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UTILIZATION AND CONSERVATION STATUS OF PLANT RESOURCES OF MOUNTANIOUS RANGE OF PIR PUNJAL OF AZAD KASHMIR, PAKISTAN

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Abstract

The utilization patern of plant resources of Pin Punjal Mountanious range of Azad Kashmir and anthropogenic stress of the ecosystem was documented. A total of 150 species were recorded by the local people for various needs, such as, 19 species used as fruit and vegetables, 47 as medicinal, 26 as fuel wood, 12 as timber for furniture making, 32 as fodder for grazing of livestock, 4 as ornamental and 10 as aesthetic for cultural and religious activities. The anthropogenic pressure on the ecosystem was analysed by using principal components analysis (PCA) which resulted significant anthropogenic stressors on the natural resources of the area.

Introduction

Mountainous regions are often biodiversity hotspots that contain multitudes of diverse ecosystems and have among the world's highest species richness (Spehn and Körner 2005). Humans utilize mountain ecosystems in a variety of ways (MEA 2005). The mountain ecosystem benefits to humans and are classified into broad categories such as provisioning, regulating, supporting and cultural (Jordan *et al.* 2010). Human being harvest directly, provisioning services, in the form of fuel, timber, and medicinal products that contribute to agricultural, socio-economic, and industrial activities (Boyd and Banzhaf 2007). Vegetation contributes to the regulation and maintenance of biotic environments. Plant diversity may provide the foundation for the ecosystem's continuance in many ways, i.e. soil formation and fertility, retention of soil and water, and local climate, all critical for successful human agricultural (Rasul 2010). About 10% of the world's human population depend directly on mountain resources for their livelihoods, and an estimated 40% depend indirectly on mountain resources for water, timber, mineral resources, flood control, hydroelectricity, niche products, and recreation (Schild 2008). Mountains are subjected to both biophysical and anthropogenic changes due to over-exploitation. Uncontrolled forest cutting, livestock grazing, fire and collection of fodder, edible and medicinal species (Uprety *et al.* 2011) put natural ecosystems at risk. Mountain vegetation often responds in very sensitive manners to environmental change. This fragility greatly increases the possibility of species depredation and/or extinction. In order to develop appropriate methods of sustainable utilization, it is crucial to understand how environmental and anthropogenic stressors influence biodiversity. The local people of various ethnic groups possess sound knowledge of plant diversity, distribution, identifications and use of the species which are at risk (Uprety *et al.* 2011). Very limited work has been done to provide quantitative descriptions of the plant use among cultural gradients and overexploitation (Malik and Husain 2008). The strong corroboration between human and livestock sustenance and natural vegetation, is very strong in the mountains of Pakistan. Identifying the uses, benefits and threats that occur in the Pir Punjal range provide the first steps towards developing long-term management and conservation strategies for its ecosystems.

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Such strategies might have positive results for the maintenance and stabilization of ecosystems and mountain biodiversity. These actions will also have a positive impact on lowland ecosystems that depend on the sustainability of these mountain ecosystems. A lot of studies on Lesser Himalayas have been done by Faiz *et al.* 2014, Faiz and Fakhr 2015a, 2015b, 2015c but the results of this study provide quantitative information on the natural vegetation of the Pir Punjal range. This contribution also assesses the importance and roles this plant diversity provides the ecosystem, with the overall aim being the identification of those plant species and communities at greatest risk of overuse and loss.

Materials and Methods

The Lesser Himalayas is a mountainous tract (80 km in width, 2621 km length) in the north of the Siwalik Range, with three ranges (Nag Tibba, Dhaola Dhar, and Pir Punjal). The mountainous range of Pir Punjal Range (1,400 m to 4,100 m asl) runs from east-southeast to west-northwest across the Indian state (Himachal Pradesh and Jammu) and Pakistan (Kashmir, Azad Jammu and Kashmir). In Pir Punjal Range, on one side is Banihal Pass, while on other end of range lie Baramulla Pass and Hajipir Pass. The Hajipir Pass joins Poonch and Uri hills. Five model villages (Dhaholdhok, Bunbhak, Kotari, Toppa and Raara) in Poonch hill range were selected. The study area has subtropical to moist temperate vegetation (Anon. 2007).

