, the cortex contains vallecular canal, cascular bundles are collateral below the ridges, the protoxylem disintegrates to form the central carinal canal, the endodermis is variable, either only a single or an additional internal endodermis layer also be present or in some cases each vascular bundle is surrounded by its own endodermis, the stem is fistular (hollow) at the internodes, but a diaphragm is present at the nodes. Some species produce tubers (a single swollen Internode) for vegetative propagation. This genus is represented by three species in the North Western Himalaya.¹⁶ However, only one species (*Equisetum ramosissimum* Desf.) was recorded from the study area.

7. *Equisetum ramosissimum* Desf.

Fl. Atlan. 2: 398. 1800

(PLATE II, Fig. A)

Sterile and fertile stems alike, large sized, erect with a large central cavity. Stems simple or irregularly branched in the upper portion, branches from main stems at their base; ascending up to 6 at each node;

ribs less prominent, main stem narrow, scabrous; leaf sheaths rather loose, teeth of sheath triangular, acute, below the cone pale yellow, at node colourless; cones sessile, usually solitary, oblong, apiculate. Spores with elaters.

Ecology: It grows along water courses in sandy places and in damp hedge-banks, moist bushes etc.

Distribution in Himachal Pradesh: It is distributed upto 1500 m in H.P. It was earlier recorded from six districts of Himachal Pradesh (Kangra, Mandi, Kullu, Shimla, Solan and Sirmaur).

Collection Examined: CPUH 13, locality: Bhota, Date of collection: 13 March, 2017. CPUH 14, locality: Bassi, Date of collection: 20 March, 2017.

FAMILY PTERIDACEAE Ching

Webbia 35(2): 239 (1982).

Rhizome usually short, erect or short-creeping, dictyostelic, densely scaly; scales, lanceolate, uniformly dark brown, septate hairs absent. Stipes usually stramineous, rarely reddish, brown or carmine red. Fronds mostly clustered or close together. Lamina 1-2 pinnate or subtripinnate, glabrous; veins free or anastomosing; costae with small appendages; setae on upper surface. Sori continuous, marginal; indusia formed by incurved lamina margin which never reach the costule. Spores mostly tetrahedral, trilete, rarely bilateral, monolete, dark brown or pale brown with rugulose or verrucose exine. The family is represented by single genus *Pteris* L. in the North Western Himalaya, which was recorded from the study area during the present study.³⁶

Pteris L.

Sp. Pl. 2: 1073 (1753)

Rhizome short, erect or creeping, scaly; scales generally towards rhizome apex, linear-lanceolate, margin entire or variously lobed or fimbriate. Stipes base generally scaly. Lamina 1-2 (-3)-pinnate, never finely dissected; texture herbaceous or coriaceous, glabrous, lowest pair of pinnae often forked near the base on basisopic side resulting in a long pinnule with its lobes similar to other pinnae; veins free or anastomosing to form a series of narrow areolae along the costa or costules; areolae without included veinlets. Sori actually submarginal but as the margin curls back to form the indusium it becomes marginal, linear; indusia formed by reflexed pinna margin. Spores brown, tetrahedral, trilete, rarely bilateral, monolete, non-perinate, exine smooth, tuberculate or verrucose, the two surfaces have different types of ornamentation. This genus is represented by 12 species in North Western Himalaya.³⁶ However, only two species

(*Pteris cretica* L. and *Pteris vittata* L.) were recorded during the present study.

Key to species of *Pteris* L.

- 1 Lamina uni-pinnate, lowest pinnae forked at least once... *Pteris cretica* L.
- 1' Lamina uni-pinnate, lowest pinnae gradually reduced..... *Pteris vittata* L.

8. *Pteris cretica* L.

