Indigenous Uses of Fern Flora for Sustainable Livelihood Security of Swat Kohistan Valley, Hindu Kush Range, Northern Pakistan

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Abstract

A detailed investigation was carried during 2023 on ethnomedicinal knowledge and conservation value of fern flora for sustainable livelihood security of Swat Kohistan Valley, Hindu Kush Range, Swat, Northern Pakistan. A total of ten Fern Medicinal taxa belong to 8 genera and five families were recorded from Swat Kohistan Valley used by the rural communities for the treatment of various animal and human diseases. The Adiantaceae and Pteridaceae were the prominent families in term of species diversity with three species each, followed by Dryopteridaceae with two fern taxa. Aspleniaceae and Thelypteridaceae are monospecific that contribute one species and one genus each. Fronds was widely used part 9, followed by Rhizome 7 and Leaves 2. Information was mostly collected from farmers, herbalists, Ajars, Gujars, elder peoples belonging to different habitats and sub localities of research area through interview, group discussion and direct field observations. About 51 diseases/disease groups were recorded and used by the local inhabitants for the treatment of various human disorders. The main aim of the study was to document the traditional knowledge and indigenous practices of ethnomedicinal fern and fern allies in the research area. It was concluded that most of the medicinal plant resources are threatened due to habit loss, over exploitation, land use change and unscientific harvesting. Conservation practices, public awareness about the importance of the indigenous flora and sustainable of utilization of highly valuable medicinal plants is highly desirable by involvement of rural communities in their natural habitats.

Keywords: ethnomedicinal, Cultural Practices, Folk Usage, ferns, Swat Kohistan, HHR, Northern Pakistan.

Introduction

Plant biodiversity is a major pre-requisite for healthy ecosystem that sustains all the life on the earth. Documentation and exploration of plant biodiversity was the first sixteen targets for 2010adopted by the 6th Conference of the Parties to the CBD, (Callmander*et al., 2005*). All the

vascular plants (Tracheophytes) are divided into two major groups: the lycophytes and euphyllophytes. The latter is further divided into spermatophytes and monilophytes (fern and their allies), (Judd *et al*., 2002). There are 260 genera and 1200 species of ferns worldwide. From Pakistan 200 pteridophytes comprising of 20 families including ferns, have been reported (CBD, 2014). 55 ferns and fern allies have been reported from Swat Valley (Stewart, 1967).

Considerable descriptive work on ethnomedicinal and conservation of fern flora in Pakistan has been carried out by few workers i.e. Stewart (1972) reported 144 ferns species from West Pakistan and Kashmir, belonging to 43 genera and 12 families. These ferns were mostly found in the coniferous forests of mountainous regions including some species from Swat valley. Shah and Sadiq (1985) reported the Pteridophytes of Malakand Division. Nakaike and Malik (1992) reported a total 68 Pteridophytes distributed among 25 genera and 13 families. Nakaike and Malik (1993) reported a second checklist of Pteridophytes and mentioned 87 taxa distributed among 32 genera and 20 from the various regions of Pakistan. Khan (1997) conducted research work on Ferns and Fern allies of Districts Swat and reported 31 species. Saleem *et al.,* (2000) described 26 species of 14 genera and 10 families of Ferns and Ferns allies from District Dir. Saima *et al.,* (2010), collected and explored 167 plants species along with 7 species of ferns from Ayubia National Park, District Abbottabad. Razzaq *et al.,* (2010) reported 2 species of Adiantum, i.e. *Adiantum venustum* and *A. capillus veneris* from Changa valley of District Shangla, Pakistan, having ethnobotanical potential. Saleem (2011) reported 37 ferns species and their allies from Upper Dir, Similarly Ilyas *et al.* (2013) documented a preliminary checklist of twenty species of ferns and their allies. Iltaf *et al*., (2013) taxonomically and ethnobotanically explored the fern flora of Punjab and reported 36 fern species distributed to 18 genera and 13 families. Ilyas *et al.,* (2013) documented and prepare preliminary checklist of 59 vascular flora of Kabal Valley Swat, of which 20 species of ferns belonging to 8 families and 12 genera were also reported. Fazalullah *et al.*, 2014 compiled fern flora of Maidan Valley, Lower and reported twenty-five taxa of pteridophytes of 13 genera and 8 families from different localities. Ullah *et al.,* 2014 recorded 62 species belong to 57 genera and 37 families in which 2 species of pteridophytes were also reported from Kalash Valley Chitral. *Mir et al.,* (2015) reported 81 Pteridophytes of 27 genera and 11 families from district Shopian of Kashmir valley. Razzaq *et al.,* (2015) explored 25 medicinal plant taxa belonging to 21 families at higher altitude of District Shangla. Gul *et al.,* (2016) reported 130 Pteridophytes from different area of Mansehra of district

