

Indigenous Knowledge of Some Medicinal Plants of Himalaya Region, Dawarian Village, Neelum Valley, Azad Jammu and Kashmir, Pakistan

Khawaja Shafique Ahmad^{1,*}, Sadaf Habib²

¹Department of Botany, University of Agriculture, Faisalabad

²University of Chinese Academy of Sciences, Beijing

*Corresponding Author: khsahmad@yahoo.com

Copyright © 2014 Horizon Research Publishing All rights reserved.

Abstract Investigation and documentation of the status of medicinal plants and associated knowledge was conducted in village Dawarian, Neelum valley AJ&K. A total of 59 plant species were used for fourteen (14) different categories of diseases. The medicinal plants were economically used in treating a certain ailments, such as skin diseases (10 spp., 14.49%) followed by headache & fever, cough & flu (8 spp., 11.59% each), stomach problems & asthma (7 spp., 10.14% each), jaundice & dysentery (5 spp., 7.25% each), bronchitis (4 spp., 5.80%), diabetics, rheumatic pain, bone fracture & wound healing (3 spp., 4.35%), ulcer (2 spp., 5.10% each) and dandruff (1 spp., 1.45%). The highest value of Informant consensus factor (ICF) is 0.71 for diabetics and lowest value is for bronchitis 0.21% whereas, *Berberis lycium* and *Ajuga bracteosa* has the highest fidelity level (FL: 100%) being used to cure diabetic patients. Direct Matrix Ranking (DMR) results showed that *Juglan regia* stands first in being the most multipurpose medicinal plant, followed by *Morus alba* whereas, *Aconitum heterophyllum* was found most threatened plant in the study area. Timber mafia/export was the leading threat followed by construction, fuel, grazing and urbanization respectively. Medicinal flora such as, *Berberis lyceum*, *Ajuga bracteosa*, *Aconitum heterophyllum*, *Bistorta amplexicaule*, *Saussurea lapa* and *Jurinea dolomiaea* are on the edge of extinction due to over exploitation.

Keywords Ethnobotany, Threat Assessment, Dawarian, Neelum Valley, AJ&K

1. Introduction

Indigenous knowledge has been significant in sourcing of medical remedies and development of commercial products. Recently, focus in ethnobotanical research has intensified on medicinal, cultural and commercial/livelihoods ethnobotany (Hossain *et al.*, 2010). Ethnobotany is a broad term used to the study the direct interrelations between man and plants

(Balick and Cox, 1996). The reliance of human beings on plants for their livelihoods is mandatory and it is primarily started by domestication and dates back to 10,000 years (Martin, 1995). Ethnobotanical study documents the facts on cultural interaction of people with plants. It also tries to find out how local people have traditionally used plants for various purposes and how they integrated plants into their cultural tradition and religion (Balick and Cox, 1996).

The focus of ethnobotany is on how plants have been or are used, managed and perceived in human societies and includes plants used for food, medicine, rituals, social life and others. The relationship between plants and human cultures is not limited to the use of plants for food, clothing and shelter but also includes their use for religious ceremonies, ornamentation and health care (Khan *et al.*, 2008). The indigenous knowledge of plants has been communicated from generation after generation through oral message and individual experience (Shinwari, 2010).

In developing countries, use of indigenous plants by local people for their day ailments is common practice because western based health care system is inefficient due to poor staffing or because western drugs are expensive (Mahmood *et al.*, 2011). Ethnomedicine is the system to maintain health and treat diseases based on folk beliefs and traditional knowledge, skills, methods and practices. This knowledge is disappearing because of rapid scientific, ecological and socio-economic changes. Therefore, ethnomedicinal knowledge must be acknowledged and conserved in a systematic way (Mohammed *et al.*, 2006).

In Pakistan 60% of population especially in the villages are taking health cares by traditional practitioners who recommend herbal prescriptions (Haq, 1983). It is reported that 80% of the African population is depended on the traditional medicines (WHO, 2002). In Pakistan almost 80% of endemic plants are restricted to the northern and western mountains (Ali & Qaiser, 1986). Azad Jammu and Kashmir (AJ&K) is gifted with rich diversity medicinal plants. Many studies have been reported on the traditional medicinal uses

of plants by the local communities of AJ&K (Ishtiaq *et al.*, 2012; Mahmood *et al.*, 2011; Qureshi *et al.*, 2007; Ishtiaq *et al.*, 2006; Dar, 2003). The present study is focused on the important plant resources and their indigenous uses from the Dawarian, Neelum valley, AJ&K, Pakistan.

2. Materials and Methods

2.1. The Study Area

The Neelum Valley is situated north-east of Muzaffarabad at an altitude of 900-6325 meters above sea level (a.s.l). It lies between 73°-75° E longitude and 32°-35° N latitude (Mahmood *et al.*, 2011; Ahmad *et al.*, 2012b). It is the largest district of Azad Kashmir covering an area of 3737 km² (Fig 1). Dawarian village is situated at 110km north of the capital Muzaffarabad and is about 5450 ft above sea level (a.s.l). This mountain based area is excellent for adventure tourism and unique customs and way of living. The climate is temperate with very cold winters (average 0-4 °C) and moderate summers (average temperature 20-30 °C). Average rainfall is 165 cm annually. The area has various types of landforms and small plateaus. Soil is loamy and sandy loam, capable of retaining moisture and good growth of forests. Majority of the area is covered with thick vegetation and forest trees (Dar, 2003).

