

# A CHECKLIST OF MOSSES OF DISTRICT MANSEHRA

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**ABSTRACT:** This paper deals with the moss diversity of Mansehra district. These findings were concluded based on previously published literature and own field investigations in the last three years i.e. 2012 to 2015. There are 107 moss species in Mansehra district and this figure meets about 31.36 % of the total known moss flora of Pakistan. These taxa distributed in 25 families and 61 genera. Of these, 58 species (52.26%) are Acrocarpus mosses and 53 species (47.74%) are Pleurocarpus mosses. Family-wise, Brachytheciaceae found to be the largest family with 5 genera and 16 species, followed by Bryaceae with 5 genera and 11 species. In the remaining families, less than 10 species found to occur per family. For genera, Brachythecium was the largest genus with 11 species, followed by Bryum (9 species) and Fissidens (6 species). These species distributed at different altitudes in a range between 456-5200m.

**Keywords:** Fissidens, Acrocarpus, Pleurocarpus, Bryum, Mansehra

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## INTRODUCTION

Mutually within the manifold types of rocks the district Mansehra shows a broad variation of climatic and altitudinal gradients, these conditions induced a range of ecological habitats that contribute to the unique biodiversity of mosses. In most cases, moss species are stenocious and therefore restricted to a particular substrate and ecological niche [1]. Initially, some workers collected mosses in some selected localities of the northern part and a few plain localities of the country [2-20]. Townsend [19] reported 40 taxa from Kaghan valley among which 9 new records for Pakistan. Islam *et al.*, [21] work on taxonomic study of Bartramaceae from Mansehra and present six species of the family in his investigation. However, all these efforts collectively contribute only ca. 340 taxa. The current study is an attempt that has been made to prepare an updated checklist of mosses of Mansehra based on self-extensive field surveys and on previous studies of some workers [2-5, 14, 16-19, 21].

## MATERIALS AND METHODS

### a) The Study Area

The district Mansehra falls under the North Western Himalayan region of Pakistan. The district is situated between 34°-14' to 35°-11' N and 72°-49' to 74°-08' E with an altitudinal ranges from 450-5400 m and covers an area of 4,579 km<sup>2</sup>. Northern border of the area is surrounded by Kohistan and Batagram districts. Muzaffarabad is situated on the eastern side, Tor Ghar and Buner, Shangla districts are located on western side, while southern boundary is delimited by means of Abbottabad and Haripur district [22]. Fig. 1

### b) Experimental Design

Initially, available relevant literature was reviewed. Specimens of the area hosted at Pakistan Museum of Natural History (PMNH) were consulted. Based on the findings, field trips were conducted in various localities of the district from October 2012 to December 2015. Plants material was collected and given a separate collection number for each specimen. Habitat, substrate, habit was also photographed. Collected specimens were dried, kept in the special envelopes (4 x 6 inch) and were properly labeled. Small quantity of each

specimen was separately preserved for identification. Each specimen was examined under stereoscope and microscope at Cryptogamic Lab, Hazara University and identified with the help of relevant literature. Finally, specimens were deposited in the Cryptogamic Lab, Hazara University Herbarium (HUP).

All moss taxa included in the list were checked against the TROPICOS database [23]. concerning current acceptable nomenclature.

## RESULTS AND DISCUSSION

In this study, from the district Mansehra, total 107 species were observed under 65 genera and 26 families. The largest family is Brachytheciaceae with 15 species and largest genus is Brachythecium with 10 species. generic index showed the high diversity value i.e. 1.72 in the study area. Out of 26 families 11 are of Acrocarpus and 15 are Plurocarpus. High diversity is seen in Acrocarpus mosses which represent 61 species in the study area.

**Table 1: 5 largest families**

Family	No. of species	% in the study area
Brachytheciaceae	14	12.5
Pottiaceae/Bryaceae	10	8.92
Amblystegiaceae	09	8.035
Fissidentaceae	07	6.25
Thuidiaceae	06	5.35

**Table 2: 5 largest genera by volume**

Genus	No. of species	% in the study area
Brachythecium	10	8.92
Fissidens	7	6.25
Bryum	5	4.46
Grimia	5	4.46
Mnium	4	3.57

