

**BIODIVERSITY, ETHNOBOTANY AND  
CONSERVATION STATUS OF THE FLORA OF  
KAGHAN VALLEY MANSEHRA, NWFP.  
PAKISTAN.**

**BY**

**ZAFAR JAMAL**



**Department of Plant Sciences  
Quaid-i-Azam University  
Islamabad  
Pakistan  
2009**

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*A Thesis Submitted to the Quaid-i-Azam University in Partial  
Fulfillment of the Requirements for the Degree of*

**DOCTOR OF PHILOSOPHY**

**In**

**Plant Sciences**

**Plant Taxonomy (Biodiversity, Ethnobotany)**

**By**

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**IN THE NAME OF ALLAH,  
THE MOST BENEFICENT, THE MOST MERCIFUL.**

*“He laid out the earth for His creatures, with all its fruits and palms having sheathed cluster, and grain with husk and scented herbs. So, O jinn and men, which of your Rabb’s favors will both of you deny?”*

**Al.Quran.**

(Sura Rahman, Ayat: 9-13)

*Dedicated to*

My Loving Father and Mother

**(Mr. & Mrs. Ameer Hussain Abbasi).**

## **CERTIFICATE**

This thesis submitted by Mr. Zafar Jamal is accepted in its present form by the Department of Plant Sciences, Quaid-i-Azam University, Islamabad, Pakistan as satisfying the thesis requirements for the degree of Doctor of Philosophy in Plant Sciences (Plant Taxonomy).

1. **Internal Examiner** \_\_\_\_\_  
(Supervisor) **(Prof. Dr. Mir Ajab Khan)**  
**Dean, Faculty of Biological Sciences.**
  
2. **External Examiner** \_\_\_\_\_
  
3. **External Examiner** \_\_\_\_\_
  
4. **Chairman** \_\_\_\_\_  
(Department of Plant Sciences)

Dated: - \_\_\_\_\_

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## ABSTRACT

The present study was carried out to investigate floristic diversity, ethnobotanical profile and conservation status of important plant species of Kaghan Valley. The Valley is situated in the Northern Pakistan. It is 161 km long scenic wonderland with its towering Himalayan peaks, peaceful lakes, majestic glaciers and splashing water falls. The people are mostly poor, illiterate and are very much dependent upon plant resources. During the study 6 species of Bryophytes (6 families), 53 species of Pteridophytes (9 families), 12 species of Gymnosperms (4 families), and 775 species of Angiosperms (108 families), were collected, preserved and presented as checklist. The people of Kaghan Valley utilize 108 plant species as medicinal plants. Majority of these medicinal plants are used for multiple purposes. These include 91 species of Dicots, 09 species of Monocots, 06 species of Gymnosperms and 02 species of Pteridophytes. Among these ethnobotanically important plants, 27.77 % were found at risk regarding their conservation status. 2.77% were found critically endangered, 12.96 % endangered, 9.25 % vulnerable and 2.77 % near threatened. Seeds of 5 medicinal plants, i.e, *Colchicum luteum*, *Hyoscyamus niger*, *Aconitum heterophyllum*, *Geranium wallichii* and *Paeonia emodii*, were collected from the wild and deposited at Forest Nursery Besian near Balakot as an ex-situ conservation effort. Medicinal plants and edible mushrooms are produced in bulk in Kaghan Valley and are considered as a fair source of income generation for local communities. Beside these, potatoes, peas, beans, maize, walnut and apple also yields good return. The floristic diversity of Kaghan Valley is threatened by the effects of natural and human impacts. Natural causes are hailstorm, drought, snowfall, thunderstorm and earthquake. Among the human causes, fuel wood consumption, illicit cutting for timber, encroachment on forest land, lopping for fodder, grazing, grass cutting, fires and tourism are important. For indigenous people in developing countries like Pakistan where exploitation of environment is necessary for survival, help is needed in constructing alternatives for sustainable development, in order to establish biodiversity conservation much profitable. Multiple uses of forests, development of agro-forestry, silviculture and sustainable exploitation of wild species are some of the alternatives that have been suggested to be considered as future strategy for the development of Kaghan Valley. This part of Himalayan region contains immense biological resources of benefit mankind.

Figure 1: Index map of Pakistan showing location of Kaghan Valley

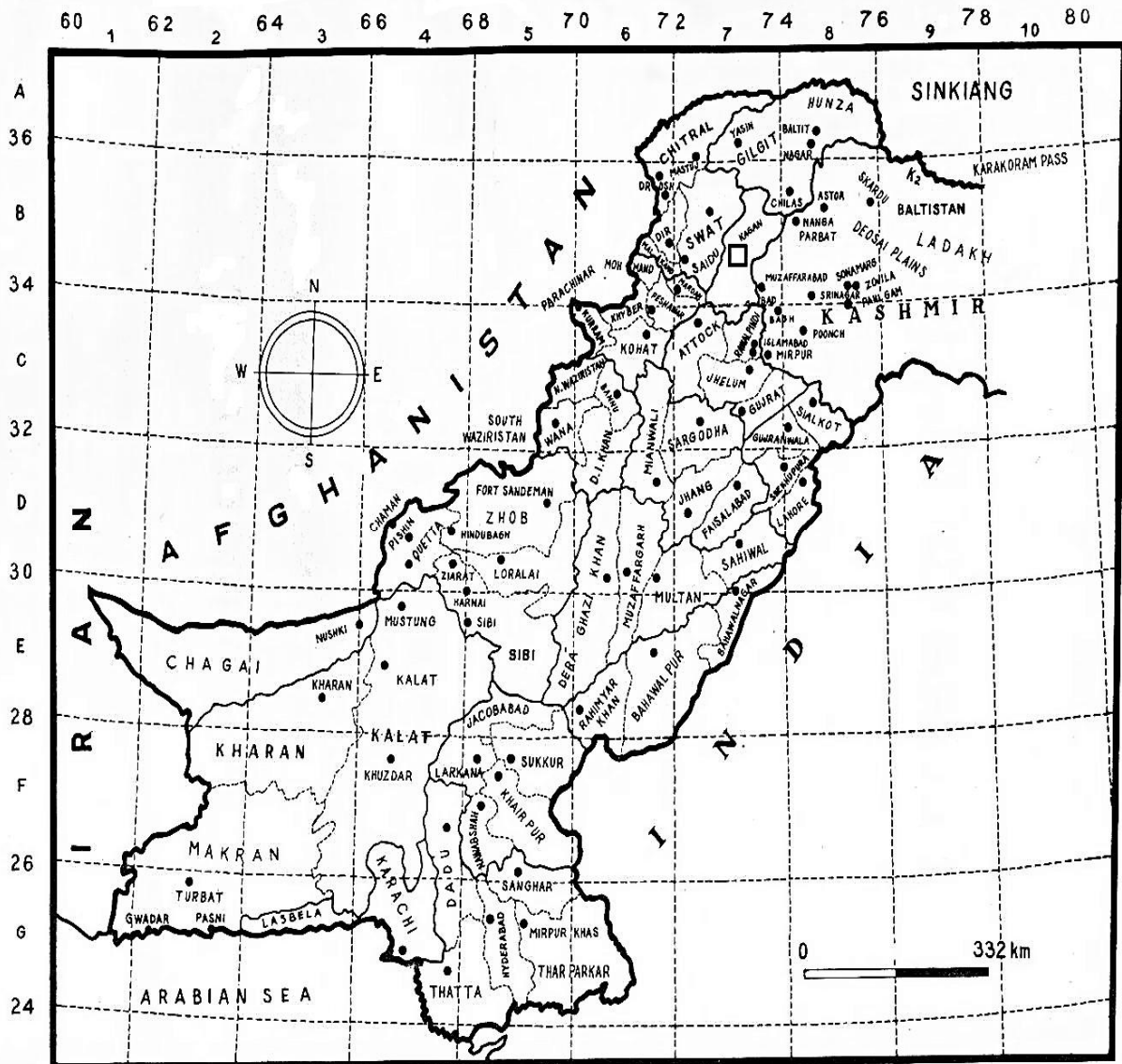


Figure 1.1: Generalized Map of Study Area

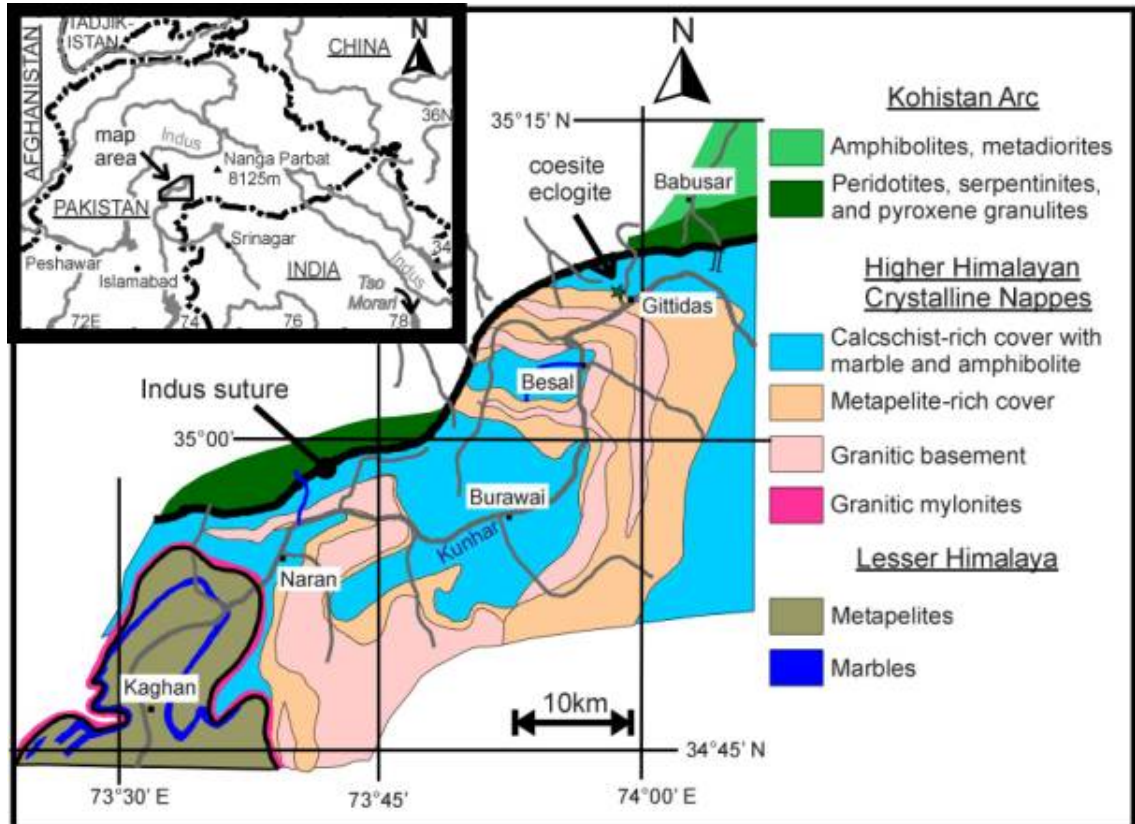
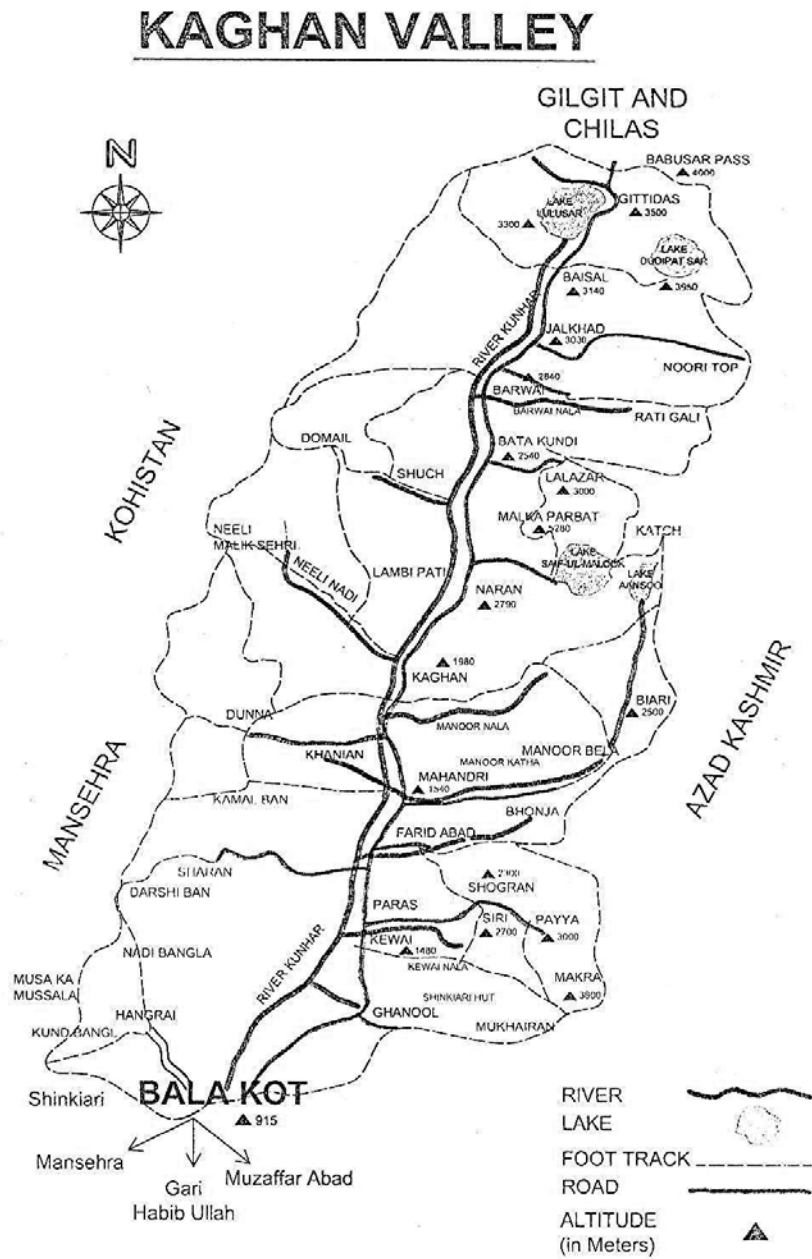




Figure 1.2: Map of Kaghan Valley.



## INTRODUCTION

### 1.1 Introduction to Kaghan Valley:

Pakistan is located in a transitional zone where the summer monsoon influenced climate of the east gradually merges with the winter precipitation dominated by Mediterranean climate of the west. Out of the total land area of Pakistan, 88 % is classified as arid and semi arid, with only 12 % being humid and sub-humid, primarily located in the Himalayan and Karakuram ranges, 5% of the country's total area is under forest cover. (Karki and Williams, 1999). Overall there are 6 endemic genera and an estimated 410 endemic species of the phanerogames in Pakistan. (Ali, 1986). It has been estimated that as many as 709 species of the vascular plants are in danger of being gradually wiped out or exterminated altogether.

The research area Kaghan Valley is located in the Northern Pakistan. The Kunhar river catchments area is commonly known as "Kaghan Valley". It is 161 km long scenic wonderland with its towering Himalayan peaks, peaceful lakes, majestic glaciers and splashing water falls. It is situated between 34°-17' to 35°-10' North latitude and 73°-28' to 74°-7' East longitude. Total area of the valley is about 1627 km.

The research area is one of the global biodiversity centers. There are still many sites in upper Kaghan valley where comprehensive floristic studies and its documentation are required in connection with conservation status of important plant species. Very little research has been conducted in the Himalayan and Karakuram Highlands of Northern Pakistan on the aspects of biodiversity and conservation. The valley is important for ecotourism. Tourist spots such as Shogran, Siri Payye, Manoor, Kaghan, Naran, Saif-ul-Malook, Lalazar, Besal, Dodi Patsar, Lulusar and Babusar Pass etc are fairly attractive for the visitors.

In Pakistan, rapid population growth (5% per annum in mountain dwellers) is resulting in smaller more fragmented land holdings, poverty, illiteracy, cold climate, wasteful housing construction practices (using more timber and less stone and mortar) a changing pattern of life style requiring more houses, excessive grazing pressures, complex land tenure ship, a large influx of Afghan refugees and a construction boom resulting in high and very attractive prices for timber that is accelerating rapid habitat depletion Due to these factors, the forest/ wild life growing stock has been depleted drastically. In northern mountain regions, about 200-380 t/ha of soil erodes every year. (ICIMOD, 1995) more than 50% of the valuable coniferous timber is wasted

through on site conservation and 70% of the forests are untreated and unmanaged. (ICIMOD, 1995).

All the accessible areas within the Valley are exploited for various recreational uses and / or to meet the daily needs of an increasing nomadic (Gujars) population and visits from tourists and guests. Communities use different plants for protecting their houses, cultivated land and other plants to feed their roaming goats and sheep in the pastures and to protect some grass land in the valley basin. Many plants are uprooted and many are heavily collected due to their medicinal uses at a local and national level. Land ownership conflicts are one of the reasons for the non-existence of positive developmental work in the area. This issue has contributed to natural resource exploitation. Due to many geographical and financial difficulties the local taxonomists have not fully exploited the flora of Northern Pakistan and some species are difficult for them to identify as well. (Sheikh, 2002).

Kaghan Valley is situated in District Mansehra of N.W.F. Province, Pakistan. The profile of District Mansehra is as follows.

#### **1.1.1 Local Government.**

For each local area, there is a local government comprising:

- a. District Government and Zilla Council in District or a City District.
- b. Tehsil Municipal Administration and Tehsil Council in a Tehsil
- c. Town Municipal Administration and Town Council in a Town.
- d. Union Administration and Union Council in a Union.

#### **1.1.2 District Government.**

The District Government consists of Zilla Nazim and District Administration. The District Government is competent to acquire, hold or transfer any property movable and immovable, to enter into contract and to sue or be sued in its Name, through District Coordination Officer.

#### **1.1.3 Zilla Nazim**

Zilla Nazim is head of the District Government. He ensures that the business of the District Government is carried out in accordance with provisions of the LGO, 2001 (Local Government Ordinance). He provides vision for the district, wide developments, leadership and decision for efficient functioning of the District Government.

#### **1.1.4 District Coordination Officer.**

The DCO is the coordinating head of the District Administration. He ensures that the business of the District Coordination Group of officers is carried out in

accordance with the laws for the time being in force. He coordinates the activities of the group of offices for coherent planning, synergistic development, effective and efficient functioning of District Administration. He is Principle Accounting Officer of the District Government EDOs work under DCO with group of officers/ officials in their respective offices.

#### **1.1.5 Strength of Elected Members of District Government.**

1. Zilla Nazim	1
2. Naib Zilla Nazim.	1
3. Member of Zilla Council.	83
4. Members of 59 Union Councils.	1218
Total:	1303

#### **1.1.6 Union Councils in the District:**

District Mansehra is comprised of three Tehsils, i.e. Tehsil Mansehra, Tehsil Oghi and Tehsil Balakot.

Tehsil Mansehra has 36 Union Councils, Tehsil Oghi has 11 and Tehsil Balakot has the following 12 Union Councils.

1. U/C Balakot.
2. U/C Garlat
3. U/C Ghanool
4. U/C Shohal Mazullah.
5. U/C Hangrai
6. U/C Kewai
7. U/C Satbani
8. U/C Kaghan
9. U/C Talhatta
10. U/C Mahandri
11. U/C Garhi Habibullah
12. U/C Karnol.

Total number of Union Councils = 59

Total number of TMAs = 3 (Mansehra, Oghi and Balakot.)

#### **1.1.7 Mansehra in Historical Perspective:**

Mansehra derives its Name from headquarter town, it was created as District in 1976. Presently it comprises of three Tehsils and PATA. (Provincially Administered Tribal Areas). i.e., Mansehra, Balakot, Oghi and PATA with a total area of 4579 sq. km and total population 1152839.

Mansehra is a historical place and has been in existence during many historical periods which have been given below in chronological order.

Alexander the Great	-----Urasha.
Ashoka	----- Rock Inscriptions.
Mughal period	----- Pakhli Sarkar.
Sultan Pakhal	----- 17 <sup>th</sup> Century.
Sikh Regime	----- 19 <sup>th</sup> Century.
Revolt against Sikhs	----- 1825-1830
British Rule	----- 1849-1947
War of Independence	----- 1857
Emergence of Governance	-----1874

#### **1.1.7.1 Topography:**

Mountainous: Stretching from North South.

Fertile Valleys: Pakhal, Kaghan, Konsh and Mangal Tract.

Lakes: Lulusar, Dodipat and Saif-ul-Malook.

Rivers: Kunhar and Siran. (Plate # 8. River Kunhar)

#### **1.1.7.2 Climate:**

Generally pleasant, severe cold in mountainous area in winter, some what hot in plains during summer.

#### **1.1.7.3 Area Land and Land Use:**

Total Area – 4579 sq. Km. 6.14% of NWFP. 5<sup>th</sup> largest District.

#### **1.1.7.4 Land Use (1999-2000)**

	<b>Hectares</b>
Reported Area	439,423
Cultivated Area	80,747
Sown Area	71,157
Current Follow	9,590
Cropped Area	110,395
Area sown more than once	39,238

Figure 1.3 (Source: District Profile Mansehra, 2007.)

**1.1.7.5 Uncultivated Area (1999-2005 in Hectares)**

	<b>Hectares.</b>
Total Area	350,676
Cultural waste	7,702
Forest	332,252
Not Available for cultivation	8,722

**1.1.7.6 Farming:**

<b>Size of Farms</b>	<b>Number of Farms</b>
Total Farms	102,301
Under 1 acre	15,310
1.0-2.5	31,035
2.5-5.0	29,400
5.0-7.5	12,860
7.5-12.5	8,613
12.5-25.0	3,737
25-50	943
50-150	362
150 and above	41

Figure: 1.4 (Source District Profile Mansehra, 2007)

**1.1.7.7 Crop Production (Kg/ Hectares)**

<b>Crops</b>	<b>Mansehra/(Average)</b>	<b>NWFP/(Average)</b>
Wheat	1,555	1,477
Maize	1,718	1,562
Rice	2,377	2,017
Tobacco	2,085	2,252

Figure 1.5: (Source: District Profile Mansehra, 2007)

**1.1.7.8 Population:**

<b>Year</b>	<b>1998</b>	<b>1981</b>
Total	1,153,000	770200
Density	252 p/sq. Km	168 p/sq. Km
Growth rate	2.40 %	

**1.1.7.9 Age Groups:**

	%
< 15 years	45.5
15-64	50.6
64- >	3.9

**1.1.7.10 Population**

Population	1,152,839
Male	571,881 (49.60 %)
Female	580,958 (50.40 %)
Projected up 2010	1.6 Million
Rural	10, 91,739
Urban	61,100
Average House holds	6.7
Literacy Rate	36.3 %
Male	47 %
Female	26.4 %
Years of doubling	30 years

**1.1.7.11 Population (Age wise)**

<b>Age</b>	<b>Population</b>
0-4	166,500
5-9	190,600
10-14	167,400
15-19	123,600
20-24	88,900
25-29	77,600
30-34	67,000
35-39	49,700
40-44	46,400
45-49	41,500
50-54	37,500
55-59	27,400
60-64	24,100
65-69	14,400
70-74	13,400
75 and above	16,900



Figure 1.6: (Source: District Profile Mansehra, 2007)

**1.1.7.12 Health Department:**

Total number of Health Facilities =	104
DHQ Hospital =	1
Mental and General Hospital (Dadar) =	1
Tehsil Head Quarter Hospital Balakot =	1
Civil Hospitals =	9
Regional Health Centres =	8
Basic Health Units (BHUs) =	58
Civil Dispensaries =	18
Leprosy Clinics =	4
TB Centres =	1

**1.1.7.13 Education Department:**

Category	Male	Female	Total
Primary Schools	1016	659	1675
Middle Schools	130	60	190
High Schools	76	27	103
Higher Secondary Schools	14	03	17
Colleges	04	01	05
Polytechnique /Commerce	02	01	03
Masjid/ Maktab	511	0	511

<b>1.1.7.14 Enrolment:</b>			
<b>Schools</b>	<b>2002-03</b>	<b>2003-04</b>	<b>Increase</b>
Primary	97,624	172,024	74,400
Secondary	37,523	45,482	7,959
<b>1.1.7.15 Education (Establishment Strength)</b>			
<b>Schools</b>	<b>Number</b>		
<b>Secondary</b>			
Male	3552		
Female	1212		
<b>Primary</b>			
Male	4280		
Female	2239		
Total	11,283		

Figure 1.7: (Source: District Profile Mansehra, 2007)

**1.1.7.16 Strengths:**

- ✚ Patriotism
- ✚ Scenic beauty.
- ✚ Attractive tourist spots Shogran, Naran, Saif-ul-Malook, Kund, Dadar, Tarbela Lake, Machi Sar (Oghi)
- ✚ Fertile agri-land, pastures, hardworking farmers.
- ✚ Mild climate.
- ✚ Perennial rivers and ravines.
- ✚ Forests, mineral resources and live stock.
- ✚ Vibrant and politically matured population.

**1.1.7.17 Weaknesses:**

- ✚ Hilly tracts and difficult topography.
- ✚ Institutional degradation.
- ✚ Poor planning and overlapping developmental infrastructure.
- ✚ Lack of focus.
- ✚ Axis and orbital problems of the Local Governments.
- ✚ Kala Dhaka the most neglected area of the country.
- ✚ Deforestation and environmental degradation.
- ✚ Rapid population growth.
- ✚ Unemployment.
- ✚ Absence of Industries.

**1.1.8 The Kaghan Valley:**

Physiography: The tract is rugged and mountainous ranging from 1220 meters (4000 ft) to 5302 meters (17390 ft) above sea level having Malka Parbat being the highest peak in the valley which stands to the east of Saif-ul-Malook Lake. The lower parts of the slopes generally have steep to very steep gradients but the higher parts are often exceedingly rugged and inaccessible. Another marked feature is the existence of deep and narrow ravines. Snow slides and land slides are very common and causing a lot of damage, especially to the forests in the upper parts of the valley.

**1.1.8.1 Geology rock and soil:**

All types of rock formations are met with from dense compact carbonaceous slates and finely crystalline limestone to adinole like beds, graphitic schist's micaceous and geneses. Between Naran and Babusar pass the rocks are finely stratified in series of alternating genesis's, graphite, mica, grantiferous schist's with marble giumal. Sand stone is also found in a group of dark colored, close grained, massive sand stone, calcarious shale and shalley lime stone.

Glacial actions in upper part of the valley are everywhere apparent. Fertile soil for plant growth is available wherever the gradient permits it to accumulate. The best soils occur on gentle slopes and in depression.

**1.1.8.2 Climate:**

The climate of the tract is temperate throughout the year with marked seasonal variations. Winter is usually very severe and the growing season, particularly in the upper parts of the valley beyond Dewanbela and the higher elevation is short. Rainfall varies with the elevation, which decreases progressively towards the head of the

Valley owing to the decreasing influence of the southwest monsoon. Snowfall during the winter is heavy and may be expected anytime between the end of October and mid of May. However the global variation in climate is also evident over here in Kaghan. Some years now bring very less and delayed snow, while even very dry winters like 1998 are also experienced sometimes.

The forests however receive a large portion of moisture in the form of snow during the winter months and less in the summer, as the south west monsoons very nearly exhaust themselves by the time they reach upper parts of the Valley. Drought period extends from May to mid of July and September to November with occasional exceptions. However, the trends are now changed with some years as very moist and others very dry.

The climatic data as recorded by the Balakot Meteorology station is as follows.

**Figure 1.8: Annual Total Rainfall (mm)**

(Source: Resource Management Plan for Upper Kaghan Guzara Forests. 2004, 05 to 2013, 14)

**Figure 1.9: Monthly Mean Minimum Temperature (°C)**

(Source: Resource Management Plan for Upper Kaghan Guzara Forests. 2004, 05 to 2013, 14)

**Figure 1.10: Monthly Mean Maximum Temperature (°C)**

(Source: Resource Management Plan for Upper Kaghan Guzara Forests. 2004, 05 to 2013, 14)

**Figure 1.11: Station Balakot: Humidity at 0800 am (%)**

(Source: Resource Management Plan for Upper Kaghan Guzara Forests. 2004, 05 to 2013, 14)

**Figure 1.12: Station Balakot: Humidity at 0500 pm (%)**

Source: Resource Management Plan for Upper Kaghan Guzara Forests. 2004, 2005 to 2013, 2014)

### 1.1.9 Vegetational Zones of Kaghan Valley:

According to standard classification of Forest Types of Pakistan (Champion, Seth and Khattak, 1965), the Kaghan Valley forests fall under the major type Montane Temperate Forests, and are placed in the group Himalayan Moist Temperate and Himalayan Dry Temperate Forests.

As a broad division of forests beyond Dewanbela are representative of later type. For any comprehension to get better picture of these forests, these are classified under four main categories.

#### 1.1.9.1 Pure Blue Pine Forests. (Alt: 1370m to 2590m)

Blue Pine (*Pinus wallichiana*) locally called “Biar or Kail” is found as a pure plant in Lachi-Khan, Mukhair, Malkandi, Shogran, Manoor and Kamalban forests. Depending upon aspect, its distribution varies from 1370m to 2590meters. It is generally confined to the warmer, southern and western slopes as typically represented by Malkandi forests. The natural phenomenon of Fir colonizing in the cooler aspect and Blue pine in warmer reaches may be distinctly noticed in some parts of Malkandi, Nuri and Kamalban forests. The broad leaved associates are *Juglans regia*, *Aesculus indica*, *Prunus padus*, *Acer ceasium* and *Populus ciliata*. Undergrowth generally consists of *Viburnum* spp, *Indigofera* spp, *Lonicera* spp, *Skimmia laureola*, *Berberis lycium*, *Rosa* spp and *Rubus* spp. Ground cover is thick, particularly in moist and cool localities. The ground flora consists of *Rumex* spp, *Trifolium* spp, *Fragaria vesca*, *Geranium* spp, *Atropa accuminata*, *Viola* spp, Ferns and various species of grasses. The total area covered by these forests is 3203 hectares.

#### 1.1.9.2 Pure Deodar Forests (Alt. 1520m to 2430m)

Deodar “*Cedrus deodara*” locally called as “Diar” in lower and “Paludar” in the upper parts of the Valley is found nearly pure in Kamalban, Malkandi, Nuri, Naran and Battal at an altitude from 1520m to 2430 metres, mostly on warmer aspect. Common broad leaved associates are *Aesculus indica*, *Populus* spp, *Acer* spp, *Prunus* spp and *Quercus* spp. The shrub layer varies considerably being thin under a close canopy of Deodar but well developed under an open canopy. Common shrubs are *Parrotia* spp, *Viburnum* spp, *Lonicera* spp, *Berberis* spp, *Sorbaria* spp and *Cotoneaster* spp. Ground flora consists of *Viola*, *Fragaria*, *Dicanthum*, *Anemone* spp and Ferns. Climbers like *Clematis* and *Rosa* are also found in some places. Total area of these forests is 1712 hectares.

### 1.1.9.3 Pure Silver Fir/Spruce Forests: (Alt 2130m to 3190m)

Fir "*Abies pindrow*" locally known as "Rewar" is generally available as pure crop at varying altitude from 2130m to 3190m and with spruce "*Picea smithiana*" locally called "Kachhal" at lower elevation. Besides other areas, such forests may be noticed in Malkandi, Nuri, Manshi, Nagan, Kamalban, Dewanbela, Karkana and Battal Forests.

The undergrowth is usually of *Viburnum* spp, *Skimmia laureola*, *Indigofera* spp, *Spiraea* spp, *Rubus* spp and *Lonicera* spp. The herbaceous flora consists of *Valeriana wallichii*, *Viola* spp, *Paeonia emodi*, *Fragaria* spp, *Bergenia* spp, *Atropa accuminata*, *Aconitum* species and *Primula* spp. Total area covered by these forests is 9296 hectares.

### 1.1.9.4 Mixed Deodar, Kail / Fir / Spruce Forests. (Alt: 1320m to 3000m).

This category is found scattered in and around other stand types. It ranges from 1320m to 3000 meter elevation. Common mixture is that of Deodar, Kail and Fir/ Spruce. The best mixed forests are found in Malkandi, Manshi, Nuri, Kamalban, Nagan and Naran Forests. Deodar seems to be happy in mixture with Kail and less often with Fir or Spruce like other stand types, almost all broad leaved species are also met with *Juglans regia*, *Aesculus indica*, *Acer cesium*, *Prunus padus*, *Populus* spp and *Taxus wallichiana* are the common associates.

The shrubs commonly found are *Parrotia* spp, *Viburnum*, *Rubus*, *Skimmia*, *Cotoneaster*, *Berberis* and *Spiraea* species.

Herbaceous growth is generally same as found in other stand types.

### 1.1.10 Forests Area

Area of Pakistan's various forests types as well as its rangeland area are shown in figure 1.13. Table 1.1 gives province wise estimates of area by forest types circa 1993. (Sheikh, 1993)



Figure 1.13

**Table: 1.1 Forest Types and Range Land Areas of Pakistan**

Forest type/ Tree Cover/ Forests	Azad Jammu & Kashmir	Balochistan	Northern Areas	NWFP	Punjab	Sindh	Total
Conifers	241	42	660	940	30		1913
Scrub	16	504		539	132		1191
Riverain	1	20		13	27	112	173
Mangrove		2				205	207
Irrigated Plantations		1			79	23	103
Farmland Trees	7	23	6	70	306	54	466
Linear Planting				2	14		16
Miscellaneous Planting	10			120	20	5	155
<b>Total</b>	<b>275</b>	<b>592</b>	<b>666</b>	<b>1684</b>	<b>608</b>	<b>399</b>	<b>4224</b>

**1.1.11 Floods:**

Cultivation on steep slopes on gentle and easy slopes without proper terracing, uncontrolled felling in the past and deforestation by the inhabitants for cultivation and grazing purposes have resulted in violent floods, which are of common occurrence. These floods not only take a high toll of human and animal lives but the tract is being deprived of useful land for rice cultivation by heavy sedimentation and erosion. The Watershed Project of the Forest Department has raised good plantation on many

denuded hills which need further expansion and proper protection to save the soil on hill slopes against erosion.

#### **1.1.12 Earthquake 2005:**

The entire Pakistani nation in general and the inhabitants of the Valley in particular were surprised and shocked to know that the area is situated in fault line when drastic earthquake occurred leaving many people dead, injured and many others home less. The day 8<sup>th</sup> October 2005 will always be remembered in the history of Pakistan as tragic day. Unfortunately, Balakot City (A gateway to Kaghan Valley) was among the most affected areas. All the aspects of life suffered from the impacts of earthquake. A few glimpses of Earthquake devastation are presented in plates 1 to 7.