2.2. Data Collection

Many field trips were arranged and the area was thoroughly surveyed for the documentation of folk

knowledge. Standard methods such as open-ended and close-ended interview were used for collection of plant materials. One hundred informants were randomly selected interview. The plant specimens collected, pressed, dried, preserved and were arranged alphabetically by family name, vernacular name and ethnomedicinal uses. The collected specimens were identified with the help of floristic literature (Nasir & Ali, 1970-1989; Ali & Nasir, 1990-1991; Ali & Qaiser, 2001-2008; Qureshi, 2004).

2.3. Data Analysis

Data was tested through statistical methods to obtain results from the observations and data collected from the study area. Information consensus factor (ICF) was calculated for each category to identify the agreement of the informants on the reported cure. ICF was calculated by equation $[ICF = \frac{nur-nt}{nur-1}]$ where Nur= number of use citation in each category and Nt= number of species used. The fidelity level (FL), the percentage of informants claiming the use of a certain plant for the same major purpose, was calculated by, $[\frac{Np}{N} * 100]$. Where Np = number of informants that claim a use of a plant species for a particular use and N = number of informants that use the plants. Such methods are helpful in the selection of plants for further studies (Alexiades, 1996). Direct matrix ranking was conducted following Cotton (1996) for 7 multifarious medicinal plants commonly reported by informants. Preference ranking and threat to medicinal plants were also determined (Alexiades, 1996).

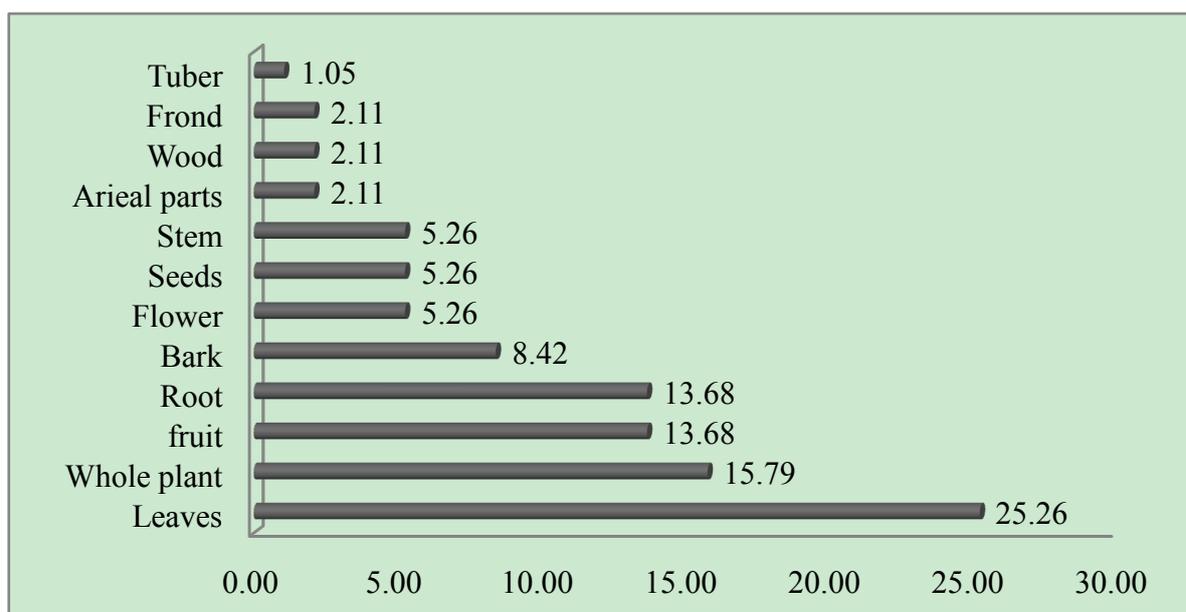


Figure1. Parts percentage of plants used for different purposes

3. Results and Discussion

Many studies have been conducted on the indigenous uses of medicinal plants in Pakistan and Azad Kashmir (Ahmad et al., 2012a; Ahmad et al., 2012b; Ishtiaq et al., 2012; Shinwari and Qaiser, 2011; Mahmood et al., 2011; Shinwari, 2010; Ishtiaq et al., 2007; Ishtiaq et al., 2006; Hamayun et al., 2006; Shinwari & Gilani, 2003). Shinwari & Gilani (2003) and Hamayun et al., (2006) describe indigenous knowledge of medicinal plants from northern areas of Pakistan. Ali & Qaisar (2009) reported 83 taxa that were used locally in Chitral district of Hindukush range. Astragalus, the largest genus in Pakistan has about 134 species. A sum of 59 plant species belonging to 52 genera and 35 families were collected from research area. Information regarding their botanical name, vernacular name, family, part used and their ethno medicinal uses are listed in the Check List. Asteraceae was most dominating family in the study area (8 spp., 13.56%) followed by Rosaceae (4 spp., 6.78%; Table 1). Leaves were highly utilized part (24spp., 25.26%) followed by whole plant (18spp., 19.15%), fruits and roots