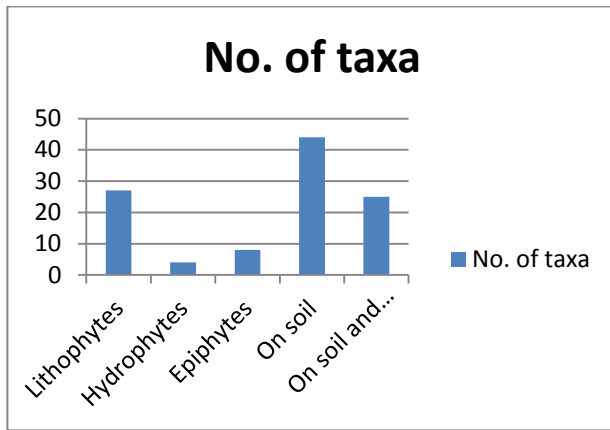


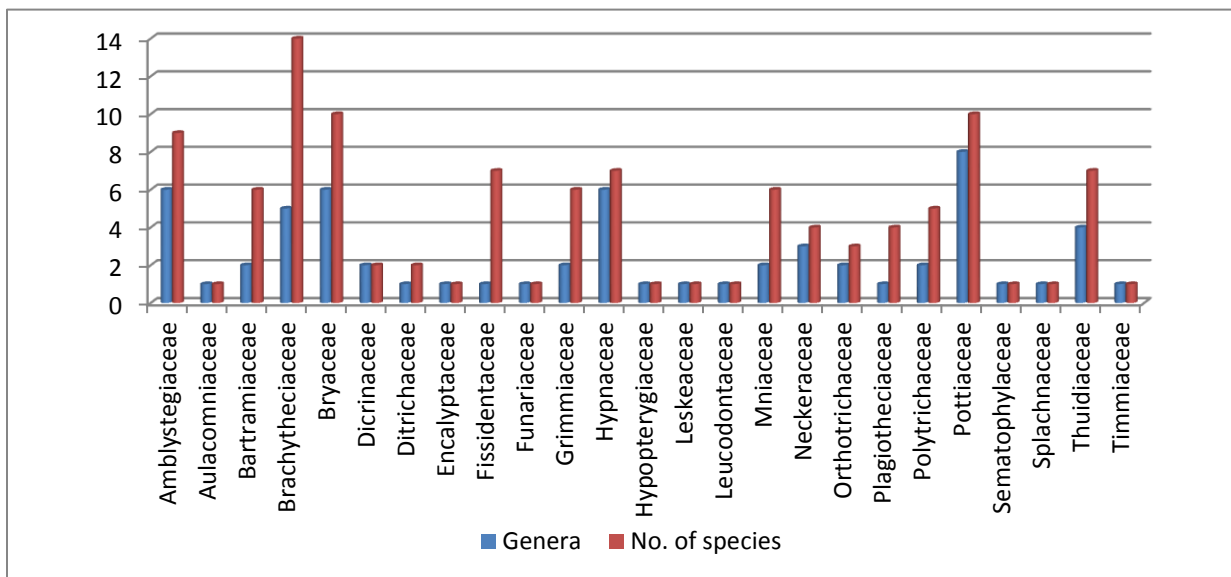
Fig. 2: Substrate-wise distribution of taxa in the study area

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Family-wise list of taxa occurring in the area

