Traditional, medicinal and food uses of Pteridophytes of district Mansehra (Pakistan) and their some adjacent areas

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Abstract

Mansehra is one of the floristically rich and most varied districts of Pakistan, gifted with plentiful pteridophytes diversity. Various ethnic communities residing in district Manshehra and its adjacent localities exhibits unique tradition, dialect and culture. They collect pteridophytes from the wild especially for medicinal purposes, general healthcare, food uses and to meet daily life requirements. An inventory survey was conducted in order to assess the traditional uses of pteridophytes by the local inhabitants of the study area. Ethno botanical information and Ornamental potential of the taxa of wild pteridophytes was documented through field trips during 2013-2014. First-hand Information and data was collected through structured questionnaire and in-depth interviews were conducted from the natives in the hilly regions. A univariate level of analysis of the collected data such as percentage and frequency distribution was performed. 60 taxa are traditionally used, distributed in 16 families, and 26 genera. This figure meets about 32 % of the total known pteridophytes taxa of Pakistan. 56 taxa (93.34%) are widely used as medicines while 55 taxa having ornamental potential and may be cultivated for commercial purpose. 15 taxa are of great economic values i.e. a good source of vegetables and bio fertilizers. Our study concluded that, elders of the area have more knowledge than youngers in the population, an ethno medicinal practice of pteridophyte species by various indigenous people for treating various diseases and food use is prominent and may be considered as potential source for pharmaceutical industries to prepare new drugs to fight against various diseases.

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Introduction

Human depends on medicines secondary to food. Traditional recipes of phytomedicines are used for a long time around the world especially in developed countries. Unfortunately modern medicines rapidly replacing the old practices associated with numerous cultures around the world. However, still 80% population of the world depends on the traditional system of health care (Ahmad, 1999). Large populations of developing countries rely on traditional medicine in this context (Nair, 1957). In Pakistan due to limited health care services, high cost, inaccessibility of allopathic medicines coupled with poverty, majority of the people rely on traditional uses of medicinal plants. About 700 plant species are used as medicinal and aromatic plants (Pei, 1992).

There is an estimation of 10-15,000 known species of pteridophytes, classified under about 40 families (Swale, 2001). In North America, 420 ferns and fern allies have been recorded. Some Asian countries are rich in pteridophyte diversity. For instance, 639 species of ferns occur in Japan, about 1000 in the Philippines, 550 in Malaysia, more than 700 in Thailand, and about 600 in India. (Tryon, 1983, Schneider et al., 2004, Lu, 2007.). Currently 250 taxa are known to Pakistan and 130 to district Mansehra. (Gul et al., 2016). Medicinally, these plants also play an important role in the human society and the medicinal value is known to man for more than 2000 years. Theophrastus (327-287 B.C.) and Dioscorides (100 A.D).

Ferns have been used to treat fever, cough, tonic, skin problems and wounds, reproductive problems and also as insect repellent (Nair, 1959; Dixit, 1974). Ferns remedies were used by early locals throughout Jammu and Kashmir (Razdan, 1986). About66, to105pteridophytes are traditionally used in India including these regions (May, 1978, Kumar et al., 2003). Ferns remedies were used to treat cuts, ulcer, and dysentery and as protective medicine after childbirth (Perry & Metzger, 1980; Kamaruddin Salleh & Latif 2002; Jaman & Kalsom, 2010).

Medicinal aspects of these taxa are also highlighted by many other workers (Dixit, 1975, Khuller et al., 1994; Kaushik 1995; Singh et al., 1996; Vasudeva, Sullivan & Shealy 1997; 1999; Khuller et al., 2000; Singh, 2002; Singh, 2003; Benjamin & Manickam, 2007; Benniamin, 2011). In addition, ferns are also the source of fiber, craft, and fuel, building material, decoration and heavy metal removers. Ferns screens heavy metals from the soil especially arsenic (Croft, 1985; Benjamin and Manickam, 2007). *Pterisvittata* (brake fern), is used to absorb arsenic from the soil and *Microsorum pteropus* (Java fern), is one of the most popular freshwater aquarium plants (May, 1978; Lord, 2006). Ferns also contribute a great deal to environment beauty and man pleasure. Ferns enhance the beauty of gardens, parks, streets and houses; improve the environment of offices, schools and even hospitals (Oloyede et al., 2010, 2012; Kochhar, 2009; Biplab and Subir, 2007; Jim, 1999).

Materials and methods

The study area

Manshehra is one of the floristically rich and most varied districts of Pakistan, situated in the Khyber Pakhtunkhwa province with about 4579 sq. km area. Its geographical directs are between 34°-14’ to 35°-11’ N and, 72° 49’ to 74° -08’ E. The altitude varies from 400 m in the foot-hill regions to more than 4000 m high thick snow covered peaks of Malaika Parbath. District Manshehra comprises of three tehsils: Balakot, Manshehra and Oghi. Manshehra segments its borders with many other districts: the Kohistan and Diamir districts to the northern boundary, District Abbottabad to the south, District Muzaffarabad of Azad Jammu and Kashmir to the west, and District Swatto the east. District Haripur is located in the southwest, District Shangla and Batagram to the northwest and District Diamar to the northeast. Many tribes residing in the District, broadly divisible into like Gujars and Kohistani and the Pathans of the area. Abbasseis, Awans, Gujars, Swatis, Syeds, Kabli and Tanolies are the most prominent ethnic groups of the district and surroundings. Pashto, Gojri, Hindko, Pahari and Kohistani, are the local languages of Manshehra, while Urdu is spoken as a national language (Anon., 1998; Ghulam, 2003).
By advantage of exclusive climatic backgrounds, this district and surrounding area is a homeland for many pteridophyte species. According to a typical classification of forest types of Pakistan (Champion et al., 1965), the forests fall under the chief type “Montane temperate forests” These forests are predominately coniferous with some broad-leaved species. These lush forest canopies support rich fern flora of the district.

About 250 taxa (200 of known locality) of pteridophytes are currently known to Pakistan. Of these 130 (67%) taxa have been recorded from Mansehra district and its adjacent areas. Many indigenous people use several species to meet daily life needs. However, unfortunately, traditional uses of these taxa could not be documented yet including the study area. In the present study an attempt has been made to document traditional uses of this unique plant group. (Map of the study area is provided in Fig.1.)

Ethnobotanical information collection
Ethnobotanical information of wild pteridophytes being used by tribal was documented through field trips during 2013-2014.

Structured questionnaire survey method, in depth interviews with the locals was conducted to document the traditional ethno-medicinal knowledge in the area. Surveys were conducted in different villages’ local hujras (meeting places), mosques, marriage houses, and bazaars.

The village and nesses were selected based on the broad socioeconomic setup and cultural diversity. The interviews were carried out in local community, to investigate local people and knowledgeable persons (hakims, women and herdsmen, traders, and herbalists) who are the main user of medicinal plants. About 200 informants have been interviewed on random basis in this connection. Female students of various localities were involved under supervision of the first author to interview the women community of the area and male interviewed males. The already identified specimens were taken in the field to show them to various tribes, ethnic groups, to identify the potential medicinally important taxa of the study area.

Data analysis
The collected data was then put in SPSS sheet for analysis through percentages and frequency distribution. Moreover, data was analyzed to obtain information regarding traditional uses i.e. medicinal, vegetable, and ornamental and other uses across gender and different age cohort and different professions.