(13spp., 13.68% each), bark (8spp., 8.42%), seeds, flower and stem (5spp., 5.26% each), aerial parts, wood and frond (2spp., 2.11%) and tuber (1 spp., 1.05%) (Fig 1). A total of 14 different categories of diseases have been studied during the survey of selected area (Fig 2). The medicinal plants were efficiently used in treating a certain disease, such as skin diseases (10spp., 14.49%) followed by headache & fever, cough & flu (8spp., 11.59% each), stomach problems & asthma (7spp., 10.14% each), jaundice & dysentery (5spp., 7.25% each), bronchitis (4spp., 5.80%), diabetics, rheumatic pain, bone fracture & wound healing (3spp., 4.35%), ulcer (2spp., 5.10% each) and dandruff (1spp., 1.45%). Bokhari (1994) documented the vegetation analysis of Machyara National Park Muzaffarabad AJ&K and reported 10 plant communities in different regions of the National Park. Ethnobotany of Lawat and its allied areas District Muzafarabad was reported which provided a checklist of 52 species. Out of which, 3 species are of Gymnospermic families while 49 species are of Angiospermic families (Dar, 2003).

Table 1. Folk medicinal uses of plants of Neelum valley AJ&K

| S.No | Botanical Name | Local Name | Family | Part (s) used | Folk medicinal Uses |
|------|--|----------------|---------------|---------------|---|
| 1 | <i>Adiantum capillus-veneris</i> L. | Sumbal | Adiantaceae | Fr | Fruit past is used in skin diseases, fever and cough. |
| 2 | <i>Adiantum incisum</i> Forssk. | Kakva | Adiantaceae | Fr | A paste made from the rhizomes is applied to treat cuts and wounds. The paste of rhizome is applied as a remedy for conditioning of hair and scalp. |
| 3 | <i>Achyranthus aspera</i> L. | Puthkanda | Amaranthaceae | Fr | A thin paste is obtained by grinding fresh roots with sufficient quantity of water in a mortar and pastel. The paste is applied to external genitalia. |
| 4 | <i>Amaranthus spinosus</i> L. | Surukh ghanyar | Amaranthaceae | Ap | Seeds are cooked with rice and are given in joint pain. |
| 5 | <i>Anethum graveolens</i> L. | Soya | Apiaceae | Fr | Leaves are cooked as vegetable and also used as flavouring in salads. Powdered fruit is given in cough, asthma, fever, ulcer and skin allergies. |
| 6 | <i>Achillea millefolium</i> L. | Sultani booti | Asteraceae | L | Leaves are chewed to treat toothache. The juice of leaves is poured in ear to treat earache. Tea made from the plant is used to treat T.B., stomach disorder and fever. |
| 7 | <i>Anaphalis nepalensis</i> Spreng. | Paharee jaree | Asteraceae | Wp | The juice of the plant and is applied on joint pain. The same is applied to prevent skin from sun burning. |
| 8 | <i>Saussurea lanceolata</i> Clarke. | Kuth | Asteraceae | R, L, Fl | The paste of roots is externally applied on skin allergies and pimples. Decoction of roots is used to cure stomach pain and typhoid fever. |
| 9 | <i>Jurinea dolomiaea</i> Boiss. | Guggal toof | Asteraceae | R | The extract of roots is used as tonic for weakness of the bones. It is cooked with maize flour and is used for the treatment of internal fractures. |
| 10 | <i>Taraxacum officinale</i> Weber et Wigg. | Hand | Asteraceae | L, R | Leaves are used as vegetables to treat jaundice. |
| 11 | <i>Artemisia scoparia</i> Waldst & Kit. | Ghass | Asteraceae | St, L | The plant antibacterial, stomachic, anthelmintic and purgative. It is also used as fodder. |
| 12 | <i>Conyza canadensis</i> (L.) Cronquist. | Kutahudy | Asteraceae | Wp | The plant is homeostatic, stimulant, astringent and diuretic. Young leaves and seedlings are cooked in rice. |
| 13 | <i>Sonchus asper</i> (L.) Hill. | Dodak | Asteraceae | Wp | Young leaves and stem are cooked as vegetable. |
| 14 | <i>Betula utilis</i> D. Don. | Borzal | Betulaceae | B | The bark is soaked in water and few drop poured in ear to treat earache. The same is used to wash chronic wounds. The powder of bark is given in jaundice. |