#### **1.1.13 Water Supply:**

The position of drinking water is satisfactory throughout the valley. Apart from the main river Kunhar there are a number of perennial and seasonal springs well distributed throughout the area. These springs are used for irrigation purposes of the flat areas as well as for drinking. There is also a sporadic decrease in such perennial springs due to decreasing vegetation cover resulting in erosion and rapid run off. However its suitability for drinking purposes is questioned.

There is also a big potential for hydro power generation at quite a few places in the whole of the Valley, which can play a vital role in the provision of irrigation water for raising seasonal and off seasonal agricultural and vegetable crops.

#### **1.1.14 Lakes:**

Lakes are confined to the upper mountainous region in the Kaghan valley. The three world famous lakes are Lulusar, Dodipatsar and Saif-ul-Malook. The Lulusar is an irregular crescent shaped lake about 2.5 km long and 274 m wide; located 16 km west of Babusar pass at an elevation of 3384 m (Plate # 10). Dodipatsar is a circular lake about half a km in distance and located at an elevation of 3636 m; located at a distance of 60 km from Naran. Saif-ul-Malook is about half a km long and 457 m broad, located at an altitude of 3248 m and situated at a distance 8 km from Naran (Plate # 9).

#### **1.1.15 Socio – Economic Conditions:-**

The population of Kaghan valley is entirely rural and mostly poverty stricken and undernourished. Their economy is mostly agro pastoral. With intense increase of population i.e. 163030 persons (1981 Census), dearth of land and dwindling production, land hunger has increased for farming. Agriculture is the principle

occupation, although sheep and cattle raising is practiced over the adjacent mountainous areas.

**Plate # 1: Earthquake Devastation October 2005.**

**Plate # 2 : Earthquake Devastation October 2005.**

**Plate # 3 : Earthquake Devastation October 2005.**

**Plate # 4 : Earthquake Devastation October 2005.**

**Plate # 5 : Earthquake Devastation October 2005.**

**Plate # 6 : Earthquake Devastation October 2005.**

**Plate # 7 : Earthquake Devastation October 2005.**

**Plate # 8 : River Kunhar at upper elevation.**

Few people are engaged in trade, local labor and employment in bigger cities of the country.

Maize is grown as a major crop followed by wheat and rice. Potatoes and peas yield fair return. Vegetables and fruits are less common. The commercially grown important fruits are apple, walnut, plums, pears and apricot. Majority of the people resist improved practices for land development and few progressive ones lack financial support.

#### **1.1.16 Tribes/Castes, Languages:-**

The major tribes in the Valley are Gujars, Swathis, Awans and Syeds. Gujars are in numerical majority followed by Swathis (Hazara Gazetteer 1883-84).

Most of the people speak Gujari, Hindko and Pashto. Gujari is an Indian dialect used by the Gujar cowherds of the mountains. They often know no other language.

#### **1.1.17 Population of main villages:**

According to 1981 census, the population of major villages of the Valley is as follows:

<b>Sr. No</b>	<b>Name of the village</b>	<b>Population (Persons)</b>
i.	Balakot	12789
ii.	Garlat	10644
iii.	Bela Sacha	5474
iv.	Ghanool	5579
v.	Hangrai	8981
vi.	Jared	8437
vii.	Kaghan	11564
viii.	Ghari Habib ullah	12459
ix.	Shohal Maazullah	9370
x.	Kewai	9926
xi	Monoor	8902
xii.	Phagal	8350
xiii.	Sangar	8688
xiv.	Satbani	11099
xv.	Doga	11930
xvi.	Talhata	8181
xvii.	Pair	10702
	<b>Total</b>	<b>163030</b>

**Plate # 9: Lake Saif-ul-Malook. Elevation 10200 ft.**

**Plate # 10: Lake Lulusar. Elevation 11500 ft.**



**1.1.18 Education:**

Literacy rate according to 1961 census was 6.5 % and according to 1981 census it was 22.9%. This increase in literary rate in twenty years time is not encouraging. High illiteracy in the area is because of the poverty and less educational facilities.

**1.2 Biodiversity:**

“Biodiversity” where “bio” means life and “diversity” the variety of life forms. So what is so special about “Biodiversity”? It has enormous value for us. The water resource depends on it. There are millions of people who directly depend on biodiversity for their needs of food, firewood, housing, medicine and fodder. Many plants have contributed to life saving drugs. (Seema, 2003)

Biodiversity is the total sum of all species of plants, trees, other vegetation, insects, animals and other microorganisms and their genetic material including the ecosystem of these are the part. The convention on biological diversity defined the term biodiversity in its article two as “Biological diversity means the variability among living organisms from all sources including interalia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species and ecosystem. Biological diversity is an alternative name of life and death for human beings. Destruction or erosion of biological diversity beyond certain limit can lead to the death rather than pleasurable life”. (Chavan, 2006)

Biodiversity is nothing but all the species or organisms shearing the earth with and around us. The biological diversity may be defined as the total number of species in a given unit habitat at a given unit time in the form of plants, animals and other organisms. The biological diversity is a dynamic characteristic of the earth. We know the price of everything but value of nothing in nature. The comment applies to the biological diversity. The word “Biodiversity” is frequently appearing many times in the headlines of leading newspapers, journals and broad casting news items with a serious emotional warning. It is widely debated word in current environmental discussions and has widely captured the attention of world community. No doubt, Biodiversity is of great importance for human existence, as most of the food production, medicinal drugs, and raw materials for shelter are obtained from biological life that exists around him. Human activities of greed and unwise exploitation of this natural wealth is now in danger. The danger is not restricted only

to a particular species, but to the entire planet earth. The present rate of extinction of different organisms is a most serious problem of present time.

Recent scientific and technical advancement with unplanned greedy exploitation of natural resources and variety of resultant factors are causing a severe loss of biological diversity at the faster rate than ever before! The adverse impacts due to loss of biological diversity are increasing drastically and threatening the ecological balance. If not cared now, these impacts may bring the existence for human beings in danger very soon. This loss is disastrous and irreversible. It needs utmost care during the conservation and exploitation of biological resources. It calls for an urgent need to understand the present status, need of its conservation and assurance of the future generation to provide them food, medicinal products and a wide range of other material in a sustainable manner. Biological diversity provides future flexibility for human existence and enables adaptation to the natural climatic variations. The conservation and management of biological resources yields both, direct and indirect benefits like local requirement of fuel food, fruit, latex, different pharmaceutical products, raw materials for different industrial productions and tourism. Indirect benefits include the benefits like watershed, ecological balance, nutrient cycling, soil erosion control and cultural heritage.

### **1.2.1 Importance of Biodiversity:**

The role of biodiversity is crucial in the maintenance of healthy environment on which depends survival of mankind. All species of plants and animals show genetic variability among individuals and population which encourages natural selection and adaptability to changes in the environment. This ultimately ensures special survival. This variation in domestic species and their wild relatives provide an opportunity to researchers to develop improved varieties of plants and animals for the benefits of human being. A great diversity in wild plant species is a source of medicinal plants used in “Yunani Tibb,” allopathic drugs, etc. (Shah, 2008).

Biodiversity provides free of charge services worth billions of rupees to mankind in the form of clean water, pure air, pollination, soil formation and protection, crop pest control and provisions of food, fuel, fibers and drugs.

Biodiversity plays an important role in prevention of floods, land slides, avalanches, soil erosion, wind erosion, siltation of dams, and water reservoirs. Thus, biodiversity is saving billions of rupees each year which would have been otherwise spent to control such calamities. (Shah, 2008).

Biodiversity not only controls the global warming which adversely affect crop pattern throughout the world resulting in famine and hunger but also plays a crucial role to control and check raising of sea level which is threatening many European countries.

Conservation of biodiversity is crucial to the sustainability of sectors as diverse as energy, agriculture, forestry, fisheries, wild life, industry, health, tourism, commerce, irrigation and power. In view of such a crucial role of biodiversity in the human survival and development, why would a nation not invest back into the conservation of biodiversity to sustainably derive these benefits from the renewable biodiversity resources.

### **1.2.2 Biodiversity of N.W.F.P. Pakistan:**

Pakistan harbors rich variety of flora and fauna which is mainly due to great variations in its temperature, rainfall and altitude. Pakistan with an area of less than one million square kilometers comprising of desolate hot and cold deserts, forested valleys, snow bound mountains and deserts, rivers and lakes, estuaries and oceans. These variations rise to the support of 188 species of mammals, 668 species of birds, 177 species of reptiles and 6000 species of plants. Some species have very restricted ranges of their occurrence in the nature and are endemic to Pakistan. (Shah, 2008).

North West Frontier Province is blessed with rich variety of flora and fauna which can be judged from the fact that 98 species of mammals, 455 species of birds and 43 species of reptiles are found in the province. The Himalayan moist temperate and semi moist temperate forests of the province are rich in mammalian species. Large variety of birds is also found in NWFP which includes several species of migratory and resident birds.

The province harbors the elements of the mega wild life species, characterizing this unique in country and region. Palas Valley of Kohistan District in N.W.F.P is internationally recognized as hot spot of biodiversity.

The province supports a large variety of ecological zones scattered throughout the province from the plains in the south to high mountains in the north. The major zones found in N.W.F.P, include Cold deserts, Permanent snow fields, Alpine pastures, Sub-alpine pastures, Dry temperate forests, Moist temperate forests, Sub tropical Chir forests, Sub torpical semi ever green forests, Tropical thorn forests and Riverain forests.

Fast growing human population and their ever increasing demands for fuel wood, fodders, and timber coupled with over hunting, over fishing and conversion of

forests into agriculture has resulted in tremendous loss of biodiversity in Pakistan. Several species of plants and animals are adversely affected and their status has become precarious.

There is dire need to correct the course through participation of communities who are the beneficiaries but at the same time responsible for destruction of these resources.

Existing laws of forests, fisheries, wild life and other natural resources related statutes should be updated to meet emerging challenges of biodiversity, conservation in Pakistan. Protected areas need immediate attention; areas of adequate sizes, representing all ecosystems should be established and rationalized.

**Plate # 11: Monkey: A common wild animal of the area.**

**Plate # 12: *Crataegus songarica* C. Koch**

### 1.2.3 Global Estimates of Biological Diversity:

Nobody knows exactly how many species are disappearing or being newly generating on the earth. But every body has realized that we are losing the biological diversity at an unprecedented rate all over the world. The distribution of biological organisms is disturbing due to human activities largely for commercial or subsistence reasons posing a great threat. The distribution of biological diversity is uneven or unequal in different parts of the world. For example 13.7 km<sup>2</sup> area of La Selva forest in Costa Rica contains more than those found in 2,43,500 km<sup>2</sup> area of United Kingdom.

Similarly a small geographical area of Panama contains more biological species than the entire geographical area of North America. The south is richest in biodiversity, but the human dominated utilization is highest in the North (Chavan, 2006), no doubt that the earth is rich in variety of organisms.

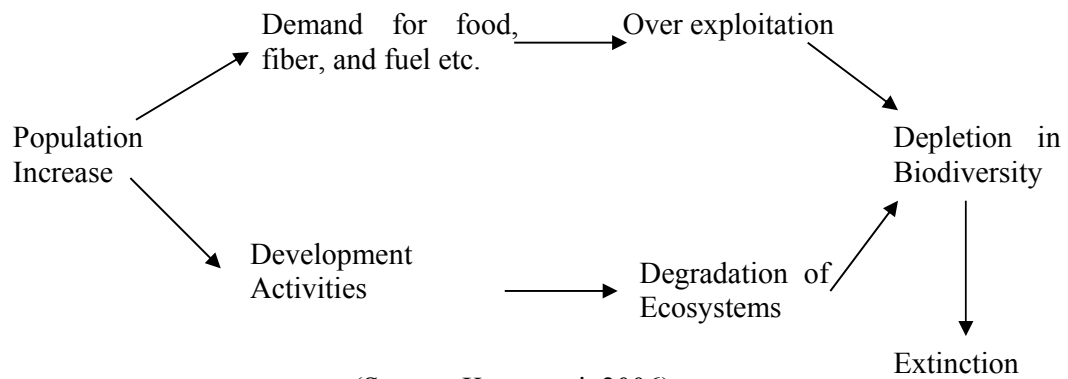
Nobody knows the exact number of species on earth. About 10 thousands new species are found every year. Most of these species are insects and other inconspicuous animals. New species of birds at the rate of about 1-5 and mammals with same rate are still being discovered every year. Some biologists predict the total number at around 5 million (Arms, 1990) whereas several put this number between 13 to 14 million (Khan and Al-Ajmi, 1999). The scientists have grouped all the organisms into five kingdoms. More than 1.5 million species of total have been scientifically identified and named. Of course the list includes approximately four lac plant species, about eight thousand insect species, forty thousand vertebrates and three lac sixty thousands microbe species.

Most of the insect species are tropical beetles inhabit in local areas in rain forests. More than half of it has been already declined and rest are declining rapidly. The reptiles of earth comprise of about 5 thousand five hundred species, most of these reptiles like crocodiles, tortoises, lizards and snakes are vastly exploited world wide for commercial purposes. A few of them have been lost due to the destruction of their natural habitats with the cutting of forests and human encroachment in river basin. Species of birds recorded are about eight thousands and five hundred, almost three fourths are threatened or endangered. Total Mammal species comprise a comparatively small number, approximately up to 3% of the total species. Some scientists put this figure to 4,230 for total mammals. These other than man are exploited by man for variety of uses, as a cheap labor, products, experimentation and transportation. There are about 2,50,000 flowering plant species. Of course, only

3,000 are used by human being for food indirectly with about two hundred by cultivating them. The total number of non flowering and lower green plants is about 1,26,725. It includes algae, fungi, bryophytes, pteridophytes and gymnosperms. These occur in diverse habitats ranging from seawater to the mountains, but are rapidly depleting with increasing water pollution. At least twenty thousand plant species are used as medicinal plants in the world. Approximately five thousand of these have been scientifically studied for harnessing them for drugs and organic chemicals. At least 100 plants species are directly used as traditional medicines globally. Even then, large number of plants remains non-exploited for any human use. The tropic is biologically very interesting region due to the occurrence of natural processes, phenomena and changes derived from social transformations. The tropical forests are richest in biological diversity in the world. Almost half of the total biological diversity is observed in moist tropical forests those contribute approximately to 7% of the total land surface. It is because of the optimum climatic conditions resulting into low rate of extinction and high rate of adaptive evolution and properly and orderly linked several food chains and food webs in the local ecosystems of these areas. (Chavan, 2006).

#### **1.2.4 Depletion of Biodiversity:**

No doubt the loss of biodiversity is a global crisis. There is hardly any region on the earth that is not facing ecological catastrophes. The factors for loss of biological diversity may be natural or artificial. The natural causes include drought, land slides, floods, storms, earth quakes, diseases, predation, fire, etc. Biological extinction has been a natural phenomenon in geological history. The rate of extinction was perhaps one in 1000 years. The artificial causes include mainly hunting, persecution, habitat destruction, over exploitation of biological resources, grazing, industrialization, urbanization, pollution, scientific and educational research, road and dam construction and introduction of exotic plants and animals, expansion of agricultural lands, thinning of ozone layers, global warming and acid rains are also some of the other reasons. Uncontrolled and excessive biotic interference also contributes to its loss. (Koteswari, 2006).



(Source: Koteswari, 2006).

### 1.3 Ethnobotany:

Ethnobotany came into being when earliest man observed animals eating certain plants; he gathered and hunted for his food and for healing his wounds or sought cover from rain and hailstorms. This knowledge got wider use and success in experiments on human and led to our recognized foods and medicines. Thus, on the basis of uses of plants, first by animals and later by human beings, the concept of Ethnozoology and Ethnobotany emerged, which merged to give birth to Ethnobiology.

The word “Ethnobotany” literally means the study of plants of the primitive human race, i.e. the study of plant used by primitive and aboriginal people. In other words, Ethnobotany deals with the study relationships between man and plants and his domesticated animals.

It has been a century ago that Hershberger (1896) coined the term “Ethnobotany” yet the concept is still in controversy. Basically Ethnobotany deals with aboriginal man and his social, cultural and religious links with plants. The interest of ethnobotanists include a wide range of subjects like, indigenous healing herbal medicines, plants used in religious rituals, cultural activities and musical instruments, foods of plant origin, fossils, ancient trade routes, wild relatives of cultivated plants, new and emergent uses of plants as alternate sources of energy , renewable biomass energy etc.(Gopal, 2004).

The pattern of the livelihood of tribal communities has not changed since time immemorial. (Kosambi, 1962-1967) rightly suggested that the reason for this lies in the availability of uncultivated food. In the dense forest areas, nature is so kind that for thousands of years it has been possible for these tribal to live in comparative ease



by hunting and food gathering. Not only abundant fish and game but also a variety of natural products provided balanced diet. Nature is providing all types of livelihood not only to them but also their pets since time immemorial. The tribals have discovered a variety of uses of plants by the trial and error method. These include fruits, nuts, berries, leafy vegetables, tubers, mushrooms, materials for shelter, fabrics, medicines and other necessities for survival that are found in the surrounding nature. (Tosh, 2004).

Man's interest in plants primarily goes back to time immemorial of the early civilizations. For basic needs namely food, shelter and clothing he was dependant on plants. Plants do play an important role as a fulcrum in any ecosystem and also contribute to the welfare of mankind by providing fuel, fiber, food, timber, medicine, etc. It is true that man has derived the greatest advantage of plants at his command, but this knowledge is very meagre considering the richness of the plant wealth in the world. Since the last century, systematic explorations of the plant wealth are being carried out with a view to document their reliable uses for mankind. It is of utmost importance that as many phytogeographical areas as possible should be explored intensively to gather the information on flora and ethnic associations of humans with them to augment knowledge, understanding and appreciation of the flora. This Ethnobotany as a science thus becomes indispensable to strive at sustainable development of the living resources of the planet.

Most of the important ancient discoveries continued to survive only by oral communications from generation to generation in rural as well as in tribal communities. With rapid intrusion of modern civilization into these remote areas, the ancient tribal traditions, cultural life of nomadic folks seem to be on the verge of extinction. Due to construction of new roads through forest areas, indiscriminate cutting of forests, acquiring forest lands for agriculture and the population explosion of the neighboring rural and affluent urban areas, the tribal inhabitants have started discarding their traditional habits and getting themselves employed as laborers on daily wages in various development projects, like road construction or on stone crushing sites, etc. There is an urgent need for undertaking extensive studies on their nomadic life and prevent extinction of the tribal and their culture through aggressive interpenetration of modern civilization. There is every possibility that valuable data on Ethnobotany will be lost in near future. It should be for this reason alone that special efforts have to be made to procure information about the use of plants in the life and culture of the tribal people.

Medicinal plants are the local heritage with global importance. World is endowed with a rich wealth of medicinal plants. Herbs have always been the principle form of medicine in Pakistan and presently they are becoming popular throughout the developed world, as people strive to stay healthy in the face of chronic stress and pollution and to treat illness with medicines that work in concert with the body's own defenses. People in Europe, North America and Australia are consulting trained herbal professionals and are using the plant medicines. Medicinal plants also play an important role in the lives of rural people particularly in remote parts of developing countries with few health facilities.

Medicinal plants have curative properties due to the presence of various complex chemical substances of different composition, which are found as secondary plant metabolites in one or more parts of these plants. These plant metabolites, according to their composition are grouped as alkaloids, glycosides, corticosteroids, essential oils, etc.

The alkaloids form the largest group which includes morphine and codein (*Poppy*), strychnine and brucine (*Nux vomica*), quinine (*Cinchona*), ergotine (*Ergot*), hyocyanine (*Belladonna*), scopolamine (*Datura*), emetine (ipecac), cocaine (*Coco*), ephedrine (*Ephedra*), reserpine (*Rauwolfia*), caffeine (tea dust), aconitine (*Aconite*), vasicine (*Vasaca*), santonin (*Artemisia*), lobelin (*Lobelia*) and a large number of others. Glycosides form another important group represented by digoxin (*Foxglove*), strophanthin (*Strophanthus*), glycyrrhizin (*Liquorice*), barbolin (*Aloe*), sennocides (*Senna*), etc. Corticosteroids have come into prominence recently and diosgenin (*Dioscorea*), solasodin (*Solanum sp*), etc. now command a large world demand. Some essential oils such as those of valerian kutch and peppermint also possess medicating properties and are used in the pharmaceutical industry. However, it should be stated in all fairness that our knowledge of the genetic and physiological make up of most of the medicinal plants is poor and we still know less about the biosynthetic path ways leading to the formation of active constituents for which these crops are valued. (Parajapati, *et al.*2003).

### **1.3.1 History of Medicinal Plants:**

To trace the history of herbalism, one must go back to the history of pharmacology, for until the last century medicinal plants were still being processed for general use. The discovery of the curative properties in plants must have sprung from some human instinct. Primitive man used plants for both food and medicine. He would have learnt after perhaps many unfortunate experiences that some plants

contained certain properties and was able to identify them by the results they induced. He would also have observed which plants animals utilized when they were sick. After seeing an injured deer rubbing itself against the gum, he might have discovered for instance, that this plant would heal his own wounds, and realized that dog tooth grass would act as an emetic, as it did with cat. Many remarkable examples of animals intuitively knowing how to treat themselves with appropriate plants are quoted by numerous writers. Cicero, for example, mentions the heartwood being used by young does to ease parturition while Plutarch refers to bears using the wild arum (lords and ladies). Cases of accidental poisoning must have been common occurrences before the beginning; curative herbs had been distinguished from the poisonous ones. The German botanist Mollisch made an interesting observation concerning six plants containing caffeine namely coffee, cola, mate, tea, cocoa and guarana; among innumerable plant species man was able to pick out these six with great precision, even though they lack particular features, which enable them to be early distinguished for their medicinal properties. (Parajapati, *et al.* 2003).

It is generally recognized by our ancestors that a wide range of medicinal plants have healing powers. Until the 20<sup>th</sup> century, every village and rural community had a wealth of herbal folklore. They have tried and tested local plants for a range of common health problems. They were using herbal plants as teas and lotions or even mixed with lard and rubbed in as an ointment. People were aware of good and bad effects of herbal plants. For example, eating of a particular root, leaf or berry by watching animal behavior after they have eaten or rubbed against certain plant. These observations have also added to medicinal values of the forest plants. For example, if one watches sheep or cattle, they almost unerringly steer a path past poisonous plant such as ragwort (*Senecio jacobaea*) or oleander (*Nerium oleander*). Such close observations helped to know the people about poisonous or medicinal value of the plants.

By about 500 BC in developed cultures, medicine began to separate from the magical and spiritual world. Hippocrates, the Greek is known father of medicine. He considered illness to be a natural rather than a supernatural phenomenon. He also felt that medicine should be given without virtual ceremonies or magic.

### **1.3.2 Ethnobotany in Pakistan:-**

Four phytogeographical regions are recognized in Pakistan. Among the uniregionals, the most common element is Irano- Turanian (46 %) followed by Sino-Himalayan (10%), Saharo-Sindian (9.5%) and Indian Element (4.5%). Though the

Saharo-Sindian region occupies by far the biggest territory, in terms of the area, the density of uniregional elements is lowest in this region.

In Pakistan 70 % species are uniregional and about 30 % of the species are bi and pluri-regional. Among the uniregionals, the Irano- Turanian element is most common (46 %), followed by Sino- Himalayan (10 %), Saharo – Sindian (9.5%) and Indian (4.5 %) elements. (Ali and Qaiser, 1986).

Most of these plants are known to possess medicinal and economic values or properties and their uses have been known to the local people in the areas for the past several hundred years. Some of these plants are now commercially exploited for the extraction of various types of active ingredients. As a matter of fact, the indigenous or eastern system of medicine is entirely based on the properties of these plants.

Medicinal plants are plants or plant parts used in health care. They probably constitute the largest single functional grouping of plants. According to an estimate, 120 or so plant based drugs prescribed for use worldwide come from just 95 species (Lewington, 1990), and an estimated 30,000 species worldwide fall in this group. They probably fall in over 5,000 genera and in more than 1000 families and subfamilies. They occur across a wide altitudinal range from the great Tibetan plateau down to the seacoast and include aquatic plants and lower plant life forms like fungi and lichens. (Shanker, 1998).

It is however, surprising that in Pakistan though numerous floristic surveys of local flora have been conducted, very little attention has been paid to the ethnobotanical aspect of the study. The Pansaris and Hakims, on the other hand are mainly concerned with the supply of the floral and vegetative parts of the medicinal plants and they are least bothered about the botanical characteristics, especially of their occurrence, sustainable use and distribution in the various regions or ecological zones of Pakistan.

Ethnobotany is a well established discipline in our neighboring countries like China, India and Bangladesh, but unfortunately it is highly neglected in Pakistan. It has now been confined only to the few rural areas of the country.

It has been estimated by the World Health Organization that 80% of the world's population relies on traditional medicines (which are mainly plant based) to meet their daily health requirements. Interest in herbal medicines has increased enormously over the last few decades. Now medicinal plants have become a target for the search by multinational drug companies and research institutes for new drugs (Akerele, 1993). All such activities are contributing to the loss of plant species and

therefore protection in terms of sustainable utilization for conservation is the dire need of the time.

#### **1.4 Conservation:**

The term conservation has both active and passive meanings. In an active sense, conservation is the taking of actions to ensure that things that are valued stand a better chance of persisting into the future. There are various features of the world of plants that can be subjects of conservation attention, including plant species, the genetic diversity found within plant species, plant resources of various sorts and types of vegetation. Conservation in the active sense can be closely related to restoration, which involves extending efforts beyond just trying to protect those aspects of the plant world that are of interest, to try to enhance their conservation worth.

In a passive sense, the term conservation refers to actions beneficial for plant conservation carried out by people with conservation not or only partly in mind as demonstrated by some traditional conservation practices. A major aim in active plant conservation is to institutionalize the everyday activities of people in order to favor plant conservation in this passive way. In brief, conservation should be promoted as a culture. (Long Chunlin and Pei Shengji, 2003). Plant conservation should not just be a crisis discipline but also an aspiration in terms of how people normally behave.

As human numbers and pressure on resources have increased, conservation problems have developed on larger scales. Human populations have long caused local extinctions of organisms (better documented for animals than plants), suffered periodic shortages of natural resources (for example, as demonstrated by recurrent famines) and been responsible for local environmental degradation (such as deforestation and soil erosion). What has now happened is that people are endangering species, over exploiting natural resources and causing pollution on a global scale. (Hamilton & Hamilton, 2006).

The root cause of plant loss is the huge and growing size of the human population, creating pressure to destroy natural habitats, expand and intensify agriculture, and collect more resources from wild plants. Intensive farms contain little botanical diversity compared to their more traditional counterparts. Not only is the population growing, but the average person is consuming more in fact 460 percent more today, on average than a century ago. (Laurance, 2001). It is predicted that the human population will rise from 6.1 billion (2005) to 8 billion (2025).

#### 1.4.1 The most frequently recorded direct threats to plants at sites selected as global centers of plant diversity.

Threat	Notes on threat	Sites %	Notes on sites
Agriculture	Both extension & intensification	60	The most frequently mentioned threat in most tropical regions.
Logging	Includes side effects	51	Clear felling is relatively infrequent but logging practices in the tropics are poor almost every where. Other types of threats are introduced along logging roads.
Grazing by domestic Animals	Over grazing and under grazing	33	Over grazing is generally the problem especially in relatively dry areas, where it can be most frequent threat. Under stocking is a more local threat e.g. in parts of Europe.
Burning		30	Generally the problem is too much burning.
Tourism	Includes recreation	29	This is the most frequently mentioned threat in Europe & North America.
Roads	Results of Construction	27	The main threat globally is the opening up of previously remote forestlands to settlements and agriculture.
Mining	Excludes peat mining	25	Can be a major threat to species confined to metaliferous soils or limestone.
NTFP Collection	Excludes fuel wood	20	Serious problems of over harvesting medicinal plants are recorded from Central South and East Asia.
Fuel wood collection		20	
Hunting		20	
Invasive plants		19	A major threat in oceanic islands, Australia, New Zealand and South Africa and locally else where.

Plant collecting	OrNamental and rare plants.	18	Different types of plants are targeted in different places e.g. orchids in South East Asia and Central America and bulbs in Turkey.
Building	Urban spread and other construction	12	
Dams		12	
Invasive animals		9	Places threatened are often the same as those threatened by invasive plants.

Sources: - (WWF and IUCN, 1994-1997; Hamilton, 1997).

The most comprehensive and authoritative inventory of the global conservation status of plants is the IUCN Red List of threatened species (IUCN, 2004). Assignment of species to categories of conservation status is made on the basis of various criteria which were revised in 1994 and again in 2001 (IUCN, 1994 a, 2001 b). Species are regarded as threatened if they have been classified as Critically Endangered or Vulnerable (2001, categories). A threatened species is defined as one facing a high risk of extinction in the near future – not a precisely defined period, but one that may be taken to extend from very soon to a few thousand years (for very long lived species). All submissions of species for incorporation within IUCN Red List must be accompanied by an assessment which has to include a minimum set of required information. Before inclusion, each assessment must be evaluated by at least two members of a Red List Authority, normally members of a relevant taxonomic or geographic specialist group of the Species Survival Commission (SSC) of the IUCN.

#### **1.4.2 Conservation implications of medicinal plant trade:**

It is evident that the trade in medicinal plants has serious implications on the survival of some plant species. If one considers that 70-90 % of material imported into Germany and 75 % of material collected in China are wild harvested, the survival of some of these species may well be under threat given the increasing demand for medicinal plants. (Kuipers, 2005)

Although there are only a relatively small number of species that are traded in any significant volume, the fact that so few species (50-100) (Lange, 1996) are produced entirely under cultivation is a matter of great concern. Examples of major cultivated species are: *Catharanthus roseus*, *Chamomilla recutita*, *Cinchona spp.*,

*Digitalis lanata*, *Digitalis purpurea*, *Duboisia spp.* *Mentha piperita*, *Papaver somniferum* and *Plantago ovata* (Lewington, 1993).

### 1.4.3 International policy and regulation:-

Despite the seriousness of the problem, there exist a limited number of measures for controlling international trade in medicinal plants. Currently the main form of regulation is through CITES (Convention on International Trade in Endangered Species of Wild Fauna and Flora). However, this agreement is not specifically concerned with medicinal plants and in fact, has only a limited number of medicinal plants listed in the appendices.

New policy is needed and an easier mechanism to control the trade of plants. Apart from the recent (and continuing) involvement of The World Bank, most of the current conservation efforts seem to be led by non-governmental organizations and privately funded international agencies, notably World Conservation Monitoring Centre (WCMC), the World Wide Fund for Nature (WWF), the Nature Conservancy (of USA), the World Conservation Union (IUCN), several botanic gardens, mainly Kew, Edinburgh, Missouri and New York. (Kuipers, 2005).

The problem lies in the fact that there is little or no legislation restricting the use of wild harvested materials in finished products, or for assuring the sustainable utilization of medicinal plants.

The World Bank in its document “Medicinal Plant; A Growing Role in Development” (Srivastava *et al*, 1995) suggests that any national strategy for medicinal plant development needs to consider the following:

- ✚ Is the use of medicinal plants encouraged in the healthcare programmes?
- ✚ Are there policies for conserving medicinal plants and incentives to encourage local community participation?
- ✚ Is there a policy for restoring plants harvested in the wild?
- ✚ Are there incentives for collectors and farmers to keep the production of medicinal plants sustainable?
- ✚ Does the Government support research into these plants?
- ✚ What are the policies regarding the export of medicinal plants?
- ✚ Are only raw materials exported?
- ✚ Is “in country” processing (which may further help the trade in medicinal plants) being promoted?

Although Western medicine has been integrated to some extent with ancient health care systems in Asia it has become the dominant method in larger hospitals



around the world. In non- hospital care in most developing countries, traditional and modern systems operate independently without a clear hierarchy, whereas in rural areas only traditional healing and herbal self- care may be at hand. In these countries, there is a great demand for medicinal plants that often come from the forests. In the future the use of these plants can be expected to increase further due to population growth and the increasing importance being attached to traditional health care by the World Health Organization (WHO). WHO's Health For All by The Year 2000 campaign emphasizes the urgent need for the conservation of medicinal plants. (Chiang Mai Declaration from Akerele, 1991)

#### **1.4.4 The Chiang Mai Declaration**

Saving Lives by Saving Plants.

We the health professionals and the plant conservation specialists who have come together for the first time at the WHO/ IUCN/ WWF/ International Consultation on Conservation of Medicinal Plants held in Chiang Mai, 21-26. March, 1998, do hereby reaffirm our commitment to the collective goal of "Health For All by the Year 2000" through the primary health care approach and the principles of conservation and sustainable development outlined in the World Conservation Strategy.

**We:**

Recognize that medicinal plants are essential in primary health care both in self medication and in national health services;

Are alarmed at the consequences of loss of plant diversity around the world;

View with grave concern the fact that many of the plants that provide traditional and modern drugs are threatened;

Draw the attention of the United Nations, its agencies and Member States, other international agencies and their members and non- governmental organizations to:

- ✚ The vital importance of medicinal plants in health care;
- ✚ The increasing and unacceptable loss of these medicinal plants due to habitat destruction and unsustainable harvesting practices ;
- ✚ The fact that plant resources in one country are often of critical importance to other countries;
- ✚ The significant economic value of the medicinal plants used today and the great potential of the plant kingdom to provide new drugs;
- ✚ The continuing disruption and loss of indigenous cultures, which often hold the key to finding new medicinal plant that may benefit the global community;

- ✚ The urgent need for international cooperation and coordination to establish programmes for conservation of medicinal plants to ensure that adequate quantities are available for future generations.

We the members of the Chiang Mai International Consultation, hereby call on all people to commit themselves to Save the Plants that Save Lives.

Chiang Mai, Thailand.26, March, 1998.

In Pakistan several sites and areas have been declared protected by IUCN and are given under the control and supervision of various Government Departments like Forest, Wildlife, etc. Protected areas are managed mainly for ecosystem, conservation and recreation. It is interesting to note that out of the total of sixteen protected areas, nine are found in N.W.F.P and Northern Areas. Out of these nine two sites are located in the present study area (The Kaghan Valley).