Important localities of the study area
The main targeted sites were: Shinkiari, Baffa, Dadar, Jacha, Jabbar, Jabori, Mandagucha, Shaheed Pani, Panjul, Kund Bungla, and Musa-Ka-Musallah, Ber Kund, Balakot, Gari Habibullah, Naddi Bangla, Jarid, Shogran, Siri Paya, Makra, Sharan Forest,

Collection and identification
Pteridophytes used in traditional way were collected and specimens were carefully observed. GPS coordinates were taken (with GPS Model ETrex20). Field data was recorded in field note books. Photographs were taken especially focusing habit. Collected specimens were pressed, dried, mounted. Each specimen was mounted on herbarium sheet and labeled properly with the help of already taken field data. Ferns were identified through the relevant available literature and classified according to Smith et al., (2006). Magnifying lenses, stereo microscope, light microscopes, compound microscopes with micrometer and microphotographs were used for critical examination of the material. The voucher’s numbers are provided in Anexture 1.

Finally, these specimens were deposited in the Hazara University Herbarium (HUH), Pakistan.

Fidelity level (FL) Value
The fidelity level (FL), The percent tage of informants claiming the use of the taxa for the medicinal purpose was calculated according to the following formula (Alexiades, 1996):

\[ FL(\%) = \frac{Ip}{Iu} \times 100 \]

Where:
Ip is the number of informants who independently suggested the use of the species for a particular disease; Iuis the total number of informants who mentioned the species for medicinal purpose.

Results and discussions
District Mansehra falls in the sinojapanese region of Pakistan having rich floristic and culture diversity. Two hundred locals of various ethnic communities were approached to get data about the use of the taxa in District Mansehra but valuable information's were obtained from 185 respondents only.

Frequency and percentage of various ethnic groups in the study area has been shown in Table 1. Hindko, Gujri, Urdu, Kohistani and Pushtoo remain the dominant language of 185 respondents. More males 60% as compared to females 40% responded to our interviews and questionnaire about the use of the taxa due to social set up of the study area. Education significantly changes the awareness level and informants with high level of education residing in hilly areas. Hindko speakers have been known more regarding medicinal uses of the taxa. Teachers, Hakims and local wound healers found to be more informative as compared to other professions.

Gender based analysis of the taxa
Gender based analysis of the taxa uses by the frequency and percentage has been given in Table 2. High percentage of males knew more common names of the taxa used for medicinal, ornamental and other purpose. Most of the locals used the edible species in hilly and rural areas i.e. 64%, as compared to suburban i.e. 26 % as well as in urban area, while ornamental aspect was more known to suburban inhabitant i.e. 66%, followed by rural and hilly areas i.e. 36%. Most of them used the taxa for many purposes but only know 1- 5 or more taxa common names and in many case no name of those species.

Locality wise uses of the taxa
Uses of the taxa in hilly, rural, suburban and urban area have been given in Table 3. Among 185 respondents, 174 (94%) have knowledge about the taxa, while the remaining 11 persons (6%) have no idea about the uses. Further majority i.e. 105 (56.76%) of the people used 1-5 taxa, while only 8 person (4.3%) have knowledge of more than 20 taxa. The highest number of medicinal and vegetables taxa 1-20, hilly areas residents (7%) had more knowledge, followed by rural (1%). 1-5 taxa were frequently used (41%) as vegetables by hilly, rural and suburban people. However, urban people used more taxa (66%) as ornamentals, followed by rural (46%) and hilly areas people (46%). Rural and hilly area’s people known more common names (55%), followed by suburban and urban (30%).
Like-wise rural and hilly areas people known about the use of 1-5 taxa (54%) for multi purposes, while urban used less comparatively (20%) taxa only. The other uses are i.e. forage, thatching, source of fiber for ropes, making baskets, as insulating layer on ground in winter and, summer, packing materials and washing utensils with its fibers.

Table 1. Frequency and Percentage Distribution of the Respondents.

<table>
<thead>
<tr>
<th>Gender</th>
<th>Male</th>
<th>Female</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frequency/%</td>
<td>132/71.4</td>
<td>53/28.6</td>
</tr>
<tr>
<td>Age</td>
<td>20-30</td>
<td>31-40</td>
</tr>
<tr>
<td>Frequency/%</td>
<td>88/47.6</td>
<td>43/23.2</td>
</tr>
<tr>
<td>Education</td>
<td>Non-Primary</td>
<td>Secondary Higher</td>
</tr>
<tr>
<td>Frequency %</td>
<td>31/16.8</td>
<td>41/22.2</td>
</tr>
<tr>
<td>Profession</td>
<td>Teacher</td>
<td>Mullah</td>
</tr>
<tr>
<td>Frequency %</td>
<td>51/27.6</td>
<td>13/7.0</td>
</tr>
<tr>
<td>Place of Origin</td>
<td>Hilly</td>
<td>Rural</td>
</tr>
<tr>
<td>Frequency/%</td>
<td>39/21.1</td>
<td>100/54.1</td>
</tr>
<tr>
<td>Ethnicity</td>
<td>Hindko</td>
<td>Pashto</td>
</tr>
<tr>
<td>Frequency/%</td>
<td>93/50.3</td>
<td>78/42.2</td>
</tr>
</tbody>
</table>

Ethnomedicinal importance

Large number of ferns are medicinal and they are commonly practiced to treat various ailments in the area. Table 4. shows ethnomedicinally important 56 taxa in the study area distributed in 27 genera and 17 families. Pteridaceae is the largest medicinal family having 4 medicinal genera and 16 taxa while Dryopteridaceae having three medicinal genera and 4 taxa. 59 remedies are commonly practiced against 20 different diseases like hepatitis, diabetes, infertility, skin problems, hair care and general tonics. Edible species are Diplazium polypodioides (Kunjie), Diplazium esculentum, Marsilea minuta, Marsilea quadrifolia, Pteridium aquilinum var. latiusculum Nephrolepis rsutula, Osmunda cinnamonea, Asplenium ensiforme and Nephrolepis biserrata. The young fronds are used as vegetables source or as a pot herb. The voucher’s numbers are provided in Anexture 2.

Table 2. Gender based analysis of the taxa uses by frequency and percentages.