| | | | | | |
|----|--|-----------|------------------|-----------|--|
| 15 | <i>Berberis lycium</i> Royle | Sumbal | Berberidaceae | B, R | The paste of bark and roots is applied externally to treat fracture and headache. Locally the dried root is mixed with egg and fried in cow's ghee and used for the treatment of fractured bones and wounds healing. The same is internally given as general body tonic. |
| 16 | <i>Cynoglossum lanceolatum</i> Forssk. | Landi | Broginiaceae | Wp | The past of leave is applied on abscess to remove pus. |
| 17 | <i>Onosma bracteatum</i> Wall. | Gaozaban | Broginiaceae | Wp | Powder of root is used in asthma and bronchitis. Decoction of leave is given in stomach and bladder irritation. |
| 18 | <i>Brassica campestris</i> L. | Sarryan | Brasicaceae | Fl | Leaves and roots are commonly used as vegetable acting as digestive. |
| 19 | <i>Canabus sativa</i> L. | Bhung | Canabinaceae | L, Fl | The powder of leaves is used in abdominal disorders and diarrhea. |
| 20 | <i>Viburnum cotinifolium</i> D. Don | Guchh | Caprifoliaceae | Fr, L | The flower and leaves are sedative and astringent. |
| 21 | <i>Silene apetala</i> Willd. | But Karam | Caryophylaceae | L, St | Leaves are emollient. The plant is used as fodder for cattle. |
| 22 | <i>Cucumis sativus</i> L. | Kheera | Cucurbitaceae | Fr, Sd | Fruit is used in salad as cooling agent. Powder of seed is used as digestive. |
| 23 | <i>Dioscorea bulbifera</i> Decne. | Contrees | Dioscoreaceae | L, St, Tu | The leaf juice is used to treat snakebites and scorpion stings. The powder of tuber is given in dysentery and piles. The fern is also used in the production of sex hormones |
| 24 | <i>Dryopteris ramosa</i> (Hope) | Longur | Dryopteridaceae | St, L | The juice of the plant is given in stomach pain. Fronds are used as fodder for the horses. |
| 25 | <i>Dryopteris stewartii</i> Fraser. Jenk | Dad | Dryopteridaceae | Wp | Soft and fresh branches are boiled and used as vegetable. |
| 26 | <i>Diospyros lotus</i> L. | Amlok | Ebenaceae | Fr | The juice of unripe fruits given to lower the blood pressure. The fruit is used as a remedy for hiccough. |
| 27 | <i>Ricinus comunis</i> L. | Arind | Euphorbiaceae | Sd, L | Castor oil is given in constipation before and after child birth to mother. The same is given to infants to remove constipation. Paste of leaves is slightly warmed over fire and applied on rheumatic pain and injuries. |
| 28 | <i>Phaseolus lunatus</i> L. | Moth | Fabaceae | Sd | Powder of seed is used in fever and is good source of food. The dried seeds are cooked with rice and given to fever patients. |
| 29 | <i>Trigonella foenum-graceum</i> L. | Methi | Fabaceae | Wp | Seeds are chewed and swallowed with salad water for indigestion. The powder of the plant is given in diabetes. |
| 30 | <i>Trifolium repens</i> L. | Sinja | Fabaceae | Wp | Seeds are chewed and swallowed with water to relief abdominal pain. |
| 31 | <i>Indigofera heterantha</i> Wall. ex Brandis. | Kanthi | Fagaceae | Wp | Leaves are rubbed on skin allergy. Leaves are given to cattle to treat dysentery. |
| 32 | <i>Quercus incana</i> A. Camus. | Reen | Fagaceae | B | The decoction of the bark prepared is given to treat throat pain and tonsillitis. The same is also used in diarrhea, dysentery and rectal bleeding. Galls are used in small quantity as alternate to bark. |
| 33 | <i>Geranium wallichianum</i> D. Don | Ratanjog | Geraniaceae | R | Powder of dried root is doted on wounds. Leaves extract is given in vision problem. |
| 34 | <i>Morchella esculenta</i> Fries | Gujai | Helveliaceae | Wp | Whole plant is given for general body tonic, joins aches or potency, insomnia and poor appetite. |
| 35 | <i>Aesculus indica</i> Wall. ex. Comb (Hook) | Bankkor | Hippocastanaceae | L | Fruits are given to horses in colic pain. Oil obtained from the seed is externally applied in rheumatic pains. |
| 36 | <i>Juglans regia</i> L. | Khoor | Juglandaceae | L, B, Fr | The ripened fruit is used as a brain tonic. The bark of stem and root is used for cleansing teeth and gums. The wood is used as fuel source. |
| 37 | <i>Ajuga bracteosa</i> Wall. ex Benth. | Jane adam | Lamiaceae | Wp | Paste of the leaves is applied to cure headache. The powder of the whole plant is given to treat abdominal pain and indigestion. |
| 38 | <i>Mentha arvensis</i> L. | Podina | Lamiaceae | Wp | The plant along with lemon grass is boiled in water to obtain extract that is given in fever. The plant is mixed with funnel seeds and boiled in water |