#### 1.4.5 Protected Areas of Pakistan.

	<b>Area/ Site</b>	<b>Region</b>	<b>Size (ha)</b>	<b>Year</b>
i.	Ayubia	N.W.F.P	3312	1984
ii.	Central Karakoram	Northern Areas	973,845	1995
iii.	Chinji	Punjab	6,070	1987
iv	Chitral Gol	N.W.F.P	7,750	1984
v.	Deosai Plains	Northern Areas	363,600	1993
vi	Handrap Shandhoor	Northern Areas	51,800	1993
vii	Hazarganji- Chiltan	Balochistan	15,555	1980
viii.	Hingol	Balochistan	699,088	1997
ix.	Khanjerab	Nothern Areas	227,143	1975
x.	Kirthar	Sindh	308,733	1974
xi.	Lal Suhanra	Punjab	51,588	1972
xii.	Machiara	AJK	13,593	1996
xiii.	Margalla Hills	Islamabad	17,386	1980
xiv.	Sheikh Buddin	N.W.F.P	15,540	1993
xv.	Lulusar Lake	N.W.F.P	12,026	2003
xvi.	Saif-ul-Malook Lake.	N.W.F.P	75,058	2003

Source: (The IUCN Directory of South Asian Protected Areas, 1990) & (The Nation May 8<sup>th</sup>, 2003).

Medicinal plants have a rich resource base which is spread over a wide range of ecological zones in Pakistan. About 40 % of flowering plants are confined to the arid and semiarid regions, 35 % in arid to moist regions and 26 % in sub humid to moist regions (Ali, 1986). Out of about 5691 known species of the flowering plants in Pakistan (Stewart, 1972) approximately 1010 can be classified as medicinal (Usman Ghani, *et al.* 1986). In Pakistan reliance on herbal medicine is partly owing to the high cost of conventional allopathic medicine and inaccessibility of modern health care facilities especially in remote areas. Moreover, traditional medicine is often deemed as a more appropriate method of treatment especially in rural areas.

### **1.5 Aims and Objectives of the Present Study:**

The main objectives of this research project are:

- i) To explore the floristic diversity of the area with special emphasis on medicinal and threatened plants.
- ii) Documentation of indigenous knowledge of medicinal plants of the area.
- iii) To check the traditional use of those medicinal plants scientifically which are not evaluated biochemically.
- iv) To identify taxonomically problematical medicinal plants of the area.
- v) To study people are plant relationship and to work out ways for sustainable use of important plant species.
- vi) To find out the conservation status of selected plant species by applying IUCN criteria (after slight modifications).
- vii) Exploration of underutilized species with traditional knowledge and Modern Sciences.

## MATERIALS & METHODS

The present study was carried out from August 2005 to August 2008. During this period the research area was frequently visited for the collection of data pertinent to floristic diversity, ethnobotany and conservation. Each trip was pre-planned and executed effectively. The research work was completed in three phases, i.e. literature survey, field trips for data collection and documentation of data obtained from Kaghan Valley.

### **2.1 Field Work:**

Field work was carried out in order to investigate floristic diversity, existing ethnobotanical practices and conservation status of the flora of Upper and Lower Kaghan Valley, Mansehra. The field work included interviews, observations, guided field walks /transects walks and plant collection.

The following two approaches helped a lot in gathering all the possible information during field work.

#### **2.1.1 Observations:**

Documented and recorded the entire prevailing situation after observations. These general observations included socio-economic conditions faced by the people, culture, problems faced by the people, life style and behavior of nomads, climatic conditions and above all relationship of people with plants. These observations were made while visiting different villages and spending time with local people. By adopting this practice, local methods of medicinal plant collection, storage, drying, harvesting time, processing and utilization were observed and noted. In the mean time all the plants during flowering / fruiting stage were collected pressed and preserved.

#### **2.1.2 Interviews:**

During field work, interviews were conducted with the local inhabitants, selected informants, the herbalists “hakims” (local physicians of Eastern system of Medicine), pansaries (medicinal plant sellers in local markets). The method of questionnaire was adopted (Annexure 1, 2, 3, 4.) during the surveys in order to get qualitative and participatory approach about the plant recourses and their utilization by the local people. Questions concerning the utility of different plants, quantity of plants used, rate of consumption, availability, economics/ market value and fuel wood/ fodder head loads had been asked. Apart from this information the method proved to be very useful in recording variation of ethnobotanical knowledge among different villages, i.e. how same plant is used for different ailments in different

villages or if a plant is very useful in one area but of little value in another area because of unawareness of those people.

## **2.2 Floristic diversity:**

Bryophytes, Pteridophytes, Gymnosperms and Angiosperms were collected during different seasons of the year especially spring and summer seasons. The plants were then pressed, poisoned with mercuric chloride, mounted, identified and preserved at Quaid-i-Azam University Islamabad Herbarium. All the relevant information was recorded. (Annexure-5). Although the technique of mercuric chloride is not recommended these days because of its highly poisonous chemical actions but we carried out this technique with complete precautionary measures. In future our herbarium has decided to practice the technique of deep freezing at -18C which kills all the insect life.

In case of Bryophytes, collection of the samples was done in polythene bags and the specimen bottles, after removing the clay/ sand and washing the material in running water. These plants were then preserved in Formalin- acetic acid- alcohol.

Each plant specimen was assigned a voucher specimen number from Sr. No. 001 to Sr. No. 800, plants were assigned to their relevant families and a checklist of the flora of Kaghan Valley was documented. The checklist was then compared with available literature. (Stewart, 1967; Nasir & Ali, 1971-91; Ali & Qaiser, 1986).

## **2.3 Ethnobotany:**

The plants of ethnobotanical importance were collected and classified on the basis of their utility in the area. Local people including plant collectors and others on age group basis were interviewed for ethnobotanical information of the area. The most challenging task was to get information from nomads (the most important source of ethnobotanical information), especially it is very difficult to access their females for ethnobotanical information. Those people have their own culture and unique tradition. It is interesting to mention here that this area is a hub of nomads and they prefer to stay here during summer months along with their sheep and cattle.

The timings for the field work were selected according to the growth and collection season of the plants, presence of nomads and situation of track etc. Population size and its distribution, languages, ethnic affiliation, history of settlement, major social groups or classes, productive activities, subsistence crops, migration trends, etc. were also explored during the field work. All the required information was recorded in the form of questionnaires. For example,

**Questionnaire for Ethnobotanical Survey****Biodata of Informant:**

Name: Muhammad Shafique

Age: 60 Years

Gender: Male

Education: Illiterate

Date: 10.5.2007

**Information about the Plant:**

Local Name of Plant: Kikar

Botanical Name: *Acacia nilotica*

Locality of collection: Mahandri

Uses of the Plant: Medicinal plant, used in digestive problems, fuel wood

Quantities harvested: /day/month/year: Approx. 2 tons annually

Who collect the Plant? (Men/Women/Children) Men, Women

Why collected? Medicinal purposes, fuel wood.

Which part is collected? Bark, pods, leaves and gum

How the plant is collected? Cutting, picking

Is it sold? No

To whom it is sold? Nil

What kinds of post harvest processes are practiced? Drying

**Local Price/Kg in Rs.:**

Quantity sold each year: Nil

Availability status of plant in last 10 years: Persistent  
(Increased/Decreased/persistent).

Any conservation effort on the part of locals: No

Any other observation: Monkeys were seen feeding on flowers.

**Questionnaire for Fuel Wood Consumption Survey****Biodata of Informant:**

Name: Noor Bibi

Age: 75 Years

Gender: Female

Education: Illiterate

Date: 10.8.2007

**Information about the Plant:**

Local Name of Plant used for fuel wood: Diar

Botanical Name: *Cedrus deodara*

Locality of collection: Kaghan

% age of use: 30%

Who collect fuel wood? (Men/Women/Children) Women, Children

When and from where it is collected? July, August. From all accessible areas

Is it sold? Yes

Quantity consumed per day: Approx. 10-20 kg in each house daily

Summer: Same

Winter: Same

Quantity consumed per annum: Difficult to correctly assess

Status of fuel wood consumption during last 10 years.

(Increased/Decreased/No Change.) Increased

Any other observation: Nil

**Questionnaire for Conservation Status Survey****Biodata of Informant:**

Name: Ghulam Nabi

Age: 80 Years

Gender: Male

Education: Primary

Date: 12.8.2007

**Information about the Plant:**

Local Name of Plant: Atis

Botanical Name: *Aconitum heterophyllum*

Which part is collected? Roots

Utility of the plant: Used in stomach disorders and haemorrhoids

Present availability status: Available in just few places

Availability status during the last 10 years:

(Increased / Decreased / Persistent) Decreased

Major causes of decrease: Roots are collected in bulk for commercial purposes

Any conservation effort by collector / community: No

Name of most threatened plant species: *Taxus wallichiana*

Any Extinct plant species: Yes / No. No

If yes, which one and why? Nil

Any other observation: Animals avoid eating this plant i.e, *Aconitum heterophyllum*.



**Questionnaire for Medicinal Plants Market Survey****Biodata of Informant:**

Name of Vendor: Hakeem Chisti

Age: 65 Years

Education: Graduate

Date: 24.3.2008

Type of Vendor: Permanent / Temporary.

Permanent

Total Number of species traded: More than 80

Number of suppliers: 15-20

Number of employees: 4

**Information about the Drug Plant:**

Local Name of Plant: Ratan jot

Botanical Name: *Geranium wallichii*

Part Used: Roots

Price/Kg Rs: 300

Purchase Rate = 40

Sale Rate = 300

Availability:

Increased / Decreased: No change

Demand:

Increased / Decreased: Increased

Exported to: Please mention Name of city: Peshawar, Rawalpindi, Lahore

Condition of Plants: fresh /dried / preserved: Dried

Brought to market: Daily / Weekly / Occasionally: Occasionally

Present sale comparison with past: more /less / same. More

Who sell it to you: middle man / collector? Both

Any other observation: The plant is also sold by many temporary vendors sitting on foot paths near the roads.

**Plate # 13: Herbal Drugs ready for marketing.**

**Plate # 14: Data collection from local informant.**

### **2.3.1 Market Assessment:**

Market assessment of medicinal plants available in the markets of Mansehra and Abbottabad was carried out. Questionnaire for the survey is attached in (Annexure-4). Marketing chain for medicinal plants collected and people involved in medicinal plant trade were investigated. A list of economically important plants was prepared with emphasis on plant market availability status, collection methods, and local- prices of these plants. The available literature on the market survey was also collected and made a review from it for comparison with present findings. Some of the methods adopted for data collection are presented in Plates # 13, 14.

### **2.4 Plant Conservation:**

Conservation status of ethnobotanically valued flora of Kaghan Valley was studied by developing a new conservation assessment scale. The IUCN criteria for threatened categories were also used (IUCN, Version 3.1, 2001) with some modifications in order to get a clear picture without any complication. IUCN included nine different categories, which were modified to seven categories in the present study and the criteria for Rare and Secure category was also included. Thirty different types of herbs, shrubs, and trees have been analyzed by using this procedure.

Seeds of 5 threatened medicinal plants were also collected from the wild and were handed over for sowing to the forest office nursery in Besian near Balakot. A questionnaire was developed for collecting conservation status data. (Annexure-3).

#### **2.4.1 Assessment criteria:**

Ranking is a qualitative process and it takes into several factors which function as guidelines rather than arithmetic rules. The ranker's overall knowledge of the element allows him or her to weigh each factor in relation to others and to consider all pertinent information for a particular element. The factors considered in ranking species and communities are similar but the relative weight given to the factors differs.

#### **2.4.2 Data collection Pertinent to Conservation Status Assignment:**

In Kaghan Valley, the plant resources are ruthlessly utilized and thus most of the threatened plants are of ethnobotanical importance. In order to study the conservation status of ethnobotanically important flora, transect walks were made during different seasons through out the area which covered all slopes, aspects and altitudes. Local people especially plant collectors got valuable information about plant's abundance, distribution and localities of their maximum availability. These

informations were confirmed through field visits. Personal observations were made in the field keeping several parameters under consideration. Field observations include range, extent and area of occupancy, exploitation level, plants availability, habitat alteration, conservation efforts, plant collection techniques, part of plant collected, invasive plants, threats (pollution urbanizations, lack of awareness, deforestation, etc.). The plant species were then categorized into Critically Endangered, Endangered, Vulnerable, Rare, Near threatened and Secure. Figure 2.1 Shows IUCN Structure for defining the status of plant species.

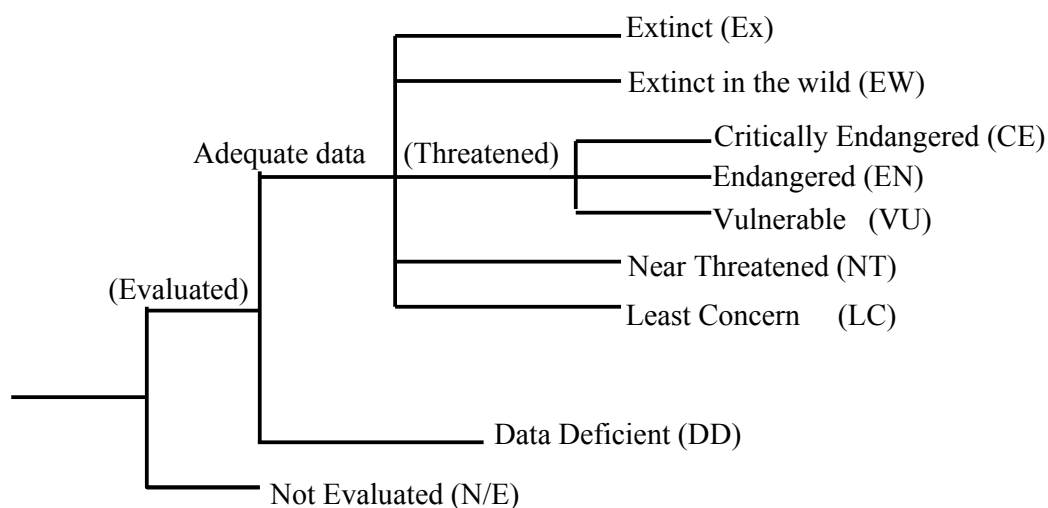


Figure: 2.1:- IUCN Structure for Defining the Status of a Plant Species.

**Extinct (Ex):**

A taxon is Extinct when there is no reasonable doubt that the last individual has died.

**Extinct in the Wild (EW):**

A taxon is Extinct in the Wild when it is known only to survive in cultivation in captivity or as a naturalized population (or populations) well outside the past range. A taxon is presumed extinct in the wild when exhaustive surveys in known and/ or expected habitat at appropriate times (diurnal, seasonal, annual) throughout its historic range have failed to record in individual. Surveys should be over a time frame appropriate to the taxon's life cycle and life form.

**Critically Endangered (CE):**

A taxon is Critically Endangered when it is facing an extremely high risk of extinction in the wild in the immediate future.

**Endangered (EN):**

A taxon is Endangered when it is not critically endangered but is facing a very high risk of extinction in the wild in the near future.

**Vulnerable (VU):**

A taxon is Vulnerable when it is not critically endangered or endangered but is facing a high risk of extinction in the wild in the medium term future.

**Lower Risk (LR):**

A taxon is Lower Risk when it has been evaluated does not satisfy the criteria for any of the categories critically endangered, endangered or vulnerable. Further they are subcategorized into:

- i) Conservation dependent (cd),
- ii) Near threatened (nt), and
- iii) Least concern (lc)

**Data Deficient (DD):**

A taxon is Data Deficient when there is inadequate information to make a direct or indirect assessment of its risk of extinction based on its distribution and/or population status.

**Not Evaluated (NE):**

A taxon is Not Evaluated when it is / has not yet been assessed against the criteria.

**2.4.3 Criteria developed for conservation status Assessment:**

A plant is assigned global rank (G- rank) which applies across its entire range; a national rank (N- rank) for each nation in its range, and a sub- national rank (S-rank) for any other small unit (a specific locality) jurisdiction in its range (e.g. Kaghan Valley). The conservation rank of an element known or assumed to exist within a jurisdiction is designated by a specific number from 0 to 6, preceded by a G (Global), N (National) and S (Sub- National or local). The numbers have the following meanings:

0. Extinct
1. Critically Endangered
2. Endangered
3. Vulnerable or Extirpation
4. Rare
5. Near Threatened
6. Secure

G1, for example indicates critically endangered situation of a plant species on world wide basis, i.e., a great risk of extinction through out the globe. N1 indicates critically endangered situation on national or country level. S1 indicates critically endangered situation within a particular state, province or other sub- national jurisdiction, in other words, a great risk of extirpation of the element from that sub- nation, regardless of its status elsewhere.

#### 2.4.4 Development of a Conservation status scale:

In order to find out conservation status of a plant species in a specific area, different localities of that area need to be surveyed. The threatened plant species can be sorted out by using field observations, information from local people and reports of earlier collectors on the flora of that area. Thus plant species are given different ranks (from 0 to 6) in that specific locality. The conservation status score of a plant species at different localities was then added and divided by the total number of localities visited.

During present study as earlier reports on the flora (herbs, shrubs and trees) of Kaghan Valley were not available, the prime tools used for rank assignment were field observations and local informants.

$$\text{Conservation Status scale (CSS)} = \frac{\text{Total conservation score of a species at different localities}}{\text{Total number of localities visited}}$$

**For different threatened categories, the CSS value should fall in the following given ranges:**

Extinct	0
Critically Endangered	$0 < CE \leq 1$
Endangered	$1 < E \leq 2$
Vulnerable	$2 < V \leq 3$
Rare	$3 < R \leq 4$
Near Threatened	$4 < NT \leq 5$
Secure	$5 < S \leq 6$

#### 2.4.5 Documentation of the research data:

The third and last phase was the documentation of the data obtained during field work. During documentation process the flora collected during the study was documented properly. The ethnobotanical data obtained during field work was

checked and compared with the available literature and analyzed. Hence the indigenous knowledge about plant resources, religious and cultural aspects and conservation status of the flora was also documented. The ethnobotanical inventory includes Botanical Names, Families, Local Names, Common Names, Plant habit, Part used, and Folk Medicinal Uses, etc.

#### **2.4.6 Chemical Analysis of Soil:**

The growth development and distribution of plants and their communities are greatly influenced by the chemistry of soil. The chemical nature of saline soils drastically differs from non-saline and organically rich soils and consequently the plant life and productivity vary. The variation in the soil chemistry occurs due to the nature of parent material, developmental process, climatic factors and management practices. The chemical analysis of soils, therefore, becomes of prime importance in solving ecological problems (Hussain, 1989). Soil samples were collected from eight prominent sites of Kaghan Valley (i.e. Balakot, Shogran, Sheeno, Jared, Mahandri, Khanian, Kaghan & Naran) and chemically analyzed first at Land Resources Research Institute National Agricultural Research Center, Islamabad and then at Soil and Water Testing Laboratory for Research, Rawalpindi.

## RESULTS

### 3.1 Soil Analysis:

Soil is one of the important and critical factors affecting the growth and distribution of plants species in nature. The relationships of plant species with soil is so intimate that they strongly influence each other. The characteristics of soil undergo continuous change which depends upon a number of ecological factors. Soil samples were collected from eight different localities of Kaghan Valley, (Balakot, Shogran, Sheeno, Jared, Mahandri, Khanian, Kaghan and Naran) and chemically analyzed. The results are presented in Table 3.1. The generalized guidelines for interpretation of soil analysis data are given in Table 3.2.

It has been observed that there exists a considerable variation in the physical features of soil in Kaghan Valley. The type of habitat, its developmental processes, precipitation, parent material, vegetational cover and cultural practices are the key factors, influencing the physical condition of soil.

The soil sample collection sites in different localities were dominated by the following plant species:

- i) Balakot: *Acacia modesta* Wall., *Berberis lycium* Royle.
- ii) Shogran: *Paeonia emodi* Wallich., *Geranium wallichianum* D.Don.
- iii) Sheeno: *Cedrus deodara* Roxb., *Ranunculus muricatus* L.
- iv) Jared: *Acacia nilotica* L., *Dodonea viscosa* L.
- v) Mahandri: *Berberis lycium* Royle., *Potentilla reptans* L.
- vi) Khanian: *Abies pindrow* Royle., *Fragaria nubicola* Lindl.
- vii) Kaghan: *Pinus wallichiana* A.B. Jackson, *Aesculus indica* L.
- viii) Naran: *Pinus wallichiana* A.B. Jackson, *Cedrus deodara* Roxb.



**Table 3.1: Soil Analysis Report**

Sr.No	Sample ID	AB-DTPA Extract (mgKg <sup>-1</sup> )			1:1		Organic Matter	Texture
		NO <sub>3</sub> -N	PO <sub>4</sub> -P	K	pH	ECe (dSm <sup>-1</sup> )		
1	Balakot	0.51	3.46	36	7.00	0.25	1.50	Silt Loam
2	Shogran	0.22	6.25	89	7.50	0.16	2.10	Clay Loam
3	Sheeno	0.15	3.14	60	7.20	0.20	0.70	Silt Loam
4	Jared	0.18	2.18	34	7.80	0.26	0.92	Silt Loam
5	Mahandri	0.38	5.25	82	7.60	0.29	0.85	Silt Loam
6	Khanian	0.30	4.23	65	7.80	0.45	0.72	Clay Loam
7	Kaghan	0.10	5.80	74	7.60	0.15	1.00	Clay Loam
8	Naran	0.41	1.44	38	7.70	0.16	2.05	Clay Loam

**Table 3.2 Generalized Guidelines for interpretation of Soil Analysis data.**

Measurement	Soil Test	Low	Mariginal Adequate	
Nitrate (NO <sub>3</sub> -N)	AB-DTPA	<11	11-12	>20
Phosphate (PO <sub>4</sub> -P)	AB-DTPA	<4	4-7	>7
Potassium (K)	AB-DTPA	<60	60-120	>120

### 3.2 Floristic Diversity of Kaghan Valley:

The research area “Kaghan Valley” was extensively visited during 2005 to 2008. The plants were collected dried in blotting papers/news papers and then pressed. These plants were later on mounted on herbarium sheets and poisoned, then identified, preserved and deposited in Herbarium of Pakistan, Quaid-i-Azam University, Islamabad. The Bryophytes were preserved in specimen bottles containing Formalin- acetic acid- alcohol. (F.A.A ).

During the study, 6 species of Bryophytes belonging to 6 families, 53 species of Pteridophytes belonging to 9 families, 12 plants species of Gymnosperms belonging to 4 families and 775 plant species of Angiosperms belonging to 108 families (136 species of Monocots belonging to 12 families and 639 species of Dicots belonging to 96 families) were collected from the project area as presented in Table3.3.

**Table 3.3: Floristic Diversity of Kaghan Valley.**

<b>A. Bryophyta</b>		
Sr. No	Family/ Plant	Locality
<b>Ricciaceae:</b>		
1	<i>Riccia frostii.</i> (Mich.) L.	Found on damp soils
<b>Marchantiaceae:</b>		
2	<i>Marchantia polymorpha</i> L. , Sp. Pl.	Balakot, Kaghan, Naran
<b>Pelliaceae:</b>		
3	<i>Pellia epiphylla</i> (Raddi.) Dum.	Found on damp soils
<b>Anthocerotaceae:</b>		
4	<i>Anthoceros erectus</i> L.	Kaghan
<b>Funariaceae:</b>		
5	<i>Funaria hygrometrica.</i> Hedw.	Balakot, Kaghan, Naran
<b>Polytrichaceae:</b>		
6	<i>Polytrichum densifolium.</i> Hedw.	Kaghan, Naran
<b>B. Pteridophyta</b>		
<b>Selaginellaceae:</b>		
1	<i>Selaginella indica</i> (Milde) Alston.	Balakot
<b>Equisetaceae:</b>		
2	<i>Equisetum arvense</i> L.Sp.Pl.	Balakot

3	<i>E. debile</i> . Roxb.	Balakot
	<b>Ophioglossaceae:</b>	
4	<i>Botrychium lunaria</i> . (L.) Sw.	Kaghan
5	<i>B. virginianum</i> (L.) Sw.	Kaghan
	<b>Osmundaceae:</b>	
6	<i>Osmunda claytoniana</i> L. Sp. Pl.	Kaghan
	<b>Pteridaceae:</b>	
7	<i>Adiantum capillus veneris</i> . L. Sp. Pl.	Kaghan
8	<i>A. pedatum</i> L. Sp. Pl.	Balakot
9	<i>Cheilanthes albomarginata</i> Clarke, T.L.S.	Shogran
10	<i>C. dalhousiae</i> Hk. Sp. Fil.	Balakot
11	<i>C. farinosa</i> (Forssk). Kaulf.	Balakot
12	<i>C. grisea</i> Blanf.	Balakot
13	<i>C. persica</i> (Bory) Mett.	Shogran
14	<i>C. pteridioides</i> (Reichb) C.Chr.	Shogran
15	<i>C. subvillosa</i> Hk. Sp. Fil.	Shogran
16	<i>Coniogramme fraxinea</i> D.Don.	Shogran
17	<i>Cryptogramme brunoniana</i> Wall.	Shogran
18	<i>C. stelleri</i> S.G. Gmel.	Makra
19	<i>Gymnopteris vestica</i> Underw. Torr.	Shogran
20	<i>Hypolepis punctata</i> (Thunb.) Mett.	Balakot
21	<i>Onychium cotiguum</i> Wall.	Shogran
22	<i>Pellaea nitidula</i> Wall.	Balakot
23	<i>Pteridium aquilinum</i> L.	Balakot
24	<i>Pteis excelsa</i> Gaud.	Balakot
25	<i>Pteris vittata</i> L. Sp. Pl.	Kaghan
26	<i>Ampelopteris prolifera</i> Retz.	Kaghan
27	<i>Athyrium acrostichoides</i> (Sw.) Diels, Nat.	Balakot
28	<i>A. attenuatum</i> (Clarke) Geobot.	Makra
29	<i>A. fimbriatum</i> Moore Ind.	Makra
30	<i>A. mackinnonii</i> (Hope) C. Chr.	Kaghan
31	<i>A. schimperi</i> Mounq.	Kaghan
32	<i>A. wallichianum</i> Wall.	Makra
33	<i>Dryopteris blanfordii</i> Hope.	Kaghan

34	<i>D. chrysocoma</i> Christ.	Kaghan
35	<i>D. marginata</i> Wall.	Balakot
36	<i>D. ramosa</i> Hope.	Kaghan
37	<i>D. serratodentata</i> Bedd.	Kaghan
38	<i>D. sinofibrillosa</i> Ching.	Kaghan
39	<i>Polystichum discretum</i> D. Don.	Kaghan
40	<i>P. lonchitis</i> L.	Kaghan
41	<i>P. squarrosum</i> D. Don.	Kaghan
42	<i>Thelypteris laterepens</i> Trotter.	Kaghan
43	<i>T. levingei</i> Bak.	Kaghan
	<b>Aspleniaceae:</b>	
44	<i>Asplenium adiantum nigrum</i> L.	Kaghan
45	<i>A. septentrionale</i> L.	Kaghan
46	<i>A. varians</i> Wall.	Shogran
47	<i>A. viride</i> Huds	Saif-ul-Malook
48	<i>Cetarch dalhousiae</i> Hk.	Shogran
49	<i>C. officinarum</i> DC.	Shogran
	<b>Blechnaceae:</b>	
50	<i>Woodwardia unigemmata</i> Makino	Kaghan
	<b>Polypodiaceae:</b>	
51	<i>Pleopeltis clathrata</i> Clarke	Kaghan
52	<i>P. nuda</i> Hk.	Kaghan
	<b>Salviniaceae:</b>	
53	<i>Azolla pinnata</i> R.	Balakot

### C. Gymnospermae

#### Ephedrales:

1	<i>Ephedra gerardiana</i> Wall.	Basel
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#### Coniferales:

##### Pinaceae:

2	<i>Abies pindrow</i> Royle.	Kaghan
3	<i>Cedrus deodara</i> Roxb.	Kaghan
4	<i>Picea smithiana</i> Wall.	Kaghan
5	<i>Pinus roxburghii</i> Sargent	Balakot
6	<i>P. wallichiana</i> A.B. Jackson	Kaghan

**Cupressaceae:**

7	<i>Cupressus macrocarpa</i> Hartweg	Balakot
8	<i>C.sempervirens</i> L.	Balakot
9	<i>Juniperus communis</i> L.	Babusar
10	<i>J. excelsa</i> M. B. Fl.	Babusar
11	<i>J. squamata</i> Buch.	Babusar

**Taxales:**

12	<i>Taxus baccata</i> L.	Shogran
13	<i>Taxus wallichiana</i> Zucc.	Shogran

**D. Angiospermae****I. Monocotyledanae.****Juncaginaceae:**

1	<i>Triglochin palustris</i> L.	Kaghan
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**Araceae:**

2	<i>Acorus calamas</i> L	Balakot
3	<i>Arisaema flavum</i> Forssk.	Siri Paye Track
4	<i>A. jacquemontii</i> Blume	Balakot
5	<i>A. wallichianum</i> Hk. f.	Kaghan

**Commelinaceae:**

6	<i>Commelina benghalensis</i> L.	Kaghan
7	<i>Murdannia nudiflorum</i> . L.	Kaghan

**Juncaceae:**

8	<i>Juncus bufonius</i> L.	Kaghan
9	<i>J. compressus</i> Jacq.	Kaghan
10	<i>J.inflexus</i> . L.	Shogran
11	<i>J. leucomelas</i> Royle.	Kaghan
12	<i>J. membranaceus</i> . Royle.	Kaghan
13	<i>J. prismatocarpus</i> . R. Br.	Kaghan
14	<i>Luzula spicata</i> L.	Kaghan

**Liliaceae:**

15	<i>Allium griffithianum</i> Boiss	Balakot
16	<i>A. humile</i> Kunth.	Kaghan
17	<i>A. sativum</i> L.	Balakot
18	<i>A. stracheyi</i> Baker.	Manoor

19	<i>A. tunicaule</i> Regel.	Kaghan
20	<i>Aloe barbedensis</i> Mill.	Balakot
21	<i>Asparagus capitatus</i> Baker.	Balakot
22	<i>A. filicinus</i> . Ham.	Kaghan
23	<i>A. racemosus</i> . Willd.	Balakot
24	<i>Colchicum luteum</i> . Baker.	Shogran
25	<i>Dipcadi hysudricum</i> . Edgew	Kaghan
26	<i>Eremurus himalaicus</i> Baker.	Kaghan
27	<i>Fritillaria roylei</i> Hk.	Mahandri
28	<i>Gagea dschungarica</i> . Regel.	Mahandri
29	<i>G. elegans</i> Wall.	Kaghan
30	<i>Lilium polyphyllum</i> D.Don	Shogran
31	<i>Lloydia serotina</i> L.	Shogran
32	<i>Notholirion thomsonianum</i> Royle.	Kaghan
33	<i>Polygonatum geminiflorum</i> Dcne.	Kaghan
34	<i>P. multiflorum</i> L.	Kaghan
35	<i>P. verticillatum</i> All.	Shogran
36	<i>Smilax glaucophylla</i> Klotzsch in Reise Pr.	Balakot
37	<i>Trillium govanianum</i> Wall.	Kewai
38	<i>Tulipa stellata</i> HK.F	Mahandri
	<b>Haemodoraceae:</b>	
39	<i>Aletris pauciflora</i> Klotzsch.	Jared
40	<i>Liriope graminifolia</i> L.	Kaghan
	<b>Amaryllidaceae:</b>	
41	<i>Ixiolirion montanum</i> Labill	Balakot
	<b>Dioscoreaceae:</b>	
42	<i>Dioscorea bulbifera</i> L.	Balakot
43	<i>Dioscorea deltoidea</i> Wall.	Shogran
	<b>Iridaceae:</b>	
44	<i>Iris decora</i> Wall.	Kaghan
45	<i>I. ensata</i> Thunb.	Shogran
	<b>Orchidaceae:</b>	
46	<i>Cephalanthera longifolia</i> Huds.	Shogran
47	<i>Cypripidium cordigerum</i> D.Don.	Makra

48	<i>Dactylorhiza hatagirea</i> D.Don.	Shogran
49	<i>Epipactis helleborine</i> L.	Kaghan
50	<i>E.royleana</i> . Lindl.	Kaghan
51	<i>Goodyera repens</i> L.	Kaghan
52	<i>Herminium angustifolium</i> Lindl.	Shogran
53	<i>H. monorchis</i> L.	Kaghan
54	<i>Malaxis muscifera</i> Lindl.	Kaghan
55	<i>Neottia inayatii</i> Du.	Shogran
	<b>Cyperaceae:</b>	
56	<i>Carex cardiolepis</i> Nees in Wight.	Kaghan
57	<i>C. cruenta</i> Nees in Wight.	Kaghan
58	<i>C.divisa</i> Huds.	Shogran
59	<i>C.duthiei</i> Clarke.	Kaghan
60	<i>C.haematostoma</i> Nees in Wight.	Mahandri
61	<i>C. luteobrunnea</i> Nelmes.	Mahandri
62	<i>C. gracilescens</i> Kuk.	Kaghan
63	<i>C.pamirensis</i> C.B.Clarke.	Shogran
64	<i>C. pisanensis</i> V. Krecz.	Kaghan
65	<i>C. plectobasis</i> V. Krecz.	Kaghan
66	<i>C. pseudofetida</i> Kuk.	Lulusar
67	<i>C.remota</i> L.	Lulusar
68	<i>C. setosa</i> Boott.	Makra
69	<i>C. tristis</i> M. Bieb.	Makra
70	<i>Cyperus globosus</i> All.	Kaghan
71	<i>C. rotundus</i> L.	Shogran
72	<i>C.squarrosus</i> L.	Kaghan
73	<i>Eleocharis mitracarpa</i> Steud.	Kaghan
74	<i>E. quinqueflora</i> Hartm.	Kaghan
75	<i>Eriophorum comosum</i> Wall. ex. Roxb.	Kaghan
76	<i>E. scheuchzeri</i> Hoppe.	Shogran
77	<i>Kobresia capillifolia</i> . Dcne.	Kaghan
78	<i>K.laxa</i> Nees in Wight.	Kaghan
79	<i>K. vaginosa</i> C.B.Cl.	Makra
80	<i>K. nitens</i> Clarke.	Shogran