Mansehra, Khyber Pakhtunkhwa. Irfan eta al., 2021, recorded 40 taxa of 19 genera and 10 families used by the inhabitants of KP for various primary health care ailments but due to extremely varied and diverse flora of Pakistan, the works seems to be fragmentary and negligible and there is dire need for exploration of the ethno medicinal and Indigenous Uses of Fern plant biodiversity for the sustainable livelihood security of the area.

The Swat Kohistan region is one of the hot Centre and biologically diverse regions in the Hindukush Himalaya Region with some of highly rich and economically important medicinal plants of therapeutic interest. Since Swat Kohistan has a rich plant biodiversity but data on Medicinal Fern Plants are rare and insufficient. To complete partial and fragmentary studies those have been carried out throughout the Hindukush Himalaya Region. It is therefore necessary to document baseline information regarding the Medicinal Fern flora. Therefore, the present study was designed to explore Fern Plant biodiversity with special reference to their medicinal values for the sustainable livelihood security of the research area. The present research will provide baseline information regarding the fern flora of the neglected areas of the Swat valley.

Materials and Methods

Study area

The valley of Swat, popularly known as the Switzerland of the east with lush green valleys, snow covered glaciers, forests, meadows and plains. and is highly popular among the tourists for its lavish display of natural majesty and scenery. The Valley consists of 6226 Km² of land and can be traced within 34° 30´- 35° 55´ N latitude and 71° 45´- 72° 50´ E longitude. The District is composed of rocky mountainous series of Hindu Kush-Himalayan having great altitudinal variation, ranging from gentle slope in the south to very steep slopes at high altitude of northern parts (Ahmad, 1995). Attitudinally it varies from about 600 m in the south to more than 6000 m in the north and Falaksair (6220 m) is the highest peak of the area. Major portion of the area comes under the influence of Sino-Japanese floristic region. (Ali and Qaiser,1986).

The Swat District is bounded by Chitral and Ghizer districts in the North, Kohistan and Shangla districts in the East, Buner district and Malakand protected area in the South and by the districts of Upper and Lower Dir in the West. It has altitudinal variation from 600 meters above sea level in the South to more than 6,000 meters in the north. (Ahmad, 1995). The total land area of district Swat is 5,337 square kilometers. This total area is divided in two tehsils, namely Matta and Swat, having areas of 683 sq. km and 4,654 sq. km, respectively. The valley of Swat is

divided into two physical regions, i.e., Swat-Kohistan and Swat. Swat Kohistan is the mountainous areas on the upper reaches of the Swat river up to Ain in the south while the whole area south of Ain is Swat proper. Ain is subdivided into Bar (upper Swat) and Kuz (Lower Swat). There are several mountain peaks ranging from 4500 to over 6000 meters above sea level, mostly covered with everlasting snow. The topography of the district is such that not all the land is suitable for cultivation. Total reported area of the district is 506,528 hectares out of which 96,582 hectares (19.4 percent) are cultivated. (Anonymous, 1998).

The Swat Kohistan Valley is marked by harsh weather with the highest maximum temperature 33 °C during summer (July and August) and below -2 °C during winter (December-March). The summer in lower Swat valley is short and moderate while it is cool and refreshing in the upper northern part. The coldest month is January with mean maximum and minimum temperature of 11°C and -2°C, respectively. The hottest month is June with mean maximum and minimum temperature of 33°C and 16°C, respectively. The average annual rainfall ranges from 1000 mm to 1200 mm which falls mainly in the rainy seasons; winter, spring and summer. The winter season is long and extends from November to March, rain and snowfall occurs during this season. Snowfall generally starts by the mid of November on the high peaks of valley and descend downwards as the temperature falls. The amount of rainfall received during winter season is more than that of summer season. The highest rainfall recorded during the month of March is about 242 mm.