The data collected from five main localities of Pir Punjal Range (Bunbhak, Kotari, Toppa, Raara and Satnara) by using a structured questionnaire. The structured questionnaire was consistently gathered information on how people in these areas utilize the local environments to obtain food supplies and goods (water, wood for fuel and construction, plants used for medicinal purposes, foods such as mushrooms, fruits and vegetables, ornamental plants and the hunting of birds and mammals, from the natural resources, by following (Khan *et al.* 2011c). These localities were precisely located with GPS (Fig. 1).

Results and Discussion

One hundred and fifty plant species were recognized as being currently utilized by the human population of the Pir Punjal Range through fruits, vegetables, timber, fuel, fodder, traditional medicine, and aesthetics and livestock grazing (Fig. 3). Vegetables are obtained 77.3% of the Bunbhek inhabitants, 60% in Kotari, 33.3% in Raara, 12.5% in Toopa, and 10% of Satnara. Fruits were gathered by 61.5% of the inhabitants of Bunbhek, 33.3% in Toopa, 16.7% in Kotari, 15% in Raara and 10% in Satnara (Table 1).

Major types of fruits and vegetables are *Myrsine africana, Rubus fruticosus, Rubus niveus, Vibernum nervosum, Viburnum cotinifolium, Viburnum grandiflorum, Zanthoxylum armatum, Duchesnea indica, Erythronium montanum, Euphorbia helioscopia, Fragaria nubicola, Galium asperifolium, Rumex dentatus, Taraxacum officinale, Dactyloctenium aegyptium, Phalaris minor, Stipa sibirica* and *Momordica dioica*.

Several species used as ornamental plants found in the area are *Jasminum mesnyi, Caltha alba, Adiantum incisum, Coniogramme rosthornii*. The inhabitants of Bunbhek, Toopa and Raara gather ornamental plants 20% while15% of the villagers of Kotari and Satnara.

Various species utilized as medicinal plants are *Aesculus indica, Momordica dioica, Albizia lebbek, Elaeagnus umbellata, Juglans regia, Nerium oleander, Prunus domestica, Prunus persica, Prunus granatum, Prunus malus, Quercus incana, Skimmia laureola, Berberis lyceum, Clematis buchananiana, Desmodium podocarpum, Rosa brunonii, Rubus fruticosus, Rubus niveus, Zanthoxylum armatum, Ajuga bracteosa, Artemisia dubia, Bergenia ciliata, Dioscorea deltoidea, Euphorbia*

helioscopia, Fumaria indica, Malvestrum coromendelianum, Mentha royleana, Plantago lanceolata, Podophyllum emodi, Polygonatum multiflorum, Rumex dentatus, Salvia moorcroftiana, Saussurea candolleana, Swertia ciliate, Taraxacum officinale, Trichodesma indicum, Valeraina jatamansi, Valeriana pyrolifolia, Verbascum thapsus, Veronica beccabunga, Viola canscens, Viola pilosa, Adiantum capillus-veneris, Hedera nepalensis and *Momordica dioica*.