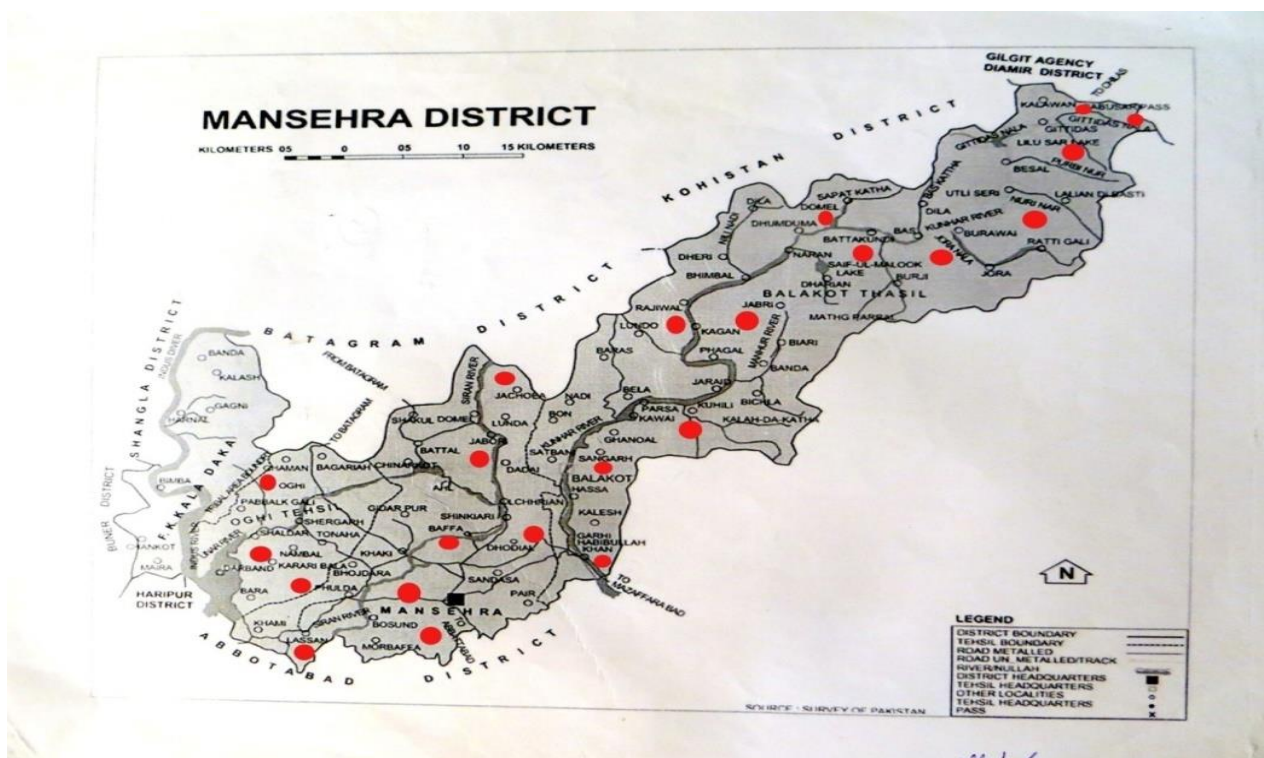


Fig. 1: Map of Mansehra District

Table 3. Check list of the taxa along family, substrate, locality, altitude and life form

Family	Species	Substrate	Locality	Altitude	Life form
Amblystegiaceae	<i>Hypnum stellatum</i> var. <i>terraenovae</i> Brid.	On boulders and rock crevices.	Shogran	2740 m	Mat
Amblystegiaceae	<i>Cratoneuron commutatum</i> (Hedw.) G. Roth	On wet and submerged boulders along the streams.	Shran, Naran: Saiful Maluk	2100-2780 m	Weft
Amblystegiaceae	<i>C. filicinum</i> (Hedw.) Spruce.	On wet submerged boulders along the streams.	Kaghan: valley: Shinu; Sharan; Saiful Maluk, Shogran	2370-3150 m	Weft
Amblystegiaceae	<i>Callialaria curvicaulis</i> (Jur.)	On boulders along the	Kaghan valley: Kiwai,	2370-3150 m	Weft