It is mountainous area with elevations ranging from 600 to 6000 meters above mean sea level and the area dominated by species such as *Abies pendrow, Pinus wallichiana, Pinus longifolia, Cedrus deodara, Picea smithiana, Quercus incana, Q. ilex, Q. dilatata,* and *Q. semicarpifolia.*

The Chir pine and *Quercus incana* occupying the low altitude ranging from 1000-1600m whereas blue dominates the higher elevation and mostly found at altitude of 1600-3000 m. *Abies pendrow* and *Picea smithian*a dominates the shady places while *Cedrus deodara* and *pinus geradiana* found on exposed and dry rocks of the area. (Anonymous, 1998).

Ethnomedicinal Data collection

The current study was carried out during 2023-24 in order to collect the ethnomedicinal and traditional knowledge of local communities about the medicinal fern flora Swat Kohistan,

Hindukush Himalaya Range Northern Pakistan. Traditional knowledge, Usage and Folk recipes of fern plant species were documented. Field trips were arranged to the different localities and sub localities of the research area. Information on medicinal uses and folk recipes were mostly collected from farmers, hakims, shop keepers (engaged in medicinal plants business) and elders belonging to different communities and habitats through interview and group discussion. ethnomedicinal data regarding botanical name, family name, vernacular name, part used, habit, habitat, part used, traditional and folk recipes, mode of administration, flowering seasons, distribution, abundance and conservation status were also recorded. Plant specimens were collected and personal observations were also recorded in the fields with comprehensive field's notes including locality, sub locality, habit, abundance, altitude, etc.

Plant Collection, Preservation and Identification

Medicinal Fern flora were collected from different regions of the research area. The plants specimens were collected from the wild, photographed at the time of collection, tagged, pressed, dried, preserved, labelled and mounted on the herbarium standard sheets (41.25 cm × 28.75). All the fern medicinal plants were identified with the help of relevant floras and other available scientific literatures. Flora of Pakistan (http://legacy.tropicos.org/Project/Pakistan), Flora of China (http://www.efloras.org/flora_page.aspx?flora_id=2), Flora of North America-(http://www.efloras.org/flora_page.aspx?flora_id=1), Tropicose(http:/tropicose.org), the ferns and Fern allies of the far west Himalaya, Pakistan, Ferns and Allies of the far-west IndoHimalaya (Mr. C. R. Fraser-Jenkins by 1992, 2014) were used for identification. For verification a detailed morphology and taxonomic characters of collected voucher plant specimens were compared with different sources likes published papers, books, internet, available monographs, and voucher specimens of other herbaria. The verification of Botanical name and authentication of plants was further confirmed using the legitimate data base for plant taxonomy; WFO Plant List (https://wfoplantlist.org/), International Plant Name Index(http://www.ipni.org), Plant of the World online(https://powo.science.kew.org), the Global Biodiversity Information Facility (http://www.gbif.org). Smith's classification (2006) was used for ferns in order to follow different taxonomic ranks. Boulos (1938) were followed for

terminologies of various medicinal plants. Properly pressed and preserved Voucher specimens were deposited at Herbarium of Qarshi Herb Garden, QHRC.

Results and Discussion

. A total of 10 Medicinal Ferns have been recoded, belonging to 8 genera and 5 Families. These medicinal ferns were used by the rural communities of Swat Kohistan for the treatment of various animal and human diseases (Table IV & VI). The Adiantaceae and Pteridaceae were the prominent families in term of species diversity with three fern species each, followed by Dryopteridaceae with two fern taxa (Table I). Aspleniaceae and Thelypteridaceae are monospecific that contribute one species and one genus each (Table I). Fronds was widely used part 9, followed by rhizome 7 and Leaves 2. (Table IV). About 51 diseases/disease groups viz., expectorant, cold, cough, fever, skin diseases, demulcent, diuretic, hair wash, toothache, eye washing, measles, cuts and wounds, asthma, stomach problems, dyspepsia, hair fall and dandruff, coolant, tonic, emetic, ophthalmic, blood purifier, refrigerant, backache, Jaundice, hepatic disorders/ liver disorders, chest infection, headache, cleaning of teethes, cuts and wounds, eye trouble, hair loss, laxative irregular menstrual cycle, cold, chest infection, leukoderma and dermatitis, bronchitis, anthelmintic, rheumatism, hair tonic, flu, antioxidant, antibacterial, dysentery, irritation, inflammation, swelling, female infertility were used in the treatment of various disorders. (Table-V).