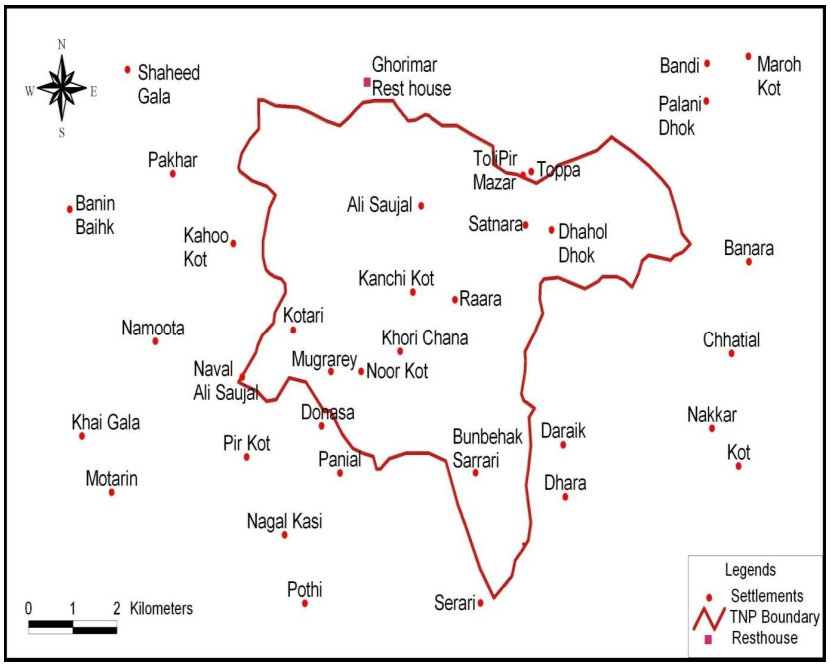

Fig. 1**.** Map showing human settlements (Source: Arc View 3.3 and Google Earth Pro 4.2).

Table 1. Percentage of utilization of plant resources.

Sites	Furni-ture	Fuel	Mush-rooms	Medicinal plants	Orna-mentals	Fruits	Vege-tables	Water	Entertain-ment	Grazing
Dhahol-dhok	95.1	93.3	60	28.6	20	61.5	77.3	93.3	100	55
Raara	100	95	16.7	5	20	15	12.5	100	100	52.6
Kotari	81.8	100	40	40	15	16.7	60	100	93.3	83.3
Toopa	25	25	5	5	20	33.3	12.5	66.7	33.3	100
Satnara	50	50	10	5	15	10	10	75	100	66.7

The percentages of inhabitants utilize these local medicinal plants are 40 in Kotari, 28.6 in Bunbhek, and 5 in Toopa, Raara and Satnara, respectively. The percentage of humans collecting local mushrooms as a food item are 60 in Bunbhek, 40 in Kotari, 16.7 in Toopa, 10 in Satnara, and 5 in Raara.

Various plant species are used as fuel wood are *Aesculus indica, Acer pentapomicum, M. africana, Vibernum nervosum, Vibernum cotinifolium, Vibernum grandiflorum, Caltha alba, Cederala serrata, Punica granatum, Punica pashia, Quercus baloot, Quercus dilatata, Quercus incana, Robinia pseudo-acacia, Salix acmophylla, Vibernum nervosum, Conyza bonariansis, Dicliptera bupleuroides, Euphorbia wallichii, Heracleum candicans, Salvia lanata, Senecio chrysanthemoides, Clematus grata, Castanea sativa*, and *Populus ciliata.* Woody fuel of plants use in Kotari, is 95%, in Toopa, 93% in Bunbhek, 50% in Satnara and 25% in Raara.

The plant species used for the construction and wooden furniture are *Abies pindrow, Castanea sativa, Celtis caucasica, Dalbergia sissoo, Juglans regia, Pinus roxburgii, Pinus wallichiana, Pinus chinensis, Prunus domestica, Punica granatum*, and *Salix denticulate.* The inhabitants of Toopa currently utilize these species, 95% in Bunbhek, 82% in Kotari, 50% in Satnara and 25% in Raara. The dominant plants used for grazing of livestock are *Aesculus indica, Celtis caucasica, Pistacia chinensis, Prunus persica, Punica granatum, Pyrus pashia, Quercus dilatata, Quercus incana, Primula denticulata, Clematis buchananiana, Indigofera heterantha, Myrsine africana, Rumex hastatus, Vibernum nervosum, Vibernum cotinifolium, Vibernum grandiflorum, Conyza bonariansis, Dicliptera bupleuroides, Duchesnea indica, Fumaria indica, Gerbera gossypina, Oenothera rosea, Ranunculus arvensis, Rumex dentatus, Taraxacum officinale, Trichodesma indicum, Triufolium repens, Urtica dioica, Phragmites karka, Adiantum capillus-veneris* and *Hedera nepalensis*. Positive responses for the utilization of these species was 100% in Raara, 83.3% in Kotari, 66.7% in Satnara, 55% in Bunbhek, and 52% in Toopa.