<table>
<thead>
<tr>
<th>Number of Pteridophytes</th>
<th>None</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20</th>
<th>More</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>F/% in Male</td>
<td>12/9.1</td>
<td>70/53.0</td>
<td>22/16.7</td>
<td>14/10.6</td>
<td>7/5.3</td>
<td>7/5.3</td>
<td>132/100</td>
</tr>
<tr>
<td>F/% in Female</td>
<td>3/5.7</td>
<td>35/66</td>
<td>11/20.8</td>
<td>3/5.7</td>
<td>0/0</td>
<td>1/9.1</td>
<td>53/100</td>
</tr>
<tr>
<td>Number of taxa for medicinal use</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F/% in Male</td>
<td>31/23.5</td>
<td>71/53.8</td>
<td>20/15.2</td>
<td>6/4.5</td>
<td>3/2.3</td>
<td>1/0.8</td>
<td>132/100</td>
</tr>
<tr>
<td>F/% in Female</td>
<td>17/12.1</td>
<td>19/35.8</td>
<td>9/17.0</td>
<td>2/3.8</td>
<td>3/5.7</td>
<td>3/5.7</td>
<td>53/100</td>
</tr>
<tr>
<td>Use for Vegetable</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>F/% in Male</td>
<td>38/28.8</td>
<td>77/53.8</td>
<td>8/6.1</td>
<td>7/5.3</td>
<td>2/1.5</td>
<td>0/0</td>
<td>132/100</td>
</tr>
<tr>
<td>F/% in Female</td>
<td>18/14</td>
<td>20/37.7</td>
<td>8/15.1</td>
<td>3/5.7</td>
<td>3/5.7</td>
<td>1/1.9</td>
<td>53/100</td>
</tr>
<tr>
<td>Number of taxa for ornamental purpose</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>F/% in Male</td>
<td>24/18.2</td>
<td>81/61.4</td>
<td>14/10.6</td>
<td>5/3.8</td>
<td>4/3.0</td>
<td>4/3</td>
<td>132/100</td>
</tr>
<tr>
<td>F/% in Female</td>
<td>12/22.6</td>
<td>27/50.9</td>
<td>4/7.5</td>
<td>9/17.0</td>
<td>1/1.9</td>
<td>0/0</td>
<td>53/100</td>
</tr>
<tr>
<td>Common names of pteridophytes known to indigenous people</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>F/% in Male</td>
<td>45/34.1</td>
<td>72/54.5</td>
<td>8/6.1</td>
<td>5/3.8</td>
<td>2/1.5</td>
<td>0/0</td>
<td>132/100</td>
</tr>
<tr>
<td>F/% in Female</td>
<td>22/18.5</td>
<td>19/35.8</td>
<td>3/5.7</td>
<td>2/3.8</td>
<td>2/3.8</td>
<td>5/9.4</td>
<td>53/100</td>
</tr>
<tr>
<td>For other use</td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>F/% in Male</td>
<td>59/44.7</td>
<td>58/43.9</td>
<td>10/7.6</td>
<td>4/3.0</td>
<td>1/0.8</td>
<td>0/0</td>
<td>132/100</td>
</tr>
<tr>
<td>F/% in Female</td>
<td>28/22.8</td>
<td>19/35.8</td>
<td>3/5.7</td>
<td>1/1.9</td>
<td>0/0</td>
<td>2/3.8</td>
<td>53/100</td>
</tr>
</tbody>
</table>
Widely used ferns for various remedies
Fig.2. Shows that locals using 6 species as tonic and 6 against cough and chest congestion, 5 species for wound and skin healing 4 species as antipyretic and against leucorrhea, 3 for stomach disorders and 3 as antidiotes, 2 against hepatitis, 2 as purgative, 2 for joint pains and 2 for bones dislocation and pectoral affections. One or two species are used as, antidiabetic, for spermatorhea, menstrual disorders, diarrhea, as diuretic, for body pains and as nerve relaxant. Some taxa are used to prevent bad evils and against majoitotoona, while others are used as roof thatching, Shade making, ground insulation, sheep forage, as a dishwashing sponge and baskets making. Some ferns are grown with the belief to get wealthy, while others are considered as mood relaxant and health promoting.

Table 3. Number of taxa and their uses in hilly, rural, suburban and urban areas.

<table>
<thead>
<tr>
<th>Number of Pteridophytes</th>
<th>None</th>
<th>1-5</th>
<th>6-10</th>
<th>11-15</th>
<th>16-20</th>
<th>More than 20</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>F/% in hilly area</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>39/100</td>
</tr>
<tr>
<td>5/12.8</td>
<td>17/43.6</td>
<td>3/7.7</td>
<td>3/7.7</td>
<td>6/15.4</td>
<td>5/12.8</td>
<td></td>
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</tr>
<tr>
<td><strong>F/% in Rural</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100/100</td>
</tr>
<tr>
<td>4/4.0</td>
<td>59/59.0</td>
<td>24/24.0</td>
<td>9/9.0</td>
<td>1/1.0</td>
<td>3/3.0</td>
<td></td>
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</tr>
<tr>
<td><strong>F/% in sub urban</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15/100</td>
</tr>
<tr>
<td>2/13.3</td>
<td>10/46.7</td>
<td>3/20.0</td>
<td>0/0.0</td>
<td>0/0.0</td>
<td>0/0.0</td>
<td></td>
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<tr>
<td><strong>F/% in Urban</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31/100</td>
</tr>
<tr>
<td>4/12.9</td>
<td>19/61.3</td>
<td>3/9.7</td>
<td>5/16.1</td>
<td>0/0.0</td>
<td>0/0.0</td>
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</tr>
<tr>
<td><strong>No. of taxa used as medicinal</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>F/% in hilly</strong></td>
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<td>39/100</td>
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<tr>
<td>10/25.6</td>
<td>12/30.8</td>
<td>6/15.4</td>
<td>5/12.8</td>
<td>3/7.7</td>
<td>3/7.7</td>
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<tr>
<td><strong>F/% in Rural</strong></td>
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<td></td>
<td></td>
<td>100/100</td>
</tr>
<tr>
<td>23/23</td>
<td>59/59.0</td>
<td>14/14.0</td>
<td>2/2.0</td>
<td>1/1.0</td>
<td>1/1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F/% in sub urban</strong></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15/100</td>
</tr>
<tr>
<td>6/40</td>
<td>5/33.0</td>
<td>3/20.0</td>
<td>0/0.0</td>
<td>1/6.7</td>
<td>0/0.0</td>
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<td></td>
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<tr>
<td><strong>F/% in Urban</strong></td>
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<td></td>
<td></td>
<td></td>
<td>31/100</td>
</tr>
<tr>
<td>9/29.0</td>
<td>14/45.2</td>
<td>6/19.4</td>
<td>1/3.2</td>
<td>1/3.2</td>
<td>0/0.0</td>
<td></td>
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</tr>
<tr>
<td><strong>No. of taxa used as vegetable</strong></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td><strong>F/% in hilly</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31/100</td>
</tr>
<tr>
<td>13/33</td>
<td>16/41.0</td>
<td>6/15.4</td>
<td>1/2.6</td>
<td>2/5.1</td>
<td>1/2.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F/% in Rural</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100/100</td>
</tr>
<tr>
<td>21/21</td>
<td>64/64.0</td>
<td>7/7.0</td>
<td>6/6.0</td>
<td>2/2.0</td>
<td>0/0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F/% in sub urban</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15/100</td>
</tr>
<tr>
<td>7/46.7</td>
<td>4/26.0</td>
<td>2/13.3</td>
<td>1/6.7</td>
<td>1/6.7</td>
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<tr>
<td><strong>F/% in Urban</strong></td>
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<tr>
<td><strong>F/% in hilly</strong></td>
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<td>39/100</td>
</tr>
<tr>
<td>7/17.9</td>
<td>18/46.2</td>
<td>5/12.8</td>
<td>5/12.8</td>
<td>3/7.7</td>
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<tr>
<td><strong>F/% in Rural</strong></td>
<td></td>
<td></td>
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<td>100/100</td>
</tr>
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<td>17/17</td>
<td>64/64.0</td>
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<td>5/5.0</td>
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<td>3/3.0</td>
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<tr>
<td><strong>% in sub urban</strong></td>
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<tr>
<td><strong>F/% in Urban</strong></td>
<td></td>
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<td>31/100</td>
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<td><strong>Local common names</strong></td>
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<tr>
<td><strong>F/% in hilly</strong></td>
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<td>39/100</td>
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<td>14/35.9</td>
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<td>3/7.7</td>
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<tr>
<td><strong>F/% in Rural</strong></td>
<td></td>
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<td></td>
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<td>100/100</td>
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<tr>
<td>29/29</td>
<td>61/61.0</td>
<td>3/3.0</td>
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<td>3/3.0</td>
<td>1/1.0</td>
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</tr>
<tr>
<td><strong>F/% in sub urban</strong></td>
<td></td>
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<td></td>
<td>15/100</td>
</tr>
<tr>
<td>7/46.7</td>
<td>4/26.7</td>
<td>3/20.0</td>
<td>0/0.0</td>
<td>0/0.0</td>
<td>1/6.7</td>
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<tr>
<td><strong>F/% in Urban</strong></td>
<td></td>
<td></td>
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<td>31/100</td>
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<tr>
<td>17/54.8</td>
<td>10/32.3</td>
<td>3/9.7</td>
<td>1/3.2</td>
<td>0/0.0</td>
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<tr>
<td><strong>Other uses of the taxa</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td><strong>F/% in hilly</strong></td>
<td></td>
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<td></td>
<td>39/100</td>
</tr>
<tr>
<td>15/38.5</td>
<td>17/43.6</td>
<td>3/7.7</td>
<td>3/7.7</td>
<td>0/0.0</td>
<td>1/2.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F/% in Rural</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>100/100</td>
</tr>
<tr>
<td>40/40.0</td>
<td>50/50.0</td>
<td>6/6.0</td>
<td>2/2.0</td>
<td>1/1.0</td>
<td>1/1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F/% in sub urban</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>15/100</td>
</tr>
<tr>
<td>10/66.7</td>
<td>3/20.0</td>
<td>2/13.3</td>
<td>0/0.0</td>
<td>0/0.0</td>
<td>0/0.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>F/% in Urban</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>31/100</td>
</tr>
<tr>
<td>22/71.0</td>
<td>7/22.6</td>
<td>2/6.5</td>
<td>0/0.0</td>
<td>0/0.0</td>
<td>0/0.0</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fidelity level (FL) value**
The fidelity level (FL), the percentage of informants claiming the use of certain Pteridophytes for the medicinal purpose was calculated according to the following formula (Alexiades, 1996): FL (%) = $\frac{Ip}{Iu} \times 100$