May-June

	<i>Ochyra</i> syn. <i>C. filicinum</i> (Hedw.) Spruce var. <i>curvicaule</i> (Jur.) Moenk.	streams.	Saiful Maluk		
Amblystegiaceae	<i>Drepanocladus aduncus</i> (Hedw.) Warnst.	On boulders in the stream water	Kaghan valley: Shogran	2740 m	Weft
Amblystegiaceae	<i>Hamatocaulis vermicosus</i> (Mitt.) Hedenäs syn. <i>D.vermicosus</i> (Lindb.) Warnst.	On wet soil in or along the streams.	Kaghan valley: Sharan	2400 m	Weft
Amblystegiaceae	<i>Hygroamblystegiumfluviatile</i> (Hedw.) Loesk.	On rocks and boulders submerged in soil.	Kaghan valley: Shogran	2200 m	Tuft
Amblystegiaceae	<i>Hygrohypnum luridum</i> (Hedw.) Jenn.	On soil and soil submerged boulders.	Naran	2450 m	Tuft
Amblystegiaceae	<i>Palustriella commutata</i> (Hedw.) Ochyra	On wet soil in swamp.	Kaghan valley: Sharan	2400 m	Weft
Aulacomniaceae	<i>Aulacomnium palustere</i> (Hedw.) Schwaegr.	On dry boulders.	Naran: Gittidas	4300 m	Turf
Bartramiaceae	<i>Bartramia ithyphylla</i> Bridel	On soil under dry rocks in alpine zone.	Naran: Babusar Pass	4181 m	Tuft
Bartramiaceae	<i>B. pomiformis</i> Hedw.	On moist shady rocky slope in pine forest.	Kosh valley: Sathan Gali	2545 m	Tuft
Bartramiaceae	<i>B. halleriana</i> Hedw.	Grows on moist shady slope in <i>Pinuswillichiana</i> forest.	Kosh valley: Sathan Gali	1867 m	Tuft
Bartramiaceae	<i>Philonotis marchica</i> (Hedwig) Bridel	On wet soil and rocks near springs in <i>Pinuswillichiana</i> forest.	Sathan Gali	2545 m	Tuft
Bartramiaceae	<i>P. falcate</i> (Hook.) Mitt.	In moist shady places.	Sathan Gali	1867 m	Tuft
Bartramiaceae	<i>P. Fontana</i> (Hedwig) Bridel	In moist shady places.	Besal	2424 m	Tuft
Brachytheciaceae	<i>Cirriphyllum cirrosum</i> (Schwaegr.) Grout	On moist shady soil and stones.	Suiful Maluke	3500 m	Mat
Brachytheciaceae	<i>Brachythecium glareosum</i> (Bruch ex Spruce) Schimp.	On boulders in dry streams.	Shogran-Kawai; Paya	2250-2430 m	Mat
Brachytheciaceae	<i>Brachythecium procumbens</i> (Mitt.) A. Jaeger	On shady soil along the stream	Kaghan: Shogran	2900m-2960m	Mat
Brachytheciaceae	<i>Brachythecium reflexum</i> (Starke) Schimp.	On soil in bank of trails.	Shogran- Sali Hut; Kaghan, Paras, Naran	2710 m	Mat
Brachytheciaceae	<i>Brachythecium buchananii</i> (Hook.) A. Jaeger	On humus rich shady soil.	Kaghan: Shogran	1780m	Mat
Brachytheciaceae	<i>B.emodi-glareosum</i> Broth. nom. nud.		Kaghan	2800 m	Mat
Brachytheciaceae	<i>Brachythecium glareosum</i> (Bruch ex Spruce) Schimp..	On soil shady soil.	Shogran-Kawai; Kaghan, Paya	2250m-2940m	Mat
Brachytheciaceae	<i>B.indicopopuleum</i> Dix.	On shad soil and soil covered boulders.	Kaghan valley; Babusar Pass		Mat
Brachytheciaceae	<i>B.plumosum</i> (Hedw.) Schimp.	On humus rich shady soil.	Kaghan, Shino	1450 m	Mat
Brachytheciaceae	<i>B.rivulare</i> Schimp	Along streams in <i>Pinus willichiana</i> forests.	Kaghan, Sharan forest, Naran	1800-3230m	Mat
Brachytheciaceae	<i>Brachythecium garovaglioides</i> Müll. Hal.  <i>Syn. B. wichurae</i> (Broth.) Par.	On humus along the stream and roadside.	Kawai	2020 m	Mat
Brachytheciaceae	<i>Eurhynchium pulchellum</i> (Hedw.) Jenn.	On humus rich shady soil.	Kaghan, Saiful Maluke	3250-3400m	Mat
Brachytheciaceae	<i>Palamocladium euchloron</i> (Bruch ex Müll. Hal.) Wijk & Margad.	On moist shady soil.	Kaghan	2340 m	Mat
Brachytheciaceae	<i>Platyhypnidium riparioides</i> (Hedw.) Dix.	On soil in <i>Pinus willichiana</i> forests.	Paras	1780 m	Mat
Bryaceae	<i>Anomobryum filiforme</i> var. <i>juliforme</i> (Solms) Husn.	On boulders and cliffs along the dry streams.	Shogran and sharan forest.	2300-2400 m	Tuft
Bryaceae	<i>Bryum argenteum</i> Hedw.	On rocks and boulders submerged in soil.	Paya, Shogran	2740 m	Tuft
Bryaceae	<i>Bryum blindii</i> Bruch &	On soil and boulders.	Babusar Pass	4181 m	Tuft