Table 2 . Correlation analysis.

Eigen analysis	F_1	F_2	F_3	F_4
Eigen value	5.80	1.96	1.71	0.52
Variability (%)	58.00	19.62	17.10	5.26
Cumulative %	58.00	77.63	94.735	100

The PCA results clarified that anthropogenic pressures at F_1 is greater and decreases gradually from F_2, F_3 and F_4 (Table 2, Fig 2). The results showed a total inertia, sum of all variance or Eigen Values, of 10 (Table 2). The sum of all canonical Eigen values (explained variance) was 10. First Eigen values was found to be quite high at 5.8. It represented the strength of huge anthropogenic pressure along the axis. 1st axis explained 58.00% of total unexplained variance. Taken together, 1st and 2nd axis of the data set explained more than half (75%) of total inertia, accounting for 71% of anthropogenic pressure. The cumulative percentage variance of anthropogenic relation in the 3rd row of the data table represents the amount of variance explained by axis as a fraction of total inertia. Ordination diagram showed clear pattern of anthropogenic pressure (Fig. 3).

Floristic composition is the most important ecological attribute of areas showing variations in response to environmental, as well as anthropogenic variables (Gairola *et al*. 2008). The variations in a vegetation community are directly correlated with the intensity of variables such as geographical location, productivity, evolutionary competition and human-forest interaction (Criddle *et al.* 2003).

The present study reports the use of 19 species as fruits and vegetables, also confirm the findings (Faiz *et al.* 2014) reported in Lesser Himalayas in Tolipir landscape. The use of the species (*J. mesnyi, C. alba, A. incisum, C. rosthornii*) as ornamental and spiritual purposes also confirm the findings (Faiz *et al*. 2014) reported in Lesser Himalayas in Tolipir landscape.

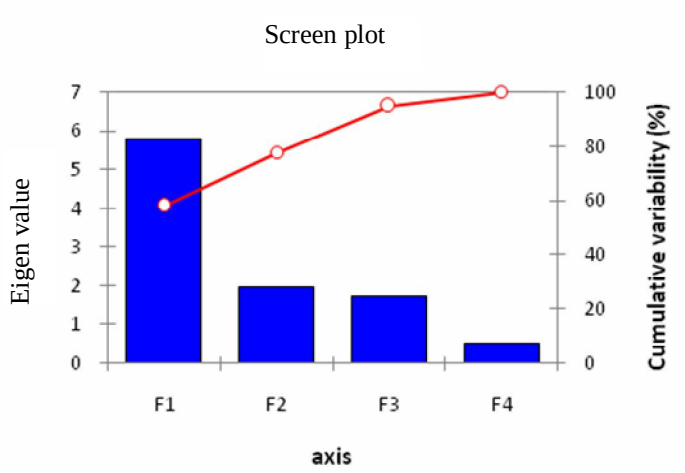

Fig. 2. PCA screen plot for anthropogenic pressure.