Where: Ip is the number of informants who independently suggested the use of the species for a particular disease and Iu is the total number of informants who mentioned the species for medicinal purpose.
Highly used pteridophytes fidelity level
The area is rich for edible species and active ingredients containing taxa particularlye practised against various ailments. Table 5. Shows the use of various Ferns and Allies by 30-180 respondents against 1-6 remedies. The highly used taxa are *Diplazium esculentum* and *Asplenium dalhousiae* (180), followed by *Equisetum arvense* (178), *Equisetum ramosissimum* and *Adiantum incisum* (175), *Hypodematum crenatum* and *Christella dentate* (170). *Nephrolepis cordifolia* and, *Adiantum venustum* (160), *Adiantum caudatum* (150), *Marsilia minuta* (140). The rest of the species were used by 31 - 100 respondents only. The locals utilize these plants due to its potential active constituents and due to easy availability in the study area.

**Table 4.** Medicinally important taxa of District Mansehra and adjacent areas.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Species with family name</th>
<th>Part used</th>
<th>Common Names</th>
<th>Remedy against</th>
<th>Method of application</th>
</tr>
</thead>
<tbody>
<tr>
<td>1*</td>
<td><em>Asplenium dalhousiae</em> Aspleniaceae</td>
<td>Rhizome</td>
<td>Hook. Naroky</td>
<td>Gonorrhoea, hepatitis</td>
<td>Orally decoction for one week is practiced and antiviral effect is observed.</td>
</tr>
<tr>
<td>2</td>
<td><em>Asplenium ceterach x punjabense</em> Chahala Nakaike Aspleniaceae</td>
<td>Root , leaf</td>
<td></td>
<td>Leucorrhoea. skin diseases</td>
<td>Orally decoction for one month leaf paste used as poultice. Antiviral.</td>
</tr>
<tr>
<td>3*</td>
<td><em>Woodwardiaraudicans</em> Smith. Zip Fern Blechnaceae</td>
<td>Fronds</td>
<td></td>
<td>Worms</td>
<td>A leaf extract is given to children’s to remove worms. The women use fronds and petioles for baskets making.</td>
</tr>
<tr>
<td>4*</td>
<td><em>Equisetum ramosissimum</em> Desf. Eqvisitaceae</td>
<td>Whole plant</td>
<td>Saram, Bahari Bandaky.</td>
<td>Scabies, itching, skin infections. bone fracture, female infertility, Wounds healing</td>
<td>Plant paste applied in bone fracture. Powdered stem dissolved in water is used for enema during stomach disorder in children. Women drink rhizome decoction to increase fertility. Plant is known to have ant rheumatic, antifungal diuretic, hemostatic, &amp; antiviral properties. Paste of branches with leaves is used as local.</td>
</tr>
<tr>
<td>5</td>
<td><em>Hippochaete debilis</em> (Roxb.exVaucher) Ching Eqvisitaceae</td>
<td>Whole plant</td>
<td>Bandaky Jenabil</td>
<td>Fracture, dislocation of bones.</td>
<td>Decoction of whole plant is useful for to increase bones strength. Paste of plant is used in hair to remove skin problem and maintain hair shine.</td>
</tr>
<tr>
<td>6</td>
<td><em>Equisetum arvense</em> L. Eqvisitaceae</td>
<td>Cones</td>
<td>Bandaky</td>
<td>Kidney troubles, acidity and for problems</td>
<td>Decoction is taken orally at bedtime to move belly worms. The women use fronds and petioles for baskets making.</td>
</tr>
<tr>
<td>7</td>
<td><em>Equisetum palustre</em> L. Eqvisitaceae</td>
<td>Cones</td>
<td>Bandaky</td>
<td>Stomach disorders</td>
<td>Decoction, also Plant powder mixed with mustard oil is used in the treatment of bone fracture, backache and in muscular pain. Decoction, remove kidney stones, also body cooling.</td>
</tr>
<tr>
<td>8</td>
<td><em>Dryopteris nigropaleacea</em> Fraser-Jenk. Dryopteridaceae</td>
<td>Rhizome</td>
<td>Kandhalbeni Mangeti, Manjihotti</td>
<td>Snakebite, rheumatism leprosy</td>
<td>Decoction of cones is orally practiced for stomach disorders.</td>
</tr>
<tr>
<td>9</td>
<td><em>Dryopteris cochleata</em> (Buch. Manjhi botii. Young frond Dried rhizome</td>
<td>Croziers cooked vegetable, sag. Plant powder, mixed with water given to patients as well as paste relieves pain.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10**</td>
<td><em>Hypodematum crenatum</em> (Forssk.) Kuhn,v. Deek. Dryopteridaceae</td>
<td>Rhizome, Fertile fronds</td>
<td>Infertility, UTI wounds snake, scorpion, dog bites</td>
<td>Rhizome extract, decoction is useful orally. Paste of whole plant useful on wounds snake, scorpion, dog bites, also antifungal.</td>
<td></td>
</tr>
<tr>
<td>11***</td>
<td><em>Polystichum squarrusum</em> (D.Don.) Fée. Dryopteridaceae</td>
<td>Sporophyll-s, Fertile fronds</td>
<td>Wounds</td>
<td>Rhizome powder mixed in coconut with raw brown sugar called gur increases fertility in females, antibacterial, Sporophylls extracts is used as antibacterial</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td><em>Pteridium-resolutum</em> (BL) Barheipani Nakaike Dennstaedtiaceae</td>
<td>Rhizome</td>
<td>Belly worms.</td>
<td></td>
<td>Decoction is taken orally at bedtime to remove belly worms.</td>
</tr>
<tr>
<td>13</td>
<td><em>Pteridium aquilinum</em> (L) Kahn Barheipani Dennstaedtiaceae</td>
<td>Rhizome, Fertile fronds</td>
<td>Stomach cramps, Against worms. Bad effects on sheeps milk.</td>
<td>Decoction of rhizome and fronds is taken orally at bedtime in the treatment of worms. The infusion of plant is used to relieve stomach cramps and increases urine flow.</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>Species</td>
<td>Common Name</td>
<td>Part Used</td>
<td>Description</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>14*</td>
<td>Nephrolepis cordifolia (L.) Presl. Ghwar</td>
<td>Booty, Fronds</td>
<td>Bleeding</td>
<td>Abortifacient. Decoction of rhizome drunk as herbal health tea. Locals try to remove this species from cow, sheep feed causes as abortion.</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Nephrolepis exaltata (L.) Schott Ghwar</td>
<td>Booty, Fronds</td>
<td>Air saturation</td>
<td>Potted ornamental remove ghosts and unseen evils.</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Nephrolepis auriculata (L.) Triamen</td>