81	<i>K. pygmaea</i> C. B. Clarke.	Shogran
82	<i>Scirpus mucronatus</i> L.	Balakot
	<b>Gramineae:</b>	
83	<i>Cymbopogon distans</i> Nees.	Kewai
84	<i>Erianthus filifolius</i> Ness ex Steud.	Shogran
85	<i>E. ravennae</i> L.	Shogran
86	<i>E. rufipilus</i> Steud.	Shogran
87	<i>Eulaliopsis binata</i> Retz.	Kaghan
88	<i>Hyparrhenia hirta</i> L.	Lalazar
89	<i>Imperata cylindrica</i> L.	Lalazar
90	<i>Rottboellia exaltata</i> L.f.	Shogran
91	<i>Sorghum nitidum</i> Vahl.	Shogran
92	<i>Brachypodium distachyon</i> L.	Balakot
93	<i>B. sylvaticum</i> Huds.	Kaghan
94	<i>Echinochloa colonum</i> L.	Balakot
95	<i>Oplismenus compositus</i> L.	Shogran
96	<i>O. undulatifolius</i> Ard.	Shogran
97	<i>Pennisetum triflorum</i> Nees ex Steud.	Balakot
98	<i>Alopecurus aequalis</i> Sobol.	Kaghan
99	<i>A. geniculatus</i> L.	Kaghan
100	<i>A. myosuroides</i> Huds	Kaghan
101	<i>Calamagrostis emodensis</i> Griseb.	Kaghan
102	<i>C. epigejos</i> L.	Mahandri
103	<i>C. garhwalensis</i> C.E. Hubb.	Kaghan
104	<i>Muehlenbergia himalayensis</i> Hack.	Shogran
105	<i>M. huegelii</i> Trin.	Shogran
106	<i>Arundinella nepalensis</i> Trin.	Shogran
107	<i>Avena sativa</i> L.	Balakot
108	<i>Duthiea bromoides</i> Hackel in Verh.	Jared
109	<i>Trisetum aeneum</i> Hk.f.	Balakot
110	<i>Bromus velutinus</i> Koch.	Balakot
111	<i>Cynadon dactylon</i> L.	Balakot
112	<i>Danthonia schneideri</i> Pilger in Feddes.	Makra
113	<i>Acrachne racemosa</i> Heyne.	Kaghan



114	<i>Tripogon filiformis</i> Nees ex Steud.	Kewai
115	<i>T. hookerianus</i> Bor in Ahmad.	Kewai
116	<i>Festuca altaica</i> Trin in Ledeb.	Shogran
117	<i>F. gigantea</i> L.	Saif ul Malook
118	<i>F. kashmiriana</i> Stapf in FBI.	Shogran
119	<i>Lolium perenne</i> L.	Balakot
120	<i>Poa falconeri</i> Hk. f.	Balakot
121	<i>P. nemoralis</i> L.	Kaghan
122	<i>P. polycolea</i> Stapf in Hk.f.	Shogran
123	<i>P. setulosa</i> Bor in Kew.	Shogran
124	<i>P. stapfiana</i> Bor.	Shogran
125	<i>P. stewartiana</i> Bor in Kew.	Shogran
126	<i>Melica onoei</i> Franch.	Shogran
127	<i>M. scaberrima</i> Nees.	Shogran
128	<i>Milium effusum</i> L.	Balakot
129	<i>Sporobolus diander</i> Retz.	Kaghan
130	<i>Oryzopsis aequiglumis</i> Duthie.	Kaghan
131	<i>O. fasciculata</i> Hack.	Kaghan
132	<i>O. geminiramula</i> Ohwi in Acta.	Shogran
133	<i>Stipa jacquemontii</i> Jaub. & Spach.	Shogran
134	<i>Aegilops tauschii</i> Cosson, Not.	Mahandri
135	<i>Agropyron schrenkianum</i> Fisch & Mey.	Kaghan
136	<i>A. semicostatum</i> Nees ex Steud.	Shogran

## II Dicotyledonae

### Salicaceae:

1	<i>Populus ciliata</i> Wall.	Balakot
2	<i>Salix denticulata</i> N.J. Anderss.	Shogran
3	<i>S. hazarica</i> Parker.	Kaghan
4	<i>S. elegans</i> Wall.	Babusar
5	<i>S. flabellaris</i> N.J. Anderss.	Saif ul Malook
6	<i>S. julacea</i> N.J. Anderss.	Shogran
7	<i>S. lindleyana</i> Wall. ex Anders.	Shogran

	<b>Juglandaceae:</b>	
8	<i>Juglans regia</i> L.	Mahandri
	<b>Betulaceae:</b>	
9	<i>Alnus nitida</i> Endl.	Jared
10	<i>Betula utilis</i> D.Don.	Balakot
	<b>Corylaceae:</b>	
11	<i>Carpinus faginea</i> Lindl.	Kaghan
12	<i>Corylus jacquemontii</i> . Dcne in Jacq.	Kaghan
	<b>Fagaceae:</b>	
13	<i>Castanea sativa</i> Mill.	Shogran
14	<i>Quercus baloot</i> Griffith.	Kaghan
15	<i>Q.dilatata</i> Lindl. ex Royle.	Shogran
16	<i>Q. glauca</i> Thunb.	Shogran
17	<i>Q. incana</i> Roxb.	Shogran
18	<i>Q. semecarpifolia</i> Sm. in Rees Cyclop.	Shogran
	<b>Ulmaceae:</b>	
19	<i>Celtis australis</i> L.	Kaghan
20	<i>C. eriocarpa</i> Dcne in Jacq.	Balakot
21	<i>Ulmus villosa</i> Brandis ex Gamble.	Shogran
22	<i>U.wallichiana</i> Planch.	Shogran
	<b>Moraceae:</b>	
23	<i>Ficus auriculata</i> Lour.Fl.	Balakot
24	<i>F. bengalensis</i> L.	Balakot
25	<i>F. carica</i> L.	Balakot
26	<i>F. cunia</i> Ham. in Roxb.	Balakot
27	<i>F. palmata</i> Forssk.	Shogran
28	<i>Morus alba</i> L.	Balakot
29	<i>M.serrata</i> Roxb.	Shogran
	<b>Cannabaceae:</b>	
30	<i>Cannabis sativa</i> L.	Balakot
	<b>Urticaceae:</b>	
31	<i>Debregeasia salicifolia</i> D.Don.	Balakot
32	<i>Girardinia palmata</i> Forssk.	Shogran
33	<i>Pilea umbrosa</i> Wedd.	Shogran

34	<i>Pouzolzia zeylanica</i> L.	Kewai
35	<i>Urtica dioica</i>	Shogran
	<b>Santalaceae:</b>	
36	<i>Thesium indicum</i> Hedrych.	Balakot
	<b>Loranthaceae:</b>	
37	<i>Arceuthobium minutissimum</i> Hk.f.	Shogran
38	<i>Viscum album</i> L.	Shogran
	<b>Polygonaceae:</b>	
39	<i>Fagopyrum cymosum</i> Trev.	Kaghan
40	<i>F. esculentum</i> Moench.	Shogran
41	<i>Polygonum affine</i> D.Don.	Kaghan
42	<i>P. amplexicaule</i> D.Don.	Shogran
43	<i>P. barbatum</i> L.	Balakot
44	<i>P. capitatum</i> Ham in D.Don.	Balakot
45	<i>P. molle</i> D.Don.	Kaghan
46	<i>P. nepalense</i> Meissn.	Shogran
47	<i>P. polystachyum</i> Meissn. in Wall.	Kaghan
48	<i>P. stagninum</i> Ham. ex Meissn. in Wall.	Shogran
49	<i>Rheum emodi</i> Wall. ex Meissn. in Wall.	Kaghan
50	<i>R. webbianum</i> Royle.	Shogran
51	<i>Rumex dentatus</i> L.	Siri Paye track
52	<i>R. hastatus</i> D.Don.	Siri Paye track
53	<i>Tovara virginiana</i> L.	Kaghan
	<b>Chenopodiaceae:</b>	
54	<i>Acroglochin persicarioides</i> Poir.	Basel
55	<i>Chenopodium album</i> L.	Kaghan
56	<i>C. foliosum</i> Moench.	Shogran
57	<i>C. hybridum</i> L.	Kaghan
	<i>C. prostratum</i> Bunge ex Herder in Acta	
58	Hort.	Jalkhad
	<b>Amaranthaceae:</b>	
59	<i>Achyranthus aspera</i> L.	Kaghan
60	<i>A. porphyristachya</i> Wall. ex Moq.	Shogran
61	<i>A. bidentata</i> Blume Bijd.	Shogran

62	<i>A. sanguinilenta</i> L.	Jalkhad
63	<i>Amaranthus viridis</i> L.	Jalkhad
64	<i>Celosia argentea</i> L.	Jalkhad
	<b>Phytolaccaceae:</b>	
65	<i>Phytolacca latbenia</i> Moq.	Jalkhad
	<b>Portulacaceae:</b>	
66	<i>Portulaca oleracea</i> L.	Shogran
	<b>Caryophyllaceae:</b>	Kaghan
67	<i>Arenaria festucoides</i> Bth. in Royle.	Shogran
68	<i>A. leptoclados</i> Reichb.	Shogran
69	<i>Cerastium fontanum</i> Baumg.	Naran
70	<i>Dianthus angulatus</i> Royle.	Naran
71	<i>D.jacquemontii</i> Edgew.	Naran
72	<i>Lychnis apetala</i> L.	Naran
73	<i>L.himalayensis</i> Rohrb.	Naran
74	<i>L. fimbriata</i> Edgew.	Shogran
75	<i>L. nutans</i> Bth. in Royle.	Shogran
76	<i>Myosoton aquaticum</i> L.	Naran
77	<i>Pseudostellaria himalaica</i> Franch.	Kaghan
78	<i>Sagina apetala</i> Ard.	Naran
79	<i>S. saginoides</i> L.	Kaghan
80	<i>Silene moorcroftiana</i> Wall.	Kaghan
81	<i>S.tenuis</i> Willd.	Kaghan
82	<i>S. vulgaris</i> Moench.	Shogran
83	<i>Stellaria decumbens</i> Edgew.	Naran
84	<i>S.media</i> L.	Kaghan
85	<i>S.monosperma</i> Buch.	Kaghan
	<b>Ranunculaceae:</b>	
86	<i>Aconitum chasmanthum</i> Stapf ex Holmes.	Basel
87	<i>A.heterophyllum</i> Stapf.	Kaghan
88	<i>A. kashmiricum</i> Stapf ex Conventry.	Basel
89	<i>A. laeve</i> Royle.	Kaghan
90	<i>A. rotundifolium</i> Kar. & Kir.	Shogran
91	<i>Adonis chrysocyathus</i> H. & T.	Shogan

92	<i>Anemone falconeri</i> T.T. in Hk.	Kaghan
93	<i>A.obtusiloba</i> D.Don.	Shogran
94	<i>A. potentilloides</i> Camb.	Kaghan
95	<i>A. polyanthes</i> D.Don.	Makra
96	<i>A.rupicola.</i> Camb.	Shogran
97	<i>A.vitifolia</i> Ham.	Kaghan
98	<i>Aquilegia moorcroftiana.</i> Wall ex Royle.	Shogran
99	<i>A.nivalis</i> Falc. ex Jackson.	Shogran
100	<i>A. pubiflora</i> Wall ex Royle.	Mahandri
101	<i>A. mussooriensis.</i> Royle.	Shogran
102	<i>Callianthemum pimpinelloides.</i> D. Don.	Naran
103	<i>Cimicifuga foetida</i> L.	Kaghan
104	<i>Clematis grata.</i> Wall.	Balakot
105	<i>C.montana</i> Buch.	Kaghan
106	<i>Delphinium cashmerianum</i> Royle.	Shogran
107	<i>D. denudatum</i> Wall.	Shogran
108	<i>D. lacostei</i> Danguy, Journ.	Kaghan
109	<i>D. vestitum</i> Wall.	Naran
110	<i>Paeonia emodi</i> Wall.	Shogran
111	<i>Paraquilegea anemonoides</i> Willd.	Kaghan
112	<i>P. grandiflora</i> Fisch.	Shogran
113	<i>Ranunculus munroanus</i> J.R.Drum.	Shogran
114	<i>R.muricatus</i> L.	Kaghan
115	<i>R.polypetalus</i> Royle.	Shogran
116	<i>Thalictrum cultratum</i> Wall.	Makra
117	<i>T.elegans</i> Wall.	Shogran
118	<i>T.hazarica</i> RRS ined.	Kaghan
119	<i>T.minus</i> L.	Balakot
120	<i>T.pedunculatum</i> Edgew.	Kaghan
121	<i>Trollius acaulis</i> Lindl.	Naran
	<b>Berberidaceae:</b>	
122	<i>Holboellis latifolia</i> Wall.	Shogran
123	<i>Berberis kunawurensis</i> Royle.	Kaghan
124	<i>B.lycium</i> Royle.	Mahandri

125	<i>B.pachyacantha</i> Koehne.	Kaghan
126	<i>B.pseudumbellata</i> Parker.	Naran
127	<i>Epimedium elatum</i> Morr. & Dcne.	Shogran
128	<i>Podophyllum emodi</i> Wall.	Shogran
	<b>Papaveraceae:</b>	
129	<i>Meconopsis aculeate</i> Royle.	Makra
	<b>Fumariaceae:</b>	
130	<i>Corydalis clarkei</i> Prain in J.A.S.	Shogran
131	<i>C.cyrtoentra</i> Prain in J.A.S.	Naran
132	<i>C. diphylla</i> Wall.	Kaghan
133	<i>C.govaniana</i> Wall.	Kaghan
134	<i>C.moocroftiana</i> Wall.	Shogran
135	<i>C. stewartii</i> Fedde.	Makra
136	<i>C. thyrsiflora</i> Prain, J.A.S.	Naran
137	<i>C. tibetica</i> H. & T.	Naran
138	<i>Fumaria indica</i> Hausskn.	Balakot
	<b>Cruciferae:</b>	
139	<i>Aphragmus obscurus</i> Dunn.	Jared
140	<i>Arabidopsis himalaica</i> Edgew.	Jared
141	<i>A.lasiocarpa</i> H. & T.	Kaghan
142	<i>Arabis auriculata</i> Lam.	Manoor
143	<i>A. pangiensis</i> Watt, J.L.S.	Manoor
144	<i>A. ptrosperna</i> Edgew.	Kaghan
145	<i>Arcyosperma primulifolium</i> (T.T) O.E.S.	Kaghan
146	<i>Brassica juncea</i> L.	Kaghan
147	<i>Capsella bursa - pastoris</i> L.	Balakot
148	<i>Cardamine macrophylla</i> Willd.	Naran
149	<i>C. inayatii</i> O.E.S.	Naran
150	<i>Draba falconeri</i> (C.B.Cl) O.E.S.	Shogran
151	<i>D. dasycarpa</i> O.E.S.	Kaghan
152	<i>D. lanceolata</i> Royle.	Saif-ul-Malook
153	<i>D.lasiophylla</i> Royle.	Shogran
154	<i>D. trinervis</i> . O.E.S.	Kaghan
155	<i>D. winterbottomii</i> H. & T.	Kaghan

156	<i>Ermania himalayensis</i> Camb.	Saif-ul-Malook
157	<i>Erysimum altaicum</i> C.A.Meyer in Ledeb.	Naran
158	<i>E.hieraciifolium</i> L.	Kaghan
159	<i>E. melicentae</i> Dunn, Kew Bull.	Makra
160	<i>Lignariella obscura</i> Dunn.	Naran
161	<i>Microsisymbrium flaccidum</i> O.E.S.	Kaghan
162	<i>Sisymbrium orientale</i> L.	Kaghan
163	<i>Thlaspi andersonii</i> H. & T.	Shogran
164	<i>T. cochlearioides</i> H. & T.	Naran
165	<i>T. kotschyanum</i> Boiss.	Kaghan
166	<i>Torularia humilis</i> C. A.M.	Shogran
	<b>Crassulaceae:</b>	
167	<i>Sedum multicaule</i> Wall. ex Lindl.	Kaghan
168	<i>S. oreades</i> Dcne.	Kaghan
169	<i>S. fantigiatum</i> H. & T.	Kaghan
170	<i>S. vigueri</i> R.	Naran
171	<i>S. algidum</i> Ledeb.	Shogran
172	<i>Tillaea pentandra</i> . Royle ex Edgew.	Naran
	<b>Grossulariaceae:</b>	
173	<i>Ribes alpestre</i> Dcne ex Jacq.	Shogran
174	<i>R. emodense</i> Rehdr in Journ	Kaghan
175	<i>R. glaciale</i> Wall in Roxb.	Kaghan
176	<i>R. orientale</i> . Desf.	Kaghan
	<b>Parnassiaceae:</b>	
177	<i>Parnassia cabulica</i> Planch ex. Clarke.	Naran
	<b>Saxifragaceae:</b>	
178	<i>Bergenia ciliata</i> Haw.	Shogran
179	<i>B.himalaica</i> Boriss.	Gittidas
180	<i>B.stracheyi</i> H. & T.	Gittidas
181	<i>Saxifraga androsacea</i> L.	Shogran
182	<i>S. filicaulis</i> Wall. ex Ser. in DC.	Gittidas
183	<i>S. stenophylla</i> Royle.	Gittidas
184	<i>S. jacquemontiana</i> Dcne.	Shogran
185	<i>S. lilacina</i> Duthie in Gard.	Kaghan

186	<i>S. moorcroftiana</i> Ser.	Shogran
187	<i>S. pulvinaria</i> H. Smith in Bull.	Kaghan
	<b>Hamamelidaceae:</b>	
188	<i>Parrotiopsis jacquemontiana</i> Dcne.	Kaghan
	<b>Rosaceae:</b>	
189	<i>Alchemilla cashmeriana</i> Rothm	Kaghan
190	<i>Cotoneaster microphylla</i> Wall. ex Lindl.	Naran
191	<i>C. nummularia</i> Fisch.& May.	Shogran
192	<i>Duchesnea indica</i> Andr.	Shogran
193	<i>Fragaria nubicola</i> Lindl.	Shogran
194	<i>Geum elatum</i> G.Don.	Kaghan
195	<i>Potentilla embigua</i> Camb in Jacq.	Kaghan
196	<i>P.leucochroa</i> Lindl.	Kaghan
197	<i>P.collectiana</i> Aitch & Hemsl.	Kaghan
198	<i>P.desertorum</i> Bunge, Ledeb.	Babusar
199	<i>P.gelida</i> C.A.Mey.	Shogran
200	<i>P.reptans</i> L.	Mahandri
201	<i>P.trifoliata</i> Hk.f.	Mahandri
202	<i>P.caespitosa</i> Lehman.	Shogran
203	<i>P.supina</i> L.	Shogran
204	<i>Prinsepia utilis</i> Royle.	Balakot
205	<i>Pyrus communis</i> L.	Shogran
206	<i>Pyrus pashia</i> Ham ex. D. Don.	Kaghan
207	<i>Rosa foetida</i> Herrm.	Kaghan
208	<i>Rubus biflorus</i> Ham. ex Sm.	Shogran
209	<i>R.ellipticus</i> Smith in Rees.	Shogran
210	<i>Rubus irritans</i> Focke in Bibl.	Kaghan
211	<i>R. niveus</i> Thunb.	Shogran
212	<i>R. pungens</i> Camb. in Jacq.	Kaghan
213	<i>Sorbaria tomenfosa</i> Lindl.	Shogran
214	<i>Sorbus lanata</i> D.Don	Shogran
215	<i>Spiraea affinis</i> Parker, Ind.	Kaghan
216	<i>S.bella</i> Sims, Bot.	Naran
217	<i>S.hazarica</i> R.N. Parker.	Kaghan



218	<i>S.zabeliana</i> Schneider.	Kaghan
	<b>Leguminosae: Caesalpinoideae:</b>	
219	<i>Cassia wallichiana</i> DC in Mem.	Kaghan
	<b>Mimosoideae:</b>	
220	<i>Acacia arabica</i> Lam.	Balakot
221	<i>A.modesta</i> Wall.	Balakot
222	<i>A.nilotica</i> Linn.	Jered
223	<i>Albizia chinensis</i> Osbeck.	Kaghan
224	<i>A.lebbeck</i> L.	Kaghan
	<b>Papilionoideae:</b>	
225	<i>Alysicarpus ovalifolius</i> Schumach.	Balakot
226	<i>Astragalus amherstianus</i> Bth.	Shogran
227	<i>A.chlorstachys</i> Lindl.	Kaghan
228	<i>A.graveolens</i> Buch.	Kaghan
229	<i>A.hoffmeisteri</i> Kl.	Kaghan
230	<i>A.maddenianus</i> Bth. ex Baker in Hoof.	Kaghan
231	<i>Crotalaria prostrata</i> Roxb.	Balakot
232	<i>Dalbergia sissoo</i> Roxb.	Baladot
233	<i>Desmodium microphyllum</i> Thunb.	Shogran
234	<i>D.gangeticum</i> L.	Kaghan
235	<i>Flemingia fruticulosa</i> Wall.	Kaghan
236	<i>Hedysarum alpinum</i> L.	Kahgan
237	<i>H.cachemirianum</i> Bth.	Kaghan
238	<i>H.falconeri</i> Baker in FBI.	Kaghan
239	<i>H.microcalyx</i> Baker.	Kaghan
240	<i>Indigofera astragalina</i> DC.	Shogran
241	<i>I. hebepatala</i> Bth.	Shogran
242	<i>Lathyrus aphaca</i> L.	Balakot
243	<i>L. humilis</i> Fisch.	Kaghan
244	<i>L. odoratus</i> L.	Balakot
245	<i>Lespedeza floribunda</i> Bunge, Pl.	Shogran
246	<i>L. juncea</i> L.f.	Kaghan
247	<i>L. variegata</i> Camb.	Kaghan
248	<i>Pisum sativum</i> L.	Mahandri

249	<i>Robinia pseudo acacia</i> L.	Balakot
250	<i>Sesbania bispinosa</i> Jacq.	Kaghan
251	<i>Sophora mollis</i> Royle.	Kaghan
252	<i>Vicia tenuifolia</i> Roth.	Kaghan
	<b>Geraniaceae:</b>	
253	<i>Biebersteinia odora</i> Steph.	Shogran
254	<i>Geranium kishtvariense</i> R. Knuth.	Kaghan
255	<i>G. ocellatum</i> Camb.	Shogran
256	<i>G. pusillum</i> Burm.	Balakot
	<b>Oxalidaceae:</b>	
257	<i>Oxalis acetosella</i> L.	Shogran
258	<i>O. corniculata</i> L.	Balakot
	<b>Linaceae:</b>	
259	<i>Reinwardtia inica</i> Dumort.	Shogran
	<b>Rutaceae:</b>	
260	<i>Dictamnus albus</i> L.	Shogran
261	<i>Skimmia laureola</i> DC.	Shogran
262	<i>Zanthoxylum armatum</i> DC.	Balakot
	<b>Simarubaceae:</b>	
263	<i>Ailanthus altissima</i> Mill.	Balakot
	<b>Meliaceae:</b>	
264	<i>Cedrela serrata</i> Royle.	Shogran
265	<i>Melia azedarach</i> L.	Balakot
	<b>Poygalaceae:</b>	
266	<i>Polygala chinensis</i> L.	Kaghan
267	<i>P. sibirica</i> L.	Shogran
	<b>Euphorbiaceae:</b>	
268	<i>Andrachne cordifolia</i> Dcne.	Shogran
269	<i>Euphoria cornigera</i> Boiss.	Shogran
270	<i>E. indica</i> Lam.	Shogran
271	<i>E. prolifera</i> Ham in D. Don.	Balakot
272	<i>E. wallichii</i> Hk. f.	Kaghan
273	<i>Flueggea virosa</i> Roxb.	Kaghan
274	<i>Phyllanthus niruri</i> L.	Shogran

275	<i>Ricinus communis</i> Roxb.	Balakot
	<b>Buxaceae:</b>	
276	<i>Sarcococca saligna</i> Don.	Shogran
	<b>Anacardiaceae:</b>	
277	<i>Pistacia integerrima</i> J.L. Stewart.	Jared
278	<i>Rhus punjabensis</i> Stewart ex Brandis.	Kaghan
279	<i>R. succedanea</i> L.	Kaghan
	<b>Celastraceae:</b>	
280	<i>Euonymus fimbriatus</i> Wall.	Mahandri
281	<i>E. hamiltonianus</i> Wall.	Kaghan
	<b>Staphyleaceae:</b>	
282	<i>Staphylea emodi</i> Wall. ex Brandis.	Shogran
	<b>Aceraceae:</b>	
283	<i>Acer caesium</i> Wall. ex Brandis.	Shogran
284	<i>A. pentapomicum</i> J. L. Stewart in Brandis.	Shogran
	<b>Hippocastanaceae:</b>	
285	<i>Aesculus indica</i> Wall. ex Camb.	Shogran
	<b>Sapindaceae:</b>	
286	<i>Dodonaea viscosa</i> L.	Mahandri
	<b>Balsaminaceae:</b>	
287	<i>Impatiens balsamina</i> L.	Shogran
288	<i>I. edgeworthii</i> Hk.f.	Shogran
289	<i>I. flemingii</i> Hk.f.	Kaghan
290	<i>I. glandulifera</i> Royle.	Kaghan
291	<i>I. parviflora</i> DC.	Kaghan
	<b>Rhamnaceae:</b>	
292	<i>Berchemia edgeworthii</i> Lowson in FBI.	Naran
293	<i>Rhamnus virgata</i> Roxb.	Shogran
294	<i>Sageretia theezens</i> L.	Shogran
295	<i>Ziziphus jujuba</i> Mill.	Kaghan
296	<i>Z. nummularia</i> Burm.f.	Balakot
297	<i>Z. oxyphylla</i> Edgew.	Shogran
	<b>Vitaceae:</b>	
298	<i>Vitis Jacquemontii</i> Parker.	Kaghan

299	<i>V. persica</i> Boiss.	Kaghan
	<b>Tiliaceae:</b>	
300	<i>Corchorus olitorius</i> L.	Balakot
301	<i>Grewia optiva</i> Drum.	Shogran
	<b>Malvaceae:</b>	
302	<i>Lavatera kashmiriana</i> Camb. In Jacq.	Makra
303	<i>Malva neglecta</i> Wallr, Syll.	Shogran
304	<i>M. parviflora</i> L. Demonstr.	Kaghan
305	<i>Sida alba</i> L.	Balakot
	<b>Hypericaceae: (Guttiferae)</b>	
306	<i>Hypericum dyeri</i> Rehder, Journ.	Shogran
307	<i>H. napaulense</i> Choisy.	Shogran
308	<i>H. oblongifolium</i> Chosiy.	Shogran
309	<i>H. perforatum</i> L.	Shogran
	<b>Tamaricaceae:</b>	
310	<i>Myricaria dahurica</i> Willd.	Naran
	<b>Violaceae:</b>	
311	<i>Viola biflora</i> L.	Balakot
312	<i>V. kunawurensis</i> Royle.	Kaghan
313	<i>Viola odorata</i> L.	Shogran
314	<i>V. rupestris</i> F.W. Schm.	Shogran
315	<i>V. sylvestris</i> Lam.	Saif-ul-Malook
	<b>Datisceae:</b>	
316	<i>Datisca cannabina</i> L.	Kaghan
	<b>Begoniaceae:</b>	
317	<i>Begonia picta</i> Sm. Exot.	Shogran
	<b>Thymeleaceae:</b>	
318	<i>Daphne oleoides</i> Schreb.	Mahandri
	<b>Elaeagnaceae:</b>	
319	<i>Elaeagnus umbellata</i> Thunb.	Kaghan
	<b>Lythraceae:</b>	
320	<i>Woodfordia fruticosa</i> L.	Shogran
	<b>Punicaceae:</b>	
321	<i>Punica granatum</i> L.	Balakot

	<b>Alangiaceae:</b>	
322	<i>Alangium chinense</i> Lour.	Kaghan
	<b>Myrtaceae:</b>	
323	<i>Eucalyptus globulus</i> L.	Balakot
	<b>Onagraceae:</b>	
324	<i>Circaea cordata</i> Royle.	Shogran
325	<i>Epilobium laxum</i> Royle.	Kaghan
326	<i>E. tibetanum</i> Hausskn.	Kaghan
327	<i>Oenothera rosea</i> Soland.	Shogran
	<b>Hippuridaceae:</b>	
328	<i>Hippuris vulgaris</i> L.	Kaghan
	<b>Araliaceae:</b>	
329	<i>Aralia cachemirica</i> Dcne. in Jacq.	Kewai
330	<i>Hedera nepalensis</i> K. Koch.	Balakot
	<b>Umbelliferae:</b>	
331	<i>Aegopodium alpestre</i> Ledeb.	Naran
332	<i>Angelica glauca</i> Edgew.	Kaghan
333	<i>Bupleurum longicaule</i> Wall.	Makra
334	<i>B. giraldii</i> Koso.	Kaghan
335	<i>B. hazarica</i> Nasir, Biologia	Makra
336	<i>B. ramosum</i> Nasir, Univ. of Calif.	Kaghan
337	<i>B. marginatum</i> Wall. ex DC.	Kaghan
338	<i>B. subuniflorum</i> Boiss.	Shogran
339	<i>B. thomsoni</i> Clarke.	Kaghan
340	<i>Carum carvi</i> L.	Balakot
341	<i>Centella asiatica</i> L.	Balakot
342	<i>Chaerophyllum acuminatum</i> Lindl in Royle.	Naran
343	<i>C. reflexum</i> Lindl.	Kaghan
344	<i>Hydrocotyle sibthorpioides</i> Lam.	Balakot
345	<i>Pimpinella acuminata</i> Edgew.	Shogran
346	<i>P. stewartii</i> Dunn.	Kaghan
347	<i>Pleurospermum brunonis</i> DC.	Kaghan
348	<i>P. condollei</i> DC.	Kaghan
349	<i>P. corydalifolium</i> Aitch & Hems.	Kaghan

350	<i>Sanicula elata</i> . Ham in D.Don.	Kaghan
351	<i>Seseli libanotis</i> L.	Kaghan
	<b>Cornaceae:</b>	
352	<i>Cornus macrophylla</i> Wall. in Roxb.	Kaghan
	<b>Ericaceae:</b>	
353	<i>Cassiope fastigiata</i> Wall. D. Don.	Shogran
354	<i>Gaultheria trichophylla</i> Royle.	Shogran
355	<i>Rhododendron hypenanthum</i> Balf in Notes.	Shogran
356	<i>R.lepidotum</i> Wall. ex D.Don.	Balakot
	<b>Primulaceae:</b>	
357	<i>Androsace duthieana</i> Knuth	Shogran
358	<i>A. foliosa</i> Dcne.	Shogran
359	<i>A. hazarica</i> RRS ined.	Shogran
360	<i>A. septentrionalis</i> L.	Kaghan
361	<i>A. villosa</i> L.	Kaghan
362	<i>Cortusa brotheri</i> Pos ex Lipsky.	Makra
363	<i>Lysimachia prolifera</i> Klatt in Abh.	Balakot
364	<i>Primula denticulata</i> Sm. Exot.	Shogran
365	<i>P. duthieana</i> Balf.	Kaghan
366	<i>P. elliptica</i> Royle.	Gittidas
367	<i>P. hazarica</i> Duthie in Ann.	Kaghan
368	<i>P. inayatii</i> Duthie.	Kaghan
369	<i>P. reptans</i> Hk. f.	Makra
370	<i>P. rosea</i> Royle.	Makra
371	<i>P. schlagintweitiana</i> Pax.	Basel.
	<b>Plaubaginaceae:</b>	
372	<i>Acantholimon lycopodioides</i> Girard.	Makra
	<b>Ebenaceae:</b>	
373	<i>Diospyros lotus</i> L.	Mahandri
	<b>Oleaceae:</b>	
374	<i>Fraxinus excelsior</i> L.	Shogran
375	<i>F. xanthoxyloides</i> Wall. ex G.Don.	Kaghan
376	<i>Jasminum humile</i> L.	Shogran
377	<i>J. officinale</i> L.	Shogran

378	<i>Olea ferruginea</i> Royle.	Shogran
379	<i>Syringa emodi</i> Wall. ex Royle.	Kaghan
	<b>Loganaceae:</b>	
380	<i>Buddleja crispa</i> Bth.	Kaghan
	<b>Gentianaceae:</b>	
381	<i>Gentiana aprica</i> Dcne in Jacq.	Mahandri
382	<i>G.azurea</i> Bunge in Nouv.	Saif-ul-Malook
383	<i>G.cachemirica</i> Dcne.	Makra
384	<i>G. pedunculata</i> Royle. ex G.Don.	Kaghan
385	<i>G.tianshanica</i> Rupr. ex Kusn.	Babusar
386	<i>G.venusta</i> Wall. ex Griseb.	Makra
387	<i>Jaeschkea canaliculata</i> Royle.	Makra
388	<i>J.oligosperma</i> Griseb.	Naran
389	<i>Lomatogonium carinthiacum</i> Wulf.	Naran
390	<i>L.rotatum</i> L.	Kaghan
391	<i>Swertia chirayita</i> Roxb. ex Fleming.	Kaghan
392	<i>S.coerulea</i> Royle.	Saif-ul-Malook
	<b>Apocynaceae:</b>	
393	<i>Nerium indicum</i> Mill, Gard.	Shogran
394	<i>Vinca rosea</i> L.	Shogran
	<b>Asclepiadaceae:</b>	
395	<i>Calotropis procera</i> Willd.	Balakot
396	<i>Cynanchum arnottionum</i> Wight.	Shogran
397	<i>C. jacquemontianum</i> Dcne in Jacq.	Naran
398	<i>C. vincetoxicum</i> L.	Kaghan
399	<i>Periploca hydaspidis</i> Falc.	Kaghan
	<b>Convolvulaceae:</b>	
400	<i>Convolvulus arvensis</i> L.	Balakot
401	<i>Ipomoea pes tigridis</i> L.	Balakot
	<b>Cuscutaceae:</b>	
402	<i>Cuscuta reflexa</i> Roxb.	Mahandri
	<b>Polemoniaceae:</b>	
403	<i>Polemonium coeruleum</i> L.	Kaghan

**Boraginaceae:**

404	<i>Arnebia banthami</i> Wall. ex G.Don.	Naran
405	<i>Cynoglossum microglochin</i> Benth.	Naran
406	<i>Ehretia laevis</i> Roxb.	Balakot
407	<i>E.obtusifolia</i> Hochst. ex DC.	Balakot
408	<i>E. serrata</i> . Roxb.	Kaghan
409	<i>Eritrichium nanum</i> Vill.	Shogran
410	<i>Hackelia macrophylla</i> Brand.	Kaghan
411	<i>H. uncinata</i> Benth.	Shogran
412	<i>Lindelofia longifolia</i> Benth.	Kaghan
413	<i>L. spectabilis</i> Lehm.	Kaghan
414	<i>L. stylosua</i> . Kar. & Kir.	Naran
415	<i>Onosma hispidum</i> Wall. ex G.Don.	Kaghan
416	<i>O. thomsonii</i> Clarke in Hook.	Shogran
417	<i>Pseudomertensia nemerosa</i> DC.	Batakundi
418	<i>P.moltkioides</i> Royle in Benth.	Batakundi
419	<i>P. primuloides</i> Decne.	Batakundi
420	<i>P. leichtlinii</i> Kazmi.	Batakundi
421	<i>P.trollii</i> Melch.	Batakundi
422	<i>P. harrissii</i> Kazmi.	Naran
423	<i>Solenanthus circinnatus</i> Ledeb.	Naran
424	<i>S. stamineus</i> Desf.	Kaghan