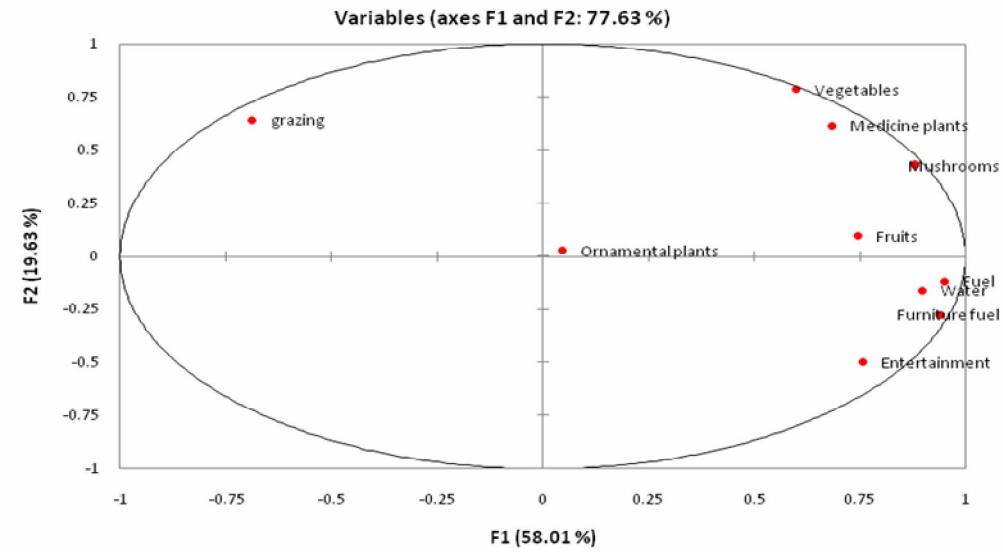

Fig. 3. Ordination diagram showing anthropogenic pressure on natural resources in Pir Punjal range.

In all, 47 species are used for medicinal purposes. The plants are used for preparing local medicines. The species *V. grandiflorum, B. ciliata, T. indicum, D. deltoidea, A. dubia* and *F. nubicola* are special plants used in different medicines. This practice makes these herbs more vulnerable to extinction (Jan *et al.* 2008).

In all, 26 plant species are used as fuel wood and 11 species for wooden furniture, the use of wild plants for fuel wood purpose which create anthropogenic pressure are similar as reported by (Faiz and Fakher 2015c) in Lesser Himalayas in Tolipir landscape.

Table 3. A check list of recorded plants.

Sl. No.	Family	Scientific name	Family	Scientific name
1.	Pinaceae	*Abies pindrow* Royle (Partal Paluder silver fie)	Hippocotanaceae	*Aesculus indica* (Wall. ex Camb.) Hook. f. (Bankhore, Horsechestnut)
2.	-	*Pinus roxburgii* Roxb. (Chir)	Rutaceae	*Skimmia laureola* (DC.) Sieb
3.	-	*Pinus wallichiana* A.B. Jackson (Biar, blue pine)	-	*Zanthoxylum armatum* Dc. Prodr
4.	Aceraceae	*Acer pentapomicum* J.L. Stewart ex Brandis (Tarkanna, Maple)	Mimosaceae	*Albizia lebbek* (Linn.) Bth. (Shirin)
5.	Fagaceae	*Castanea sativa* Mill. (Chest nut)	Melliaceae	*Cedrella serrata* Royle (Drawa)
6.	Ulmaceae	*Celtis caucasica* Willd. (Batkaral)	Fragaceae	*Quercus baloot* Griff. (Rein, Shah baloot)
7.	Elaeagnaceae	*Elaeagnus angustifolia* Linn.	-	*Quercus dilatata* Royle (Oak, Barungi)
8.	-	*Elaeagnus umbellata* Thunb. (Russian olive)	-	*Quercus glauca* Thunb. (Oak)
9.	Moraceae	*Ficus palmate* Forssk. (Phaghwar, Anjir)	-	*Quercus incana* Roxb. (Rein, Ban, Rinji)
10.	-	*Ficus carica* Linn. (Phagwar)	Salicaceae	*Salix acmophylla* Boiss. (Beens, Bed, Gaith)
11.	Juglandaceae	Juglans regia Linn. (Akhrot, Khore)	-	*Salix denticulate* Andersson (Beens)
12.	Apocynaceae	Nerium oleander Linn.	-	*Populus ciliata* Wall. ex. Royle Popular)
13.	Rhamnaceae	*Ziziphus* spp.	Urticaceae	*Urtica dioica* L. (Bichu buti)
14.	Papilionaceae	*Medicago minima* (Linn) Grafb.	-	*Debregeasia salicifolia* (D. Don) Rendle
15.	-	*Desmodium podocarpum* DC.	Asteraceae	*Anaphalis adnata* D.C.
16.	-	*Robinia pseudo-acacia* Linn. (Kikar)	-	*Cirsium falconeri* (Hk.f.) Petrak (Kandiari)
17.	-	*Medicago minima* (Linn.) Grafb.	-	*Conyza bonariansis* (L) Cronquist (Buti)
18.	-	*Melilotus alba* Desr.	-	*Gerbera gossypina* (Royle) Beaur
19.	-	*Sophora mollis* (Royle) Baker	-	*Launia secunda* (C.B. Clarke) Hk.f.
20.	-	*Lespedeza juncea* (Linn.f.) Press. var. *juncea*	-	*Parthenium hysterophorus*
21.	-	*Alysicarpus bupleurifolius* (L.) D.C	-	*Saussurea candolleana* (Wall. Ex. D.C.) -
22.	Anacardiaceae	*Pistacia chinensis* Bunge (Kangar)	Umbelliferae	*Heracleum cachemiricum* C.B. Clarke