<td>Booty, Fronds</td>
<td>Air saturation</td>
<td>Potted ornamental, remove ghosts and unseen evils.</td>
<td></td>
</tr>
<tr>
<td>17*</td>
<td>Lygodium japonicum (Thunb.) Sw.</td>
<td>Leaves</td>
<td>Burns, as cooling agent.</td>
<td>Chest. Fronds infusion reduce high blood pressure.</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>Lygodium scandense (L.) Sw.</td>
<td>Leaves</td>
<td>Female infertility</td>
<td>Fresh leaves are used as salad.</td>
<td></td>
</tr>
<tr>
<td>19*</td>
<td>Marsilea quadrifolia L. Devasthal</td>
<td>Whole leaves &amp; petioles</td>
<td>Migraine nerve relaxant infantile diarrhea.</td>
<td>Used as an expectorant.</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>Marsilea minuta L. Deva sthali; leaves with petioles.</td>
<td>Cough, insomnia.</td>
<td>Used as an expectorant.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21*</td>
<td>Botrychium lunaria (L.) Sw.</td>
<td>Whole plant</td>
<td>Fever</td>
<td>Infusion with coconut oil increases fertility.</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>Osmunda regalis L. Deva sthal; leaves with petioles.</td>
<td>Root decoction ,tea administered orally, paste is poultice.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>23**</td>
<td>Botrychium virginianum (L.) Sw. Jenkins</td>
<td>Root</td>
<td>Hypertension, and wounds</td>
<td>Fresh young leaves extract 2 drops of dropped in the nostrils of nose twice a day effective in migraine. Crushed plant is used with sugar candy or honey. Also used as a pot herb.</td>
<td></td>
</tr>
<tr>
<td>24*</td>
<td>Ophioglossum capense Schrad.</td>
<td>Leaf</td>
<td>Menstrual disorders.</td>
<td>About 10 g whole fresh plant paste is mixed with</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>Ophioglossum petiolatum Hook. Nawana</td>
<td>Leaf</td>
<td>Dysentery</td>
<td>Decoction is given to lower body temperature.</td>
<td></td>
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<tr>
<td>26</td>
<td>Ophioglossum vulgatum L.</td>
<td>Leaves</td>
<td>Joint pain.</td>
<td>To use against bites fresh juice of fronds is used orally.</td>
<td></td>
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<tr>
<td>27*</td>
<td>Adiantum cappillus- veneris L. Ratanjot</td>
<td>Whole plant</td>
<td>Female sterility, Snake dog bites</td>
<td>5 g fresh leaf along with 100 g rice is made into a cake and the boiled cake is taken orally in empty stomach for 15-20 days. To use against bites fresh juice of fronds is used orally.</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Adiantum incisum Foresk. Ratanjot, Barheipani</td>
<td>Leaves</td>
<td>Falling hairs, malaria, and bronchial diseases, cough, sugar, diabetes and fever.</td>
<td>Frond juice is used for hair massage. Fresh juice of leaf is used to lower blood pressure.</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>Adiantum venustum D. Don Hansraj Sunbal</td>
<td>Fronds</td>
<td>Cold &amp; cough</td>
<td>Dried leaf powder and fresh juice is taken orally.</td>
<td></td>
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<tr>
<td>30</td>
<td>Adiantum myrosorum Baker.</td>
<td>Whole plant</td>
<td>Chronic catarrhs and other pectoral affections</td>
<td>Leaf decoction is given in dysentery.</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>Adiantum aethiopicum Sess</td>
<td>Whole plant</td>
<td>Congestion</td>
<td>Leaf poultices are applied for skin diseases and swelling.</td>
<td></td>
</tr>
<tr>
<td>32</td>
<td>Adiantum caudatum L. Kairakacha</td>
<td>Fronds</td>
<td>wound healing</td>
<td>Fronds extract is used to relieve intestinal gripping, as tonic &amp; styptic.</td>
<td></td>
</tr>
<tr>
<td>33**</td>
<td>Actiniopteris australis (L.f) Link. Chahala</td>
<td>Rhizome</td>
<td>Snakebite.</td>
<td>Powder of rhizomes is given as an antidote against dog bite and snakebite. The extract of leaves is taken orally and paste of leaves is applied on the lower portion of stomach for</td>
<td></td>
</tr>
</tbody>
</table>
Most of the taxa having a significant potential to be used as medicinal but having narrow ecological amplitude, habitat specificity and scarce distribution in the study area that’s why rarely practiced to cure diseases.

(*Indicate the start of new family and **indicate 2nd & ***3rd genus of the same family).
Table 6. highlighting the least used taxa in the study area due to its rarity. Range of the respondents was from 4-30 and used these taxa against 1-3 diseases only. These species *Psilotum nudum* and *Schizaea dichotoma* are the rarest taxa having least area of occupancy due to over exploitation and no of present respondents were comparatively very less.

Potential parts of pteridophytes.
Various parts store various secondary metabolites and their mode of medicinal applications was determined by the locals for different remedies. Pteridophytes sporophyte or plant body prominent parts are fronds in case of ferns and rhizome (underground stem), one of the important parts for storage of photosyn thate in all ferns and allies. These are used as a part of various locally formulated recipes.

Figure 3. shows various part uses of the species utilized in various remedies. The highest potential of part use was recorded for leaf or Frond (50%), followed by rhizome 33.4%, Whole plant 16.7%, and the root 8.3%.

The rest of the parts cones, sporophylls and spores are used comparatively very less 3.33% each. Similarly for various remedies Leaf and fronds are more useful 58.33%, followed by whole plant 26.67%, rhizome 21.67%and root 10 %. Cones, spores and sporophylls are used in a few remedies like, 5, 3.33 and 1.6% only.

Pteridophytes ornamental importance
Pteridophytes are not only the source of various medicines and food but also having a great ornamental potential and can fulfill the asthetic requirement of any garden, home and public recreational centre. Indoor keeping quality of ferns pots in even offices, banks and all working points is very easy as they are shade lovers.