**Verbenaceae:**

425	<i>Lantana camara</i> L.	Balakot
426	<i>Vitex negundo</i> . L.	Balakot

**Labiatae:**

427	<i>Ajuga bracteosa</i> Wall. ex Bth.	Balakot
428	<i>A. pariflora</i> Bth.	Shogran
429	<i>Craniotome furcata</i> Link.	Kewai
430	<i>Elsholtzia ciliata</i> Thunb.	Kaghan
431	<i>E.eriostachya</i> Bth.	Kaghan
432	<i>Lamium album</i> L.	Shogran
433	<i>L. amplexicaule</i> L.	Balakot
434	<i>Leonurus pubescens</i> Bth.	Shogran



435	<i>Leucas mollissima</i> Wall. ex Bth.	Balakot
436	<i>Mentha arvensis</i> L.	Kaghan
437	<i>M. longifolia</i> L.	Kaghan
438	<i>M. spicata</i> L.	Kaghan
439	<i>Nepeta cataria</i> L.	Kaghan
440	<i>N. clarkei</i> Hk. f.	Kaghan
441	<i>N. connata</i> Royle ex Bth.	Kaghan
442	<i>N. erecta</i> Bth.	Shogran
443	<i>N.govaniana</i> Bth.	Makra
444	<i>N.kokanica</i> Regel.	Gittidas
445	<i>N.linearis</i> Royle ex Bth.	Kaghan
446	<i>N.nervosa</i> Royle ex Bth.	Kaghan
447	<i>Origanum glaucum</i> Rech. f & Edelb.	Shogran
448	<i>Otostegia limbata</i> Bth.	Balakot
449	<i>Perilla frutescens</i> L.	Shogran
450	<i>Phlomis setigera</i> Falc. ex Bth.	Kaghan
451	<i>Plectranthus striatus</i> Wall. ex. Bth.	Naran
452	<i>Salvia asperata</i> Falc. ex Bth.	Balakot
453	<i>S. lanata</i> Roxb.	Balakot
454	<i>S. nubicola</i> Wall. ex Sweet.	Kaghan
455	<i>Scutellaria linearis</i> Bth. in Wall.	Kaghan
456	<i>S. prostrata</i> Jacq. ex Bth.	Kaghan
457	<i>S. repens</i> Ham. ex D.Don.	Kaghan
458	<i>S.teucrifolia</i> Dunn.	Shogran
459	<i>Stachyopsis oblongata</i> Schrenk.	Kaghan
460	<i>Stachys floccosa</i> Bth.	Balakot
461	<i>Teucrium royleanum</i> Wall. ex Bth.	Shogran
462	<i>Thymus serpyllum</i> L.	Kaghan
<b>Solanaceae:</b>		
463	<i>Atropa acuminata</i> Royle.	Kaghan
464	<i>Datura stromonium</i> L.	Shogran
465	<i>Hyoscyamus niger</i> L.	Jalkhad
466	<i>Solanum dulcamara</i> L.	Kaghan
467	<i>Solanum surattense</i> Burm.	Balakot

468	<i>S. tuberosum</i> L.	Balakot
469	<i>Withania somnifera</i> L.	Kaghan
	<b>Scrophulariaceae:</b>	
470	<i>Euphrasia aristulata</i> Penn.	Makra
471	<i>E. himalayica</i> Wettst.	Kaghan
472	<i>Lagotis cashmeriana</i> Royle.	Kaghan
473	<i>Leptorhabdos parviflora</i> Bth.	Kaghan
474	<i>Lindenbergia macrostachya</i> Bth.	Balakot
475	<i>Lindernia anagallis</i> Burm.f.	Balakot
476	<i>L. ciliata</i> Colsm.	Balakot
477	<i>L. pyxidaria</i> L.	Balakot
478	<i>Pedicularis brevifolia</i> D. Don.	Shogran
479	<i>P. elephantoides</i> Bth.	Kaghan
480	<i>P. kashmiriana</i> Penn.	Kaghan
481	<i>P. bipinnatifida</i> Penn.	Gittidas
482	<i>P.pycnantha</i> Boiss.	Kaghan
483	<i>P. roylei</i> Maxim. in Bull.	Shogran
484	<i>P. stewartii</i> Penn.	Kaghan
485	<i>P. tenuirostris</i> Bth.	Kaghan
486	<i>Picrorhiza kurrooa</i> Royle ex Bth.	saif-ul-Malook
487	<i>Scrophularia calycina</i> Bth. Scroph.	Kaghan
488	<i>S. koelzii</i> Penn.	Shogran
489	<i>S. polyantha</i> Royle ex Bth.	Shogran
490	<i>S. scabiosifolia</i> Bth in DC.	Balakot
491	<i>Verbascum erianthum</i> Bth. in DC.	Balakot
492	<i>Veronica anagallis aquatica</i> L.	Shogran
493	<i>Veronica cachemirica</i> Gandoger in Bull.	Makra
494	<i>V. hirta</i> Penn.	Makra
495	<i>V. lasiocarpa</i> Penn.	Kaghan
496	<i>V.melissifolia</i> Desf. ex Poir.	Shogran
497	<i>V. serpyllifolia</i> L.	Kaghan
498	<i>V. humifusa</i> Dickson.	Shogran
499	<i>V. verna</i> L.	Kaghan
500	<i>Wulfenia amberstiana</i> Wall. ex Bth.	Kaghan

	<b>Orobanchaceae:</b>	
501	<i>Lathraea squamaria</i> L.	Shogran
502	<i>Orobanche alba</i> Stephan in Willd.	Kaghan
	<b>Lentibulariaceae:</b>	
503	<i>Utricularia vulgaris</i> L.	Kaghan
	<b>Acanthaceae:</b>	
504	<i>Adhatoda vasica</i> Nees in Wall.	Balakot
505	<i>Dicliptera roxburghiana</i> Nees in Wall.	Balakot
506	<i>Justicia simplex</i> D.Don.	Shogran
507	<i>Strobilanthes atropurpurens</i> Nees in Wall.	Kaghan
508	<i>S.dalhousieanus</i> Nees.	Shogran
509	<i>S.wallichii</i> Nees.	Kaghan
	<b>Plantaginaceae:</b>	
510	<i>Plantago erosa</i> Wall. in Roxb.	Kaghan
511	<i>P.himalaica</i> Pilger.	Kaghan
512	<i>P.lanceolata</i> L.	Kaghan
513	<i>P.ovata</i> Forssk.	Balakot
	<b>Rubiaceae:</b>	
514	<i>Asperula oppositifolia</i> Reg.	Babusar
515	<i>Galium asperifolium</i> Wall in Roxb.	Shogran
516	<i>G.hoffmeisteri</i> Kl.	Balakot
517	<i>G.elegans</i> Wall in Roxb.	Kaghan
518	<i>G.pauciflorum</i> Bunge.	Kaghan
519	<i>G.serpylloides</i> Royle.	Shogran
520	<i>G.vestitum</i> D.Don.	Makra
521	<i>Leptodermis virgata</i> Edgew.	Balakot
522	<i>Oldenlandia coccinea</i> Royle.	Balakot
523	<i>Randia tetrasperma</i> Roxb.	Kaghan
524	<i>Rubia cordifolia</i> L.	Kaghan
	<b>Caprifoliaceae:</b>	
525	<i>Abelia triflora</i> R.Br in Wall.	Balakot
526	<i>Leycesteria formosa</i> Wall in Roxb.	Shogran
527	<i>Lonicera angustifolia</i> Wall ex. DC.	Kaghan
528	<i>L.discolor</i> Lindl.	Kaghan

529	<i>L.bracteata</i> Royle.	Shogran
530	<i>L.obovata</i> Royle.	Kaghan
531	<i>L.purpurascens</i> Dcne.	Kaghan
532	<i>L.webbiana</i> Wall. ex DC.	Shogran
533	<i>Sambacus nigra</i> L.	Kaghan
534	<i>S.wightiana</i> Wall. ex Wight.	Kaghan
535	<i>Viburnum cotinifolium</i> D.Don.	Kaghan
536	<i>V.mullaha</i> D.Don.	Shogran
	<b>Valerianaceae:</b>	
537	<i>Valeriana dioica</i> L.	Shogran
538	<i>V.dubia</i> Bunge in Ledeb.	Kaghan
539	<i>V.hardwickii</i> Wall in Roxb.	Kaghan
540	<i>V.jatamansi</i> Jones.	Shogran
541	<i>Valerianella dentata</i> L.	Balakot
	<b>Dipsacaceae:</b>	
542	<i>Dipsacus mitis</i> D.Don.	Shogran
543	<i>D.strictus</i> D.Don.	Shogran
544	<i>Morina colteriana</i> Royle.	Kaghan
545	<i>M.persica</i> L.	Shogran
546	<i>Scabiosa speciosa</i> Royle.	Kaghan
	<b>Cucurbitaceae:</b>	
547	<i>Luffa cylindrica</i> L.	Mahandri
548	<i>Zehneria indica</i> Lour.	Naran
	<b>Campanulaceae:</b>	
549	<i>Asyneuma thomsonii</i> H. & T.	Kaghan
550	<i>Campanula argyrotricha</i> Wall. ex DC.	Kaghan
551	<i>C. cashmeriana</i> Royle.	Kaghan
552	<i>Codonopsis clematidea</i> Schrenk.	Balakot
553	<i>C. ovata</i> Bth. in Royle.	Kaghan
554	<i>C. rotundifolia</i> Bth. In Royle.	Shogran
	<b>Compositae:</b>	
555	<i>Achillea millefolium</i> L.	Shogran
556	<i>Ainsliaea aptera</i> DC. Prodr.	Kaghan
557	<i>Artemisia amygdalina</i> Dcne.	Shogran

558	<i>A. brevifolia</i> Wall. ex DC.	Naran
559	<i>A. maritima</i> L.	Lalazar
560	<i>A. parviflora</i> Roxb.	Lalazar
561	<i>A. persica</i> Boiss.	Kaghan
562	<i>A. roxburghiana</i> Wall.	Makra
563	<i>A. grata</i> Wall.	Kaghan
564	<i>A. purpurascens</i> Jacq. ex Besser.	Makra
565	<i>Aster falconeri</i> Clarke.	Makra
566	<i>A. molliusculus</i> DC.	Shogran
567	<i>A. peduncularis</i> Wall. ex Nees.	Makra
568	<i>A. thomsonii</i> Clarke.	Babuser
569	<i>Blumea bifoliata</i> L.	Shogran
570	<i>B. mollis</i> D. Don.	Balakot
571	<i>Brachyactis menthodora</i> Bth. in Hk.	Naran
572	<i>B. pubescens</i> DC.	Kaghan
573	<i>Carpesium abrotanoides</i> L.	Kaghan
574	<i>C. cernuum</i> L.	Kaghan
575	<i>Carthamus lanatus</i> L.	Balakot
576	<i>C. oxycantha</i> M.B.Fl.	Balakot
577	<i>Centaurea calcitrapa</i> L.	Balakot
578	<i>C. iberica</i> Trev.	Shogran
579	<i>Chrysanthemum daucifolium</i> Pers.	Shogran
580	<i>C. leucanthemum</i> L.	Shogran
581	<i>C. pyrethroides</i> Kar. & Kir.	Kaghan
582	<i>Cirsium argyranthum</i> DC.	Shogran
583	<i>Conyza stricta</i> Willd.	Shogran
584	<i>Crepis kashmirica</i> Babcock in Univ. Calif.	Shogran
585	<i>C. congesta</i> Regel.	Kaghan
586	<i>Doronicum falconeri</i> Clarke.	Kaghan
587	<i>Echinops niveus</i> Wall. ex DC.	Shogran
588	<i>Eclipta prostrata</i> L.	Balakot
589	<i>Erigeron angustissimum</i> Lindl.	Kaghan
590	<i>E. inornatus</i> non A. Gray in Proc.	Naran
591	<i>E. multiradiatus</i> Bth.	Kaghan

592	<i>E.roylei</i> DC. Prodr.	Shogran
593	<i>Eupatorium reevesii</i> Wall. ex DC.	Balakot
594	<i>Gerbera gossypina</i> Royle.	Shogran
595	<i>G.nepalensis</i> Sch. Bip.	Makra
596	<i>Gnaphalium affine</i> D. Don.	Balakot
597	<i>Hieracium echioides</i> Lumnitz.	Kaghan
598	<i>H.prenanthoides</i> Vill. Prosp.	Kaghan
599	<i>Inula cappa</i> Ham.	Balakot
600	<i>I. cuspidata</i> DC.	Balakot
601	<i>I. grandiflora</i> Willd.	Kaghan
602	<i>I. indica</i> L.	Balakot
603	<i>I. vestita</i> Wall. ex DC.	Shogran
604	<i>Jurinea ceratocarpa</i> Dcne.	Naran
605	<i>J.himalaica</i> RRS.	Shogran
606	<i>Lactuca dissecta</i> D. Don.	Shogran
607	<i>L. dolichophylla</i> Kitamura in Add.	Kaghan
608	<i>L. lessertiana</i> Wall. ex DC.	Shogran
609	<i>L. lyrata</i> Stebb.	Kaghan
610	<i>L. rapunculoides</i> DC.	Kaghan
611	<i>Laggera alata</i> D. Don.	Balakot
612	<i>Ligularia thomsonii</i> Clarke.	Kaghan
613	<i>Petasites tricholobus</i> Franchet.	Kaghan
614	<i>Saussurea candolleana</i> Wall. ex. DC.	Makra
615	<i>S.falconeri</i> Hk. f.	Babusar
616	<i>S. lappa</i> Dcne.	Kaghan
617	<i>S. nana</i> Pamp. in Sped.	Makra
618	<i>Scorzonera virgata</i> DC.	Shogran
619	<i>Senecio amplexicaulis</i> Wall.	Kaghan
620	<i>S. chenopodifolius</i> DC. Prodr.	Balakot
621	<i>S. chrysanthemoides</i> DC. Prodr.	Shogran
622	<i>S. jacquemontianus</i> Dcne.	Shogran
623	<i>S. nudicaulis</i> Ham. ex D.Don.	Kaghan
624	<i>Sarratula pallida</i> DC. Prodr.	Shogran
625	<i>Siegesbeckia orientalis</i> L.	Kaghan

626	<i>Silybum marianum</i> Gaertn.	Balakot
627	<i>Solidago virgaurea</i> L.	Shogran
628	<i>Sonchus asper</i> L.	Balakot
629	<i>Tagetes erecta</i> L.	Kaghan
630	<i>Tanacetum falconeri</i> Hk.f.	Kaghan
631	<i>T. longifolium</i> Wall. ex DC.	Shogran
632	<i>Taraxacum aereum</i> V.Soest.	Kaghan
633	<i>T. canum</i> v.S.Kon	Balakot
634	<i>T. kashmirensis</i> v.S.	Kaghan
635	<i>T.stenolepium</i> Hand.	Saif-ul-Malook
636	<i>Tussilago farfara</i> L.	Mahandri
637	<i>Vernonia cinerea</i> L.	Balakot
638	<i>Waldheimia glabra</i> Dcne.	Shogran
639	<i>Youngia japonica</i> L.	Shogran

### 3.3 Ethnobotany of Kaghan Valley:

Human beings and plants co-exist on the earth. Plant is a peculiar organism of unlimited kindness and benevolence it offers to mankind, the product of its life activities in many ways. Among them commercial, industrial and domestic uses are well known. Ethnobotany encompasses all aspects of aboriginal and traditional use of plants including fuel, food, clothing, poison, narcotics, timber, fodder, medicines, dyes and veterinary medicines etc.

Ethnobotanical survey of Kaghan Valley gave a review of interaction between man and his surrounding plant wealth. For this purpose intensive field survey was carried out in the selected sites of the study area. These surveys were conducted in 20 different sites. i.e, Balakot, Paras, Faridabad, Sharan, Mahandri, Shogran, Siri, Paye, Kewai, Ghanool, Khanian, Manoor, Kaghan, Naran, Batakundi, Jalkhad, Basel, Lalazar, Gittidas, and Babusar Top. Several medicinal plant species were documented along with data about traditional uses, gathered from tribal chiefs and villagers of the area. Overall, 71 people native to the areas were interviewed. About 108 species of plants were recorded which were used to prepare the herbal medicine, of which a vast majority of plants have been reported by elder people and local Hakeems to be used for almost similar purposes in different parts of the Valley. The species are arranged alphabetically by their Botanical Names, which is followed by Family Names, Local Names, Common Names, Part Used, Taxonomic Description and Folk Medicinal Uses. As such, only those species which were reported to be under medicinal use by more than 5% of the total interviewed persons have been enlisted in the present preview of study. The list of medicinal plants utilized in the area is presented in Table 3.10.

By keeping a focus on these 108 medicinal plants, they were further investigated for other ethnobotanical uses as well, like fuel wood, fodder, food, timber, veterinary medicine, against animal bites and other miscellaneous uses.

Among these 108 plants Angiosperms are represented by 53 families and 100 species i.e., Monocot 5 families with 9 species and Dicots 48 families with 91 species, Gymnosperms are represented by 4 families and 6 species and Pteridophytes by 2 families and 2 species.

It was observed that most of the medicinal plants exhibit multiple uses. For example 7 among them are also used for animal bites, 31 for fodder, 18 for food, and



19 for fuel wood, 11 for timber, and 10 for veterinary medicines. As shown in tables 3.11, 3.12, 3.13, 3.14, 3.15, and 3.16 respectively.

### **3.3.1 Medicinal Plants:**

The results revealed that in the past, production of a variety of medicinal plants in Kaghan Valley was in abundance. The production has now decreased significantly. The system involves leasing out of a particular forest area to a bidder for a season to harvest certain herbs or parts thereof, at a pre-fixed rate. The bidder or contractor pays the price before transporting the product out of the area. Due to the lack of proper management, and other flaws, production of these plants over the years has diminished. The list of medicinal plants utilized in the area is presented in Table 3.10.

It has been observed that most of the medicinal plants are not utilized in the way they should be. Although, these plants are collected and traded in the market, but are not properly utilized because of lack of awareness and negligence on behalf of collector. The properties of medicinal plants, their composition, amount and medicinal efficacy depends upon a number of factors, of which the most important are the conditions in which the plant is grown, time of collection, drying, curing, preservation, storing, packing and marketing, etc. Market survey of important medicinal plants of Kaghan Valley was conducted and the results are presented in Table 3.9.

### **3.3.2 Plant Species used against animal bites:**

The results presented in Table 3.11 revealed that 7 plant species are utilized against animal bites. These plant species are commonly used in snake / scorpion bites.

### **3.3.3 Fodder:**

The entire valley is open to uncontrolled grazing which seriously hampers the survival of plants. After the monsoon rains, grass is harvested from the entire accessible area to make hay which is the major source of fodder for the local livestock during winter. Along with grass the locals also cut tree seedlings either unintentionally or even intentionally to prevent the encroachment of forest trees on grass producing blanks. Similarly except some accidental fires, most are deliberate, to prevent tree cover on some lands, in order to get fresh grass every year.

No reliable figures are available about the livestock population in the Kaghan Valley. The census figures for the livestock population of Mansehra District in 1998 are as follows:

**Table 3.4: Livestock population of Mansehra District 1998**

Ass	32473
Buffalo	172957
Cattle	159144
Camel	152
Goat	206714
Horse	4109
Mule	3101
Sheep	69137
<b>Total:</b>	<b>647789</b>

More than half of livestock population of Mansehra district belongs to Kaghan Valley. Besides an estimated 0.4 million livestock like goat, sheep, donkey, horses and mules visit alpine pastures in Kaghan Valley through undefined routes every year. Livestock of Kaghan valley is deficient in nutrition and health care.

Broad leaved trees like oak, horse chestnut and others are heavily lopped for fodder particularly during winter months to feed the livestock. The forests situated near the habitations suffer heavily from this damage. The live stock population of Mansehra District is presented in Table 3.4.

#### **3.3.4 Food:**

The agricultural land of upper Kaghan Valley is about 7699 ha. There exists a good scope for the off season vegetables and improved varieties of fruit crops like apple, walnut, cherries etc. in the valley. Various food plants are listed in Table 3.13. They are utilized as fruits, vegetables, spices and condiments. The detail of various crops, their annual production and annual income is given below in Table 3.5.

**Table 3.5: Detail of Crops and their annual income in Rupees**

S.No.	Area/Site	Name of Fruit/ Vegetable	Annual Production	Annual Income Rs.
1.	Battakundi	Potato, Peas	Potato = 63000 bags	Potato= 1000/bag Rs=63000000
2.	Naran	Potato, Peas	Peas= 41000 bags	Peas Rs=140/bag Rs=57400000
3.	Kaghan			
4.	Pottendes	Maize, Beans, Potato, Walnut, Apple.	-	-
5	Manur	Maize, Beans, Potato, Walnut, Apple.	-	-

Source: Resource Management Plan, Upper Kaghan Guzaza Forests.

The crop area and income realized from Pottendes and Manur is not ascertained. So there exists a great potential for agriculture in the Valley. Agriculture Department has established a Potato Research Farm at Batakundi. There exists a great possibility for the expansion of agriculture sector after the completion of under-construction Mansehra – Jalkhad Road and the two outlets found at the back of the valley i.e., one at Babusar leading to Gilgit and the other one at opposite side leading from Noori Nar top to Sharda and Kail areas of Kashmir.

### 3.3.5 Fuel Wood:

There are two main categories of forests i.e., Guzara forests and Reserve forests. In Guzara forests all the activities are allowed unless prohibited by the Government while in Reserve forests all the activities are prohibited by the Government.

Guzaras are tree bearing waste lands and are the property held jointly or severally as the case may be, of the land owners of village in whose boundaries they are included.

Removal of fuel wood is the predominant source of damage to guzara forests. From all accessible forests dead wood has since been removed. Green trees are cut and lopped and the bases of large trees are damaged which cater the requirement of fuel wood of the locals. Although, the other sources of energy like LPG, kerosene oil and electricity are available in few areas of the valley but a vast majority of people living in far flung areas are totally not interested in such options. Due to increase in population the pressure over forests for fuel wood is increasing rapidly. In winter the fuel wood consumption is increased because the people have to keep themselves warm to survive in severe cold. Almost all the people in the valley use fuel wood as the major source of domestic energy.

However, it is collected by the poor, mostly women and children and sold in nearby habitations. Blue pine and oaks are the major species whose fuel wood is sold in the market. In the local markets, the price of per 50 Kg of coniferous firewood varies from Rs.80/- to Rs.90/- and that of oak varies from Rs.80/- to Rs.100/- depending upon the distance from the forest. According to prevalent market rate, fuel wood worth Rs.552, 350 is obtained annually from the local forests. Data related to fuel wood is presented in Table 3.14.

### **3.3.6 Timber:**

Cutting of trees for construction purposes and clearance of forests for cultivation and grass growth are the common practices in the Valley. Data related to timber wood is presented in Table 3.15.

The total population of the area has tremendously increased the quota of trees allowed by the government to meet their needs. The local people therefore, cut the trees to fulfill their needs without seeking permission as required under the rules.

The reliable data both about construction of new houses and the use of timber in these houses is not available. However, the data about the free grants of permits (resident and non-resident) from 1994 – 95 to 2003 – 04 shows that the total volume utilized for the right holder permits worked out to be 386819 cft. (Local permits = 374464 cft and non-resident permits = 12355 cft) which comes out to be 38682 cft/annum.

### **3.3.7 Veterinary Medicines:**

It was observed that in every village of the study area, there are individuals who are regarded as especially knowledgeable or skilled in the treatment of animal

diseases. Usually they keep animals themselves and their remedies are considered very much authentic. The treatment of about 8 – 10 types of diseases is commonly practiced. The most frequent are digestive problems, fever, respiratory tract infections and rheumatism etc. The medicines are prepared on the spot from plants that grow in the environs of the village and other standard ingredients that are locally available such as desi ghee, oil and butter etc. It was observed that single plant or combination of plant parts as a formulation is given to the animal. For the oral dose special utensils are used made of plant parts. It was also observed that fresh and dry plant parts are given as fodder or mixed with cattle feed to treat some diseases. There is a general perception that all those plants which have the healing powers for human beings are equally effective for animals as well. All those plant species which are used in veterinary medicine are listed in Table 3.16.

### **3.4 Fish Farming in Kaghan Valley:**

There is a great potential for fish farming in Kaghan Valley as the area provides a best natural habitat for the growth of Trout fish. At present, there are two private fish farms in Kaghan Valley; one is located at Shinu and the other at Naran, which are producing five to six metric tones of fish per annum. It is an important income generating activity in the Valley. Plate # 15.

### **3.5 Bee Keeping in Kaghan Valley:**

Bee keeping is also successfully practiced in Kaghan Valley. Plate # 16. Although, the production of wild honey has been decreased over the years because of the depletion of natural flora but still many people are engaged with this profession and are satisfied with this business. Typical honey bee plant species are given in Plates # 17 & 18.

### **3.6 Mushrooms of Kaghan Valley:**

Wild mushrooms are abundantly produced in Kaghan Valley. The most prominent among them is *Morchella esculenta* (L.) locally called “Guchi”. The people are very much familiar with the importance of this product and they use to collect “Guchi” during March/April when snow starts melting from the forest. It has been estimated that about 2000 Kg. of “Guchi” is produced in the valley every year. It is crudely picked and dried. It is sold to local shopkeepers at Rs.4000 to 5000 per Kg. when dry. The shopkeepers then fix their own rates in the market, sometimes up to Rs.10, 000/- per kg.

**Plate # 15: Fish farming as income generating activity of local community.**

**Plate # 16: Honey bee keeping (Wooden Boxes) in the study area.**

**Plate # 17: Honey Bees in the flora of study area.**

**Plate # 18: Honey Bees in the flora of study area.**

### 3.7 Medicinal Plant Collectors in Kaghan Valley:

It was observed that among the medicinal plant collectors, the percentage of women is 41%, men are 36% and children below 19 years are 23%. The results are shown in Figure 3.1. About 60% of the total medicinal plants collected are sold to the local hakeems or pansaris and 40% are taken to the markets of Mansehra and Abbottabad for more profit. Locally they are purchased at very low prices but the collectors have limited options and they prefer to sell them locally because it becomes very difficult for them to carry and transport those plants to larger towns.

Figure 3.1

The medicinal plants are digged, cut or collected depending upon the part used and habit of plant. Some amount of medicinal plants is retained by the women for their own needs and home remedies; the rest is sold to earn profit. Women's knowledge about traditional medicinal plants and their usage is remarkable and it becomes very difficult to approach women for this purpose because of cultural limitations and traditions of the Valley. Again, because of differing gender roles, women often possess an understanding of local biodiversity that differs from that of men. Interestingly, it was found that women on average named 8 uses of plants, while men could name only 3. For many women, especially landless ones, forest products is the only source of income. Figure 3.2 shows the marketing chain of Medicinal Plants of Kaghan Valley.



Figure 3.2: Marketing Chain of Medicinal Plants of Kaghan Valley

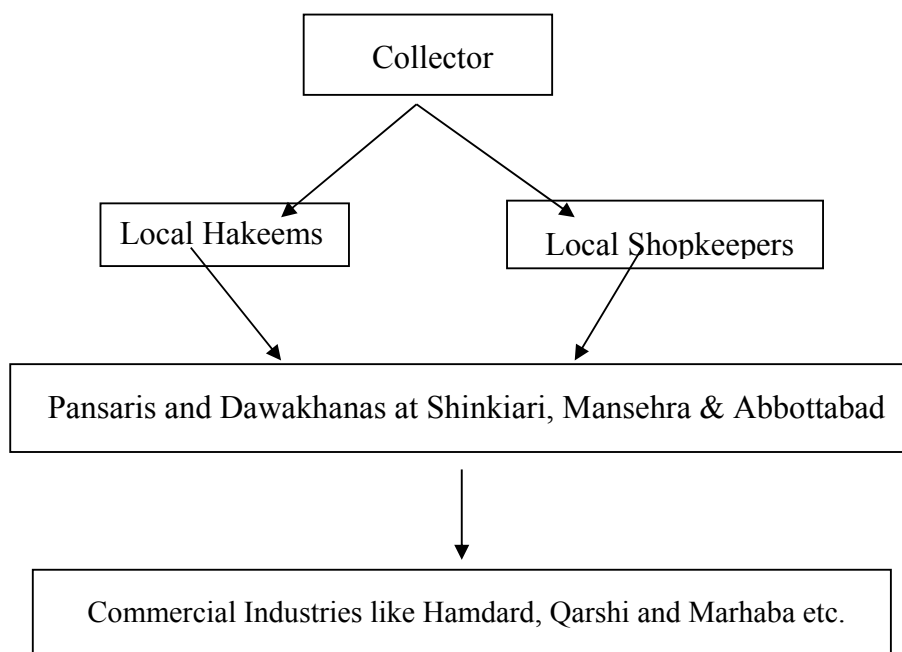


Table 3.6: Pakistan's Major Exports of Medicinal Herbs and Spices

Sr.No.	Industry	Export (US\$ Million)
1.	Hamdard Laboratories	1.450
2.	Herbion Pvt. Ltd.	0.900
3.	Hashmi Surma	0.135
4.	Qurshi Industries	0.050
5.	Tayyebi Dawakhana	0.020
6.	Marhaba	0.020
7.	Medics	0.15
8.	Others	0.800
	<b>Total:</b>	<b>3.390</b>

Source: Export Promotion Bureau, Pakistan. (1999)

**Plate # 19: Local Herbal Market.**

**Plate # 20: Author in the Herbal Market.**

**Plate # 21: Children collecting wild ornamental cut flowers for sale.**

**Plate # 22: Author collecting *Ephedra* in the field.**

A list of major exporters of medicinal herbs and spices in Pakistan and a list of wholesale markets of medicinal herbs in Pakistan is given in Tables 3.6 and 3.7 respectively.

There are various Pakistani Companies in the market for manufacturing and distributing herbal medicines. A few are dealing as local supplier while other mainly deals in export of herbal medicine. A few well-known herbal companies are named as below:

- ✚ Adil Laboratories
- ✚ Ajmal Laboratories
- ✚ Aksiri Dawakhana (Pvt.) Ltd.
- ✚ Al-Behr (Herbal) Pharma
- ✚ Alvi Dawakhana
- ✚ Azeemi Dawakhana
- ✚ Barkati Dawakhana
- ✚ Be-Misaal Dawakhana
- ✚ Farzana Dawakhana
- ✚ Hamdard Laboratories (Waqf) Pakistan
- ✚ Herbal life (Pvt.) Ltd.
- ✚ Herbion Pakistan (Pvt.) Ltd.
- ✚ J.F. Laboratories
- ✚ Jawahir Laboratories
- ✚ Karachi Laboratories
- ✚ Marhaba Natural Research Labs
- ✚ Medics Laboratories
- ✚ Pak Dawakhana
- ✚ Qarshi Industries
- ✚ Qasmi Dawakhana
- ✚ Rafahe-Aam Herbal Laboratories

- ✚ Shahi Dawakhana
- ✚ Sharifi Dawakhana
- ✚ Tayyebi Dawakhana (Pvt.) Ltd.
- ✚ Vital Laboratories

Source: Herbal Medicine Industry in Pakistan, (2000).

**Table 3.7: Wholesale Markets of Medicinal Herbs in Pakistan**

Sr. No.	City	Market	Approximate Wholesalers.
1.	Swat	Mingora	20
2.	Peshawar	Kissa Khawani Bazar	8
		Namak Mandi	19
3.	Rawalpindi	Gang Mandi	19
		Anwari Bazar	11
4.	Lahore	Akbari Mandi	63
		Paper Mandi	39
5.	Multan	Ghala Mandi	29
6.	Faisalabad	Gol Karyana Bazar	23
7.	Hyderabad	Shahi Bazar	9
8.	Karachi	Jodia Bazar	79

Source: Jawa Group of Trade and Industry, 1999.

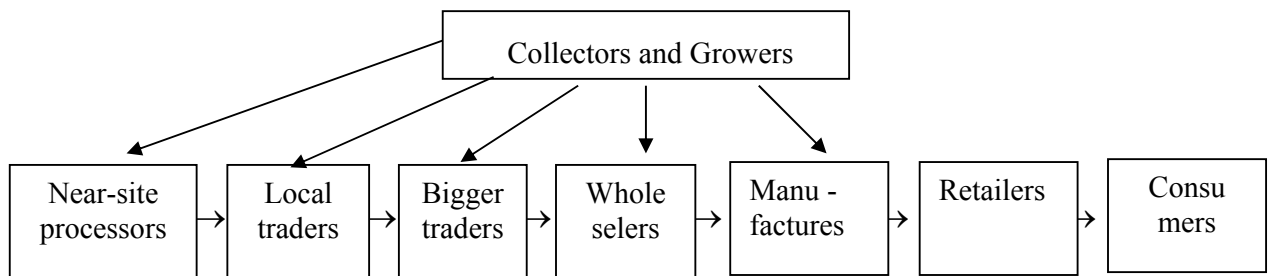
**Table 3.8: Crude drugs exported from Pakistan (1997 – 1999)**

S.No.	Name of Plants	Part Used	Quantity (Tones)	Value in Rs. (Million)
1.	<i>Ricinus communis</i> (Castor)	Seeds	1,220	6.93
2.	<i>Cyamopsis tetragonoloba</i> (Gwar)	Seedgum	394	9.86
3.	<i>Atropa acuminata</i> (Bellabona)	Leaves & Roots	34	0.70
4.	<i>Datura alba</i> (Datura)	Leaves	4	0.10
5.	<i>Cassia angustifolia</i> (Sanna)	Leaves, Pods	0.20	0.03
6.	<i>Cinchorium intybus</i> (Tukhm Kasni)	Whole plant	1.40	0.20
7.	<i>Glycrrhyza glabra</i> (Melethi)	Root	52.02	0.32
8.	<i>Plantago ovata</i> (Ispaghool)	Seeds	32	0.43
9.	<i>Terminalia chebula</i> (Harr)	Fruit	51.00	0.14
10.	<i>Acacia nilotica</i> (Kikar)	Gum	10.12	0.06
11.	<i>Ferula asafoetida</i> (Heeng)	Gum	47.00	2.41
12.	Unani and Ayurvedic Medicines.		3.00	0.53
	<b>Total:</b>		<b>1853.85</b>	<b>21.82</b>

Source: Medicinal Plants of Pakistan, 2001. Crude drugs valued at 21.8 million are exported annually from Pakistan.

A list of crude drugs exported from Pakistan during 1997-99 is presented in Table 3.8. Some categories of people who are involved in trade chains for plant resources are shown in figure 3.3.

**Figure: 3.3.** Some categories of people who are involved in trade chains for plant resources; the arrows denote movements of raw materials or products.



Source: Alan Hamilton, 2006.