Six drug formulations were used by the local inhabitants of which paste and juice was the most common (25% each) followed by powdered form and decoctions (20% each), Infusion and Poultice (1% each). (Table V).

The plant biodiversity is major source of income for the livelihood security of the area. Local community of the area is very poor and primarily dependent upon plant resources to fulfill their basic and life needs. In recent years there has been a gradual rise in the demand of herbal products and plant-based drugs resulting in the over consumption, over exploitation of medicinal plants. loss of quality habitat, habitat fragmentation, deforestation, unscientific harvesting and illegal trade in herbal products have severely threatened some important and rare medicinal plant species of the area.

Some medicinal Ferns are also are under high biotic pressure due to over exploitation, non-sustainable collection, loss of quality habitat and land use change. Some highly valuable plant

taxa like *Adiantum capillus-veneris* L., *A.Venustum* D. Don. and *A. incisum* L. were frequently used for different ailments in the research area and become threatened due overharvesting for medicinal purposes. It has been concluded that there is over ride need to protect the medicinal plant biodiversity and ensure their sustainable use for better and long-term livelihood security and safety of the area.

Conclusion

A total of 10 plant taxa belonging to 08 genera and 05 families were recorded used by the used by the local communities for treatment of various human and animals' ailments. A total 51 diseases/disease groups were recorded and used in the treatment of various human disorders. Fronds was widely used part 9, followed by rhizome 7 and Leaves 2. Ecotourism is a developed industry and thousands of tourists visit the Swat Kohistan valley round the year especially in summer season which aid waste material to the ecosystem and disturbed the natural balanced of ecosystem. The main aim of the study was documenting the Traditional knowledge and indigenous and cultural practices of ethnomedicinal fern and fern allies in the research area. It was recommended that conservation practices, sustainable collection, rehabilitation of degraded habitats and public awareness about natural resources must be carried out to protect vascular and fern plant biodiversity for sustainable livelihood security of the local community.

ACKNOWLEDGMENT:

This paper is part of the Project of first author. The authors are thankful to the local communities of Swat Kohistan, Hindukush Himalaya Range, Northern Pakistan for sharing their valuable traditional and cultural knowledge on these fern medicinal plants. Authors are also thankful for hospitality, cooperation during the field surveys and interviews.

CONFLICT OF INTREST

All the authors have no conflict of interest.

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Table I. Family Wise Distribution of the Medicinal Fern Flora of the Swat Kohistan, Hindukush Range, Northern Pakistan

S.No	Family	Genera	Species
	Adiantaceae	1	3
	Aspleniaceae	1	1
	Dryopteridaceae	2	2
	Pteridaceae	3	3
	Thelypteridaceae	1	1

A total of 10 Medicinal Ferns have been recoded, belonging to 8 genera and 5 Families

Table-II. Medicinal Fern Flora of Swat Kohistan, Northern Pakistan

S. No.	Family	Genus	Species
1	Adiantaceae	*Adiantum* L.	*Adiantum capillus-veneris* L.
			Adiantum incisum L
			Adiantum venustum D. Don.
2	Aspleniaceae	*Asplenium* L.	*Asplenium trichomanes* L.
3	Dryopteridaceae	*Dryopteris* Adans.	*Dryopteris marginalis* (L.) A.Gray
		Polystichum Roth	*Polystichum setiferum*(Forssk.) T.Moore ex Woynar
4	Pteridaceae	*Cheilanthes* Sw.	*Cheilanthes anceps* Blanf.
		Onychium Kaulfuss	*Onychium Japonicum* (Thunb.) Kunze
		Pteris L.	*Pteris cretica* L.
5	Thelypteridaceae	*Cyclosorus* Link	*dentata* (Forssk.) E.P.St.John