Mant. Pl. : 130 (1767)

(PLATE II, Fig. B)

Rhizome short, erect, apex scaly; scales brown, bicolorous (central region dark with thick walled cells, marginal cells pale and thin walled), margins irregularly fimbriate with a few long projections. Stipes 30-45cm long, stramineous, extreme base brown, thick, rachis glabrous. Lamina pinnate, 30-45 pairs, 15 -25 cm long, 3-5 cm broad, short petiolate, lanceolate, margin deeply lobed almost to the costa; lobes 20 pairs, 1.5 -3.0 cm long, 0.5-1 cm broad (sterile lobes broader), oblong, apex rounded, margin entire, sinus narrower in sterile, broad in fertile, acroscopic lobes smaller than the basiscopic ones, the lowest pair of pinnae always forked on the basiscopic side opposite the second acroscopic lobe; veins the basiscopic basal veins from each costules anastomosing with acroscopic basal veins of the next costule to form a more or less curved continuous arc along the costa many veins arise from them and go towards the base of the sinus, remaining veins in the inner lobe free, forked; costae and costules with small setae on the upper surface at their junctions. Sori indusiate, margins continuous from the base of sinus and reaching almost the apex with a very little infertile apex left, indusia continuous, curls back at maturity. Spores dark-brown, densely rugulose on the distal surface, verrucose on the proximal one.

Ecology: It grows luxuriantly on the humus rich forest-floor or even in open or shaded places.

Distribution in Himachal Pradesh: It is distributed upto 2500m in H.P. It was earlier recorded from nine districts of Himachal Pradesh (Chamba, Kangra, Bilaspur, Mandi, Kullu, Kullu, Shimla, Solan and Sirmaur).

Collection Examined: CPUH 15, locality: Neri, Date of collection: 13 March, 2017. CPUH 16, locality: Bhiar, Date of collection: 20 March, 2017.

9. *Pteris vittata* L.

Sp. Pl. 2: 1074 (1753)

(PLATE II, Fig. C)

Rhizome, short, sub-erect, thick, scaly; scales light-brown, concolorous, linear-lanceolate, entire, acumin-

ate. Stipe length variable, generally much shorter than the lamina, stramineous or light-green, light brown upon drying, thick, scaly and fibrillose, base densely scaly; scales

as on rhizome, becoming gradually narrower higher up on stipe, fibrils of the same colour as the scales on stipe but narrower. Lamina pinnate, oblong-obovate, texture herbaceous to subcoriaceous, upper surface glabrous; pinnae many, alternate, sessile, linear, base truncate or cordate, or slightly auricled, margin of sterile pinnae and infertile apex of fertile pinnae finely dentate serrate; lower up to 7 pairs of pinnae gradually reduced and distant, usually sterile, apical pinnae variable in size, either of the same length as the lateral pinnae or much elongated and the longest; veins free, simple, nearly at right angle to the costa, sometimes forked, not anastomosing. Sori marginal, continuous from the base of pinnae, stopping a little short of the apex, indusiate; indusia yellowish, membranaceous, margin irregularly serrulate. Spores light-brown, nonperinate, exine tuberculate to rugulose on the proximal side, reticulate on distal side.

Ecology: It commonly grows along the streamlets, or riverbanks, on open roadsides, or on walls.

Distribution in Himachal Pradesh: It is distributed upto 2000m in H.P. It was earlier recorded from seven districts of Himachal Pradesh (Chamba, Kangra, Mandi, Kullu, Shimla, Solan and Sirmaur).

Collection Examined: CPUH 17, locality: Bhareri, Date of collection: 13 March, 2017. CPUH 18, locality: Bassi, Date of collection: 20 March, 2017.

FAMILY SELAGINELLACEAE Willkomm

Prodr. n. *Ilisp.* 1(1): 14 (1861)

Plants herbaceous, terrestrial, lithophytic or sometimes epiphytic. Stem tufted, erect or creeping or even climbing. Roots generally adventitious, dichotomous, often arising from leafless rhizophores. Leaves small, spirally arranged or decussate or in rows, ligulate, homophyllous or heterophyllous. Sporangia usually associated with leaves (sporophylls), that are aggregated together in terminal strobili, heterosporous, both; megasporangia and microsporangia are contained in a strobilus. Microsporangia usually in the apical part, usually oval, orange-red. microspores many, small. Megasporangia slightly lobed, greenish-white, usually four megasporangia per megasporangium, megasporangia usually occupy the lower half of a strobilus. Spores trilete. This family is represented by a single genus *Sellaginella* in the North Western Himalaya, which was recorded during the present study.¹⁶

Selaginella Paliset de Beauv.