| | | | | | |
|----|--|----------------|----------------|--------------|---|
| | | | | | (<i>Foeniculum vulgare</i>) which is given in diarrhea, vomiting and cholera. |
| 39 | <i>Plectranthus rugosus</i> Wall. ex Benth. | Peemar | Lamiaceae | Wp | Past of roots and leaves is used in burning sensation, leprosy and skin disease. The juice of leaves is given in vomiting and diarrhea. |
| 40 | <i>Acacia nilotica</i> Willd. | Kiker | Mimosaceae | L, B | Bark decoction used as a gargle in sore throat and toothache. Foliage and pods used as fodder. Wood is used as timber, agricultural implements and fuel wood source. |
| 41 | <i>Morus alba</i> L. | Safed toot | Moraceae | R, B, Fr, L | Roots bark is used in toothache and cough. Leaves are boiled in water and given to treat fever, sore throat and headache. |
| 42 | <i>Morus nigra</i> L. | Kala toot | Moraceae | Fr | The syrup is made from fruit pulp and given in anemia and sore throat. |
| 43 | <i>Olea ferruginea</i> Royle | Rons pattar | Oleaceae | Wp | Leaves past are used to cure wounds and ulcer. The paste of leaves is applied in healing fractured bones. |
| 44 | <i>Plantago major</i> L. | Asphagol | Plantaginaceae | Wp | Powder of leaves is given in abdominal pain and indigestion. Dry seeds soaked in water are given in dysentery to cure. The paste of tuber is used as antidandruff agent. |
| 45 | <i>Plantago ovata</i> Forssk. | Chamchi pattar | Plantaginaceae | Sd | Powder of dried seeds is given in constipation, chronic, diarrhea, dysentery. Paste of seed applied on burning areas to relieve. |
| 46 | <i>Bistorta amplexicaulis</i> (D.Don) Greene | Masloon | Polygonaceae | R, L | Dried roots are used in making tea. The herbaceous roots are also used as fodder to cattle. |
| 47 | <i>Rumax nepalense</i> Spreng. | Holla | Polygonaceae | L, St, R | Leaves are cooked as vegetable and given to pregnant to treat constipation. Stem and leaves extract is applied on wounds to stop bleeding. |
| 48 | <i>Punica granatum</i> L. | Anar | Punicaceae | Wp | The bark and seeds are used in bronchitis. The ripe fruit is used as tonic. |
| 49 | <i>Aconitum heterophyllum</i> Wall ex. Royle | Ptrees | Ranunculaceae | R | Root is boiled with milk and used for the treatment of fever, flu cough and abdominal pain. Roots are also used for dysentery, cirrhoses, fever, and vomiting and stomach disorder. |
| 50 | <i>Actaea spicata</i> L. | Rech dad | Ranunculaceae | R, L, Fr | Dried powder of leaves is used as insecticide. Oil obtained from roots is given as tonic. |
| 51 | <i>Aquilegia flavescens</i> Watson. | Zaban posh | Ranunculaceae | L, R | Powder of roots and leaves is given in fever. The paste of seed is applied to get rid lice from the hair. |
| 52 | <i>Prunus avium</i> L. | Glass | Rosaceae | Wd, Fr, L | Leaves are used as fodder. Wood is used as fuel. |
| 53 | <i>Prunus bokharensis</i> Royle | Alobukhara | Rosaceae | B, L, Fl, Fr | Paste of fresh leaf and stem bark is applied externally on wounds. |
| 54 | <i>Prunus persica</i> Stokes. | Aroo | Rosaceae | Fr | Fruit is eaten by diabetic patients. It is also useful in rheumatic pain. |
| 55 | <i>Prunus domestica</i> L. | Alocha | Rosaceae | Fr, L | The fruit of plant is laxative and used in treating constipation. |
| 56 | <i>Salix tetrasperma</i> Roxb. | Beensa | Salicaceae | B, L, Wd | Wood is used as making sport articles like cricket balls. It is also used as fuel and foliage as fodder. |
| 57 | <i>Urtica dioica</i> L. | Kairy | Urticaceae | R, Ap | Young leaves are cooked as a potherb and added to soups. They can also be dried for winter use. Decoction of root is given to increase milk secretion and reduces prostate enlargement. The decoction of plant is applied on baldness and dandruff. |
| 58 | <i>Viola canescens</i> Wall. ex Roxb. | Banafsha | violaceae | Sd, R, L | The decoction of leaves and flowers is given internally in the treatment of bronchitis, respiratory catarrh, coughs and asthma to treat. The same is used as gargle to treat mouth and throat infections. |
| 59 | <i>Vitis vinifera</i> L. | Dakh | Vitaceae | Fr, L, Fl | Fruit is used as tonic and in relieving constipation. Flowers are used in bronchitis and anemia. |

Key: B=Bark, Fl=Flowers, Fr=Fruits, L=Leaves, R=Roots, Sd=Seeds, Wp=Whole plant, Wd=Wood, Ap=Aerial parts, Fr=Fronds, Tu=Tubers, St=Stem.