Table III. A Checklist and Phytogeographic Distribution of the Medicinal Fern Flora of the Swat Kohistan, Hindukush Range, Northern Pakistan

S.No	Species	Locality	Reference
1.	*Adiantum venustum* D. Don.	Hazara, Mansehra, Battgram, Dir, Buner, Malakand. Swat	Ilyas et al., (2013), Nakaike and Malik (1992), R.R Stewart (1972)
2.	*Adiantum incisum* Forssk.	Besham,Mansehra, Balakot, Kashmir, Swat	Nakaike and Malik (1992), Stewart (1972)
3.	*Adiantum capillus-veneris* L.	Abbottabad, Mansehra, Kurram, Murree, Kashmir, Swat	Abbottabad, Mansehra, Kurram, Murree, Kashmir, Swat
4.	*Asplenium trichmanes* L.	Kaghan, Malakand, Dir, Mansehra, Murree, Swat, Kashmir,	Nakaike and Malik (1992),
5.	*Cheilanthes anceps* Blanf. Syn. *Aleuritopteris anceps* (Blanf.) Panigrahi.	Hazara, Mansehra, Balakot, Battgram, Dir, Malakand, Swat	R.R. Stewart (1972)

6.	*Dryopteris marginalis* (L.) A.Gray	Hazara, Abbottabad, Balakot, Dir, Swat,	Nakaike and Malik (1992), R.R Stewart (1972)
7.	***Onychium japonicum*** (Thunb.) Kunz.	Swat, Dir, Shangla. Manshra, Balakot	R.R Stewart (1972)
8.	*Polystichum setiferum*(Forssk.) T.Moore ex Woynar	Hazara, Swat, Kashmir	R.R Stewart (1972)
9.	*Pteris cretica* L.	Mansehra, Shogran, Dir, Swat, Kashmir	R.R. Stewart (1972), Nakaike(1993)
10.	*Thelypteris dentata* (Forssk.) E.P.St.John Syn. Christella dentata (Forssk.) Brownsey & Jermy	Swat, Miandam, Odigram, Barikot Hazara, Mansehra	A.Gul and J. Alam (2016)

Table-IV. Ethnomedicinal/Folk Usage and Cultural Practices of Fern Medicinal Plants in HKH Range, Northern area, Pakistan.

S.No	Botanicl Name	Family	Local Name	Part Used	Ethnomedicinal Uses
1.	*Adiantum capillus-veneris* L.	Adiantaceae	Sumbal/ Maidenhair Fern	Fronds	The fronds are used for curing scorpion bite. Juice of the fresh plant is used as anti-diabetic, emetic, and expectorant. Frond is used for the treatment of cold, cough, fever, skin diseases and diabetes. Plant is expectorant, demulcent, coolant, diuretic and hair tonic. Decoction of plant is used in cough, toothache and eye washing. Frond is eaten with carrot for measles. Folk Recipes: A fresh frond is crushed to make a paste & applied on the snake & scorpion bite twice a day. A Paste is prepared from the frond & applied externally to treat cuts and wounds. Decoction is also used as hair tonic in the form of hair wash.

2.	*Adiantum incisum* Forssk.	Adiantaceae	Sumbal/ Maidenhair Fern	Fronds & rhizome	Fronds are used for fever, cough, asthma, skin problems, & scorpion bites. The fronds are externally used in skin ailments. Frond is used for the treatment of skin diseases, asthma, cough, fever, diabetes, stomach problems, dyspepsia, and scorpion bite. Folk Recipes: The frond is powdered, mixed with butter and are used to control the internal burning of the stomach/dyspepsia. A Paste prepared from the rhizome of plant is applied externally for healing of cuts and wounds. Juice of plant is used for diabetes, jaundice and hepatic disorders. Young frond extract is mixed with mustard oil and applied on the hair as useful remedy for hair fall and dandruff.
	Adiantum venustum D. Don.	Adiantaceae	Sumbal/ Himalayan Maidenhair Fern	Fronds & rhizome	Fronds of the plant are coolant, expectorant, tonic, emetic, diuretic. ophthalmic, blood purifier, refrigerant and also used for fever, cough & backache. Frond is also used as remedy for jaundice, hepatic disorders, chest infection, headache & scorpion bites. Plant is also taken for cleaning of teethes and toothache. Rhizome's extract is also used for diabetes and liver disorders. The decoction is used in scorpion bite. Folk Recipes: Paste prepared