**Plate # 23:** *Adiantum capillus veneris* L.

**Plate # 24: *Berberis lycium* Royle. (Root Bark)**

**Plate # 25: Roots of *Bergenia ciliata* Haw.**



**Plate # 26: *Datura stramonium* L. A medicinal and poisonous plant.**

**Plate # 27: Roots of *Geranium wallichianum* D.Don ex Sweet.**

**Plate # 28: Root bark of *Juglans regia* L. as Tooth Brush**

**Plate # 29: Roots of *Paeonia emodi* Wallich ex Royle.**

**Plate # 30: Leaves of *Skimmia laureola* (DC) Sieband Zucc. ex Walp.**

**Plate # 31: Rhizomes of *Valeriana wallichii* DC.**

**Plate # 32: *Viola odorata* L. A medicinal herb.**

**Plate # 33: *Zanthoxylum armatum* D.C.**

**Table 3.9: Market Survey of Important Medicinal Plants of Kaghan Valley**

S.No.	Species	Local Name	Part used	Harvesting month	Market rate Rs/kg		Demand
					Purchase Price	Sale Price	
1.	<i>Adiantum capillus veneris</i>	Kakh pai	Whole Plant	Mar – Apr	Rs.100	Rs.250	Decreased
2.	<i>Berberis lycium</i>	Simblu	Bark of Root	Aug – Sep	Rs.200	Rs.600	Consistent
3.	<i>Berginia ciliata</i>	Pat piya	Root	Jun – July	Rs.80	Rs.200	Consistent
4.	<i>Datura stramonium</i>	Datura	Seed	Jul – Aug	Rs.50	Rs.160	Consistent
5.	<i>Geranium wallichii</i>	Ratanjot	Root	May – Jun	Rs. 40	Rs. 300	Increased
6.	<i>Juglans regia</i>	Khor	Bark of Root & Stem	Aug – Sep	Rs. 300	Rs. 800	Increased
7.	<i>Paeonia emodi</i>	Mamaikh	Root	May – Jun	Rs. 80	Rs. 500	Increased
8.	<i>Skimmia laureola</i>	Ner	Leaves	Whole year	Rs. 50	Rs. 150	Increased
9.	<i>Valeriana wallichii</i>	Mushkbala	Root	May – Jun	Rs. 100	Rs. 300	Consistent
10.	<i>Viola canescens</i>	Banafsha	Flower	Mar – Apr	Rs. 200	Rs. 600	Increased
11.	<i>Zanthoxylum armatum</i>	Timber	Twigs/ Seeds	Aug – Sep	Rs. 5/ twig	Rs. 25/ twig	Consistent

These important medicinal plant species are shown in Plates 23 to 33.

### 3.8 Traditional Uses of Plants of Kaghan Valley:

Present study revealed that the people of Kaghan Valley utilize 108 plant species belonging to 61 families. These plants were assigned their respective Families, Botanical Names, Local Names, Common Names (English), Taxonomic Description, Part Used and Folk Medicinal Uses.

1. Botanical Name: *Acacia nilotica* Delile ssp, indica (Benth.) Brenan.

**Family:** Mimosaceae.

**Local Name:** Babul, Kikar

**Common Name:** Indian gum Arabic tree

**Description:** It is a moderate sized tree with a short trunk, spreading crown and feathery foliage usually with a height of 15m. The bark is dark brown and much fissured. The leaves are 2.5 – 5.0 cm long, bipinnate with spinescent stipules; leaflets are in 10-20 pairs, long, linear, and glabrous. The flowers are yellow and fragrant in axillary globose heads forming axillary cluster of 2-5 heads. The pods are generally solitary, 8-12 seeded, white, flat and about 7.0-15.0cm long.

Flowering is in rainy season and fruiting during cold season.

**Part Used:** Bark, pods, leaves and gum.

**Folk Medicinal Uses:** The powder of the bark is applied externally in ulcers and their decoction is used as a gargle in sore throat and toothache and also in chronic dysentery and diarrhoea. The decoction of pods is used in urinogenital diseases. Infusion of tender leaves is also a remedy for diarrhoea and dysentery. Gum is used in diabetes mellitus. Plant is also considered as a good source of dye and fuel wood.

2. Botanical Name: *Achillea millefolium* Linn.

**Family:** Asteraceae

**Local Name:** Gandana.

**Description:** A small, perennial, tufted herb up to 50cm tall, with a slender cropping rootstock throwing numerous roots and stolons with blunt succulent scale at each node. Leaves alternate, oblong-lanceolate, 3-pinnatisect, minutely divided into linear, dentate, mucronate more or less hairy segments. Flowers are numerous small, white in corymbose, ovoid flat topped beads at the ends of stems and branches. Fruits shining, with no pappus.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The decoction of leaves and flower heads is employed as a carminative, tonic and aromatic stimulant. They are also used as vapor bath for fever. Local inhabitants chew the leaves to relieve toothache as it produces a pungent, but tingling and cooling sensation bringing immediate relief.

3. Botanical Name: *Achyranthes aspera* Linn.

**Family:** Amaranthaceae

**Local Name:** Lathjira

**Common Name:** Prickly-chaff flower.

**Description:** It is a stiff erect herb about 30-90 cm high with erect and simple or slightly branched stem. Leaves are 3.8-12.5 cm x 5.0-7.5 cm, opposite, elliptic, obovate or suborbicular, usually rounded at apex and tomentose or velvety on both surfaces. Flowers are bisexual, greenish-white and are borne in long spikes, which elongate in fruits and reach up 50cm in length. Fruit is an oblong utricle that is enclosed in the hardened perianth and disarticulating easily and carrying spinous bracteoles with it. The seeds are sub cylindrical with a truncate brown apex.

Flowering is in winter and fruiting in summer.

**Part Used:** Whole plant, roots and leaves.

**Folk Medicinal Uses:** The plant is considered pungent, purgative, diuretic and astringent and is used in dropsy and haemorrhoids. The decoction of plant is used in pneumonia, cough and kidney stones and ash of the plant is given in haemorrhoids. The leaves made into a paste with water and are applied to bites of poisonous insects, wasps and bee etc. The root paste is given to stop bleeding after abortion. Powdered roots mixed with honey are given internally in haemorrhoides.

4. Botanical Name: *Aconitum heterophyllum* Wall. Ex Royle.

**Family:** Ranunculaceae

**Local Name:** Atis

**Common Name:** Atis Roots.

**Description:** A perennial, erect, showy herb. Stem long, simple or branched from base, glabrous and puberulous above; leaves broad. Ovate or orbicular or somewhat 5-lobed and toothed, upper 3-lobed or entire. Flowers 2.5 cm long, helmet-shaped, bright, blue or greenish-blue with purple veins.

**Part Used:** Underground stem and roots.

**Folk Medicinal Uses:** The roots are used in dysentery, diarrhoea, stomach disorders, fever, haemorrhoids, haemorrhage and internal inflammatory conditions. The plant is considered as a safe remedy for various diseases in children.

5. Botanical Name: *Adhatoda vasica* Nees.

**Family:** Acanthaceae.

**Local Name:** Baikar.

**Common Name:** Malabar nut.

**Description:** It is a dense evergreen erect undershrub or shrub attaining a height up 1.2-2.5 m. Stem is densely appressed, pubescent on young parts. The leaves are ovate-lanceolate to oblong with cuneate often decurrent base, acuminate and 5.0 – 15.0 cm x 3.0-8.0 cm; petiole is 0.5-3.0 cm long. The flowers are white and are borne in 3.0-15.0 cm long peduncled spikes. The capsules are 2.0 cm long, short hairy and 4-seeded. Seeds are 1-2 in each cell, glabrous and tubercled. Plate # 34.

Flowering during December-April and fruiting during February-May.

**Part Used:** Leaves, roots and flowers.

**Folk Medicinal Uses:** The leaves are considered antiseptic and are used in cough, chronic bronchitis and asthma. These are also used as insecticidal. The roots and flowers are also used antiseptics and expectorants.

6. Botanical Name: *Adiantum capillus-veneris*. Linn.

**Family:** Adiantaceae.

**Local Name:** Hansraj.

**Common Name:** Maiden hair fern.

**Description:** It is a delicate graceful fern. The stipes are blackish 10-25 cm long, suberect, naked and polished. Fronds are bipinnate with a short terminal pinna and numerous erect patent lateral ones on each side, the lowest being slightly 1.5-2.5 cm broad. The sori are roundish or obreniform which are placed in the roundish sinuses of crenations. Sori are formed throughout the greater part of the year.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The plant is demulcent, and febrifuge and is used as hair tonic. The fronds pounded with honey are used in catarrhal affections. An infusion of the leaves with tea is given in menstrual complaints.



7. Botanical Name: *Aesculus indica* Hook.

**Family:** Hippocastanaceae.

**Local Name:** Bankhor

**Common Name:** Horse Chestnut.

**Description:** A large, deciduous tree, with a short, straight, cylindrical bole and spreading crown, 30 m in height bark grey when old, exfoliating upwards, in long and thin bands; leaves digitate: leaflets 5-9, oblanceolate or oblong; flowers white tinged with red and yellow in large thyrsoid panicles; capsules ovoid, rough outside, 5 cm long, leathery; seeds 2-3, dark brown, smooth, shining. Plate # 35.

**Part Used:** Seeds

**Folk Medicinal Uses:** Seeds are especially used for the complaints of the veins, such as phlebitis, haemorrhoids, in ulcers, to prevent thrombosis and in some cases of migraine. Fruits are given to horses in colic. Oil from seeds is externally applied in rheumatism.

Wood is used for making furniture, turned articles, agricultural appliances and household utensils. The leaves are used as fodder.

**Plate # 34:** *Adhatoda vasica* Nees.

**Plate # 35:** *Aesculus indica* (Wall ex Camb) Hk. f.

8. Botanical Name: *Ajuga bracteosa* Wall. Ex Benth.

**Family:** Labiatae

**Local Name:** Khurbanti, Ratti But.

**Descriptions:** A perennial, erect or ascending hairy herb, often prostrate, with oblanceolate or sub-spathulate, obtuse, sinuate toothed leaves; purplish violet tinged from lower surface. Flowers are purplish-violet, tinged from lower surface in distant, axillary whorls in a spike.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The aromatic leaves are regarded as stimulant, diuretic and tonic. It is given in the treatment of fever and also used as febrifuge. The herb is also used in gout, rheumatism and amenorrhoea.

9. Botanical Name: *Albizia lebbek* (Linn.) Benth.

**Family:** Mimosaceae.

**Local Name:** Siris.

**Common Name:** East Indian Walnut.

**Description:** It is a large deciduous, erect and spreading tree about 15-18 m high with dark grey bark that is irregularly cracked. The leaves are bipinnate with 8-18 leaflets; leaflets are 3.3-5.0 cm x 1.7 – 2.5cm, shortly petioled, oblong, oblique, obtuse and glabrous or glabrescent. Inflorescence is in globose heads of greenish yellow flower. The flowers are shortly pedicelled and fragrant. Pods are yellowish-brown, 15.0 to 25.0 cm x 3.7-4.3 cm, flat, thin, firm, straw colored and 6-10 seeded with brown spots and depressions alternately on either side over the seeds.

Flowering is during rainy season and fruiting in winter.

**Part Used:** Seeds, leaves, bark, pods and flowers.

**Folk Medicinal Uses:** The leaves are used as remedy for night blindness. The powder of root bark is used to strengthen gums.

The aqueous extract of bark is used against conception in women. The pod extract is considered hypoglycaemic. The flowers are considered as a cooling medicine and are externally applied to boils, eruptions and swellings.

The plant is also considered as a good source of timber and fuel wood.

10. Botanical Name: *Allium sativum* Linn.

**Family:** Liliaceae.

**Local Name:** Lasun, Thoom.

**Common Name:** Garlic

**Description:** The plant is 30-60 cm high with soft stems. Leaves are flat and scape is slender. The spathes are long beaked and heads bear bulbils and flowers. Flowers are white. The sepals are lanceolate and acuminate and inner filaments 2-toothed. The bulb consists of smaller bulbs called cloves that are 5-12 in number.

Flowering and fruiting is during winter.

**Part Used:** Bulbs and their oil.

**Folk Medicinal Uses:** It is used for rheumatism and catarrhal affections. Raw garlic is used to decrease glucose, total cholesterol and triglycerides etc. in healthy persons. It is also used in dyspepsia and cryptococcal meningitis in man. Internally, it is given in nervous diseases and headache etc. with salt. It is also used as antibacterial, antinflammable and pesticidal agent.

The plant is an important ingredient in food products and is used as a vegetable and spice.

11. Botanical Name: *Aloe barbadensis* Mill.

**Family:** Liliaceae.

**Local Name:** Kanwar Ghandal

**Common Name:** Aloe

**Description:** It is a perennial and succulent herb about 30-60 cm high. Stem is short, thick and somewhat divided. Leaves are sessile, crowded and lanceolate. Scape is longer than the leaves and branched. Inflorescence is of long ad dense racemes. Bracts are short- lanceolate and membranous. Flowers are pendulous, imbricate and yellow.

Flowering and fruiting is in late winter.

**Part Used:** Pulp, expressed and dried juice of leaves and roots.

**Folk Medicinal Uses:** The plant is used in menstrual diseases and stomach pain, after pregnancy as tonic, in fever and in uterine disorders. The pulp is used in menstrual suppressions. The dried juice is given in constipation and fresh juice in fevers. The plant is used as antiseptic, germicidal and blood purifier and in chronic ulcers to stimulate healing.

It is considered as an important pulp yielding plant.

12. Botanical Name: *Amaranthus viridis* Linn.

**Family:** Amaranthaceae

**Local Name:** Chauloi, Chaleri

**Common Name:** Green amaranth

**Description:** It is an erect and much branched annual herb. Leaves are 2.0-10.0 cm x 1.5-5.0cm, ovate-rhomboid to oblong with a rounded, cuneate and often decurrent base and glabrous. Flowers are shortly stalked and pale – green and are borne in small axillary clusters or in slender axillary and terminal paniced spikes. Utricle is ovoid, short-beaded indehiscent and rugose Flowering is during the rainy season and fruiting in winter.

**Part Used:** Whole plant leaves and roots.

**Folk Medicinal Uses:** The plant is used as cooling medicine in snakebite. The roots are used as anti fertility agent. The plant is also cooked as vegetable.

13. Botanical Name: *Arisaema flavum* (Forsk.) Scott.

**Family:** Araceae

**Local Name:** Soor Ganda, Obais

**Common Name:** Cobra plant.

**Description:** Stem less, perennial herb, with well- developed tuber. Tuber depressed, globose, 2-4 cm in diameter, bearing 2-3 small tubers; fibrous roots spreading from the top of tuber. Leaves pedate, segments 5, 10-20 cm long, lateral ones oblong-lanceolate, petioles 15 – 30 cm long. Peduncle stout, shorter than petioles: spathe 10 cm long, tube pale green, margined with purple, blade erect, 5-6cm long greenish and sometimes purple–striped, or violet. Spadix with terminal appendage cylindrical, 4 cm long. Plate # 36.

**Part Used:** Tubers

**Folk Medicinal Uses:** Anticonvulsant. They are used in headache and are considered expectorant. Tubers are also given to cattle for various disorders.

14. Botanical Name: *Artemisia absinthium* L.

**Family:** Asteracere.

**Local Name:** Cahu, Vilayathi ajsanthin

**Common Name:** Worm wood, Abisinthe.

**Description:** An aromatic and bitter shrubby plant. Stems erect, angular, hoary and ribbed; leaves ovate to obovate. Unequally 2-3 pinnatifidly cut into spreading linear

or lanceolate obtuse segments, hairy on both surfaces; flower heads heterogamous, numerous but hardly crowded, flowers yellow, ray florets dilated below. Outer involucre bracts oblong, hoary, narrowly scarious; inner orbicular, broadly scarious; receptacular hair oblong. Straight; achences elliptic-oblong.

**Part Used:** Whole plant

**Folk Medicinal Uses:** The drug is used as stomachic, febrifuge and anthelmintic. It is used for inflammation of liver and menstrual disorders. Tincture of the plant is used as tonic, digestive, anthelmintic, febrifuge and nervous disorders. The plant is also used as a fodder.

15. Botanical Name: *Asparagus racemosus* Willd.

**Family:** Liliaceae.

**Local Name:** Shatavar

**Description:** It is a much-branched perennial herb with a tuberous rootstock. Stems are triquetrous with 0.5 -1.2 cm long patent or recurved spines. Cladodes are 2-3 and are arranged in a tuft and falcate. Racemes are 2.5- 5.0 cm long and pedicels are jointed at the middle and slender below the joint. The flowers are white. Perianth is 0.3-0.5 cm long. Style is short. Fruits are red or reddish violet and 1-3 seeded berries. Flowering is in October- November and fruiting during cold season.

**Part Used:** Root and bark of stem.

**Folk Medicinal Uses:** The root tubers are used in fever, rheumatism and as sexual tonic. A decoction of roots is given for fever and their extract is considered antibacterial and antifungal. The plant is also used for certain animal diseases.

16. Botanical Name: *Berberis lycium* Royle I.C.FBI.

**Family:** Berberidaceae.

**Local Name:** Sumbul

**Common Name:** Berberry, Jaundice berry.

**Description:** A deciduous shrub having roots of pale yellow color. The plant is 1-2.5 m high and even higher under cultivation, with thorny alternate, angular branches. Leaves in tufts, somewhat shining, leathery petioled, elliptical, lanceolate, obovate with margins spinous, pointed serrated and fringed, and with three cleft spreading, sharp thorns at the base of each leaf bud. Flowers in drooping, many-flowered racemes, golden yellow with red dot of glands, sepals 6, oblong in loose bunches with 2-3 finely wrinkled seeds. Fruit epidermis almost without stomata. Plate # 37.

**Part Used:** Bark of root.

**Folk Medicinal Uses:** The bark is used for renal complaints and for gallstones. The bark is used for the active movement of bowels, increasing the secretion and discharge of urine and reduces fever due to antibilious and antiseptic properties. Jaundice berry is particularly useful as a bitter tonic in jaundice and other liver disorders. The herb is considered highly beneficial in the treatment of high blood pressure. The herb is also used in menstrual disorders and excessive loss of blood. The plant is also used as a fodder.

17. Botanical Name: *Bergenia ciliata* (Haw.) Sternb.

**Family:** Saxifragaceae.

**Local Name:** Zakhm-e-Hayat, Pat piya

**Common Name:** Rockfoil

**Description:** It is a perennial climbing plant that grows well in moist. The stems are short and thick and the leaves ovate and bright red seasonally. The flowers are white, pink or purple. Plate # 38.

**Part Used:** Whole plant, rhizome.

**Folk Medicinal Uses:** The rhizome is regarded as antidotal, diuretic, emmenagogue and deobstruent. It is used for relieving pain of chest and ribs due to excess of cold. It is extensively used for removing kidney stones, bladder stones and other obstructions in digestive and excretory system. Rhizome is abortifacient; infusion is used in periodic fevers. Leaves are used in respiratory affections and spasmodic affections in children. The plant is also used as a veterinary medicine.

18. Botanical Name: *Bistorta amplexicaulis* (D. Don) Greene

Syn: *Polygonum amplexiculis*. Hk.f

**Family:** Polygonaceae.

**Local Name:** Anjabar.

**Common Name:** Anjabar and Masloon.

**Description:** Erect perennial herb with short thick rather large rhizome. Basal leaves long-petiolate, broadly ovate, acuminate, 5-10 cm long, 3-7 cm wide, cordate at base, whitish beneath; lower stem leaves similar as basal leaves, upper ones almost sessile, lanceolate. Spike solitary, terminal on peduncle 30-80 cm long, densely flowered, cylindrical, stamens 8, styles 3, Fruit achene, 3mm long, enclosed in persistent perianth. Plate # 39.

**Part Used:** Shoots and leaves.

**Folk Medicinal Uses:** Leaves are used for curing ulcer. Roots are used for rheumatic pain, backache, and gout. It is used for rheumatic fever and for improving eye sight. It is also used as veterinary medicine.

**Plate # 36:** *Arisaema costatum* Wallich.

**Plate # 37:** *Berberis lycium* Royle.



19. Botanical Name: *Calotropis procera* (Ait) Ait. f.

**Family:** Asclepiadaceae.

**Local Name:** Aak.

**Description:** It is a middle-sized shrub. Its young parts are covered with adpressed white tomentum and young leaves are hoary and glabrous when full grown. The leaves are 10-18 cm long, ovate-obovate or obvate-oblong and acute. Inflorescence is covered with woolly tomentum. The flowers are purplish-red and silvery outside with odour; buds are hemispherical. The follicles are 6.5-9.5 cm x 2.5-5.0 cm and recurved. The seeds are numerous, ovoid and 0.6 cm long with a bright silky white coma.

Flowering and fruiting during February-September.

**Part Used:** Flowers, leaves, latex and root bark.

**Folk Medicinal Uses:** Powdered flowers with black pepper are given with ash of barley seeds in cholera. The leaves are roasted and are applied to painful joints or swellings. The tincture of leaves is given in intermittent fever. The latex from the plant is considered as irritant and purgative. The root bark is anti-dysenteric, antispasmodic, diaphoretic, emetic, expectorant and purgative.

20. Botanical Name: *Cannabis sativa* Linn.

**Family:** Cannabinaceae.

**Local Name:** Bhang.

**Common Name:** Indian hemp.

**Description:** It is a tall annual herb about 1.2-4.9 m high with angular stem. The leaves are palmate, alternate or lower one opposite and 5.0-20.0 cm long; the lobes of the upper leaves are 1-5 and in lower 5-11, linear lanceolate, sharply toothed, long-pointed and narrowed at base. The flowers are small, greenish and unisexual. The males are borne in long drooping panicles and female short axillary spikes. The achenes are 0.3 cm across, ovate and flat and are enclosed in persistent perianth.

Flowering and fruiting is during March-May.

**Part Used:** Seeds, leaves, dried flowering or fruiting tops and exudates.

**Folk Medicinal Uses:** The leaves are used in ear troubles and their juice is applied on cuts after mixing with sugar. The crushed leaves are applied on skin in skin diseases. The plant as a whole is used as tonic, analgesic, and antiseptic. Crushed leaves are given to animals as appetizer. It is an important fiber yielding plant. The resinous

exudation of stem, leaves and flowers is processed to form an intoxicating drug i.e., “Charas” or “Bhang”.

**Plate # 38: *Bergenia ciliata* Haw.**

**Plate # 39: *Polygonum amplexicaule* D.Don.**

21. Botanical Name: *Capsella bursa pastoris* Moench.

**Family:** Cruciferae.

**Local Name:** Chambaraka.

**Common Name:** Shepherd's Purse.

**Description:** A glabrous or hairy herb 15-20 cm. tall with long and tapering root, with both radical and cauline leaves. Radical leaves oblong, acute or oblanceolate, tapering into petiole, emarginated, dentate or pinnatifid-parted with narrow triangular pointed lobes, sometimes entire; while the stem leaves alternate, sessile, oblong-lanceolate, amplexicaul, hestate or sagitate at the base with acute parallel or diverging auricles. Flowers small, white in raceme; calyx 4, corolla 4, corolla tube as long as calyx, stamens 6 of which 4 longer than the rest two. Stem simple or branching with angular and ribbed surface. Fruit inversely triangular or triangular cordate with a notch at the apex, flattened from sides, 5-8 cm. by 4-5 cm.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** It is used as an effective anti uric acid remedy. Also used in complaints of haemorrhage from uterine. The plant is used as a fodder.

22. Botanical Name: *Carthamus oxycantha* M.Bieb.

**Family:** Asteraceae

**Local Name:** Pohli

**Common Name:** Wild Safflower.

**Description:** An annual, erect, branching herb 0.6-1.0 m high, glabrous; stem whitish, striate. Leaves sessile, somewhat clasping, broad-lanceolate or lanceolate-oblong, attenuated at both ends, strongly dentate, slightly spinous; venation pinnate and netted. Inflorescence a broad corymb, heads 3-5 borne on leafy peduncles. Flowers orange-red, fruit a white achene, obovoid, 4-angled, truncate at the top with 4 bosses; no pappus.

**Part Used:** Seed oil, flowers.

**Folk Medicinal Uses:** Oil extracted from the seeds is used for dressing ulcer and against itch. Flowers are used in heart diseases.

23. Botanical Name: *Carum carvi* L.

**Family:** Umbelliferae.

**Local Name:** Kali zeeri.

**Common Name:** Caraway.

**Description:** Annual or biennial herb; leaves pinnately dissected; flowers in dense white umbels; schizocarps oblong-oval, yellowish brown, mericarps aromatic.

**Part Used:** Fruit.

**Folk Medicinal Uses:** The seeds are used in colic, diarrhoea, indigestion and dyspepsia. The oil obtained from seeds is also used as carminative and applied to relieve rheumatic and neuralgic pain. Caraway seeds are widely used for flavoring bread, cakes, candies, pickles and curries etc.

24. Botanical Name: *Cedrus deodara* (Roxb. ex D. Don) G. Don.

**Family:** Pinaceae

**Local Name:** Diar

**Common Name:** Deodar, Himalayan Cedar.

**Description:** A large handsome evergreen conifer tree reaching up to 85 m in height, with almost rough, black, furrowed bark and spreading branches; shoots dimorphic; leaves needle-like, triquetrous, sharp, pointed; male cones solitary, cylindrical at the ends of branchlets, female cones solitary at the ends of branchlets, composed of imbricating thin woody placental scales; seeds pale brown, wings longer than the seeds.

**Part Used:** Leaves, heart wood, oil.

**Folk Medicinal Uses:** The leaves are used in inflammations and tubercular glands. The heartwood is used for various ailments. It is bitter, acrid, thermogenic, emollient, anodyne, anthelmintic, digestive, carminative, cardiotoxic, diuretic, expectorant, antiseptic, laxative and febrifuge. The oil is considered antiseptic, diaphoretic, depurative and diuretic and is useful in leprosy, syphilis, skin diseases, wounds, ulcers and fever.

The wood is of best quality and is used for various purposes i.e., construction, furniture, vehicles and fuel wood.

25. Botanical Name: *Celosia argentea* Linn. fa.

**Family:** Amaranthaceae.

**Local Name:** Kokan

**Common Name:** Cock's comb.

**Description:** It is an erect and simple or branched annual herb. The stem is sulcate-ribbed and often tinged with purple. The leaves are alternate, 22.0cm x 7.5 cm. The flowers are rose colored in wild state and yellow or red purple in cultivated forms and

in peduncled, elongate, dense and cylindrical spikes which are often cristate or paniced. The fruit is a utricle, obovoid and 0.35 cm long. The seeds are 4-10, black colored and 0.12-0.15 cm in diameter.

Flowering and fruiting can be seen throughout the greater parts of the year, chiefly during winter.

**Part Used:** Flowers and seeds.

**Folk Medicinal Uses:** The flowers are used in diarrhoea and in excessive menstrual discharges. The seeds are considered demulcent and are used in cough and dysentery.

26. Botanical Name: *Celtis australis* Linn.

**Family:** Ulmaceae.

**Common Name:** Nettle tree.

**Description:** Dome-shaped deciduous tree growing to 25m. Have lance-shaped leaves, green glowers and small round purple-black fruits.

**Part Used:** Leaves and fruit.

**Folk Medicinal Uses:** Leaves and fruits are taken to reduce menstrual and intermenstrual uterine bleeding. They are also used to astringe the mucous membrane in peptic ulcers, diarrhea and dysentery.

27. Botanical Name: *Centella asiatica* (Linn.) Urban

**Family:** Umbelliferae

**Local Name:** Brahmi Buti

**Description:** It is a prostrate perennial herb. Stem is creeping with long stolons and nearly glabrous or hairy on young parts. The leaves are long petioled, reniform or orbicular, crenate and 3-6 and are borne in umbel in the axils of small bracts and purple whites. The fruits are sub-cylindric curved, slightly compressed, reticulate and 0.2 x 0.35cm and each is with a curvilinear subsimilar ridges with in the commissure. Flowering is in July- August and fruiting later on during October- December.

**Part Used:** Whole plant.

**Folk Medicinal Uses:**The juice of leaves is given in fevers and is also used in cataract and other eye problems. The leaves are taken as tonic improving memory and both externally as well as internally are useful in syphilitic skin diseases. The plant is also used as fodder.

28. Botanical Name: *Chenopodium album* Linn.

**Family:** Chenopodiaceae.

**Local Name:** Bathu

**Common Name:** Lamb's quarters.

**Description:** It is a scentless herb with about 30-90 cm height. The leaves are stalked and extremely variable; lower ones ovate or oblong, 2.5-5.0 cm with angular or toothed margins and upper usually narrow and entire the flowers are bisexual, clustered at the nodes and often tinged with purple. The utricles are covered by persistent perianth. The seeds are smooth, 0.1-0.15 cm across and keeled.

Flowering and fruiting is during winter season. Plate # 40.

**Part Used:** Whole plant seeds and leaves.

**Folk Medicinal Uses:** The plant is considered as a blood purifier. The seeds are administered in hepatic diseases and spleen enlargement. The powder of leaves is externally used as an antiseptic around genitalia of children. An infusion of leaves is also given as laxative and anthelmintic. The plant is also used as a vegetable.

29. Botanical Name: *Chrysanthemum leucanthemum* L.Sp.Pl

**Family:** Asteraceae

**Local Name:** Gul-i-Daudi

**Common Name:** Chrysanthemum.

**Description:** Annual or perennial herb, 20-50 cm. High. Stems sulcate, glabrous. Leaves alternate, deeply lobed and irregularly toothed. Inflorescence is an axillary or terminal corymb of many heads; flowers yellow. Plate # 41.

**Part Used:** Flowers

**Folk Medicinal Uses:** The flowers are used as antibacterial and anti hypertensive agents. They are utilized for photopsia, fever, headache, ophthalmia and hypertension. They are an important constituent of composite prescriptions. Decoction of flowers is also used for different ailments.

**Plate # 40:** *Chenopodium foliosum* (Moench) Asch.

**Plate # 41:** *Chrysanthemum leucanthemum* L.

**Plate # 42: *Colchicum luteum* Baker.**

**Plate # 43: *Dioscorea deltoidea* Wall.**



30. Botanical Name: *Colchicum luteum* Baker. In Gard Chron.

**Family:** Liliaceae.

**Local Name:** Kakar moonay, Surinjan talkh

**Common Name:** Meadow saffron

**Description:** Attractive perennial growing from bulb-like corm to 10cm. has pointed lance-shaped leaves and tubular 6-petalled pink flowers in autumn. Plate # 42.

**Part Used:** Corm and seeds.

**Folk Medicinal Uses:** Corms are considered one of the best remedies for gout pain. The herb is also used effectively to treat ulcers and leukaemia. Externally it is applied to relieve neuralgia and itchiness.

31. Botanical Name: *Cupressus sempervirens*. Linn

**Family:** Cupressaceae.

**Local Name:** Saru

**Common Name:** Mediterranean cypress.

**Description:** It is a tall tree with fluted stem and erect branches forming a narrow dense cylindrical crown. The leaves are small scale like apposite closely appressed and imbricate. The flowers are monoecious and are borne at the ends of short branch lets. The cones are few and about 2.5 cm across and scales rough, with a protection an convex or keeled point.

The cone formation is started in January- February and they mature during October-November.

**Part Used:** Wood, fruits, essential oil from the leaves and seed oil.

**Folk Medicinal Uses:** The wood and fruit are used as astringent and anthelmintic. The essential oil obtained from the leaves is used as antimicrobial and also for whooping coughs. seed oil of the plant is also used for massaging in muscle pain.

32. Botanical Name: *Cuscuta reflexa* Roxb

**Family:** Convolvulaceae .

**Local Name:** Akashbel

**Common Name:** Dodder.

**Description:** It is a leafless, climbing, yellowish-green and thread -like twining herb, which germinates in soil but becomes parasitic on the plant on which it meets with. The stem is 0.1-0.3 cm across. Flowers are sub racemose; bracts small, fleshy and subquadrate. The corolla is whitish and campanulate and scales are removed from the

filaments. The fruit is a globose capsule which is acute with black warts. The seeds are black.

Flowering is during October-December and fruiting December- February

**Part Used:** Whole plant, fruit, seeds and stem.

**Folk Medicinal Uses:** The plant is used internally in protected fevers. An infusion of plant is used as a wash for sores. The fruit is used in cough and fever. A cold infusion of the seeds is used as carminative and depurative and its decoction is used in bilious affections.

33. Botanical Name: *Cynodon dactylon* (Linn) Pers.

**Family:** Poaceae.

**Local Name:** Khabal

**Common Name:** Conch Grass.

**Description:** It is a perennial and creeping herb with underground rhizomes. Culms are decumbent-ascending and nodes are glabrous. Leaves are linear-subulate and scabrid on the upper surface and margins. Ligule is a minute, scarious, erose and ciliate rim. The sheaths are in compressed, keeled, and glabrous except hairy throat. Spikes are 2-4 and 1.5-3.0 cm x 0.1 -0.2 cm. Spikelets are 0.2cm x 0.1 cm. Lower glume is linear-lanceolate, acute, nerved and 0.1 cm long. Upper glume is about 0.1 cm long. Lemmas are 3-nerved, bidentate, mucronate and ciliate on the keel in the upper half. Paleas are 2-keeled and 0.1-0.2 cm long. Stamens are 3. Grains are oblong and free within the glumes.

Flowering is during July-September and fruiting October-December.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The decoction of roots is diuretic and is used in dropsy. An infusion of roots is used for stopping bleeding from piles. The juice of plant is said to be astringent and is used externally to fresh cuts and wounds. The plant is also considered useful in catarrh and ophthalmia and is also used to stop nose bleeding. The plant is a good source of fodder.

34. Botanical Name: *Cyperus rotundus* Linn.

**Family:** Cyperaceae.

**Local Name:** Motha

**Description:** It is an erect and perennial glabrous herb with woody subterranean stoloniferous rhizome which is clothed with fibrous remains of leafsheaths. Stems are

nodose at base, 3-gonous and 10-60 cm high. Leaves are basal and usually shorter than the stem and are linear, tapering in the upper part to a slender acuminate apex and 0.3-0.5 cm broad. Inflorescence is an umbel of more or less condensed spikes. The flowers are reddish-brown. Bracts are 3 and unequal; the longest is up to 15 cm long. The nuts are obovoid, glabrous and 0.1 cm long.

Flowering and fruiting is during July-December.

**Part Used:** Tubers.

**Folk Medicinal Uses:** The tubers are used as diuretic, anthelmintic, astringent and stimulant. They are used in disorders of stomach and irritation of the bowel. The root paste is applied in healing wounds and sores etc. It is also used in intestinal diseases.