Mag. Encyclop. **9(5)**: 471 (1804)

Plants commonly prostrate or erect herbs, usually small-sized. Roots confined to the base (in erect species) or present on rhizophores that usually arise at the point of branching. Stem much branched, ultimate branches dichotomous, scandent or suberect. Leaves usually of two types, large laterals and small dorsal ones, both types alternating with each other, simple, entire, with a single vein, apex acute, acuminate or terminating in an awn-like structure, homophyllous, in four rows. Strobili or spikes either tetrastichous, and quadrangular, or \pm flat, sporophylls isomorphic or dimorphic, mostly resupinate, forming a dense spike, at the ends of leafy branches. Sporangia inserted in axils of sporophylls, minute, orbicular, unilocular. megaspores. Microsporangia few, large, greenish-white, with usually 4 (or 2, 3, 8, or sometimes only 1) large megaspores. Microsporangia many, containing numerous minute microspores. This genus is represented by 6 species in the North Western Himalaya.¹⁶ However, only one species (*Selaginella chrysocaulos* (Hook. & Grev.) Spring) was recorded during the present study.

10. *Selaginella chrysocaulos* (Hook. & Grev.) Spring
Bull. Acad. Brux. **10**: 232 (1843)

(PLATE II, Fig. D)

Stems densely tufted, slender, rooting at base only, erect, pale yellow, 15-30 cm long, stoloniferous at base, much branched. Rhizophores restricted to the lowest quarter. Leaves heteromorphic, bright-green, distant on the stem, subcontiguous on the branches, lateral leaves ovate, spreading at right angles, oblique. subcordate, acute, dentate or denticulate all around, inner half-leaf ovate, acute, outer half-leaf semi-ovate, axillary leaves similar lateral ones, median leaves ovate, oblique, acuminate or aristate, minutely denticulate. Strobili short, borne singly at the apices of the branchlets. Sporophylls dimorphic, dentate, larger sporophylls oblong, oblique, obtuse, smaller ones ovate, acuminate. Megaspores dark brown, verrucoid. Microspores dark orange, warty.

Ecology: It grows commonly grows along forest edges or along road-side.

Distribution in Himachal Pradesh: It is distributed upto 2700m in H.P. It was earlier recorded from seven districts of Himachal Pradesh (Chamba, Kangra, Bilaspur, Mandi, Kullu, Shimla and Solan).

Collection Examined: CPUH 19, locality: Bhareri, Date of collection: 13 March, 2017. CPUH 20, locality: Bassi, Date of collection: 20 March, 2017.

FAMILY SINOPTERIDACEAE Koidzumi

Acta Phytotax. Geobot. **3**: 50 (1934)

Rhizome short, erect or suberect or short-creeping, thick, scaly; scales brown, concolorous, basally attached, linear-lanceolate. Stipes glossy, scaly, hairy or glabrous; scales linear-lanceolate, gradually becoming fibrillose higher up on the stipe; rachis generally like the stipe. Lamina pinnate or 1-3-pinnate, texture generally herbaceous, lower surface hairy or glabrous or with or without farina.; farina variously coloured but usually white; veins free, dichotomously pinnate. Sori indusiate, often in contact laterally but not confluent; sporangia borne upon the apical portions of the veins and may extend slightly inwards from the edge, rarely an intramarginal coenosorus may be formed by the fusion of the fertile apical parts of the vein; indusia pseudoindusia *i.e.* a reflexed modified lamina margin, discontinuous or continuous, lacerate at the edge or variously lobed or merely eroded. Spores dark brown, tetrahedral or globose, trilete, perinate or non-perinate, smooth or variously ornamented. This family is represented by three genera in North Western Himalaya.³⁶ However, only one genus *Cheilanthes* Swartz was recorded from the study area.