<table>
<thead>
<tr>
<th>Taxa Used for Medicinal Purpose</th>
<th>No. of respondents</th>
<th>No. of remedies</th>
<th>Fidelity level FL (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Asplenium dalhousiae</em> Hook.</td>
<td>180</td>
<td>3</td>
<td>0.97</td>
</tr>
<tr>
<td><em>Asplenium ceterach x punjabense</em> Nakaike</td>
<td>60</td>
<td>3</td>
<td>0.324</td>
</tr>
<tr>
<td><em>Woodwardia radicans</em> Smith.</td>
<td>60</td>
<td>2</td>
<td>0.324</td>
</tr>
<tr>
<td><em>Equisetum ramosissimum</em> Desf.</td>
<td>175</td>
<td>6</td>
<td>0.94</td>
</tr>
<tr>
<td><em>Hippochaete debilis</em> (Roxb. Ex Vaucher) Ching</td>
<td>40</td>
<td>1</td>
<td>0.216</td>
</tr>
<tr>
<td><em>Equisetum arvense</em> L.</td>
<td>178</td>
<td>4</td>
<td>0.96</td>
</tr>
<tr>
<td><em>Dryopteris nigropalacea</em> Fraser-Jenk.</td>
<td>30</td>
<td>4</td>
<td>0.16</td>
</tr>
<tr>
<td><em>Dryopteris coechleata</em> (Buch. Ham. ex Don) C. Chr.</td>
<td>100</td>
<td>3</td>
<td>0.54</td>
</tr>
<tr>
<td><em>Hyhopodium crenatum</em> (Forsch.) Kuhn, V. Deck.</td>
<td>170</td>
<td>2</td>
<td>0.91</td>
</tr>
<tr>
<td><em>Polystichum squarrusum</em> (D. Don.) Fee.</td>
<td>40</td>
<td>1</td>
<td>0.216</td>
</tr>
<tr>
<td><em>Pteridium-revolutum</em> (Bl) Nakai</td>
<td>90</td>
<td>1</td>
<td>0.486</td>
</tr>
<tr>
<td><em>Pteridium aquilinum</em> Kuhn</td>
<td>40</td>
<td>4</td>
<td>0.216</td>
</tr>
<tr>
<td><em>Nephrolepis cordifolia</em> (L.) Presl.</td>
<td>160</td>
<td>1</td>
<td>0.861</td>
</tr>
<tr>
<td><em>Nephrolepis exaltata</em> (L.) Schott</td>
<td>50</td>
<td>1</td>
<td>0.270</td>
</tr>
<tr>
<td><em>Nephrolepis auriculata</em> (L.) Triame</td>
<td>50</td>
<td>1</td>
<td>0.270</td>
</tr>
<tr>
<td><em>Lygodium japonicum</em> (Thumd.) Sw.</td>
<td>35</td>
<td>3</td>
<td>0.19</td>
</tr>
<tr>
<td><em>Lygodium scandense</em> (L.) Sw.</td>
<td>35</td>
<td>3</td>
<td>0.19</td>
</tr>
<tr>
<td><em>Marsilea quadrijolia</em> L.</td>
<td>50</td>
<td>4</td>
<td>0.270</td>
</tr>
<tr>
<td><em>Marsilea minuta</em> L.</td>
<td>140</td>
<td>2</td>
<td>0.76</td>
</tr>
<tr>
<td><em>Botrychium lunaria</em> (L.) Sw.</td>
<td>30</td>
<td>1</td>
<td>0.16</td>
</tr>
<tr>
<td><em>Botrychium virginianum</em> (L.) Sw.</td>
<td>30</td>
<td>1</td>
<td>0.16</td>
</tr>
<tr>
<td><em>Ophioglossum capense</em> Sw. Schrad.</td>
<td>30</td>
<td>2</td>
<td>0.16</td>
</tr>
<tr>
<td><em>Ophioglossum petiolatum</em> Hook.</td>
<td>30</td>
<td>2</td>
<td>0.16</td>
</tr>
<tr>
<td><em>Ophioglossum vulgatum</em> L.</td>
<td>30</td>
<td>2</td>
<td>0.16</td>
</tr>
<tr>
<td><em>Osmund aregalis</em> L.</td>
<td>40</td>
<td>1</td>
<td>0.216</td>
</tr>
<tr>
<td><em>Adiantum capillus- veneris</em> L.</td>
<td>178</td>
<td>4</td>
<td>0.96</td>
</tr>
<tr>
<td><em>Adiantum incism</em> Foressk.</td>
<td>175</td>
<td>6</td>
<td>0.94</td>
</tr>
<tr>
<td><em>Adiantum venustum</em> D. Don</td>
<td>160</td>
<td>6</td>
<td>0.86</td>
</tr>
</tbody>
</table>
Ornamental potentiality of 55 pteridophyte taxa has been shown in Table 7 and Fig.4. These taxa distributed in 26 genera and 15 families. Dryopteridaceae was the largest family with 4 genera (16.66%) and 14 species (25%) of ornamental potential, followed by Pteridaceae with 4 genera (16.66%) and 12 species (21.4%).

**Table 6.** Fidelity level of the least used taxa for no. of remedies.

<table>
<thead>
<tr>
<th>Least Used taxa name</th>
<th>No. of least used taxa</th>
<th>No. of remedies</th>
<th>Fidelity level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equisetum palustre L.</td>
<td>20</td>
<td>1</td>
<td>0.10</td>
</tr>
<tr>
<td>Dryopteris nigropaleacea Fraser-Jenk.</td>
<td>30</td>
<td>3</td>
<td>0.16</td>
</tr>
<tr>
<td>Salvinia auriculata Aublet</td>
<td>10</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Botrychium lunaria (L.) Sw.</td>
<td>30</td>
<td>1</td>
<td>0.16</td>
</tr>
<tr>
<td>Botrychium virginianum (L.) Sw.</td>
<td>30</td>
<td>2</td>
<td>0.16</td>
</tr>
<tr>
<td>Ophioglossum capense Sw. Schrad.</td>
<td>30</td>
<td>1</td>
<td>0.16</td>
</tr>
<tr>
<td>Ophioglossum petiolatum Hook.</td>
<td>30</td>
<td>1</td>
<td>0.16</td>
</tr>
<tr>
<td>Ophioglossum vulgatum L.</td>
<td>30</td>
<td>1</td>
<td>0.16</td>
</tr>
<tr>
<td>Adiantum myrosorum Baker.</td>
<td>10</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Adiantum aethiopicum Sess</td>
<td>5</td>
<td>1</td>
<td>0.02</td>
</tr>
<tr>
<td>Actiniopteris australis (L.f) Link.</td>
<td>5</td>
<td>3</td>
<td>0.02</td>
</tr>
<tr>
<td>Cheilanthe spteridioides (Reich.) C. Chr.</td>
<td>10</td>
<td>1</td>
<td>0.05</td>
</tr>
<tr>
<td>Cheilanthes farinosa (Foressk.) Kaulf.</td>
<td>10</td>
<td>1</td>
<td>0.05</td>
</tr>
<tr>
<td>Cheilanthes albomarginata C.B.Clarke</td>
<td>15</td>
<td>2</td>
<td>0.08</td>
</tr>
<tr>
<td>Cheilanthes leptopodium Baker.</td>
<td>10</td>
<td>1</td>
<td>0.05</td>
</tr>
<tr>
<td>Cheilanthes acrostica (Bulbis) Todaro</td>
<td>10</td>
<td>2</td>
<td>0.05</td>
</tr>
<tr>
<td>Cheilanthes bicolour Fraser-Jenk.</td>
<td>10</td>
<td>1</td>
<td>0.05</td>
</tr>
<tr>
<td>Pellae hastate (Thunb.) Prantl</td>
<td>05</td>
<td>2</td>
<td>0.02</td>
</tr>
<tr>
<td>Pteris quadriaurita Retz.</td>
<td>5</td>
<td>1</td>
<td>0.02</td>
</tr>
<tr>
<td>Psilotum nudum (L.) Beauvois</td>
<td>4</td>
<td>1</td>
<td>0.02</td>
</tr>
<tr>
<td>Schizaea dichotoma (L.) J. S. Smith</td>
<td>05</td>
<td>1</td>
<td>0.02</td>
</tr>
<tr>
<td>Salvinia auriculata Aublet</td>
<td>10</td>
<td>1</td>
<td>0.05</td>
</tr>
<tr>
<td>Psuedophegopteris levigie (Clarke) Ching</td>
<td>30</td>
<td>1</td>
<td>0.16</td>
</tr>
</tbody>
</table>