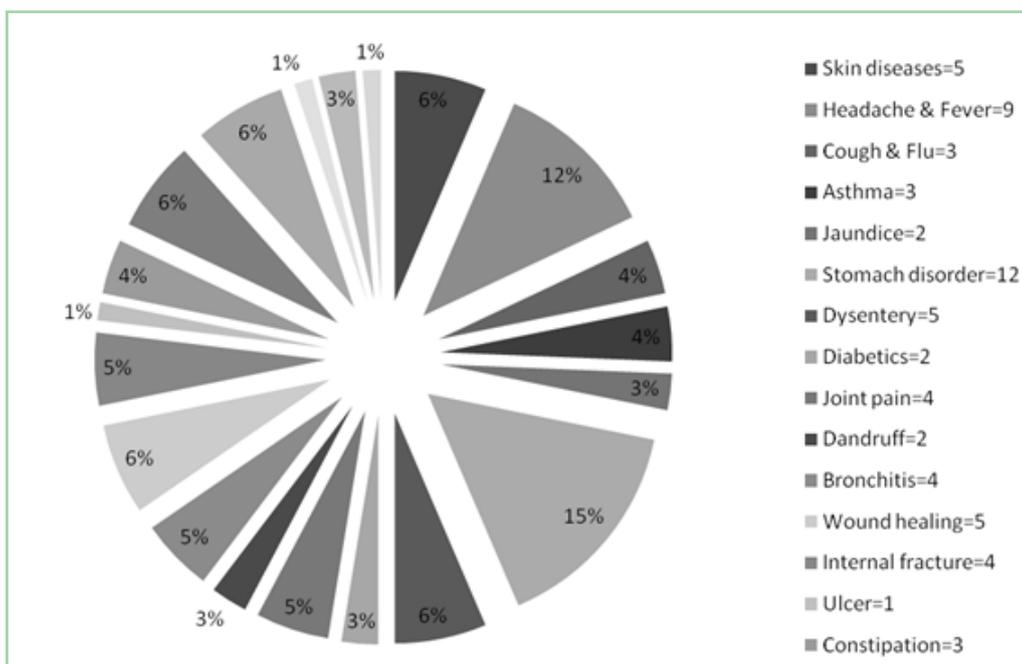


Figure 2. No. of plants used for the treatment of different diseases

Table 2. Informant Consensus Factor (ICF) by categories of diseases in the study area

| Categories | Species | Use citation | ICF (%) |
|------------------|---------|--------------|---------|
| Skin diseases | 10 | 27 | 0.65 |
| Fever | 8 | 22 | 0.67 |
| Cough | 8 | 17 | 0.62 |
| Asthma | 7 | 19 | 0.67 |
| Jaundice | 5 | 9 | 0.5 |
| Stomach problems | 7 | 25 | 0.75 |
| Dysentery | 5 | 10 | 0.5 |
| Diabetics | 3 | 8 | 0.71 |
| Rheumatic pain | 3 | 5 | 0.03 |
| Dandruff | 1 | 1 | 0.5 |
| Bronchitis | 4 | 3 | 0.1 |
| Wound healing | 3 | 7 | 0.66 |
| Bone fracture | 3 | 6 | 0.6 |
| Ulcer | 2 | 5 | 0.7 |

Table 3. Fidelity Level (FL) values of medicinal plants of the study area

| Species | Fidelity level (Fidelity) (%) |
|--|-------------------------------|
| <i>Berberis lycium</i> Royle | 100 |
| <i>Ajuga bracteosa</i> Wall. ex Benth. | 100 |
| <i>Punica granatum</i> L. | 95 |
| <i>Bistorta amplexicaulis</i> (D.Don) Greene | 88 |
| <i>Morchella esculenta</i> L. | 66 |
| <i>Juglans regia</i> L. | 49 |
| <i>Plantago major</i> L. | 75 |
| <i>Betula utilis</i> D.Don | 37 |
| <i>Acacia nilotica</i> Willd. | 34 |
| <i>Olea ferruginea</i> Royle | 26 |
| <i>Morus nigra</i> L. | 18 |
| <i>Plantago ovata</i> Forssk. | 19 |
| <i>Viola canescens</i> Wall. ex Roxb. | 14 |

Table 4. Direct Matrix Ranking (DMR) of plant species with different uses other than medicinal value (total score of 10 informants) in the study area

| Uses | <i>Juglans regia</i> | <i>Ajuga bracteosa</i> | <i>Saussurea lappa</i> | <i>Berberis lycium</i> | <i>Morus alba</i> | <i>Ricinus comunis</i> | <i>Aconitum heterophyllum</i> |
|----------------|----------------------|------------------------|------------------------|------------------------|-------------------|------------------------|-------------------------------|
| Medicinal | 6 | 9 | 10 | 8 | 7 | 7 | 10 |
| Fodder | 5 | 2 | 2 | 0 | 5 | 0 | 0 |
| Fuel | 4 | 0 | 0 | 5 | 4 | 0 | 0 |
| Construction | 4 | 0 | 0 | 0 | 3 | 0 | 0 |
| Furniture | 5 | 0 | 0 | 0 | 3 | 0 | 0 |
| Roof thatching | 4 | 0 | 0 | 0 | 2 | 0 | 0 |
| Total | 28 | 11 | 12 | 13 | 24 | 7 | 10 |
| Rank | 1st | 5th | 4th | 3rd | 2nd | 7th | 6th |

Table 5. Threatened plant species in the study area

| Threatened Plants | Informants | | | | | | | | | | Total | Rank |
|-------------------------------|------------|---|---|---|---|---|---|---|---|----|-------|------|
| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | | |
| <i>Aconitum heterophyllum</i> | 4 | 3 | 3 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 41 | 1st |
| <i>Bistorta amplexicaulis</i> | 3 | 1 | 2 | 2 | 3 | 4 | 5 | 3 | 1 | 2 | 26 | 7th |
| <i>Ajuga bracteosa</i> | 2 | 1 | 3 | 4 | 5 | 4 | 2 | 3 | 3 | 2 | 29 | 6th |
| <i>Saussurea lanceolata</i> | 5 | 3 | 4 | 4 | 3 | 4 | 5 | 4 | 4 | 3 | 39 | 2nd |
| <i>Betula utilis</i> | 4 | 3 | 5 | 3 | 2 | 4 | 3 | 4 | 3 | 3 | 34 | 4th |
| <i>Geranium wallichianum</i> | 3 | 5 | 4 | 3 | 5 | 4 | 4 | 2 | 3 | 3 | 36 | 3rd |
| <i>Dioscorea bulbifera</i> | 4 | 3 | 3 | 2 | 3 | 2 | 2 | 5 | 3 | 3 | 30 | 5th |