Cheilanthes Swartz

Syn. Fil. **5**: 126 (1806)

Rhizome short, erect or suberect, thick, solenostelic, scaly; scales concolorous or bicolorous, lanceolate or ovate-lanceolate, basally attached, margin more or less entire or fimbriate, projecting long or short toothed, apex acute to acuminate or scales ending in a gland. Stipes dark-brown or black, cylindrical, brittle, hairy or scaly or glabrous; rachis similar to stipes, glabrous or scaly. Lamina pinnate or 2-4 pinnate, generally once more pinnate in the lower half than the distal portion, generally deltate pentagonal or ovate or lanceolate; texture herbaceous to subcoriaceous; lower surface generally farinose; farina variously coloured. Sori marginal, discrete; sporangia borne at the tips of veins, becoming confluent along an intramarginal line at maturity but not forming a vascular commissure at the ends of veinlets, indusiate, partially or completely covered by the pseudoindusia. Spores tetrahedral or globose, trilete, perinate or non-perinate, smooth, variously ornamented. This genus is represented by fourteen species in the North Western Himalaya.³⁶ However, only one species (*Cheilanthes bicolor* Fraser-Jenkins) was recorded from the study area during present investigations.

11. *Cheilanthes bicolor* Fraser-Jenkins
Pak Syst. **5(1-2)**: 94 (1991)

(PLATE II, Fig. E)

Rhizome short, apex scaly; scales dark-brown, bicolorous, linear-lanceolate, entire, acuminate. Stipe length variable, generally longer than the lamina, dark brownish-black, thick, glossy, scaly; scales generally restricted to the base of stipe, or running up to some distance on it or on the entire stipe; scales bicolorous, sometimes nearly concolorous, linear-lanceolate, entire, acute, deciduous; rachis glossy, glabrous. Lamina up to 2 pinnate, length variable, deltate-lanceolate, or lanceolate, pentagonal, or narrow lanceolate, texture subcoriaceous, lower surface farinose, farina whitish or greenish white, upper surface glabrous; pinnae up to 10 pairs, alternate or sub-opposite, sessile, margin lobed to the costa; obtuse or acute, margin deeply lobed to the costa becoming 2-pinnate, basiscopic lobes longer than the acroscopic ones, basal basiscopic lobes (or pinnules) divergent, or parallel to the stipes, margin lobed up to half or almost to the costule into regular narrow lobes; veins pinnate, up to 4 pairs in each lobe, simple or forked; costae and costules glabrous. Sori indusiate, marginal; indusia light-brown, broad, margin shallowly and irregularly crenate and toothed, continuous or discontinuous. Spores dark-brown, globose to tetrahedral, perinate, perine smooth or finely crenate.

Ecology: It grows commonly on slopes, on walls or in rock-crevices.

Distribution in Himachal Pradesh: It is distributed upto 2000m in H.P. It was earlier recorded from nine districts of Himachal Pradesh (Chamba, Kangra, Bilaspur, Mandi, Kullu, Kinnaur, Shimla, Solan and Sirmour).

Collection Examined: CPUH 21, locality: Bhota, Date of collection: 26 March, 2017. CPUH 22, locality: Bhareri, Date of collection: 27 March, 2017.