(Contd.)

23.	Punicaceae	*Punica granatum* Linn. (Druna)	Caprifoliaceae	*Vibernum nervosum* D.Don (Taliana)
24.	Sapindaceae	*Sapindus mukorossi* Gaertn. (Ritha, Soap nut)	-	*Viburnum cotinifolium* D. Don
25.	Berberidaceae	*Berberis lycium* Royle (Sumblu)	-	*Viburnum grandiflorum* Wall.ex.DC
26.	-	*Clematus connate* Linn. (Langi)	Araliaceae	*Hedera nepalensis* K. Koch (Harbumbal)
27.	-	*Clematus montana* Buch. (Langi)	Pteridaceae	*Pteris cretica* Linn.
28.	Fabaceae	*Dalbergia sissoo* Roxb.	Smilicaceae	*Smilax glaucophylla* Klotroch
29.	-	*Indigofera heterantha* Wall. ex Brand (Kainthi)	Adiantaceae	*Adiantum venustum* Don
30.	Oleaceae	*Jasminum mesnyi* Hance (Pili chambali)	-	*Adiantum capillus-veneris* L. (Hansraj)
31.	-	*Lagustrum lucidam* Ail j (Guliston)	-	*Adiantum incisum* Foressk (Sumbul,
32.	Myrsinaceae	*Myrsine Africana* Linn. (Gorkhan, Chapra)	Dioscoreaceae	*Dioscorea bulbifera* L.
33.	Rosaceae	*Duchesnea indica* (Andrews) Focke	-	*Dioscorea deltoidea* Wall. ex Kunth
34.	-	*Fragaria nubicola* Lindl. ex Lacaita	Liliaceae	*Asparagus filicinus* D.Don
35.	-	*Rosa brunonii* Lindl. (Chal, Tarni, Musk Rose)	-	*Polygonatum multiflorum* (L.)
36.	-	*Rubus fruticosus* Hk f. non L (Garachey)	Primulaceae	*Androsace rotundifolia* Hardwicke
37.	-	*Rubus niveus* Thunb. (Garachey)	Ranunculaceae	*Anemone tetrasepala* Royle
38.	-	*Duchesnea indica* (Andrews) Focke (Budimewa)	-	*Caltha alba* Camb. var. *Alba*
39.	-	*Eriobotrya japonica* (Thumb). Lindler (Loquat)	-	*Clematis buchananiana* DC (Langi)
40.	-	*Prunus armeniaca* Linn. (Hari, Khubani)	-	*Ranunculus arvensis* Linn. (Chihoma)
41.	-	*Prunus domestica* Linn. (Lucha	-	*Ranunculus hirtellus* Royle
42.	-	*Prunus persica* (Linn.) Batch (Aru, Peach)	-	*Ranunculus muricatus* Linn.
43.	-	*Pyrus malu* Linn.	-	*Thalictrum pedunculatum* Edgew
44.	-	*Pyrus pashia* Ham. ex. D.Don (Butangi)	-	*Clematus grata* Linn.
45.	Acanthaceae	*Dicliptera bupleuroides* Nees in Wall.	Euphorbiaceae	*Euphorbia helioscopia* Linn. (Dhodhal)
46.	Malvaceae	*Malvestrum coromendelianum* (Linn.)	-	*Euphorbia wallichii* Hk.f.
47.	Fumaricaceae	*Fumaria indica* (Hausskan) Pugsley (Papra)	Rubicaceae	*Gallium aparine* L. (Lainda)
48.	Onagraceae	*Oenothera rosea* L.'Her. ex. Ait (Buti)	-	*Gallium asperifolium* Wall. (Lainda)
49.	-	*Epilobium tibetanum* Hausskn	Dioscoreaceae	*Dioscorea bulbifera* L.