					from the rhizome of plant is applied externally for healing of cuts and wounds. A fresh frond is crushed to make a paste & applied on the snake & scorpion bite twice a day. Juice extracted from frond of Fern is used as expectorant, emetic and diuretic. The fronds are boiled in water, cooled, and the filtered water is used for eye trouble. The decoction is also mixed with oil to prevent hair loss.
4.	*Asplenium trichmanes* L.	Aspleniaceae	Jnabil/Miadenhair spleenwort	Leaves	Fern is diuretic, expectorant and laxative. Traditionally the fern is used as remedy for cough, hepatic disorders and also for treatment of irregular menstrual cycle. The frond when smoked is used for cold and chest infection. Decoction of Leaves with coconut oil is used for treatment of skin infections, i.e. leukoderma and dermatitis. Folk Recipes: Leaves is boiled and mixed with coconut oil, applied on skin for treatment of skin infections, i.e. leukoderma and dermatitis
5.	*Cheilanthes anceps* Blanf. Syn. *Aleuritopteris anceps* (Blanf.) Panigrahi.	Pteridaceae	Silverback Fern	Fronds/rhizome	Juice extract of fern frond is used for treatment of diabetes, cough, bronchitis and wound healing and cough. Folk Recipes: The aqueous extract of frond is used for curing of various disorders of humans such as wound healing, diabetes,

					bronchitis and cough
6.	*Dryopteris marginalis* (L.) A.Gray	Dryopteridaceae	Marginal wood fern,	Fronds/rhizome	Fern is used as anthelmintic especially for tapeworm. It is also used for the treatment of toothaches and rheumatism. Folk Recipes: The infusion of the rhizome is used in the treatment of rheumatism. The warm infusion when held in mouth is consider as useful remedy for the treatment of toothaches
7.	***Onychium japonicum*** (Thunb.) Kunz.	Pteridaceae	Atir/Carrot Fern	Fronds/rhizome	The extract of frond is considered as useful remedy for skin problems and hair tonic. Leaves are used as laxative whereas powdered rhizome is used for the treatment of asthma and flu. Folk Recipes: Juice is extracted & used as hair tonic. Rhizome of fern is grinded into powdered form and used form to cure asthma and flu.
8.	*Polystichum setiferum*(Forssk.) T.Moore ex Woynar	Dryopteridaceae	Soft shield fern	Fronds/rhizome	Fern is antioxidant and antibacterial. Rhizome is used in dysentery especially for children. Folk Recipes: Rhizome is tied around the neck in the children for the treatment of dysentery
9.	*Pteris cretica* L.	Pteridaceae	Atir/Thandi Boty/ Cretan brake fern	leaves/fronds	Plant is antiseptic & used to treats cuts & wounds. Frond is applied on skin for skin diseases, cuts/wound healing, irritation, inflammation and swelling, Folk Recipes: Poultice of leaf is applied on skin for skin problems, cuts, wound healing, irritation,

					inflammation and swelling. The decoction of plant is used for healing of external wound and cuts as antiseptic and antibacterial.
10.	*Thelypteris dentata* (Forssk.) E.P.St.John Syn. Christella dentata (Forssk.) Brownsey & Jermy	Thelypteridaceae	Kunji/Downy Maidenfern	Rhizome/fronds	The young circinate fronds is used as vegetable. Rhizome is used as an antibacterial agent. Rhizome is grinded into powdered, mixed with coconut oil and sugar and orally for female infertility Folk Recipes: Rhizome is grinded into powdered, mixed with coconut oil and sugar and orally for female infertility.

Table-V. Method of Preparation and Diseases treated of Fern Medicinal Plants in HKH Range, Northern area, Pakistan.