Thelypteridaceae with 4 genera and 9 species of ornamental potential. Lomariopsidaceae and Aspleniaceae having 1 genus (4.16%) and 7 (12.5%) and 4 species (7.14%) respectively. Ophioglossaceae having 2 genera (8.32%) and 2 species (7.14%), Athyriaceae with 3 genera (12.5%) and three species (5.35%).

The rest of the families having one genus (4.1%) with one (1.67%) or more than one species each.

Equisitaceae was least significant ornamental family if potted and needs special geometrical shapes for cultivation. These valued ornamental features were considered to identify potential for commercialization like better morphology, shine, texture, modified unique pinnae, ornamental sori, variable evergreen leaves, good propagation potential, short stature or easy to transport, indoor survival capacity, more spores and fronds production, more adopted to shade etc.
Table 7. List of ornamentally potential taxa in the study area.

<table>
<thead>
<tr>
<th>Taxa</th>
<th>Family</th>
<th>Ornamental Potentiality and cultivars</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asplenium dalhousiae Hook.</td>
<td>Aspleniaceae</td>
<td>These are highly decorative small fern with shiny leathery fronds.</td>
</tr>
<tr>
<td>Asplenium ceterach L.</td>
<td>Aspleniaceae</td>
<td>Decent looking appearance of the plant.</td>
</tr>
<tr>
<td>Asplenium septentrionale (L). Hoffim</td>
<td>Aspleniaceae</td>
<td>Bifurcated, unique fronds than any other Fern.</td>
</tr>
<tr>
<td>Asplenium teunifolium D. Don.</td>
<td>Aspleniaceae</td>
<td>Striking appearance in aquatic habitats.</td>
</tr>
<tr>
<td>Azolla pinnata R.Br.</td>
<td>Azollaceae</td>
<td>A medium sized fern, grown in shady places and well-suited as potted plant.</td>
</tr>
<tr>
<td>Athyrium filix-femina (L.) Roth.</td>
<td>Athyriaceae</td>
<td>A spectacular evergreen plant, the chain fern, has long, dark green, arching fronds which can grow up to two meters in length.</td>
</tr>
<tr>
<td>Diplazium esculentum (Retz.) Sw.</td>
<td>Athyriaceae</td>
<td>The fiddle heads very attractive as well as mature fronds.</td>
</tr>
<tr>
<td>Deparia petersenii (Kunze) M. Kato</td>
<td>Athyriaceae</td>
<td>Handsome hairs and scales with attractive fronds.</td>
</tr>
<tr>
<td>Woodwardia radicans (L.) J. Sm.</td>
<td>Blechnaceae</td>
<td>Handsome hairs and scales with attractive fronds.</td>
</tr>
<tr>
<td>Dryopteris filix-mas (L.) Shott.</td>
<td>Dryopteridaceae</td>
<td>Male plant very attractive</td>
</tr>
<tr>
<td>Dryopteris odontoloma (Moore) C. Chr.</td>
<td>Dryopteridaceae</td>
<td>Pretty fronds.</td>
</tr>
<tr>
<td>Polystichum prescociatum (Wall. ex Mett.) T. Moore</td>
<td>Dryopteridaceae</td>
<td>Handsome hairs and scales with attractive fronds.</td>
</tr>
<tr>
<td>Cyrtomium macrophyllum (Makino) Tagawa</td>
<td>Dryopteridaceae</td>
<td>Stringy, dark green fronds are very glossy and toothed making it more decorative.</td>
</tr>
<tr>
<td>Cyrtomium muticum (Christ) Ching</td>
<td>Dryopteridaceae</td>
<td>Handsome hairs and scales with attractive fronds.</td>
</tr>
<tr>
<td>Cyrtomium caryotideum (Wall. ex Hook. &amp; Grev.) C. Presl.</td>
<td>Dryopteridaceae</td>
<td>Handsome hairs and scales with attractive fronds.</td>
</tr>
<tr>
<td>Cyrtomium falcatum (L. f.) C. Presl.</td>
<td>Dryopteridaceae</td>
<td>Handsome hairs and scales with attractive fronds.</td>
</tr>
<tr>
<td>Polystichum lonchitis (L.) Roth.</td>
<td>Dryopteridaceae</td>
<td>Handsome hairs and scales with attractive fronds.</td>
</tr>
<tr>
<td>Polystichum luctuosum (Kunze) T. Moore</td>
<td>Dryopteridaceae</td>
<td>Handsome hairs and scales with attractive fronds.</td>
</tr>
<tr>
<td>Adiantum venustum D. Don</td>
<td>Pteridaceae</td>
<td>Beautiful habit and fronds, cultivar ‘Victoria’ has silvery</td>
</tr>
<tr>
<td>Adiantum myrosorum Baker.</td>
<td>Pteridaceae</td>
<td>Beautiful habit and fronds, cultivar ‘Victoria’ has silvery</td>
</tr>
<tr>
<td>Pteridium revolutum (Bl.) Nakai</td>
<td>Dennstaedtiaceae</td>
<td>Tripinuated beautiful showy fronds easily spreading and flourishing.</td>
</tr>
<tr>
<td>Chelianthes albomarginata C.B. Clarke</td>
<td>Pteridaceae</td>
<td>White undersurface e of fronds with dark sori making a graceful combination.</td>
</tr>
<tr>
<td>Pteris cretica L.</td>
<td>Pteridaceae</td>
<td>Cultivars are Albo-lineata, a dwarf growing type with anointment stripe in the center of each leaflet. Childsii has light green frilled leaflets. Fronds tips are divided in Wilsonii’ with bright greencolor.</td>
</tr>
<tr>
<td>Pteris ensiformis Burm.</td>
<td>Pteridaceae</td>
<td>Cultivars are Albo-lineata, a dwarf growing type with anointment stripe in the center of each leaflet. Childsii has light green frilled leaflets. Fronds tips are divided in Wilsonii’ with bright greencolor.</td>
</tr>
</tbody>
</table>
white fronds edged of dark green color.