(Contd.)

50.	Guttiferae	*Hypericum perforatum* Linn.	Plantaginaceae	*Plantago lanceolata* Linn. (Ispamgol)
51.	Iridaceae	*Iris milesii* Foster in Gard. (Chulindry)	Podophyllaceae	*Podophyllum emodi* Wall. ex. Royle
52.	Labiatae	*Prunella vulgaris* Linn.	Primulaceae	*Primula denticulata* Smith. (Primula)
53.	-	*Salvia moorcroftiana* Wall. Ex Benth (Kaljari)	Umblliferae	*Pimpinella stewartii* (Dunn.) E.Nasir
54.	-	*Salvia hians* Royle	Dryopteridaceae	*Dryopteris juxtaposita* Christ.
55.	-	*Salvia lanata* Roxb.	Dryopteridaceae	*Polystichum squarrosum*
56.	-	*Mentha royleana* Benth. (Podina)	Athyriaceae	*Athyrium tenuifrons* Wall. apud Moore ex.
57.	-	*Nepeta erecta* (Royle ex. Benth.) Benth	Violaceae	*Viola canscens* Wall. ex. Roxb. (Banafsha)
58.	-	*Nepeta laevigata* (D.Don) Hand	Valerianaceae	*Valeraina jatamansi* Jones (Mushk bala)
59.	-	*Nepeta nervosa* Royle ex. Benth.	-	*Valeriana pyrolifolia* Decne (Mushk bala)
60.	-	*Thymus liniaris* Benth.Subsp. liniaris Jalas	Scrophulariaceae	*Verbascum thapsus* L. (Gider tabacoo)
61.	-	*Isodon rugosus* (Wall. ex. Benth.) Codd.	-	*Veronica beccabunga* Linn.
62.	Companulaceae	*Campanula benthamii* Wall.	-	*Veronica biloba* Linn.
63.	Polygoneaceae	*Rumex dentatus* L. (Jangli Palak)	-	*Veronica melissifolia* Desf.ex. Pior
64.	Sambucaceae	*Sambucus wightiana* Wall. ex. Wight. (Gandala)	Asclepidaceae	*Vincetoxicum hirundinaria* Medicres
65.	Compositae	*Senecio chrysanthemoides* DC.	Poaceae	*Brachiaria* spp.
66.	Umbellifereae	*Seseli libanotis* (L.) W. Koch	-	*Dactyloctenium aegyptium* (Linn.) Willd.
67.	Gentianaceae	*Swertia ciliata* (G.Don) B.L.Burtt	-	*Desmostachya bipinnata* (L) Stapf.
68.	Compositae	*Taraxacum officinale* Weber (Hand)	-	*Koeleria* spp.
69.	Hemionitidaceae	*Coniogramme rosthornii*	-	*Oplismenus* spp.
70.	Saxifragaceae	*Bergenia ciliata* (Haw.) Sternb. (Zakhm-e-Hayat)	-	*Phalaris minor* Retz.
71.	Borangniceae	*Trichodesma indicum* (L.) R. Br (Handusi booti)	-	*Phragmites karka* (Retz.) Trin. ex. Steud
72.	Tapilianceae	*Triufolium repens* L. (Shatal)	-	*Poa nepalensis* Walls. ex. Duthie.
73.	Equisetaceae	*Equisetum arvense* Linn.	-	*Pogonatherum* spp.
74.	Cucurbitaceae	*Momordica dioica* Roxb. ex. Willd.	-	*Stipa sibirica* (Linn.) Lam.
75.	Thelpteridaceae	*Pseudophagopteris pyrrhorhachis* (Kunze) Ching	-	*Themeda* spp.