	Schimp.				
Bryaceae	<i>B. cellulare</i> Hook.	On soil in shady places.	Kaghan	2300 m	Tuft
Bryaceae	<i>B. thomsonii</i> Mitt.		Gittidas		Tuft
Bryaceae	<i>Bryum pseudotriquetrum</i> f. <i>angustifolium</i> (Lindb.) Podp. syn. <i>B. ventricosum</i> Dicks.	On soil and crevices	Babusar Pass	2300 m	Tuft
Bryaceae	<i>Brachymerium indicum</i> (Dozy & Molk.) Bosch & Sande Lac.		Kaghan	2300 m	Tuft
Bryaceae	<i>Mniobryum albicans</i> (Wahlen.) Limper.	On boulders and soil.	Kaghan	2450 m	Tuft
Bryaceae	<i>Pohlia wahlenbergii</i> (F. Weber & D. Mohr) A.L. Andrews	On humus rich soil.	Saiful Maluke, Besal	1780-2150m	Tuft
Bryaceae	<i>Rhodobryum roseum</i> (Hedw.) Limper.	On shaded moist soil and humus.	Batal, Sathan Gali, Bugarmung	1500-1880 m	Tuft
Dicrinaceae	<i>Onchophorus wahlenbergii</i> Brid.	On rotten logs.	Shogran	2740 m	Tuft
Dicrinaceae	<i>Symblepharis vaginata</i> (Hook. ex Harv.) Wijk & Margad.	On cliffs.	Sharan	2370 m	Tuft
Ditrichaceae	<i>Distichiumcapillaceum</i> (Hedw.) Bruch et Schimp.	On cliffs.	Shogran, saiful maluk	2020-2740 m	Tuft
Ditrichaceae	<i>D. crispatum</i> Müll. Hal.	On moist rocks.	Naran	3150 m	Tuft
Encalyptaceae	<i>Encalypta streptocarpa</i> Hedw.	On moist cliffs along stream	Sharan	2020 m	Tuft
Fissidentaceae	<i>Fissidens bryoides</i> var. <i>schmidii</i> (Müll. Hal.) R.S. Chopra & S.S. Kumar	Shady moist soil, moist boulders.	Shogran, Balakot, Shinkari	1000-153 m	Tuft
Fissidentaceae	<i>Fissidens curvatus</i> Hornsch. Syn. <i>F. strictulus</i> C. Muell.	On soil and moist boulders.	Balakot, Kaghan. Shogran, Paya	1280m-2940m	Tuft
Fissidentaceae	<i>F. diversifolius</i> Mitt.	On wet boulders along the streams.	Shinkari, Kewai	1600-2020 m	Tuft
Fissidentaceae	<i>F. dubius</i> P. Beauv.	On wet cliff along the streams	Mandagucha	1500-2200 m	Tuft
Fissidentaceae	<i>F. grandifrons</i> Brid.	On submerged rocks in Streams.	Balakot, Mandagucha,	1818-2350 m	Tuft
Fissidentaceae	<i>Fissidens perplexans</i> Dixon	On cliffs in moist shady places.	Balakot	820 m	Tuft
Fissidentaceae	<i>F. taxifolius</i> Hedw.	Shady moist soil, on boulders along the road side.	Balakot	2000-2300 m	Tuft
Funariaceae	<i>Funaria hygrometrica</i> Hedw.	On moist shady soil.	Shinkar, Batrasi Pass, Bararkot.	1000-2710 m	Tuft
Grimmiaceae	<i>Grimmia ovalis</i> (Hedw.) Lindb.	On dry boulders along the road	Kawai	1300-1530 m	Cushion
Grimmiaceae	<i>Grimmia alpestris</i> (F. Weber & D. Mohr) Schleich.	On dry boulders.	Batakundi	2680 m	Cushion
Grimmiaceae	<i>G. Montana</i> Bruch & Schimp.	On dry boulders.	Batakundi	2680 m	Cushion
Grimmiaceae	<i>G. pulvinata</i> (Hedw.) Sm.	On dry boulders	Kaghan, Kewai	1300-1600m	Cushion
Grimmiaceae	<i>Grimmia anodon</i> Bruch & Schimp.	On dry boulders	Shogran	3500m	Cushion
Grimmiaceae	<i>Schistidium apocarpum</i> (Hedw.) Bruch et Schimp.	On boulders and dry cliffs.	Naran, Babusar Pass	1450-2320 m	Cushion
Hypnaceae	<i>Callicladium haldanianum</i> (Grev.) H.A. Crum	On soil covered boulders.	Sharan	2370 m	Mats
Hypnaceae	<i>Gollania clarescens</i> (Mitt.) Broth.	On shady moist boulders and rock crevices	Sharan, Sikyan near Nadi.	2020-2350 m	Mats
Hypnaceae	<i>Homomallium simlaense</i> (Mitt.) Broth.	On humus, soil covered boulders.	Shogran, Sharan, Batakundi	1600-2600 m	Mats
Hypnaceae	<i>H. cupressiforme</i> Hedw. Var. <i>cupressiforme</i>	On exposed roots of Pine trees.	Sikyan near Nadi, Batakundi	2020 m	Mats
Hypnaceae	<i>Taxiphyllum taxirameum</i> (Mitt.) M. Fleish.	On shady moist boulders along the streams and road.	Shogran- Kawai	1600-2250 m	Mats
Hypopterygiaceae	<i>Hypopterygium flavolimbatum</i> Müll. Hal. Syn.	On shady moist soil, humus and soil covered boulders.	Shogran, Sikyan near Nadi	2220-2450 m	Weft