S.No	Botanicl Name	Family	Local Name	Part Used	Method of Preparation	Disease treated
1.	*Adiantum capillus-veneris* L.	Adiantaceae	Sumbal/ Maidenhair Fern	Fronds	Decoction, Juice, paste	Scorpion bite, anti-diabetic, emetic, expectorant, cold, cough, fever, skin diseases, demulcent, coolant, diuretic, hair tonic/hair wash cough, toothache, eye washing, measles, cuts and wounds

2.	*Adiantum incisum* Forssk.	Adiantaceae	Sumbal/ Maidenhair Fern	Fronds & rhizome	Juice, powdered form Paste	Fever, cough, asthma, skin problems, scorpion bites. The asthma, cough, fever, diabetes, stomach problems, dyspepsia, healing of cuts and wounds, diabetes, hepatic disorders, hair fall and dandruff.
	Adiantum venustum D. Don.	Adiantaceae	Sumbal/ Himalayan Maidenhair Fern	Fronds & rhizome	Decoction, powdered form Juice, paste	Coolant, expectorant, tonic, emetic, diuretic. ophthalmic, blood purifier, refrigerant fever, cough, backache, Jaundice, hepatic disorders, chest infection, headache,

						scorpion bites, cleaning of teethes/toothache. Diabetes, liver disorders, healing of cuts and wounds, diuretic, eye trouble, hair loss.
4.	*Asplenium trichmanes* L.	Aspleniaceae	Jnabil/Miadenhair spleenwort	Leaves	Decoction, Paste	Diuretic, expectorant, laxative, cough, hepatic disorders, irregular menstrual cycle, cold and chest infection, skin infections, i.e. leukoderma and dermatitis.
5.	*Cheilanthes anceps* Blanf. Syn. *Aleuritopteris anceps* (Blanf.) Panigrahi.	Pteridaceae	Silverback Fern	Fronds/rhizome	Juice	Diabetes, cough, bronchitis, wound healing, wound healing,
6.	*Dryopteris marginalis* (L.) A.Gray	Dryopteridaceae	Marginal wood fern,	Fronds/rhizome	Infusion	Anthelmintic, toothaches, rheumatism, toothaches
7.	***Onychium japonicum*** (Thunb.) Kunz.	Pteridaceae	Atir/Carrot Fern	Fronds/rhizome	Juice, powdered form	Skin problems, hair tonic, laxative, asthma, flu, hair tonic
8.	*Polystichum setiferum*(Forssk.) T.Moore ex Woynar	Dryopteridaceae	Soft shield fern	Fronds/rhizome	Paste	Antioxidant, antibacterial, dysentery
9.	*Pteris cretica* L.	Pteridaceae	Atir/Thandi Boty/ Cretan brake fern	leaves/fronds	Poultice, decoction	cuts & wounds, skin diseases, irritation, inflammation,

						swelling, antiseptic and antibacterial.
10.	*Thelypteris dentata* (Forssk.) E.P.St.John Syn. Christella dentata (Forssk.) Brownsey & Jermy	Thelypteridaceae	Kunji/Downy Maidenfern	Rhizome/fronds	Powdered form	Antibacterial, female infertility

Table VI. Folk Recipes and Conservation Status of Pteridophytic Flora in Swat Kohistan Valley, Swat.