FAMILY: THELYPTERIDACEAE Sermolli

Webbia 24: 709 (1970)

Rhizome erect or suberect or long-creeping, scaly; scales not peltate at base, sometimes with unicellular

hairs on margin and on surface, dictyostelic. Stipes with 2 vascular strands at base which unite to form a U-shaped, hairy, base generally scaly; rachis hairy; hairs unicellular or septate, acicular, straight or hooked or short capitate, hairs on upper surface of rachis including costae and costules. Lamina generally pinnate or rarely bipinnate or tripinnate, lanceolate or oblong or narrowly elliptic: veins all free or with some veins from adjacent lobes united to form an excurrent vein which passes to the sinus between the lobes leaving a few toward apex of segment free. Sori indusiate or exindusiate, round or somewhat elongate or hippocrepiform, usually medial to apical on veins, minute or large, indusia reniform or round, hairy or glabrous, persistent or early fugacious. Spores monoletate, perinate to non-perinate; perine loose or very closely adherent to exine, spinulose or smooth tetrahedral, trilete. This family is represented by a single genus *Thelypteris* Schmidel in the North Western Himalaya, which was recorded from the study area during present study.³⁵

Thelypteris Schmidel

Icon. Plant. 11:13 (1763)

Rhizome long-creeping, thin. Lamina pinnate, somewhat hairy, hairs acicular or capitate, sessile spherical glands absent; pinnae many, deeply lobed, lower pinnae a little or not reduced; veins free, mostly forked, running to the margin; costae lower surface scaly, scales small, flat thin, without superficial hairs, filiform scales also present. Sori indusiate, sporangia hairy near annulus, hairs short, capitate, glandular. Spores non-perinate, exine spinulose or spiny reticulate with simple spines having ridged bases running close together to form reticulum adpressed to the underlying sporodermal surface. This genus is represented by twenty three species in the West Himalaya.³⁵ Only one species of this genus was reported from the study area during present study.

Table 1: List of Pteridophytes enumerated during the present study.

Family	Genus	Species
Adiantaceae	<i>Adiantum</i> L.	<i>Adiantum capillus-veneris</i> L.
		<i>Adiantum incisum</i> Forssk.
Aspleniaceae	<i>Asplenium</i> L.	<i>Asplenium dalhousiae</i> Hook
Athyriaceae	<i>Athyrium</i> Roth	<i>Athyrium attenuatum</i> (Wall. ex Clarke) Tagawa
Cryptogrammeae	<i>Onychium</i> Kaulfuss	<i>Onychium contiguum</i> Wall. ex Hope
		<i>Onychium plumosum</i> Ching
Equisetaceae	<i>Equisetum</i> L.	<i>Equisetum ramosissimum</i> Desf.
Pteridaceae	<i>Pteris</i> L.	<i>Pteris cretica</i> L.
		<i>Pteris vittata</i> L.
Selaginellaceae	<i>Selaginella</i> Paliset de Beauv.	<i>Selaginella chrysocaulos</i> (Hook. & Grev.) Spring
Sinopteridaceae	<i>Cheilanthes</i> Swartz	<i>Cheilanthes bicolor</i> (Roxb.) Fraser-Jenkins
Thelypteridaceae	<i>Thelypteris</i> Schmidel	<i>Thelypteris dentata</i> (Forssk.) John

12. *Thelypteris dentata* (Forssk.) John
Amer. Fern J. **26** : 44 (1936)

(PLATE II, Fig. F)

Lamina pinnate, oblong lanceolate, herbaceous, glandular, subglabrous or hairy on both surfaces. Fronds dimorphic: pinnae 15-25 pairs, lanceolate, margin lobed about half or a little more to the costa; lobes regular, slightly oblique, subfalcate. sometimes basal acroscopic lobe in lower pinnae enlarged into a well developed auricle; lower 1-4 pairs of pinnae much reduced (or not) distant; veins free except the lower one or two pairs of adjacent lobes which unite to form an excurrent veinlet to sinus. Rhizome short, ascending or short-creeping, apex scaly: scales brown, lanceolate, margin more or less entire. Stipes length variable, thick, stramineous or light-brown, hairy; hairs white, short, unicellular, stipe base scaly; scales

as on rhizome but linear and becoming sparse and filiform, rachis hairy. Sori indusiate, medial; indusia green, reniform, sometimes glabrous or hairy; hairs short. Spores dark brown, perinate. perine often with fimbriate crests, regularly folded into few sparse ridges.