	<i>Hypopterygium tibetanum</i> Mitt.				
Leskeaceae	<i>Lescuraea incurvata</i> (Hedw.) E.Jawt.	On boulders.	Babusar Pass	4180 m	Mats
Leucodontaceae	<i>Leucodon sciuroides</i> (Hedw.) Schwaegr.	On bark of trees.	Kaghan	2300 m	
Mniaceae	<i>Mnium heterophyllum</i> (Hook.) Schwaegr.	On humus or cliff along the streams.	Sikyan near Nadi, Sathan Gali	2020-2250 m	Mats
Mniaceae	<i>M. laevinerve</i> Card.	On cliffs.	Kewai	2750 m	Mats
Mniaceae	<i>M. stellar</i> Reichard ex Hedw.	On shady moist soil or soil covered boulders.	Shogran-Kawai	2250 m	Mats
Mniaceae	<i>Plagiomnium cuspidatum</i> (Hedw.) T.J. Kop.	On moist humus along the streams.	Shogran	2020m	Mats
Mniaceae	<i>Plagiomnium rostratum</i> (Schrad.) T.J. Kop.	On wet boulders, cliffs along the streams.	Sikyan, Sathan Gali	2020-2350 m	Mats
Neckeraceae	<i>Cryptoptodon pluvinii</i> (Brid.) Broth.	On humus rich shady soil.	Sharan forest,	1800-2400m	Fans
Neckeraceae	<i>Homalia trichomanoides</i> (Hedw.) Schimp.	On soil and soil submerged boulders.	Sikyan near Nadi.	2020-2740m	Fans
Neckeraceae	<i>Thamnobryum alopecurum</i> (Hedw.) Nieuwl. ex Gangulee	On soil in Abies forest.	Naran	2740m	Fans
Neckeraceae	<i>Thamnobryum subserratum</i> (Hook. ex Harv.) Nog. & Z. Iwats.	On boulders.	Sharan forest, Nadi	2020m-2400m	Fans
Orthotrichaceae	<i>Drummondia thomsonii</i> Mitt.	On bark of trees, boulders	Kiwai, Sikyan near nadi	1300-1550m	Cushion
Orthotrichaceae	<i>Orthotrichum anomalum</i> Hedw.,	On moist boulders.	Sikyan near nadi;	2020m	Cushion
Orthotrichaceae	<i>Orthotrichum pumilum</i> Sw.	On moist boulders.	Sharan, Kiwai, Kund Bangla	1530-3230m	Cushion
Plagiotheciaceae	<i>Isopterygiopsis muelleriana</i> (Schimp.) Iwats.	On humus rich soil.	Shogran, Sharan	2200m- 2300m	Tuft
Plagiotheciaceae	<i>Plagiothecium cavifolium</i> (Brid.) Z. Iwats.	On moist rocks.	SaifulMaluke	3150 m	Mat
Plagiotheciaceae	<i>P. denticulatum</i> (Hedw.) Schimp.	On humus rich soil, rocks.	near Sikyan	2020m	Tuft
Plagiotheciaceae	<i>P. latebricola</i> Schimp.	On soil and tree basis	Shogran-Sali Hut.	2710m	Tuft
Plagiotheciaceae	<i>P. nemorale</i> (Mitt.) A. Jaeg.	On soil and tree basis	Sharan forest.	2400m	Tuft
Polytrichaceae	<i>Atrichum undulatum</i> (Hedw.) P. Beauv. var. flaisetum Mitt.	On moist soil.	Shogran- Sali Hut,	2000m-2780m	Turf
Polytrichaceae	<i>Pogonatum urnigerum</i> (Hedw.) P. Beauv.	On moist shady soil	Shogran, paya, Mandagucha (Siran valley)	2400-2860 m	Turf
Polytrichaceae	<i>Polytrichum juniperinum</i> Hedw.	On soil in dry alpine zone.	Babusar Pass	4181 m	Turf
Pottiaceae	<i>Molendoa sendmeriana</i> (Bruch & Schimp.) Limpr.	On cliffs, soil and boulders	Shogran, Panrang	2350-2740 m	Cushion
Pottiaceae	<i>Timmiella anomala</i> (Bruch et Schimp.) Limper.	On cliffs, soil and boulders	Kewai, Nadi	2020-2350 m	Cushion
Pottiaceae	<i>Bryoerythrophyllum recurvirostrum</i> (Hedw.) P.C. Chen	On boulders and shady soil	Kaghan	2300 m	Cushion
Pottiaceae	<i>Barbula horricomis</i> Gangulee	On soil and boulders.	Kaghan	2400 m	Cushion
Pottiaceae	<b><i>B. gregeria</i> Mitt.</b> A. Jaeger	On moist soil and boulders.	Babusar Pass	4181 m	Cushion
Pottiaceae	<i>Erythrophyllum recurvirostre</i> var. <i>viride</i> (Schlieph. ex Limpr.) Péterfi syn. <i>Didymodon rubellus</i> Hoffm.	On moist soil and bolders	Kaghan valley	2400 m	Cushion
Pottiaceae	<i>D. rufescens</i> (Mitt.) Broth.	On moist soil and bolders	Kaghan valley	2400 m	Cushion
Pottiaceae	<i>Hymenostomum obscurissimum</i> Dix.	On humus rich soil.	Kaghan valley	2350 m	Cushion
Pottiaceae	<i>Syntrichia brandisii</i> (Müll. Hal.) R.H. Zander Syn. <i>Tortula brandisii</i> Broth.	On boulders and soil	Kaghan valley	2350 m	Cushion