SNo.	Family	Species	English/ Local Name	Part used	Folk Use	Conservation status
1	Adiantaceae	*Adiantum capillus-veneris* L.	Black Maiden Hair/ Venus hair/ Sumbal	Fronds	The fronds are used for curing scorpion bite. Juice of the fresh plant is used as anti-diabetic, emetic, and expectorant. Frond is used for the treatment of cold, cough, fever, skin diseases and diabetes. Plant is expectorant, demulcent, coolant, diuretic and hair tonic. Decoction of plant is used in cough, toothache and eye washing. Frond is eaten with carrot for measles. **Folk Recipes:** A fresh frond is crushed to make a paste & applied on the snake & scorpion bite twice a day. A Paste is prepared from the frond & applied externally to treat cuts and wounds. Decoction is also used as hair tonic in the form of hair wash.	Least Concerned
		Adiantum incisum L.	Walking maiden hair Sumbal	Fronds & rhizomes	Fronds are used for fever, cough, asthma, skin problems, & scorpion bites. The fronds are externally used in skin ailments. Frond is used for the treatment of skin diseases, asthma, cough, fever, diabetes, stomach problems, dyspepsia, and scorpion bite. **Folk Recipes:** The frond is powdered, mixed with butter and are used to control the internal burning of the stomach/dyspepsia. A Paste prepared from the rhizome of plant is applied externally for healing of cuts and wounds. Juice of plant is used for diabetes, jaundice and hepatic disorders. Young frond extract is mixed with mustard oil and applied on the hair as useful remedy for hair fall and dandruff.	Near Threatened
		Adiantum venustum D. Don.	Sumbal/ Himalayan Maidenhair Fern	Fronds Rhizome	Plant is mostly used in similar way as like *Adiantum capillus veneris*. It is cooling agent and used as good remedy for cough & asthma.	Near Threatened
2.	Aspleniaceae	*Asplenium trichmanes* L.	Jnabil/ Miadenhair spleenwort	Leaves	Fern is diuretic, expectorant and laxative. Traditionally the fern is used as remedy for cough, hepatic disorders and also for treatment of irregular menstrual cycle. The frond when smoked is used for cold	Data Deficient

					and chest infection. Decoction of Leaves with coconut oil is used for treatment of skin infections, i.e. leukoderma and dermatitis. **Folk Recipes:** Leaves is boiled and mixed with coconut oil, applied on skin for treatment of skin infections, i.e. leukoderma and dermatitis.	
3.	Dryopteridaceae	*Dryopteris marginalis* (L.) A.Gray	Marginal wood fern,	Fronds and Rhizome	Fern is used as anthelmintic especially for tapeworm. It is also used for the treatment of toothaches and rheumatism. **Folk Recipes:** The infusion of the rhizome is used in the treatment of rheumatism. The warm infusion when held in mouth is consider as useful remedy for the treatment of toothaches	Least Concern
		Polystichum setiferum(Forsk.) T.Moore ex Woynar	Soft shield fern	Fronds and Rhizome	Fern is antioxidant and antibacterial. Rhizome is used in dysentery especially for children. **Folk Recipes:** Rhizome is tied around the neck in the children for the treatment of dysentery	Least Concern
4.	Pteridaceae	*Cheilanthes anceps* Blanf. *Syn. Aleuritopteris anceps*(Blanf.) Panigrahi.	Silverback Fern	Fronds and Rhizome	Juice extract of fern frond is used for treatment of diabetes, cough, bronchitis and wound healing and cough. **Folk Recipes:** The aqueous extract of frond is used for curing of various disorders of humans such as wound healing, diabetes, bronchitis and cough	Least Concern
		Onychium Japonicum (Thunb.) Kunze Syn. *Onychium cryptogrammoides* Christ	Atir/ Japanese Claw fern		The extract of frond is considered as hair tonic. **Recipes:** Fronds of plant is grinded into powdered form & its juice is extracted & used as hair tonic.	Data Deficient
		Pteris cretica L.	Atir/Thandi Boty/ Cretan brake fern	Leaves /fronds	Plant is antiseptic & used to treats cuts & wounds. Frond is applied on skin for skin diseases, cuts/wound healing, irritation, inflammation and swelling, **Folk Recipes:** Poultice of leaf is applied on skin for skin problems, cuts, wound healing, irritation, inflammation and swelling. The decoction of plant is used for healing of external wound and cuts as antiseptic and antibacterial.	Least Concern

5.	Thelypteridaceae	*Thelypteris dentata (Forssk.) E.P.St.John Syn. Christella dentata (Forssk.) Brownsey & Jermy*	Kunji/ Downy Maidenfern	Rhizome/ fronds	The young circinate fronds is used as vegetable. Rhizome is used as an antibacterial agent. Rhizome is grinded into powdered, mixed with coconut oil and sugar and orally for female infertility **Folk Recipes:** Rhizome is grinded into powdered, mixed with coconut oil and sugar and orally for female infertility.