Table 6. Priority Ranking (PR) of factors perceived as threats to plant biodiversity based on their level of destructive effects in the study area

| Threats | Respondent (R1-R6) | | | | | | Total | Percentage (%) | Rank |
|---------------------|--------------------|----|----|----|----|----|-------|----------------|------|
| | R1 | R2 | R3 | R4 | R5 | R6 | | | |
| Construction | 6 | 4 | 5 | 5 | 6 | 4 | 30 | 19.74 | 2nd |
| Grazing | 2 | 5 | 4 | 6 | 4 | 6 | 27 | 17.76 | 4th |
| Timber mafia/export | 6 | 6 | 5 | 3 | 5 | 6 | 31 | 20.39 | 1st |
| Urbanization | 3 | 3 | 4 | 4 | 3 | 2 | 19 | 12.50 | 5th |
| Fuel | 4 | 6 | 5 | 4 | 4 | 5 | 28 | 18.42 | 3rd |

Informant consensus factor (ICF) was used to support the data and to see the degree of agreement on each plant reported by informants. The highest value of ICF is 0.71 for diabetics who depict prevalence of diseases in the area and lowest value is for bronchitis 0.21% (Table 2). In this study, it was demonstrated that *Berberis lyceum* and *Ajuga bracteosa* has the highest fidelity level (FL: 100%) being used to cure diabetic patients while *Viola canescens* has the lowest FL, 14% (Table 3). Direct Matrix Ranking (DMR) was performed to assess the multipurpose uses and their impacts on the plant species. The result of the direct matrix ranking showed that *Juglan regia* stood first in being the most multipurpose medicinal plant, followed by *Morus alba*, whereas *Ricinus comunis* was the least (Table 4). The ranking of threatened economic plants was conducted using 10 informants. The results (Table 5) indicated that *Aconitum heterophyllum* is the most threatened, and *Bistorta amplexicaulis* the least threatened. Timber mafia/export was the leading threat followed by construction, fuel, grazing and urbanization respectively (Table 6). These facts illustrate that we should not be ignorant of the scenario and, a planned and comprehensibly biodiversity conservation and preservation program with collaboration of national of international nature conservation agencies should be launched immediately.

Collection of fuel wood species kept throughout the year during harsh winter resulting continuous destruction of natural forest and vegetation. Forest resources such as, *Cedrus deodara* and *Pinus wallichiana* are disappearing at

an alarming rate. Forest department should reintroduce this tree. A number of other medicinal plants like *Berberis lyceum*, *Ajuga bracteosa*, *Aconitum heterophyllum*, *Taraxacum officinale*, *Bistorta amplexicaule*, *Saussurea lapa* and *Jurinea dolomiaea* are on the edge of extinction due to over exploitation (Ahmad *et al.*, 2012b). The natural vegetation of the area was badly affected due to high intensity of Earth-quake (7.6 magnitudes) in Oct, 2005 and recent flood August (2010). The studies suggested that indigenous knowledge should be engaged for the conservation of biodiversity and sustainable ecosystem restoration (Ishtiaq *et al.*, 2012). There should be close kinship between conservation scientists with indigenous peoples that attract and encourage their active participation in different activities of biodiversity conservation.

4. Conclusion and Recommendations

Dawarian village in Neelum Valley is floristically rich areas need attentions for plants conservation of existing vegetation and reforestation. Plants which are being eradicated, become rare, endangered, and finally diminish from the local population. The people of the area should have an easy access to doctors, so that dependence on the traditional medicinal plants can be minimized. Necessary steps should be taken not only to store the original vegetation but also to improve it. Deforestation is very common, because people have no alternative source of fuel. Therefore,

if natural gas should be supplied to the area, it will protect the vegetation to large extent.