Pottiaceae	<i>Trichostomumlilliei</i> Dix	On boulders and soil	Kaghan	2350 m	Cushion
Sematophylaceae	<i>Brotherellanictans</i> (Mitt.) Broth.	On the basis of pinus trees.	Shogran-Sali Hut.	2020-2710 m	Mats
Splachnaceae	<i>Tyloriafrolichiana</i> (Hedw.) Mitt. ex Broth.	On rotten logs.	Naran	2710 m	Tuft
Thuidiaceae	<i>Anomodon giraldii</i> Müll. Hal.	On dry cliffs and bark of exposed roots.	Sikyan near Nadi.	2020 m	Weft
Thuidiaceae	<i>Anomodon minor</i> (Hedw.) Lindb.	On bark of trees.	Shogran-Sali Hut	2710 m	Weft
Thuidiaceae	<i>Anomodon viticulosus</i> (Hedw.) Hook. & Taylor	On humus rich soil	Shogran	2020-2710 m	Weft
Thuidiaceae	<i>Claopodium pellucinerve</i> (Mitt.) Best.	On cliffs	Shogran	1600-2700 m	Weft
Thuidiaceae	<i>Thuidium cymbifolium</i> (Dozy & Molk.) Dozy & Molk.	On humus along the bank of river.	Sikyan near Nadi	2020 m	Weft
Thuidiaceae	<i>Thuidium contortulum</i> (Mitt.) A. Jaeger		Sikyan near Nadi	1500-1810m	Weft
Thuidiaceae	<i>Cyrto-hypnum vestitissimum</i> (Besch.) W.R. Buck & H.A. Crum. Syn. <i>T. vestitissimum</i> Besch.	On cliffs	Shogran-Sali Hut,	2710 m	Weft
Timmiaceae	<i>Timmia megapolitana</i> subsp. <i>bavarica</i> (Hessl.) Brassard	On soil and shady boulders	Shogran-Sali Hut,	2300 m	Turf