35. Botanical Name: *Datura stramonium* Linn

**Family:** Solanaceae.

**Local Name:** Dhatura

**Common Name:** Jimson weed.

**Description:** It is an erect, coarse and glabrous or farinose puberulous annual herb about 60-120 cm high. The leaves are stalked, 15.0-17.0 cm long, ovate, deeply toothed or sinuate and pale-green. Flowers are large and purplish or violet colored. Calyx is long, tubular and herbaceous. Corolla is long and funnel-shaped with wide mouth. The stamens are attached near the base of tube. Ovary is bi or spuriously four-celled. Fruits are ellipsoid, 4.0-7.0 cm long and spinous capsules. Seeds are many, compressed and rugose.

Flowering and fruiting is during July - December.

**Part Used:** Fruit, seeds, flowers and leaves.

**Folk Medicinal Uses:** The juice of fruit is applied to scalp for curing dandruff and hair fall. The leaves and seeds are narcotic. The powdered leaves and flowers are made into an ointment which is used for the treatment of haemorrhoids,

36. Botanical Name: *Desmodium gangeticum* (Linn.)DC.

**Family:** Papilionaceae.

**Local Name:** Salwan

**Description:** It is an erect or sub erect under shrub or herb about 60-120 cm in height with adpressed hairy branches. The stems are simple and straight. Leaves are 1-foliolate and 7.5-15.0 cm x 0.8-1.5cm; leaflets are entire membranous and glabrescent

above. Flowers are numerous and small in racemes which are 15-30cm long. Pods are in cluster of 6-8 glabrescent, sticky and 1.3-1.9cm long.

Flowering is during June- August and fruiting in cold season.

**Part Used:** Whole plant, roots.

**Folk Medicinal Uses:** The roots are used in diarrhea, chronic fever, cough, vomiting, asthma, snake bite and scorpion stings. Whole plant is used as febrifuge, digestive and bitter tonic and is used for hazy vision and in dysentery.

37. Botanical Name: *Dioscorea bulbifera* Linn.

**Family:** Dioscoreaceae.

**Local Name:** Ratalu

**Common Name:** Dog yam, Potato Yam.

**Description:** It is a twining herb with glabrous stem. The leaves are alternate, ovate-triangular to sub orbicular with a deeply cordate base, basal lobes rounded, simple, glabrous and 10-20 cm x 8-15 cm. Male flowers are in raceme-like, pendent, axillary, solitary or fascicled, simple or paniculate spikes of 5.0-8.0 cm length. Female flowers are in pendulous fascicled spikes of 10-20 cm length. The capsules are oblong, winged and 2.0-2.5 cm x 1.0-1.5 cm. The seeds are winged at the base. Plate # 43.

Flowering is during July - September and fruiting in December -March.

**Part Used:** Tubers

**Folk Medicinal Uses:** The tubers are used in piles, dysentery and syphilis and are also applied to ulcers after being dried and powdered. The rhizomes are used as diuretic.

The plant is also used as a fish poison.

38. Botanical Name: *Eclipta prostrata* Linn.

**Family:** Asteraceae.

**Local Name:** Bhangra

**Description:** It is a prostrate decumbent - ascending or erect, annual or perennial herb. Stems are creeping and rooting at the base. The leaves are sessile, ovate - lanceolate, elliptic - oblong acute or obtuse, narrowed to the base and entire or serrate. The floral heads are axillary and terminal and 0.6 - 1.0 cm across on 5.0- 7.0 cm long peduncles. Involucral bracts are 2-seriate. Ovate-lanceolate, acute, appressed-pubescent and 0.3-0.6 cm long. Marginal flowers are white and with 2-dentate and

0.25 cm long ligules. The fruits are achenes, oblong - turbinate and tuberculate with thickened margins and about 0.2 cm long.

Flowering and fruting is during the greater parts of the year.

**Part Used:** Whole plant

**Folk Medicinal Uses:** The juice of the plant in combination with aromatics is administered for catarrhal jaundice. The roots are emetic and purgative and are applied externally as antiseptic to ulcers and wounds of cattle. The leaves are also used in scorpion stings. . The juice of the leaves along with honey is used as a remedy to catarrh in infants.

39. Botanical Name: *Ephedra gerardiana* Wall. ex stapf 1.c.

**Family:** Ephedraceae.

**Local Name:** Someni

**Common Name:** Ma-Huang.

**Description:** An erect or prostrate under shrub, 20-40 cm high. Branches erect, short, glaucous green, somewhat flat. 1.0-1.5 mm thick, with sparse longitudinal striae, fasciated at the nodes; internodes 2.5-5.5 cm long by 2 mm in diameter. Leaves opposite, reduced to scales, barely 2 mm, acute-triangular. Flowers in summer, unisexual, dioecious, fruiting with often-fleshy red succulent bracts, 2-seeded Plate # 44.

**Part Used:** Fruit and leaves.

**Folk Medicinal Uses:** The plant is used for curing asthmatic bronchitis and rheumatism. The tincture of this plant is considered as a cardiac circulatory stimulant. The plant is also used for curing hay fever and cold. The plant is also used as a fuel wood.

**Plate # 44:** *Ephedra gerardiana* Wall.

**Plate # 45:** *Euphorbia wallichii* Hook. f.

**Plate # 46: *Fragaria nubicola* Lindley ex Lacaita.**

**Plate # 47: *Geranium wallichianum* D.Don.**

40. Botanical Name: *Equisetum debile* Roxb.

**Family:** Equisetaceae.

**Local Name:** Jortor

**Common Name:** Horse tail.

**Description:** It is perennial and rigid pteridophytic plant. The stem is hollow about 50-70 cm long and 0.3 – 0.6cm in diameter; fertile and barren both similar with large central lumina, smooth and simple or irregularly branched. The branches are long slender few and often only 2-3 in a whorl ribs 8-20, less prominent; internodes 2.0 - 6.0 cm long sheaths tight, green, cylindrical, 0.3 -0.5 cm long including the lanceolate, acuminate brown margined deciduous teeth, the ribs of which are distinctly grooved on the back upwards and distinctly margined on each side. Leaf teeth are subulate acuminate and 7-10 in number and branches 5-10 angled. Spikes are oblong apiculate when mature. Plate sporophylls are orbicular and pale with a black center. The sporangia are oblong and yellow and spores are alete, simple, globose and yellow with 4 hygroscopic elaters.

The sori are seen through out the greater parts of the year chiefly during August – December.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The plant is a cooling medicine and is given in gonorrhoea.

41. Botanical Name: *Euphorbia indica* Lamk.

**Family:** Euphorbiaceae.

**Local Name:** Hakshardana, Dodal

**Description:** It is an erect decumbent, often multicalumn annual herb with somewhat woody base. Stems are much branched from the base and cripsy-hairy or patent hairy or glabrous. The leaves are shortly stalked, opposite, oblong or ovate -lanceolate or obovate with an oblique and rounded-subcordate base, subacute to rounded or retuse at the apex, glabrous and dark green above, appressed-pubscent on the lower surface and about 0.6-3.7 cm long. Cymes are axillary, laxely few-flowered or densely many-flowered. Involucres are 0.1 cm long, glabrous, appressed-hairy or pubescent, lobes 5, ovate, cilliate, glands 4, red and with purplish, orbicular, entire or retuse appendages. The capsules are depressed-globose, glabrous or hairy, particularly on the angles and 0.1-0.2 cm long. The seeds are ellipsoid, 4-angled and transversely rugose. Plate # 45. Flowering and fruiting is almost throughtout the year.

**Part Used:** Leaves.



**Folk Medicinal Uses:** An infusion of dried leaves is considered as astringent and is given in dysentery and diarrhoea. The juice of leaves with milk is given in abdominal pain to children. It is also used as a fodder.

42. Botanical Name: *Ficus carica* Linn.

**Family:** Moraceae.

**Local Name:** Anjir

**Common Name:** Fig

**Description:** It is a small tree or shrub. The leaves are cordate and lobed; lobes are obtuse and 10-15 cm long, the uppermost is rough. The plant is dioecious, some trees have elongated receptacle with male and gall flowers while some others have shortly pyriform nearly globose receptacle with female flowers. The fruits are subglobose. Flowering is during May-September and fruiting in winter.

**Part Used:** Fruit, leaves.

**Folk Medicinal Uses:** The pulp of the fruit mixed with vinegar and sugar is used in bronchitis. The milky juice of the fresh green fruit is acrid and is used to destroy warts. The juice of leaves is applied in the early stages of leucoderma. The dried fruits are soaked in water during the night and next day early in the morning are eaten by persons suffering from piles and body weakness. The in an important fruit and fodder yielding plant.

43. Botanical Name: *Fragaria nubicola* Lind. ex Lacaite in J.L.S.

**Family:** Rosaceae.

**Local Name:** Budimeva

**Common Name:** Strawberry

**Description:** Low – growing perennial herb spread by runners. Has 3-lobed leaves, white flowers and small red berries. Plate # 46.

**Part Used:** Leaves and fruit.

**Folk Medicinal Uses:** Leaves are eaten in diarrhoea and dysentery. The leaves are also used for gargles in sore throat and in lotion form for minor burns. This is an important fruit yielding plant and is equally good as fodder.

44. Botanical Name: *Fraxinus excelsior* L.Sp.Pl.

**Family:** Oleaceae.

**Local Name:** Ash.

**Common Name:** Ash

**Description:** Deciduous tree growing to 40 m. has pale grey bark, black conical leaf buds and bright green leaves with 7-13 oval leaflets.

**Part Used:** Bark and leaves.

**Folk Medicinal Uses:** Bark is used as astringent and tonic. Also used in fever. The leaves are considered to have laxative and diuretic properties.

45. Botanical Name: *Fumaria indica* Pugsley.

**Family:** Fumariaceae.

**Local Name:** Common fumitory

**Description:** It is a pale –green diffuse and much branched herb up to 60cm high. The leaves are divided into thin and flat segments. The racemes are 2.5 -5.0 cm long and lax-flowered. The flowers are globose rugose when dry and each with one seed. Flowering and fruiting is during winter season.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The plant is used as diuretic, anthelmintic and blood purifier. It is also given in dyspepsia, scrofulous skin and liver complaints. The herb is also used in fever and influenza. The leaves and stems are given in the form of infusion as febrifuge and alterative. The plant is also used as fodder.

46. Botanical Name: *Galium aparine* L.

**Family:** Rubiaceae.

**Local Name:** Mandakha / Khanmirch

**Common Name:** Cleavers, Goose grass.

**Description:** Straggling, square-stemmed annual growing to a height of 1.2 m with whorls of lance-shaped leaves, clusters of small white flowers and small, round, green fruit with hooked prickles.

**Part Used:** Aerial parts.

**Folk Medicinal Uses:** It is used for skin diseases such as seborrhea, eczema and psoriasis. It is also used as a general detoxifying agent in serious illnesses like cancer. The juice and the infusion are taken for kidney stones and other urinary problems. The plant is also used as fodder.

47. Botanical Name: *Gaultheria trichophylla* Royle. I 11.Bot. Himal .

**Family:** Ericaceae.

**Local Name:** Neeli buti

**Common Name:** Checker Barry –winter green.

**Description:** A small, procumbent, evergreen shrub, with slender creeping stem giving rise to erect branches, up to 15 cm. high, bearing towards their ends 3-8 leaves; leaves alternate, dark green, oval or ovate, almost glabrous, 2.5-5 cm. long with mucronate apex and slightly revolute margins having serration or ciliate teeth. Flowers white, solitary, pentamerous, nodding in the leaf axil. Corolla white, ovate; calyx saucer shaped. Anthers with 4 awns, filaments pubescent. Fruit a berry, bright red, enclosed within bright red calyx.

**Part Used:** Leaves and berries.

**Folk Medicinal Uses:** The leaves and berries are used for inflammatory rheumatism, sciatica and neuralgia. It is also used for cystic and prostatic irritation. Sometimes also administered in acute gastritis and prolonged vomiting.

48. Botanical Name: *Geranium pusillum* Burm. f., Spec. Geran.

**Family:** Geraniaceae.

**Local Name:** Ratanjot

**Common Name:** American cranesbill.

**Description:** Perennial growing to 60 cm. has deeply cleft leaves, pink- purple flowers and beak-shaped fruit. Plate # 47.

**Part Used:** Roots

**Folk Medicinal Uses:** Juice of the plant is used as astringent, particularly used in eye sore. The root is effectively used for irritable bowel syndrome, haemorrhoids, and inflammation of the uterus. The plant is also used as fodder.

49. Botanical Name: *Hyoscyamus niger*. Linn.

**Family:** Solanaceae.

**Local Name:** Ajwain Khurasani

**Common Name:** Henbane.

**Description:** An erect, biennial or annual herb 30-80 cm high, villous. Viscid and with a disagreeable, heavy odour. Stem robust. 0.3-0.9 m. Basal leaves spreading, petiolate, oblong-ovate, 15-20 cm coarsely sinuate-toothed. The cauline leaves smaller, sessile, clasping, oval-oblong, sinuate, pinnatifid; lobes irregular, triangular,

lanceolate. Flowers in terminal, scorpioid cymes, or axillary, nearly entirely sessile; June. Calyx tubular-campanulate, segments 5, mucronate, persistent, accrete, Corolla infundibular, 5-lobed, irregular, dirty yellow veined with violet, the throat purplish-black. Stamens 5 barely exerted; ovary 2-celled. Fruit a capsule, enclosed in the persistent and enlarged calyx. Seeds small, compressed nearly ovoid, slightly reniform, 1 mm in diameter, brownish-gray, surface reticulate. Plate # 48.

**Part Used:** Seeds.

**Folk Medicinal Uses:** It is especially valuable as nervous sedative. It is used in cases of sleeplessness and nervous depressions. The seeds are used in gastric or intestinal cramps, diarrhoea, neuralgia, cough, hysteria, skin inflammations and boils. It is also used in veterinary practices as urinary sedative.

50. Botanical Name: *Hypericum perforatum* L.Sp.Pl.

**Family:** Hypericaceae.

**Local Name:** Kasni

**Common Name:** St. John's Wort.

**Description:** A rhizomatous perennial herb up to 3 ft. high; stem 2-edged; leaves opposite, sessile, oblong, ovate or linear, black dotted; flowers yellow, in terminal corymbose cymes; capsule ovoid; seeds many small. Plate # 49.

**Part Used:** Flowers

**Folk Medicinal Uses:** The flowers are used as antidepressant, antispasmodic, astringent and sedative. The flowers are used for relieving body pains. The plant is also used as fuel wood.

**Plate # 48:** *Hyoscyamus niger* L.

**Plate # 49:** *Hypericum perforatum* L.

**Plate # 50: *Indigofera heterantha* Wall ex Brand.**

**Plate # 51: *Juniperus communis* L.**

**Plate # 52: *Jasminum humile* L.**

**Plate # 53: *Lonicera quinquelocularis* Hardw.**

51. Botanical Name: *Indigofera hebeptala* Bth. ex. Baker in FBI 2.

**Family:** Papilionaceae

**Local Name:** Torki

**Common Name:** Indian Indigo.

**Description:** A branching shrub up to 2 m high, leaves with 7-13 leaflets, green when fresh and grayish back on drying, tender branches bluish red in color, flowers many in nearly sessile lax spicate racemes which are much shorter than the leaves, red of pink fruits cylindric pods, pale greenish grey when young and dark brown on ripening with 10-12 seeds. Plate # 50.

**Part Used:** Whole plant, flowers

**Folk Medicinal Uses:** The roots stem and leaves are considered to be laxative, thermogenic, bitter, expectorant, anthelmintic, tonic and diuretic. They are used in chronic bronchitis, asthma, ulcers and skin diseases. An extract of plant is also used for epilepsy and neuropathy.

The plants are also used as fuel wood and fodder.

52. Botanical Name: *Juglans regia* Linn.

**Family:** Juglandaceae

**Local Name:** Akhrot, Khor

**Common Name:** Common walnut

**Description:** A large deciduous monoecious tree with tomentose shoots; bark grey, longitudinally fissured; leaves alternate, imparipinnate; leaflets entire, aromatic; flowers small, yellowish green. Male in pendulous slender catkins, female in 1-3 flowered terminal catkins; fruits drupes, 5 cm long with leathery exocarp, woody wrinkled, hard endocarp enclosing 4-lobed, corrugated, oily, edible seeds.

**Part Used:** Leaves, bark and fruit.

**Folk Medicinal Uses:** Leaves are considered astringent, tonic and anthelmintic. The leaves and bark are used for cleaning teeth and mouth ulcers. The fruit is considered to enhance mental ability and a remedy for joint pains. The fruits are used as emollient, thermogenic, aphrodisiac, tonic and carminative. The plant is considered as a good source of dye, fuel wood and furniture making.



53. Botanical Name: *Juniperus communis* Linn.

**Family:** Pinaceae

**Local Name:** Chuch, Petthar.

**Common Name:** Common Juniper.

**Description:** A dense shrub, more or less procumbent. Leaves 5-13 mm. long, in whorls of 3, linear, sharply pointed, spreading nearly at right angles from the branchlets, convex on the back, concave and glaucous, bluish-whish on upper surface with a pale line running the whole surface, jointed at the base and continued down the stem with a large gland on the decurrent portion. Cones unisexual, axillary. Fruit 7.5-10 mm. long, subglobose, fleshy, blue-black, glaucous; seeds 1-3. Plate # 51.

**Part Used:** Ripe berries

**Folk Medicinal Uses:** The ripe berries are used for catarrhal inflammation and dropsy/ suppression of urine. The oil obtained from the fruit is carminative, stimulant and diuretic it has also been employed in mucous discharges such as gonorrhoea, gleet and leucorrhoea. Dried leaves and stems used as fuel. Wood obtained from plant is used for various purposes.

54. Botanical Name: *Jasminum officinale* Linn.

**Family:** Oleaceae

**Local Name:** Chameli.

**Common Name:** Common Jasmine.

**Description:** It is a large scandent and glabrous shrub with striate branches. The leaves are opposite and imparipinnate; leaflets are 7-11, rhomboid-oblong, the lowest larger than uppermost pair. The flowers are fragrant, white and tinged with purple outside and are borne in divaricate cymes. The corolla is 5-lobed, elliptic and obtuse or acute. The fruits are didymous and ovoid berries. The seeds are erect and ex albuminous. Plate # 52.

Flowering and fruiting is during March-August.

**Part Used:** Flower, roots and leaves.

**Folk Medicinal Uses:** The flowers are used as cooling agents and are used externally in headache and skin diseases and in weak eyes. The leaves are astringent and they are chewed for ulcerations or eruptions in the mouth. The plant is grown for ornamental purposes and is also eaten by grazing animals.

55. Botanical Name: *Lantana camara* Linn

**Family:** Verbenaceae

**Local Name:** Gendi

**Common Name:** Wild sage

**Description:** It is a straggling aromatic shrub and pubescent or scabrous with about 1.2-4m height. The branches are 4-angled and armed with recurved prickles, the leaves are opposite, simple, ovate, crenate and acute or shortly acuminate. The flowers are white light purple or yellow and are borne in pedunculate and short capitate spikes, the calyx is minute. The corolla tube is curved spreading horizontally and divided into 4 unequal lobes. Stamens are 4 and didynamous. The ovary is 2-celled with one ovule in each cell. The fruits are glabrous and globose durpes bearing and outer thin epicarp, pulpy mesocarp and hard inner endocarp, about 0.5 cm in diameter and shining black when ripe. The seeds are 2-celled.

Flowering and fruiting can be seen almost throughout the year.

**Part Used:** Aerial parts of the plant.

**Folk Medicinal Uses:** The plant is considered as antiseptic, antispasmodic, carminative and diaphoretic. The decoction of plant is given in tetanus, rheumatism and malaria. The bruised leaves are used to promote healing of wounds.

56. Botanical Name: *Lonicera hispida* Pall.

**Family:** Caprifoliaceae

**Local Name:** Loony

**Common Name:** Japenese honey suckle

**Description:** A twining evergreen plant, pubescent. Stems brownish-red, leaves opposite tomentose. Flowers in axillary pedunculate pairs often crossed at the end of branchlets, fragrant, white when blooming, then changing to yellow. Berry globose, black when ripe. Plate # 53.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The leaf-bearing stem is considered antibacterial and antiallergic. It is recommended in the treatment of boils, dysentery, syphilis and rheumatism. The plant is also used as fodder.

57. Botanical Name: *Luffa cylindrica* auct. Pl. non (Linn) Roem

**Family:** Cucurbitaceae

**Local Name:** Ghiatori

**Common Name:** Sponge gourd

**Description:** It is an annual climbing herb with 5 angular stem and 3- fid tendrils. Leaves are 10-25 cm across. 5-lobed, cordate – suborbicular, dentate and acuminate and petioles are 5.0cm long. The flowers are monoecious and white or yellow in color. Male flowers are in racemes; pedicel is short and each with a small ovate entire and viscid bract; calyx is acute, corolla long and stamens 5. Female flowers are solitary; calyx is aglandular. Fruits are ovoid - ellipsoid to cylindrical, beaked and 30-60cm long. Seeds are black, smooth or slightly tubercled, about 0.9 cm long and narrowly winged.

Flowering and fruiting is during August-December.

**Part Used:** Seeds, fruit and leaves.

**Folk Medicinal Uses:** The oil obtained from seeds is used in skin diseases. Tender fruits are considered as diuretic and the ripe fruit are used after burning and pulverizing as carminative and anthelmintic. The juice of fruit is used as purgative. The plant is used as vegetable.

58. Botanical Name: *Melia azedarach* Linn

**Family:** Meliaceae

**Local Name:** Persian lilac

**Description:** The plant is a moderate sized tree up to 14m in height with short erect trunk and broad crown. The leaves are 22.0-40cm long bi pinnate and sometimes tripinnate; leaflets are 3-12 opposite, sub opposite or alternate, ovate or lanceolate, serrate and acuminate with oblique base. The flowers are lilac, honey scented and white tinged with violet. Fruits are 1.25-1.75 cm across 5-celled and 5-seeded drupes.

Flowering is during February march and fruiting in October December.

**Part Used:** Fruits, seeds, flowers, leaves, bark, gum and wood extract.

**Folk Medicinal Uses:** The fruits are considered tonic and are eaten. The oil obtained from the seeds is applied locally in skin diseases. The flowers and leaves are applied in the form of a poultice to relieve nervous headache. The wood extract of the plant is given in asthma and the stem bark is used in ascariasis and is also applied externally in cutaneous affections.

59. Botanical Name: *Mentha longifolia* (Linn.) Huds.

**Family:** Labiatae

**Local Name:** Jungli pudina

**Common Name:** Horse mint

**Description:** It is an erect-ascending and aromatic perennial herb. The leaves are ovate-lanceolate with a rounded base, acute, serrate and gland punctuate. The verticillasters are combined into an uninterrupted, dense and spicate inflorescence. The calyx is glabrous and gland-punctuate. The corolla is white and lobes gland-punctuate.

Flowering is during July - October, but fruiting not seen.

**Part Used:** Leaves and flowers.

**Folk Medicinal Uses:** The leaves and flowers are used as carminative and stimulant. An infusion of leaves is used as cooling medicine in fever. The flowers are used as appetizer. The herb is an important spice.

60. Botanical Name: *Mentha spicata* Linn

**Family:** Labiatae

**Local Name:** Pudinaa

**Common Name:** Garden mint

**Description:** It is an erect- ascending, aromatic and perennial herb about 30-60 cm high. Leaves are coarse, ovate-lanceolate, acute and toothed. Flowers are violet coloured and are arranged in terminal spikes.

Flowering and fruiting is during July-December.

**Part Used:** Whole plant and leaves.

**Folk Medicinal Uses:** The whole plant is considered stimulant, carminative and antiseptic. A sweet infusion from its leaves is given in infantile stomach disorders, hysteria and in vomiting during pregnancy. The herb is an important spice.

61. Botanical Name: *Morus alba* Linn

**Family:** Moraceae.

**Local Name:** Shiatut

**Common Name:** White mulberry.

**Description:** It is a middle-sized deciduous tree with pubescent shoots. Leaves are 5.0-7.5 cm long, ovate to lanceolate, acute or acuminate, dentate or serrate, sometimes lobed, membranous and glabrous above and slightly pubescent along the midrib and

nerves beneath with 3-nerved and rounded or truncate base. The flowers are monoecious. Male flowers are in 1.2-5.7 cm long spikes and possess 4 sepals. Female flowers are in short and ovoid spikes with short arid free styles. The fruits are white or red and sweet compound berries.

Flowering is in February-March and fruiting during May-June.

**Part Used:** Fruit bark, leaves and root.

**Folk Medicinal Uses:** The fruits are eaten as refrigerant and are used for sore-throat and dyspepsia. The bark is used as purgative and vermifuge. The leaves are diaphoretic and roots are anthelmintic. The leaves are used as fodder and wood as fuel wood. Wood is also used for making agricultural tools.

62. Botanical Name: *Nepeta cataria* L. Sp. Pl

**Family:** Lamiaceae

**Local Name:** Cataria

**Common Name:** Catnip

**Description:** Downy, aromatic perennial growing to 1 m. Has heart-shaped, grey-green leaves and whorls of white flowers with purple spots.

**Part Used:** Aerial parts.

**Folk Medicinal Uses:** It is used as sedative and as it stimulates sweating, reduces fever. It is also administered in colds, flu, and fever in children. It is considered effective in treating headaches related to digestive problems, rheumatism and arthritis.

63. Botanical Name: *Nerium indicum* Mill.

**Family:** Apocynaceae.

**Local Name:** Kaner.

**Common Name:** Indian oleander.

**Description:** It is a large glabrous, evergreen and erect shrub with milky juice and about 5.0 m height. Leaves are linear-lanceolate, thickly coriaceous, midrib stout, dark green and shining above. The flowers are rosy or white and sweet scented; appendages of the corolla cleft into 4-7 linear segments. The fruits are cylindrical, long, straight and hard follicles. The seeds are 1.2 cm long and tipped with a coma of light brown hairs.

Flowering and fruiting is almost throughout the year but mostly during April-June.

**Part Used:** Leaves, root and root bark.

**Folk Medicinal Uses:** Decoction of leaves is used externally as anti-inflammatory agent and also applied on syphilitic ulcers and the fresh juice of young leaves is used in ophthalmia. The paste of leaves with oil of its root bark is used in ring worm and other skin diseases.

64. Botanical Name: *Olea ferruginea* Royle I 11. Bot. Himal.

**Family:** Oleaceae.

**Local Name:** Kahu, Zaitun.

**Common Name:** Olive.

**Description:** Evergreen tree growing to 10 m. Has a deeply grooved grey trunk. Small leathery leaves, cluster of small greenish – white flowers and a green fruit ripening to black.

**Part Used:** Leaves fruit and oil.

**Folk Medicinal Uses:** The leaves are used to lower blood pressure and help to improve the function of circulatory system. They are also used for lowering blood pressure levels. The oil obtained from the fruit is used as rubefacient. The leaves and bark are considered astringent and bitter. The plant yields good furniture wood which is also used for making agricultural tools and fuel wood.

65. Botanical Name: *Oxalis acetosella* Linn.

**Family:** Oxalidaceae.

**Local Name:** Rakta- pushpa.

**Common Name:** Common wood sorrel.

**Description:** It is a perennial pubescent and stemless herb. The leaves are radical and 2.5 -5.0cm across; leaflets are obovate and faintly notched. The flowers are pink-purplish and are solitary on long axillary inflorescence. The fruits are 0.8 cm long and ovoid capsules. The seeds are 2-3 in each cell.

Flowering and fruiting is almost through out the year, mostly during April- June.

**Part Used:** Whole plant and leaves.

**Folk Medicinal Uses:** The plant is considered refrigerant, antiscorbutic and diuretic and is used in liver and digestive disorders, urinary affections and haemorrhage.

66. Botanical Name: *Oxalis corniculata* Linn.

**Family:** Oxalidaceae.

**Local Name:** Amrulsak

**Common Name:** Indian sorrel.

**Description:** It is an appressed- pubescent, diffuse and creeping perennial herb with ascending or suberect branches. The leaves are delicately trifoliate, long petioled and stipulate; leaflets are obcordate. The flowers are yellow and are borne in 2-8 flowered umbel form inflorescence. The fruits are oblong capsules narrowed to the apex, 5-angled, 1.5 -2.0 cm long and pubescent. The seeds are many, transversely ribbed 0.1cm across and dark brown.

Flowering and fruiting is almost throughout the year chiefly during July- October.

**Part Used:** Whole plant and leaves.

**Folk Medicinal Uses:** The fresh juice of plant is used in anemia, dyspepsia, piles and tymparities. The leaves are applied externally on inflammatory swellings as poultice.

67. Botanical Name: *Paeonia emodi* Wall.

**Family:** Ranunculaceae.

**Local Name:** Mamekh.

**Common Name:** Peony.

**Description:** A perennial herb up to 1 m. high. Stem stout, 1-headed. Leaves dark above, pale beneath, the lower divided in 3 leaflets, each of which again divides to form 15 to 20 oblong-lanceolate lobes, 2.5 cm. or more broad; sepals outer leaflike; petals dark crimson 3-5 cm. long, roots composed of several round, oblong knob like tubers which hang below each other, connected by strings. Plate # 54.

**Part Used:** Roots.

**Folk Medicinal Uses:** The roots and tubers are used in uterine and nervous diseases and the seeds are used as purgative and emetic.

**Plate # 54: *Paeonia emodi* Wall ex Hk. f.**

**Plate # 55: *Pinus wallichiana* A.B.Jackson.**



**Plate # 56: *Podophyllum emodi* Wall.**

**Plate # 57: *Punica granatum* L.**

68. Botanical Name: *Perilla frutescens* (Linn.) Britt.

**Family:** Labiatae.

**Local Name:** Bhanjira

**Description:** It is an annual erect, branched and strongly aromatic herb. Stems are 4-gonous and patently white hairy. Leaves are stalked, ovate or orbicular with a cuneate or rounded base, acuminate, crenate -dentate, nearly glabrous except hairy nerves on the lower surface and about 5.0 - 10.0 cm x 3.0 - 10.0 cm. Verticillasters are combined into racemes. The bracts are lanceolate. Calyx is bell-shaped and hairy without; upper lip ovate and obtuse. Corolla is white and is hairy outside and on the mouth. Stamens are 4 and as long as the corolla. Nutlets are ovoid, reddish brown, glabrous and about 0.1 - 0.12 cm long.

Flowering and fruting is during August - December.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The plant is considered sedative, antispasmodic and diaphoretic and is used in uterine problems. The leaves and flowers are used for flavouring purposes.

69. Botanical Name: *Phyllanthus niruri* sensu Hook. f.

**Family:** Euphorbiaceae.

**Local Name:** Bhuian anvala

**Description:** It is an erect and glabrous annual herb about 10-30 cm high. The leaves are subsessile, elliptic-oblong or linear-oblong, dark green above, glaucous on the lower surface, 0.5-2.0 cm x 0.2-0.5 cm. The flowers are axillary and yellowish or whitish. The male flowers are 1-3, stamens 3, disk-lobes 6, glandular. The female flowers are solitary, style free, appressed to the ovary. The fruits are depressed, globose, smooth capsules, 0.2-0.3 cm across. The seeds are trigonous, brown with 6-7 straight longitudinal ribs.

Flowering and fruiting is during May-September.

**Part Used:** Whole plant, leaves, shoot and root.

**Folk Medicinal Uses:** The plant is useful in dropsy, gastro- intestinal problems as colic diarrhoea, dysentery, dyspepsia, gonorrhoea. The decoction of whole plant is given in jaundice.

70. Botanical Name: *Pinus roxburgii* Sarg.

**Family:** Pinaceae.

**Local Name:** Chir

**Common Name:** Chir Pine

**Description:** It is a large tree with symmetrical branches high up on the trunk and forming a round head of light foliage and reaching up to 30 m in height. Normally it is evergreen but becomes completely or partially deciduous in dry season. The bark is dark grey and deeply fissured. The leaves are 20-30cm long arranged in clusters of three finely toothed and light green. Male flowers are arranged in the form of cones, which are 1.5cm long. Female cones are 10.0 to 20.0 cm x 7.5- 12.5 cm, ovoid and are solitary or 2-5 together and woody. The seed without wings are 0.7-1.3cm x 0.5x0.6 cm and winged; wings are membranous and long. Plate # 55.

The cone formation is started in January, next year during June- July its cones become old and in next summer burst and seeds are shed out. About 26 months are spared to complete the whole process. The dry cones remain long on the tree.

**Part Used:** The wood, resin and oil.

**Folk Medicinal Uses:** The wood is stimulant and is used in cough, fainting and ulcerations. The wood is said to be beneficial in snakebite and scorpion stings also. The oleoresin is considered to be anodyne and diuretic and is beneficial in coryza and oedema. Externally it is used as a rubefacient in rheumatic affections and for deep seated inflammations, especially of abdomen and applied as plaster to buboes and abscesses for suppuration.

The oil from the wood mixed with mustard oil is rubbed in rheumatic pain. Its vapors relieve the spasm of whooping cough and asthma and internally it is given in indigestion loss of appetite and intestinal worms. Its seeds are edible; wood is used for construction purposes and fuel wood. Resin is used to remove unwanted hairs from the body. Bark yields tannins, which are used for dyeing leather.

71. Botanical Name: *Plantago ovata* forsk.

**Family:** Plantaginaceae

**Local Name:** Eshopgol, Sat, Isabgol.

**Common Name:** Ispaghula, Blond psyllium

**Description:** Perennial herb with radical leaves. Leaves all basal, cauline, ovate, 5-15 cm long, 3-8 cm wide, obtuse, with several parallel nerves; petioles as long as leaves, dilated at base. Scapes 10-50 cm long. Spike solitary, densely many-flowered,

glabrous. Flowers bisexual, small, not showy, calyx 4-parted; corolla 4-lobed, scarious; stamens 4, exerted; ovary superior. Fruit a capsule enclosed by calyx.

**Part Used:** Seeds.

**Folk Medicinal Uses:** The husk of seeds is taken as serbeat for dysentery. It is much valued for digestive ailments. The plant is also used as a fodder.

72. Botanical Name: *Podophyllum emodi* Wall.

**Family:** Beriberidaceae

**Local Name:** Bankakri, Gul -Kakru

**Common Name:** May apple

**Description:** An erect herb up to 1 m. in height; leaves large green, up to 30 cm. across, 5 lobed, the lobes oblong and usually 2-cleft and denate at apex; flowering stems with usually similar leaves; flowers white solitary, nodding, borne on the fork between the 2 leaves; sepals-6 petaloid, shed early; petals 6-9, longer than the sepals; stamens twice as many as pistils; fruit ovoid, yellowish, 2.5-5 cm. long, edible.

Plate # 56.

**Part Used:** Rhizome and seeds.

**Folk Medicinal Uses:** Resin obtained from seeds is used as a purgative and cholagogus. Rhizomes are commonly used for complaints of rectum and liver. The plant is also used as a fodder.