REFERENCES

- [1] Ahmad, K.S., Kiyani, W.K., Hameed, M., Ahmad, F., and Nawaz, T. 2012a. Floristic diversity and ethnobotany of Senhsa, District Kotli, Azad Jammu & Kashmir (Pakistan). *Pakistan Journal of Botany*, 44: 195-201.
- [2] Ahmad, K.S., Qureshi, R., Hameed, M., Ahmad, F., and Nawaz, T. 2012b. Conservation assessment and medicinal importance of some plants resources from Sharda, Neelum valley, Azad Jammu and Kashmir. *International Journal of Agriculture and Biology*, 14: 997-1000
- [3] Alexiades, M. 1996. Collecting ethnobotanical data. An introduction to basic concepts and techniques. In: Selected guideline for ethnobotanical research: *A Field Manual*, pp.58-94. Ali, S.I. and E. Nasir. 1970-2002. Flora of Pakistan, National Herbarium, NARC, Islamabad and Department of Botany, University of Karachi, Karachi. Fasc. No. 1-207.
- [4] Ali, H. and Qaiser, M. 2009. The Ethnobotany of Chitral Valley, Pakistan with Particular Reference to Medicinal Plants. *Pakistan Journal of Botany*, 41(4): 2009-2041.
- [5] Ali, S. I. and Qaiser, M. (Eds.). 1993-2009. *Flora of Pakistan (Fascicle series)*, Islamabad, Karachi.
- [6] Ali, S.I. and Qaiser, M. 1986. A phytogeographical analysis of the phanerogames of Pakistan and Kashmir. Proc. R. Soc. Edinburg 89B: 89-101.
- [7] Ali, S.I. and Qaiser, M. 2001-2008. *Flora of Pakistan (Fascicles series)*, Department of Botany, University of Karachi, Pakistan.
- [8] Ali, S.I. and Nasir, Y.J. (Eds.). 1990-1991. *Flora of Pakistan (Fascicle series)*, Islamabad, Karachi.
- [9] Balick, M.J. and Cox, P.A. 1996. Plants, people and Culture: Science of Ethnobotany. New York, USA.
- [10] Bokhari, A. H. 1994. Ethnobotanical survey and vegetation analysis of Machyara National Park Azad Kashmir, Pakistan. M.Sc. Thesis, University of Azad Kashhmir.
- [11] Cotton, C.M. 1996. *Ethnobotany: Principles and Applications*. John Wiley and Sons, New York, p. 412.
- [12] Dar, M.E.U. 2003. Ethnobotanical use of Lawat district Muzaffarabad, Azad Jammu and Kashmir. *Asian Journal of Plant Science*, 2 (9):680-682.
- [13] Hamayun, M., Khan, S.A., Kim, H.Y. and Leechae, I.J 2006. Traditional knowledge and ex-situ conservation of some threatened medicinal Plants of Swat Kohistan. *Pakistan Journal of Botany*, 38(2): 205-209.
- [14] Haq, I. 1983. *Medicinal plants*. Hamdard Foundation Press, Pakistan.
- [15] Ishtiaq, M., Mumtaz, A.S., Hussain, T. and Ghani, A. 2012. Medicinal plant diversity in the flora of Leepa Valley, Muzaffarabad (AJK), Pakistan. *African Journal of Biotechnology*, 11(13): 3087-3098.
- [16] Ishtiaq, M., Hanif, W. and Khan, M.A. 2006. Ethnoveterinary medicinal uses of plants from Samahni Valley District Bhimber, (Azad Kashmir) Pakistan. *Asian Journal of Plant Science*, 5(2): 390-396.
- [17] Ishtiaq, M., Hanif, W., Khan, M.A., Ashraf, M., and Butt, A.M. 2007. An Ethnomedicinal Survey and Documentation of Important Medicinal Folklore Food Phytonyms of Flora of Samahni Valley, (Azad Kashmir) Pakistan. *Pakistan Journal of Biological Science*, 10(13): 2241-2256.
- [18] Khan, M.A., Hussain, M. and Mujtaba, G. 2010. An Ethnobotanical Inventory of Himalayan Region Poonch Valley Azad Kashmir Pakistan. *Ethnobotany Research & Applications*, 8:107-123.
- [19] Mahmood, A., Qureshi, R. A., Mahmood, A., Sangi, Y., Shaheen, H.M., Ahmad I., and Nawaz, Z. 2011. Ethnobotanical survey of common medicinal plants used by people of mdistrict Mirpur, AJK, Pakistan. *Journal of Medicinal Plants Research*, 5(18):4493-4498.
- [20] Mohammed, I.C., Khan, M.A., and Hanif, W. 2006. An Ethnomedicinal Inventory of plants used for family planning and sex diseases Treatment in Samahni Valley, Pakistan. *Pakistan Journal of Biological Science*, 9 (14): 2546-2555.
- [21] Nasir, E. and Ali, S.I. (Eds.) 1970-1989. *Flora of Pakistan (Fascicle series)*, Department of Botany, University of Karachi, Pakistan.
- [22] Qureshi, R.A., Ghuffran, M.A., and Gilani, S.A. 2007. Ethnobotanical studies of selected medicinal plants of Sudhan Gali and Ganga Chotti Hills, district Bagh, Azad Kashmir. *Pakistan Journal of Botany*, 39(7): 2275-2283.
- [23] Qureshi, R. 2004. *Floristic and Ethnobotanical Study of Desert Nara Region, Sindh*. Department of Botany, Shah Abdul Latif University, Khairpur, Sindh, Pakistan. Ph.D. Thesis, Vol. I: 1-300.
- [24] Shinwari, Z.K. 2010. Medicinal plants research in Pakistan. *Journal of Medicinal Plants Research*, 4(3): 161-176.
- [25] Shinwari, Z.K. and Gilani, S.S. 2003. Sustainable harvest of medicinal plants at Bulashbar Nullah, Astore (Northern Pakistan). *Journal of Ethnopharmacology*, 84: 289-298.
- [26] Stewart, R.R. 1972. *An Annotated Catalogue of the Vascular Plants of West Pakistan and Kashmir*. Fakhri Printing Press, Karachi.
- [27] WHO. 2002. World health organization traditional medicine strategy 2002-2005.