The present study reports 32 plant species which are used for grazing of animals and these estimates are much higher than the ecologically permissible limit of 8.51 acres/grazing unit/year for the Himalaya (Singh *et al.* 1984). The higher number of sheep and goat are also a great threat to vegetation harvesting in the area (Awan 2002).

The unchecked overgrazing due to the limited available grazing area and excessive sedentary and nomadic livestock are constant threats to a proper functioning of ecosystem (Malik 2016). Grazing influences native species composition and affect the entire ecosystem (Adler and Morales 1991).

Native forests are the main source of wood utilized by the local inhabitants, but some come from cultivated acreage. The fuel wood mainly comes from trimming of lower branches or through removal of the snags, which are easier to collect and this generally meets the requirements of households. Forest trees are also sometimes removed ways by cheating the forest staff. The removal of lower branches of trees or snags, may have serious effects on maintenance of wildlife species. The extinction of the cheer pheasant has generally been associated with the removal of the lower branches of trees, which are used as roosting places, Removal of snags resulted in lower population of bird species, (Schwab *et al.* 2006) that use these snags for nesting.

The frequent removal of shrubs used as fuel wood has also caused the habitat degradation and the loss of shelter for many species. It is also likely to affect the soil organic matter and the water-holding capacity of the soil causing an increased possibility of erosion.

Mountainous people rely on the natural ecosystems for the basic needs of life. The increased human population provides greater anthropogenic pressure on mountain ecosystems which has led to the deterioration of natural habitats and the rarefactions of some plant species (Giam *et al.* 2010). Plant diversity plays a key role in the functioning of the natural ecosystem, and can be radically increased by reforestation and the establishment of protected areas (Pereira *et al.* 2005).

Several authors have addressed such issues in different regions with different approaches around the world but very few efforts have been made to tally the traditional knowledge with the abundance of plant species for better understanding and management of anthropogenic pressures (Shaheen *et al.* 2012). The present findings show that to save biodiversity, anthropogenic activities should be controlled because people choose species of their own interest and hence put enormous pressure on rare species such as medicinal plants (Evans *et al.* 2006).

For sustainable conservation of natural ecosystems, vegetation structure, animal community and abiotic resources (fresh water springs) should be used as ecological indicators. Ecological indicators, when employed together with traditional and economic gauges, can play a role in designing conservation strategies (Tarrasón *et al.* 2010).

The present study emphasizes to document basic needs of community and give subsidy to save this fragile ecosystem for long-term environmental sustainability and ecosystem services management (Moldan *et al.* 2012). The present study also provides base line guide line which could be extended to the wider Himalayan region and compared to habitat studies in relation to anthropogenic pressure being carried out in the developed world.

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