Ecology: It grows near river banks, water courses and waterfalls.

Distribution in Himachal Pradesh: It is distributed upto 2000m in H.P. It was earlier recorded from eight districts of Himachal Pradesh (Chamba, Kangra, Bilaspur, Mandi, Kullu, Kinnaur, Shimla and Solan).

Collection Examined: CPUH 23, locality: Bassi, Date of collection: 28 March, 2017. CPUH 24, locality: Bamsan, Date of collection: 29 March, 2017.

Table 2: Ethnobotanical Importance of pteridophytes of Hamirpur (H.P.).

Sr. No.	Species	Ethonobotanical Remarks
1.	<i>Adiantum capillus-veneris</i>	It is commonly known as maidenhair fern. It is ornamental and medicinal fern. Its fronds are used as antidandruff, astringent, febrifuge, laxative stimulant etc. Syrup of whole plant act as de-toxicant in alcoholism, expels worms from body, relieves from cough, bronchitis and throat infections. The fronds are also used as a garnish on sweet dishes.
2.	<i>Adiantum incisum</i>	It has astringent, tonic and febrifuge properties. It is ornamental, aromatic and medicinal fern. The leaves are used as a cure for cough, fever and chest infections.
3.	<i>Asplenium dalhousiae</i>	It is commonly known as maidenhair spleenwort. The fern is useful for ailments of the spleen. Decoction of whole plant is antiviral and also useful to cure skin blisters.
4.	<i>Athyrium attenuatum</i>	It is used as antiviral drug. It can strongly inhibit influenza virus. It is cultivated as ornamental plants.
5.	<i>Onychium contiguum</i>	Decoction of whole plant is used to cure urine complications.
6.	<i>Onychium plumosum</i>	It is ornamental.
7.	<i>Equisetum ramosissimum</i>	It is commonly known as horsetail. It is used for treatment of scabies, itches, skin infections, bone fracture, female infertility and wounds healing. Due to presence of silica, the stems are used for scouring metal and as fine sandpaper.
8.	<i>Pteris cretica</i>	It is commonly grown as an ornamental plant. It makes a beautiful ground cover. It is antibacterial and its Powder, decoction, as well as fresh paste of whole plant is applied on wounds.
9.	<i>Pteris vittata</i>	It has antimicrobial properties. Extract, powder, decoction as well as fresh paste of fronds is used for curing burns. It is grown in gardens for its attractive appearance. It is also used as bio-indicator of pollution. It is known to be a hyper accumulator plant of arsenic used in phyto-remediation.
10.	<i>Selaginella chrysocaulos</i>	It is commonly known as sanjeevani. This fern is locally used as diuretic and in gonorrhoea. The dried plant along with tobacco, are smoked by tribal people for inducing hallucinations. It is used as witch craft and in worship.
11.	<i>Cheilanthes bicolor</i>	Plant powder mixed with cow's ghee is used as an incense to keep off fear in children. Decoction of whole plant is used as tonic to cure weakness problems. It is also used for painting hands.
12.	<i>Thelypteris dentata</i>	It believed to be having antibacterial properties and is also used for treatment of menstrual disorders

CONCLUSION: A total of twelve species of pteridophytes have been recorded from Hamirpur District of Himachal Pradesh (Table 1). These species belong to nine genera (*Adiantum* L., *Asplenium* L., *Athyrium* Roth, *Cheilanthes* Swartz, *Equisetum* L., *Onychium* Kaulfuss, *Pteris* L., *Selaginella* Paliset de Beauv. And *Thelypteris* Schmidel) of nine families (Adiantaceae, Aspleniaceae, Athyriaceae, Cryptogrammaceae, Equisetaceae, Pteridaceae, Selaginellaceae, Sinopteridaceae and Thelypteridaceae) of pteridophytes. All these species have been recorded for the first time from nine localities of Hamirpur District of Himachal Pradesh. All the species are of ethnobotanical importance as medicine and as ornamental plant (Table 2).

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