<table>
<thead>
<tr>
<th>Species</th>
<th>Family</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Pteris quadriaurita</em> Retz.</td>
<td>Pteridaceae</td>
<td>Showy, good looking fronds.</td>
</tr>
<tr>
<td><em>Pteris excels</em> Gaud.</td>
<td>Pteridaceae</td>
<td>No match for its beautiful fronds.</td>
</tr>
<tr>
<td><em>Adiantum capillus – veneris</em> L.</td>
<td>Pteridaceae</td>
<td>Fine-looking, fetching fronds. Commonly called Maiden hair fern has exceedingly delicate fronds.</td>
</tr>
<tr>
<td><em>Adiantum caudatum</em> L.</td>
<td>Pteridaceae</td>
<td>Maidenhair Fern, Walking Fern*, charmingly trails with generously long, super-finely textured fronds.</td>
</tr>
<tr>
<td><em>Nephrolepis exaltata</em> (L.) Schott</td>
<td>Lomariopsidaceae</td>
<td>Commonly known sword Bostan is a terrestrial, perennial, short, ever green, herbaceous fern. Leaflets arcuerc. Rhizome is glabrous, brect with long creeping stolons; stipe is polished shining black without ramenta and indusim. Fronds are sterile, short, erect and profuse with bipinnate leaves (Oloyede, 2012). Cultivar 'Bostoniensis' has arching fronds up to 3 feet long that cascade on all sides. Cultivar, Compacta has 15- to 18-inch fronds, Childsii’ grows to 10 to 12 inches with overlapping curling leaflets. In cultivar Fluffy Ruffles have stiff upright fronds, cultivar, Verona has lacy drooping fronds while Fluffy Duffy’ is very fringed and compressed.</td>
</tr>
<tr>
<td><em>Nephrolepis auriculata Trimen</em></td>
<td>Lomariopsidaceae</td>
<td>Good potted plant with noticeable auriculate pinnae and fronds.</td>
</tr>
<tr>
<td><em>Nephrolepis cordifolia</em> (L.) C. Presl.</td>
<td>Lomariopsidaceae</td>
<td>Having all good characters as a trade plant, very popular potted plant.</td>
</tr>
<tr>
<td><em>Nephrodium molle</em> (Sw.) R. Br.</td>
<td>Lomariopsidaceae</td>
<td>Fulfilling the aesthetic requirement of gardens.</td>
</tr>
<tr>
<td><em>Nephrolepis biserrata</em> (Sw.) Schott</td>
<td>Lomariopsidaceae</td>
<td>It is called lemon button fern because its leaflets are lemon color it grows well on the soil in re-growth forest and inside the pots at homes and offices (Oloyede, 2012).</td>
</tr>
<tr>
<td><em>Osmunda japonica</em> Thunb.</td>
<td>Ophioglossaceae</td>
<td>Conspicuous habit</td>
</tr>
<tr>
<td><em>Osmunda claytoniana</em> L.</td>
<td>Ophioglossaceae</td>
<td>Appealing habit with showy fronds</td>
</tr>
<tr>
<td><em>Osmunda regalis</em> L.</td>
<td>Ophioglossaceae</td>
<td>Lovely habit, unique reproductive features.</td>
</tr>
<tr>
<td><em>Lycopodium Japonicum</em> Thunb.</td>
<td>Lycopodiaceae</td>
<td>Smart fronds and strobilus.</td>
</tr>
<tr>
<td><em>Marsilia minuta</em> L.</td>
<td>Marsiliaceae</td>
<td>The unusual climbing habit is the reason most people grow this fern. It can be grown in a hanging basket or trained on a trellis. The delicate fronds have attractive scalloped edges.</td>
</tr>
<tr>
<td><em>Lycopodium japonicum</em> (Thunb.) Sw.</td>
<td>Lygodiaceae</td>
<td>Climbing fern with attractive foliage</td>
</tr>
<tr>
<td><em>Nephrolepis auriculata</em> (L.) Trimen*</td>
<td>Lomariopsidaceae</td>
<td>Good-looking fronds</td>
</tr>
<tr>
<td><em>Marsilia quadrifolia</em> L.</td>
<td>Marsiliaceae</td>
<td>Water fern These ferns grow well in moist part of the garden, around or in water features or floating attractively in shallow ponds or streams. They can be also grown in aquarium or shallow water containers.</td>
</tr>
<tr>
<td><em>Polypodium nudum</em> (L.) P. Beauv.</td>
<td>Psilotaceae</td>
<td>Eye-catching small plant, best for potted plants.</td>
</tr>
<tr>
<td><em>Polygodium argutum</em> Wall. ex. Hook.</td>
<td>Polypodiaceae</td>
<td>Utilized for its beauty</td>
</tr>
<tr>
<td><em>Thelepteris erubescence</em> (Wall. ex Hook.) Ching</td>
<td>Thelypteridaceae</td>
<td>Gorgeous habit</td>
</tr>
<tr>
<td><em>Glyprophyteridopsis erubescens</em> Wall. ex Hook.</td>
<td>Thelypteridaceae</td>
<td>Nice-looking habit long fronds.</td>
</tr>
<tr>
<td><em>Selaginella sanguinolenta</em> (L.) Spring</td>
<td>Selaginellaceae</td>
<td>Eye-catching small plant, best for potted plants.</td>
</tr>
<tr>
<td><em>Gymnocarpium robertianum</em> (Hoffm.) Newman</td>
<td>Woodsiaceae</td>
<td>Smart habit long fronds. Creeping rhizome easy to propagate.</td>
</tr>
</tbody>
</table>
Discussions and conclusion

District Mansehra and its adjacent areas falls in the Sino Japanese region of Pakistan, having a diverse pteridophyte flora and a diverse pattern of traditional uses.

People of the area used to cure diabetes and hepatitis like life taking diseases with these plants. Women use them in various beauty remedies like hair care, glowing skin and fair complexion and to treat skin problems. As pteridophites taxa having a strong potential for skin improvement so cosmetics industry must exploit them for beauty care and good earning. Most of the taxa are highly palatable used as potherbs and locals sell them in the local market collecting from the wild. Our results match with the previous workers (Nair, 1959; Dixit, 1974).

Residents of hilly and rural areas frequently used these taxa. Knowledge-wise older people have more awareness regarding these taxa. Keeping in view their sustainability, these taxa may be utilized for new drugs and commercial purpose. These are potential indoor plants due to shade loving nature, can be easily propagate, having excellent attractive foliage and can satisfy the aesthetic thirst of the customers.

Our findings regarding ornamental potentiality to contribute environmental beauty and man pleasure and health care are is in full agreement with the previous workers. (Oloyede et al., 2010, 2012; Kochhar, 2009; Biplab and Subir, 2007; Jim, 1999). Some of the taxa are used by the locals to improve air quality like (Croft, 1985; Benjamin and Manickam, 2007). Cultivation of these taxa for food, medicine and ornamental purpose is highly needed and appreciated by a no of early pteridologists (Kalsoom et al., 2010). Ferns are mostly sited in the wild and their benefits are many, immense collection and cultivation of ferns for their ornamental aesthetics, landscaping, environmental protection, food and medicinal values is strongly recommended. Collection from the wild and their direct utilization without modern means of identification by the locals is highly risky.
Fig. 4. Family-wise representation of the taxa showing ornamental potential.

Genera like Pteridium and Marsilia having poisonous taxa and care should be taken while utilizing these plants as a food source. 

Pteridium aquilinum var. latiusculum and other toxic species need removal from Narran, and Shogran particularly to prevent their harmful effects on the livestock.
Due to severe threats i.e. deforestation, habitat loss and overgrazing, this ecologically and economically valued group of plants needs in situ and ex situ conservation for future generation.

Annexure 1.

References


Vasudev SM. 1999. Economic importance of Pteridophytes. Indian fern journal 16(1,2), 130-152.