73. Botanical Name: *Polygonum barbatum* Linn

**Family:** Polygonaceae

**Local Name:** Jal bahar

**Description:** It is an erect and glabrous annual herb. The leaves are 10.0 - 15.0 cm x 1.0 - 2.0 cm, linear-lanceolate, acute or acuminate with a rounded or subcordate base and glabrous. The racemes are erect, slender and about 5.0-10.0 cm long.

Flowering and fruiting is during August-December.

**Part Used:** Seeds, shoots and roots.

**Folk Medicinal Uses:** The seeds are considered as tonic, purgative and emetic and are used to relieve pains of colic. A decoction of shorts is used as a stimulating wash of ulcers. Roots are used as cooling agents and astringent. The plant is also used as a fish poison.

74. Botanical Name: *Potentilla collettiana* Aitch. & Hemsl., J.L.S.

**Family:** Rosaceae.

**Local Name:** Chitti jari

**Common Name:** Silverweed.

**Description:** A slender, perennial herb, up to 30 cm high; Root stocks very short, slender; leavaes pinnate; stolons up to 30 cm. long arise from the leaf axils; leaf lets 12-24, linear-oblong to narrowly lanceolate; flowers large, solitary, golden yellow, achenes numerous, smooth.

Port used: Whole plant and roots.

**Folk Medicinal Uses:** It is used as astringent and effective gargle for sore throat. Applied externally as a lotion and ointment on burns and wounds.

75. Botanical Name: *Primula denticulata* Sm. Exot. Bot.

**Family:** Primulaceae

**Local Name:** Zanghali surma

**Common Name:** Cowslip

**Description:** Hairy perennial growing to 10 cm. Has a basal rosette of slightly rough oblong leaves. Stems bear clusters of bright yellow, bell-shaped flowers.

**Part Used:** Flowers leaves & root.

**Folk Medicinal Uses:** The root is used as expectorant. It is used in chronic coughs especially those associated with chronic bronchitis and catarrhal congestion. The leaves also carry the similar properties but are slightly weaker in action. The flowers are believed to be sedative and are recommended for over activity and sleeplessness particularly in children.

76. Botanical Name: *Punica granatum* Linn.

**Family:** Punicaceae

**Local Name:** Anardana, Daruna

**Common Name:** Pomegranate

**Description:** It is a glabrous and deciduous shrub or small tree with dark grey bark. Leaves are opposite or sub opposite, often fascicled on short petiole, oblong or obovate and 2.5-6.0 cm long. The flowers are terminal or axillary, solitary, large and showy and orange red colored. Tthe calyx is cuoriaceous and persistent; prolonged above the ovary and their free part companulate. Petals are 1.2-2.5cm long, thin and wrinkled. Ovary is inferior. The fruits are large; globe 5.0-8.0 cm across, crowned by

somewhat tubular limb of the calyx and indehiscent with red pulp and juicy. The seeds are angular with coriaceous testa. Plate number 57.

Flowering is in April- May and fruiting during June- August, but flowering and fruiting both may occur at different seasons also.

**Part Used:** Leaves, bark, fruit and flowers.

**Folk Medicinal Uses:** The green leaves are made into a paste and are applied on eyes for conjunctivitis and their juice is given in dysentery. The bark of root and stem is considered astringent and anthelmintic. Fruit is used as refrigerant because of its cooling effect. The pulp and seed are stomachic and are also used as laxative. The flower buds are used in bronchitis. Fruit is edible. Dyes are extracted from it. Also used as fuel wood and foliage is given to cattle as fodder.

77. Botanical Name: *Pyrus communis* Linn.

**Family:** Rosaceae

**Local Name:** Nashpati

**Common Name:** Pear tree

**Description:** It is a moderate sized tree. The leaves are oblong or ovate acute and entire or slightly crenulate; petiole is slender and long. The flowers are white and about 2.5cm across. The calyx lobes are persistent. The petals are obovate. The fruits are pyriform or sub-globose pomes and about 2.5-5.0 cm in diameter. Plate # 58.

Flowering is during March – April and fruiting in July- September.

**Part Used:** Fruit

**Folk Medicinal Uses:** The fruit is astringent, febrifuge and sedative. On account of low sucrose content, diabetic persons eat the fruit. The fruit is also used as a remedy to maintain blood pressure. The plant is used as a fodder. Wood is used for fuel and for making small agricultural tools.

78. Botanical Name: *Quercus baloot* Griffith Itin.

**Family:** Fagaceae

**Local Name:** Shah Baloot/ Reen

**Common Name:** Common Oak.

**Description:** Slow growing, long-lived deciduous tree reaching 45m. Has deeply lobed leaves, long catkins and green to brown fruit.

**Part Used:** Bark, galls and wood.

**Folk Medicinal Uses:** Decoction of bark is used as a gargle to treat sore throat and tonsillitis. It is also applied as a wash lotion or ointment to treat haemorrhoids, burns and other skin problems. The wood is used for construction purposes and foliage for fodder. Also used as fuel wood.

79. Botanical Name: *Ricinus communis* Linn.

**Family:** Euphorbiaceae

**Local Name:** Arand.

**Common Name:** Castor.

**Description:** It is a tall glabrous and glaucous annual shrub reaching a height up to 4.0 m. Leaves are palmately 7-many lobed; lobes are oblong to linear, acute or acuminate and gland-serrated. The flowers are large and monoecious in terminal subpanicked racemes. Male flowers: calyx membranous, splitting valvately into 3-5 segments, the stamens are many in a dense globose head of branched filaments and anthers. Female flowers: calyx is spathaceous and caducous, style spreading and highly coloured and ovary 3-celled. Fruits are capsules of 3-2-valved cocci, globosely oblong and smooth or echinate. The seeds are oblong, smooth and mottled.

Flowering and fruiting is during the greater part of the year, chiefly in winter.

**Part Used:** Seeds, leaves and root bark.

**Folk Medicinal Uses:** The seeds are used as purgative and counter-irritant and are used in scorpion stings. The oil derived from the seeds is known as castor oil and is used for various purposes. Externally the leaves are applied to boils and sores in the form of a poultice. The root bark is considered emetic and is used in skin diseases.

80. Botanical Name: *Rubus niveus* Thunb

**Family:** Rosaceae

**Local Name:** Kala hinsalu

**Common Name:** Mysore raspberry

**Description:** The plant is a spreading shrub with long branches. The leaves are 5-foliolate and 7.5-25.0cm long, leaflets are 2.5 -7.5cm long ovate, elliptic or ovate lanceolate, acutely toothed or serrate, glabrous or silky above and densely white tomentose beneath, terminal often lobed and lateral nerves are close, straight and strong beneath. The flowers are 0.3-0.8cm across in terminal and axillary simple or panicked corymbs. The peduncles are 2.5-5.0cm. Calyx is densely wooly, lobes ovate or ovate-lanceolate. Petals are red, round or obovate and shorter than calyx lobes. The

carpels are many and tomentose. The fruits are globose drupes and black when ripe. Plate # 59. Flowering is during April –May and fruiting in August-September.

**Part Used:** Leaves and roots.

**Folk Medicinal Uses:** The leaves are used for relaxing uterus muscles and are also given in painful periods to women. An infusion of leaves is also used in bowel complaints. The roots are used in colic pains. Also used as a hedge plant and fodder, the fruit is eaten.

81. Botanical Name: *Rumex hastatus* D.Don.

**Family:** Polygonaceae

**Local Name:** Hullah

**Common Name:** Golden dock

**Description:** It is an annual erect herb, reaching a height up to 90cm .The leaves are lanceolate-oblong. The flowers are bisexual and are clustered at the nodes. The perianth segments are 6. Stigmas are fimbriate. The fruits are small nuts; inner sepals enlarged in fruits with hardly toothed margins. Plate # 60.

Flowering and fruiting is seen at the end of winter.

**Part Used:** Whole plant, seeds, leaves and roots.

**Folk Medicinal Uses:** The whole plant is considered cooling and antipyretic. The seeds are used as aphrodisiac and the leaves are applied to the burns. The leaves are also used to reduce itching produced by touching plants like *Urtica*. The plant is used as a condiment and is also used as folder.



**Plate # 58: *Pyrus pashia* Ham ex D,Don.**

**Plate # 59: *Rubus macilentus* Camb in Jacq.**

**Plate # 60: *Rumex hastatus* D.Don.**

**Plate # 61: *Salix denticulata* N.J.Andress. var. *hazarica* (Parker).**

**Plate # 62: *Salvia moorcroftiana* Wallich ex Benth.**

**Plate # 63: *Solanum surretense* Burm. f.**

**Plate # 64:** *Viburnum foetens* Dcne.

**Plate # 65:** *Woodfordia fruticosa* L.

82. Botanical Name: *Salix lindleyana* Wall. ex Anders.

**Family:** Salicaceae

**Local Name:** Magnun

**Common Name:** Willow

**Description:** It is a medium sized tree with long slender and pendulous branches. Leaves are 7.5-17.5cm x 0.6-1.7cm linear lanceolate, serrulate, acuminate and pubescent when young and glabrous or slightly pubescent beneath when mature. Flowers are with the leaves; male and female catkins are about 1.2-2.5cm long and are borne on short leafy peduncles. The bracts are small and pale coloured. The stamens are 2 and filaments are free and villous at the base. Capsules are glabrous. Plate # 61. Flowering is during February-March and fruiting later in summer.

**Part Used:** Leaves, bark and flowers.

**Folk Medicinal Uses:** The leaves and bark are considered astringent and tonic and are used in intermittent and remittent fevers. An infusion of the leaves is given as antipyretic and bark is also used as anthelmintic. The flowers and young branches are also used as anti-pyretics. The plant is considered a good source of fuel wood; the wood is also used for making sports and agricultural tools.

83. Botanical Name: *Salvia officinalis* L.

**Family:** Labiatae

**Local Name:** Phulgari

**Common Name:** Sage

**Description:** A hardy variable sub shrub; stem shrubby, white, woolly, 15-30 cm tall; flowering branches tomentose pubescent; leaves aromatic, entire, petiolate, oblong, base narrowed or rotund; flowers blue, purple or white, in simple racemes. Plate # 62.

**Part Used:** Leaves.

**Folk Medicinal Uses:** The leaves are used as astringent, antiseptic, aromatic, carminative, oestrogenic and tonic. The plant is also used as fodder.

84. Botanical Name: *Saussurea lappa* C.B.Clarke.

**Family:** Asteraceae

**Local Name:** Kuth

**Common Name:** Kuth, Costus

**Description:** A robust, erect perennial with a stem up to 2 m in height; keeves membranous, basal ones very large, upper ones small, irregularly thooted, basal

clasping the stems by two lobes; flowers bluish purple in axillary and terminal heads; fruits compressed, curved achenes. The roots are stout up to 60 cm long having a rough reticulated surface.

**Part Used:** Roots.

**Folk Medicinal Uses:** The roots are used in chronic and foul ulcers, cephalalgia, odontalgia, cough, asthma, bronchitis, dyspepsia, colic, cholera, leprosy, ring worm, dysentery, fever, gout and cardiopathy.

85. Botanical Name: *Scutellaria teucrifolia* Dunn, Kew Bull.

**Family:** Labiatae

**Local Name:** Dolaba

**Common Name:** Skullcap

**Description:** A perennial growing to 60 cm, with an erect many branched stem and pink to blue flowers.

**Part Used:** Seeds.

**Folk Medicinal Uses:** The plant is considered as sedative, nerve tonic, antispasmodic and mild bitter.

86. Botanical Name: *Silybum marianum* (L.) Gaertner

**Family:** Asteraceae

**Local Name:** Kandiari

**Common Name:** Milk thistle

**Description:** Erect prickly herb with leafy stem. Leaves variegated green, white, margin spiny, dentate, upper ones amplexicaul. Flower heads solitary, discoid, receptacle flat 4-5 cm broad, subtended by involucre spines 10-20 mm long; pappus white, corolla 2-lipped and pink-purple.

**Part Used:** Leaves, flower heads and seed,

**Folk Medicinal Uses:** The herb is used for intermittent fevers, dropsy and uterine troubles. Its decoction is said to be beneficial as an external application in cancer. Leaves are used as aperient and sudorific. Flower heads are used in diabetes.

87. Botanical Name: *Skimmia laureola* (DC) Sieb. & Zucc. ex Walp

**Family:** Rutaceae

**Local Name:** Nera

**Common Name:** Skimmia

**Description:** A common under shrub. The leaves have strong aromatic smell. The plant is grown for handsome foliage and red berries.

**Part Used:** Leaves

**Folk Medicinal Uses:** The leaves when crushed have an orange like smell and are burned near small- pox patients with a view of curative effects. It is also used as an insect repellent, for the removal of evils and as a preservative in cereal storage.

88. Botanical Name: *Solanum surattense* Burm. f.

**Family:** Solanaceae

**Local Name:** Bhatkatiya

**Common Name:** Yellow berried nightshade.

**Description:** It is an annual perennial prickly diffuse herb. Stems are aculeate with 0.5-2.5 cm long straight prickles and glabrous except stellate hairy young parts. The leaves are ovate or elliptic, sinuate or subpinnatifid and glabrescent with many straight spines. The flowers are in 2-6-flowered cymose inflorescence. The calyx is 0.6cm long, aculeate and stellate hairy. The corolla is blue and lobes shallow. The fruits are globose and glabrous berries about 1.5 cm long and yellow when ripe. The seeds are 0.2cm x 0.1cm, and glabrous. Plate # 63.

Flowering and fruiting is during March – June.

**Part Used:** Whole plant, fruit, flowers, seeds, leaves, stem and root.

**Folk Medicinal Uses:** Whole plant is used in bronchitis, cough, dropsy, and constipation. A decoction of plant is given in gonorrhoea and to promote conception. The fruits, flowers and stems are bitter and carminative and used in ignipeptiditis. The fine powder of the fruit with honey is used for chronic coughs of the children and is also useful in sore throat. The roots are considered expectorant, diuretic, antiemetic, and are used for cough and pain of chest. The plant is also used in veterinary medicines.

89. Botanical Name: *Solanum tuberosum* Linn.

**Family:** Solanaeae

**Local Name:** Alu

**Common Name:** Potato

**Description:** It is an erect ascending and much branched bushy herb. The stem is under ground tuber and aerial generally winged. Leaves are interruptedly imparipinnate with each pair of larger leaflets; leaflets are usually 5-9 and ovate-

oblong. The flowers are white and are borne in 7-20-flowered, terminal and lateral cymose corymbs. The calyx lobes are linear lanceolate. The corolla is rotate. Fruits are globose berries which are 2.4 cm across. Seeds are oval shaped.

Flowering and fruiting is during winter.

**Part Used:** Leaves and tubers.

**Folk Medicinal Uses:** An extract of leaves is used as antispasmodic in chronic coughs. The tubers are used as antiscorbutic, diuretic, nutritive and sedative. The tubers are ground into a paste and are applied as plasters to burns caused by fire with much benefit. The plant is an important vegetable crop of the area. The leaves are used as fodder.

90. Botanical Name: *Tagetes erecta* Linn

**Family:** Asteraceae

**Local Name:** Genda

**Common Name:** African marigold

**Description:** It is an erect simple or sparingly branched and aromatic annual herb. The leaves are opposite or upper ones alternate and pinnate; leaflets are lanceolate-oblong and acute with yellow glands along their margins. Heads are orange yellow and solitary on 4.0-15.0 cm long pedicels which are thickened at the top. The involucre is 5-10-dentate at the apex. The achenes are appressed-hairy on the ribs. Flowering and fruiting can be seen throughout the year chiefly during winter.

**Part Used:** Flowers, leaves, roots and whole plant.

**Folk Medicinal Uses:** The flowers are used externally in eye diseases and for unhealthy ulcers and internally their juice is given in bleeding piles. The flowers are used for the purification of blood. An infusion of leaves and flowers is used as carminative, diuretic and vermifuge.

91. Botanical Name: *Tanacetum parthenium* L.

**Family:** Asteraceae.

**Local Name:** Daudi

**Common Name:** Fever few.

**Description:** An herbaceous perennial growing to 60 cm, with numerous daisy-like flowerheads.

**Part Used:** Aerial parts.



**Folk Medicinal Uses:** It is used as analgesic, anti-rheumatic and bitter. The plant is also used to reduce fever and to promote menstrual flow.

92. Botanical Name: *Taraxacum officinale* Weber.

**Family:** Asteraceae.

**Local Name:** Hundh, Dudhal.

**Common Name:** Common dandelion.

**Description:** A perennial herb with thick tap root and abundant milky juice in all parts; leaves radical, sessile, variable in shape, narrowly oblong, irregularly pinnatifid, lobes linear or triangular, toothed; flowers yellow in ligulate heads; fruits glabrous achenes, flattened, ribbed minutely, spiny on the upper half, crowned with white pappus hairs.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The plant is used in chronic ulcers, diabetes, tuberculosis, dyspepsia, colic, constipation, nephropathy, fever, skin diseases, leprosy, jaundice and hepatic diseases. The drug is used for disorders of kidney and liver .

93. Botanical Name: *Taxus baccata* Linn.

**Family:** Taxaceae.

**Local Name:** Birmi

**Common Name:** Yew

**Description:** An evergreen tree up to 18m. in height, usually with a short trunk, up to 1 m. in diameter. Bark reddish, flaky, deeply longitudinally fissured in old trees. Branches spreading, forming a broad, low head, branchlets somewhat pendulous. Leaves 2-ranked, linear usually falcate, shortly acuminate with a prominent mid-rib, dark green above, pale beneath 2-3.2 cm. long or shorter in some varieties. Male flowers are borne in a small catkin with bracts, while the female flowers take the form of fleshy apical disc with a few scales at its base. The fruit is red, fleshy, cup-like encasing a single seed. Seeds brown, 0.60 cm. long.

**Part Used:** Twigs and leaves.

**Folk Medicinal Uses:** It is used as a remedy for pustular diseases of skin and night sweats, gout and chronic rheumatism. The plant is used as antispasmodic and emmenagogue. It is also used in hysteria, epilepsy, and headache. Wood is used for construction purposes, furniture, agricultural tools and fuel. Foliage is used as fodder.

94. Botanical Name: *Thymus serpyllum* Linn.

**Family:** Labiatae

**Local Name:** Banajwain

**Common Name:** Wild thyme

**Description:** The plant is a variable, aromatic, hairy, prostrate and evergreen perennial herb; 10-25 cm high and is one of the most effective ground covers, forming dense mats. Rootstock is woody and the leaves are small, elliptic or oblong-ovate or lanceolate, 6-15 mm long, sub sessile and glandular. Flowers are polygamous pink, in globose, terminal whorls. The male flowers are larger in size. The plant is pungent in taste.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** A durg for fever is made from the plant. It is also used in eye and stomach diseases. The herb is considered antispasmodic, antiseptic, expectorant, carminative, anthelmintic and stimulant. The plant is also used in veterinary medicines.

95. Botanical Name: *Tussilago farfara* Linn.

**Family:** Asteraceae

**Local Name:** Sassi

**Common Name:** Celtsfoot

**Description:** A white-wooly scapiferous herb with leaves radical, slightly fragrant, long-petioled, broadly ovate-reniform cordate-orbicular, 7.5-25 cm. board, angularly lobed and toothed with red-brown teeth along the margins, palmately 5-9 nerved, appearing after flowering, white-tomentose beneath; heads bright yellow; 40 central staminate and tubular florets surrounded by about 300 pistillate florets with very narrow, bright yellow ligulate corolla having rounded apices without teeth; heterogamous with ray and disc-florets; achenes 5 to 10 ribbed; pappus soft, snow-white. Rhizomes spreading, white, horizontal with many fibrous roots; flowering branches with alternate reddish bracts. Involucre also reddish, linear, cottony, each terminating in a small dark gland.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The plant is used for asthma, bronchitis, laryngitis and chronic cough.

96. Botanical Name: *Ulmus wallichiana* Planch.

**Family:** Ulmaceae.

**Local Name:** Kain.

**Common Name:** Elm.

**Description:** Deciduous small tree. Branches well corky, young branches pubescent. Leaves alternate, simple, toothed, obovate, acute, and asymmetrical at base, 3.5-15.5 cm long, 2-9 cm. wide, course on both sides; petioles, 2-3 cm long, pubescent. Flowers inconspicuous, appearing before leaves in spring in axils of leaves. Fruit a flat, 1-celled, 1-seeded samara with the wings surrounding the nutlet and notched at apex.

**Part Used:** Bark.

**Folk Medicinal Uses:** The plant is considered antimicrobial, nematocidal and antiparasite. The bark is used in chronic diarrhoea.

97. Botanical Name: *Urtica dioica* Linn.

**Family:** Urticaceae.

**Local Name:** Bichhu buti.

**Description:** It is an erect-ascending and perennial herb with stinging hairs. Stems are slender and 4-angled about 90-120 cm long. The leaves are ovate or lanceolate, with a rounded-subcordate to truncate base, acuminate, crenate-serrate and 6.0-15.0 cm x 2.0-0.5 cm with united stipules. The flowers are monoecious in cymes. The male flowers show perianth of 4, oblong and obtuse segments and stamens 4 and female flowers are in sessile and possess 4-segmented perianth, the segments of which are unequal and rounded; outer much shorter. The fruits are compressed, ovoid-suborbicular and pale brown achenes.

Flowering is during July-August and fruiting in October-November.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** A decoction of the plant is given in fevers. The roots are used for the treatment of fractures and dislocations.

98. Botanical Name: *Valeriana wallichii* DC.

Syn: *V. jatamansi* Jones.

**Family:** Valerianaceae.

**Local Name:** Mushkbala.

**Common Name:** Indian Valerian.

**Description:** A deciduous herb, with a tuberous, short, rhizome, bearing numerous slender, fleshy tapering, pale-brown rootlets and one or more stolons. Leaves both radical and cauline, the radical being on long petioles, whereas the cauline are opposite or alternate, exstipulate and pinnatisect with 11-22 segments with clasping petioles. Basal leaves also divided into numerous segments. Leaflets sessile, lanceolate, dentate. Flowers numerous, small, white or pink, in racemes or cymes. Calyx many-toothed. Corolla 5-lobed, pink. Fruit oblong-ovate 4-ridged, 1-seeded achenes with a feathery persistent calyx. Fruits ciliate.

**Part Used:** Roots.

**Folk Medicinal Uses:** The volatile oil obtained from roots and rhizomes is used in hysterical and neurotic conditions as a sedative. The plant is used for butter making. It protects clothes against insects. Also used as fodder.

99. Botanical Name: *Verbascum thapsus* Linn.

**Family:** Scrophulariaceae.

**Local Name:** Janglia tambacu, Ban tamaku

**Common Name:** Mullein.

**Description:** Upright biennial growing to 2m. Has slightly hairy, grey-green, oval to lance-shaped leaves, and spikes of bright yellow flowers.

**Part Used:** Leaves and flowers.

**Folk Medicinal Uses:** Leaves and flowers are used as stimulants. It is a valuable remedy in phthisis. The plant is also used as narcotic and fish poison.

100. Botanical Name: *Vernonia cinerea* auct. non Less.

**Family:** Asteraceae

**Local Name:** Sahaderi

**Common Name:** Fleabane

**Description:** It is an erect or decumbent ascending and simple or much branched herb. The stems are 5.0-15.0cm long, ribbed and glandular-pubescent. The leaves are subsessile or narrowed into 0.5 – 3.0cm long petiole, obovate, elliptic-ovate or rhomboid – ovate to oblong, subacute or obtuse, subentire or repand – dentate, gland dotted beneath and 0.5 -8.0 cm x 0.3-3.5 cm. The floral heads are 20-25 flowered, on 0.3-2.0 cm long hairy peduncles and are arranged in corymbs. Flowers are purple or violet colored. Achenes are terete and appressedly hairy.

Flowering is during rainy season and fruiting in cold season.

**Part Used:** Flowers, roots, seeds and leaves.

**Folk Medicinal Uses:** Flowers are administered for conjunctivitis of eyes. These are also used in fever and rheumatism. The extract of roots is given in stomachache and diarrhoea. The seeds are used in coughs, flatulence, colic, dysuria, leucoderma, psoriasis and chronic skin problems.

101. Botanical Name: *Veronica anagallis-aquatica* Linn.

**Family:** Scrophulariaceae

**Local Name:** Titlokia

**Description:** It is annual erect or decumbent ascending herb. Stems are glabrous downwards and patently gland hairy towards the apex. The leaves are sessile, lanceolate- oblong or linear oblong, entire or serrate, usually with cordate base. The flowers are white or purple and are borne in lax and axillary racemes. The pedicels are filiform and spreading longer the linear-lanceolate bracts. The capsules are compressed, gland ciliate and 0.3x0.4 cm

Flowering and fruiting is during cold season.

**Part Used:** Whole plant.

**Folk Medicinal Uses:** The herb is considered antiscorbutic and is used in impurity of blood and sacrofulous affection, especially of the skin. The herb is applied externally for healing burns and mitigation of swollen piles. The root decoction is used for gargles.

102. Botanical Name: *Viburnum cotinifolium* D.Don, Prodr.

**Family:** Caprifoliaceae

**Local Name:** Kasar buti/ Guch

**Common Name:** True cramp bark

**Description:** A deciduous shrub 4m high. Leaves opposite, petiolate, broadly ovate, palmately veined, 3-lobed with middles lobe elongated, margins irregularly toothed or entire, apex acuminate, petiole grooved on upper surface, with stalked or sessile glands towards apex and elongated slender, glandular stipules at base. Flowers both fertile and infertile in broad and stalked compound cyme. Fertile flowers small and green; infertile large, greenish-white and marginal. Fruit scarlet, sub globular drupe with succulent sarcocarp and flat stony endocarp, enclosing a seed. Plate # 64.

**Part Used:** Fruit, leaves and stem bark,

**Folk Medicinal Uses:** The fruits are edible and the stem bark is used for complaints of uterine cramps, colic, pains, spasmodic and congestive affections of ovarian and uterine origin. The plant is also used as fuel wood and in veterinary medicine.

103. Botanical Name: *Vinca rosea* Linn.

**Family:** Apocynaceae

**Local Name:** Sadabahar

**Common Name:** Madagascar periwinkle

**Description:** It is an erect and handsome perennial herb. The leaves are oblong or oblong ovate, acute base, obtuse or rounded, apiculate, finely pubescent, deep green and 2.5-10.0 cm long. The flowers are white or deep rose colored and are borne in axillary clusters. Follicles are 2.0-3.0 cm long and patent hairy.

Flowering and fruiting is almost throughout the year.

**Part Used:** Roots, leaves and whole plant.

**Folk Medicinal Uses:** The leaves in the form of an infusion are administered in menorrhagia and their juice is good for wasp stings. The whole plant is used as hypotensive agent and is also used as sedative and tranquiliser. It is also considered a safe remedy for diabetes.

104. Botanical Name: *Viola odorata* Linn.

**Family:** Violaceae

**Local Name:** Banafsha

**Common Name:** Sweet violet

**Description:** The plant is a creeping herb, colour brownish without any stem, consists of leaves and flowers, yellow, white, blue, purplish, or pink with long filiform stalks. Roots dry, thready, fibrous pale yellow knotty, slender as thick as a quill. Leaves cordate at the base, heart shaped carpels three nerved and brown.

**Part Used:** Flower

**Folk Medicinal Uses:** Flowers and seeds are used as diaphoretic and diuretic. An infusion of the flowers is used as a mild purgative. It is also used as a fodder.

105. Botanical Name: *Woodfordia fruticosa* (Linn.) Kurz.

**Family:** Lythraceae

**Local Name:** Dhai

**Common Name:** Fire flame bush.

**Description:** It is a semi deciduous under shrub or shrub with long and spreading branches. Stems are hairy at apices. The leaves are opposite, short petioled, lanceolate-oblong and rounded subcordate at base and are grey pubescent beneath. The flowers are scarlet, tubular on slender pedicels and dilated above and are borne in axillary clusters. The fruits are ellipsoid and membranous capsules, included in the calyx. The seeds are cuneate-obovate and smooth. Plate # 65.

Flowering is during March-April and fruiting in June-July.

**Part Used:** Flowers.

**Folk Medicinal Uses:** Dried flowers are considered as astringent and are used in dysentery, impaired hepatic functions and in piles. Powder of dry flowers or their decoction is applied over foul ulcers and wounds. The plant is also used as fuel wood.

106. Botanical Name: *Zanthoxylum armatum* D.C.

Syn: *Z. alatum* Roxb.

**Family:** Rutaceae

**Local Name:** Timbar, Timar

**Common Name:** Toothache tree.

**Description:** An armed shrub or a small tree, up to 6 m in height with dense glabrous foliage and straight prickles on stems, blaze yellowish brown rapidly darkening on exposure; leaves compound, imparipinnate, rachis winged, often bearing pink prickles, leaflets 5-11, lanceolate, more or less serrate, each serrature with a pellucid gland, glabrous, dark glossy green above, pale beneath, the terminal larger than the laterals; flowers yellow or green in dense terminal or axillary panicles, polygamous; fruits reddish subglobose glabrous follicles; seeds solitary, globose, shining, black.

**Part Used:** Bark and fruit.

**Folk Medicinal Uses:** The bark and seeds are used in fever, dyspepsia and cholera. They are also used as a remedy for toothache and considered as carminative and stomachic. The fruit is also used as a spice and condiment. Bark is used for fish poisoning. The twigs are used as “miswak” for teeth and stems are utilized as walking sticks.

107. Botanical Name: *Zea mays* Linn.

**Family:** Poaceae

**Local Name:** Makai

**Common Name:** Maize

**Description:** It is a tall annual grass. The culms are erect, upto 15-300 cm tall or more and nodes glabrous or hairy. The leaves are broad, glabrous or hairy with tubercle based hairs. The ligule is 0.2-0.7 cm long. Sheaths are glabrous except hairy throat. Male spikelets are in terminal and lax panicle with pendulous branches. Lower glume is ciliate and truncate or 2-toothed. Upper glume is subacute. Lower lemma is lanceolate, hyaline, obtuse, ciliate and paleate. Upper lemma is paleate. Female spikelets are seated on the axis of cylindrical spike.

The plant is cultivated as a crop in June.

**Part Used:** Grains.

**Folk Medicinal Uses:** The grains are considered resolvent, astringent, cooling and nutritive. Grains are crushed to form flour which is the best alternative for wheat flour. Maize flour is considered most suitable diet in consumption. Styles known as maize silk are considered to be astringent, diuretic and chloretic and their decoction is given in the diseases of bladder. The foliage is used as fodder.

108. Botanical Name: *Ziziphus jujuba* Linn.

**Family:** Rhamnaceae

**Local Name:** Ber

**Common Name:** Indian jujube

**Description:** It is a small tree or large shrub, as most evergreen and usually armed with dark grey or nearly black bark. Its young branches are rusty tomentose. The leaves are elliptic ovate or suborbicular; dark green and glabrous above and densely wooly tomentose beneath. Prickles are in unequal pairs; one straight, the other is recurved. The flowers are in axillary clusters or shortly peduncled cymes. The fruits are oblong or obovoid or globose drupes and are 2-celled fleshy, glabrous, red when ripe and edible. The seeds are plano-convex. Plate # 66.

Flowering is during September-October and fruting in October-March.

**Part Used:** Leaves, bark, root, fruit and seeds.

**Folk Medicinal Uses:** The bark from the stem is considered as astringent and its powder or decoction is used in diarrhea. The juice of the root is used as purgative and externally this is applied to gout and rheumatism. The decoction of root is also given to purify the blood and to aid digestion. A paste of leaves is applied to abscess and boils. The foliage is used as fodder and wood as fuel.



**Plate # 66: *Ziziphus mauritiana* Lam.**

**Plate # 67: Author in the field collecting medicinal plant.**

**Table: - 3.10 Medicinal Plant Profile of Kaghan Valley.**

Sr. No	Name of Species	Family	Local Name	Habit
1	<i>Acacia nilotica</i>	Mimosaceae	Kikar	Tree
2	<i>Achillae millefolium</i>	Asteraceae	Gandana	Herb
3	<i>Achyranthus aspera</i>	Amaranthaceae	Lathjira	Herb
4	<i>Aconitum heterophyllum</i>	Ranunculaceae	Atis	Herb
5	<i>Adhatoda vasica</i>	Acanthaceae	Baikar	Shrub
6	<i>Adiantum capillus - veneris</i>	Adiantaceae.	Hansraj	Fern
7	<i>Aesculus indica</i>	Hippocastanaceae	Bankhor	Tree
8	<i>Ajuga bracteosa</i>	Labiatae	Khurbanti	Herb
9	<i>Albizia lebbek</i>	Mimosaceae	Siris	Tree
10	<i>Allium sativum</i>	Liliaceae	Lasun	Herb
11	<i>Aloe barbadensis</i>	Liliaceae	Kanwar Gandal	Herb
12	<i>Amaranthus viridis</i>	Amaranthaceae	Chaleri	Herb
13	<i>Arisaema flavum</i>	Araceae	Obais	Herb
14	<i>Artemisia absinthium</i>	Asteraceae	Cahu	Shrub
15	<i>Asparagus racemosus.</i>	Liliaceae	Shatawar	Herb
16	<i>Berberis lycium</i>	Berberidaceae	Sumbul	Shrub
17	<i>Bergenia ciliata</i>	Saxifragaceae	Pat Piya	Herb
18	<i>Bistorta amplexicaulis</i>	Polygonaceae	Anjabar	Herb
19	<i>Calotropis procera</i>	Asclepiadaceae	Aak	Shrub
20	<i>Cannobis sativa</i>	Cannabinaceae	Bhang	Herb
21	<i>Capsella bursa pastoris</i>	Cruciferae	Chambaraka	Herb
22	<i>Carthamus oxycantha</i>	Asteraceae	Pohli	Herb
23	<i>Carum carvi</i>	Umbelliferae	Kalizeeri	Herb
24	<i>Cedrus deodara</i>	Pinaceae	Diar	Tree
25	<i>Celosia argentea.</i>	Amaranthaceae	Kokan	Herb
26	<i>Celtis australis</i>	Ulmaceae	Chamba	Tree
27	<i>Centella asiatica</i>	Umbelliferae	Brahmi Buti	Herb
28	<i>Chenopodium album</i>	Chenopodiaceae	Bathu	Herb
29	<i>Chrysanthemum leucanthemum</i>	Asteraceae	Gul-i-Daudi	Hreb
30	<i>Colchicum luteum</i>	Liliaceae	Surinjantalkh	Hreb

31	<i>Cupressus sempervirens</i>	Cupressaceae	Saru	Tree
32	<i>Cuscuta reflexa</i>	Convolvulaceae	Akashbel	Herb
33	<i>Cynadon dactylon</i>	Poaceae	Khabal	Herb
34	<i>Cyperus rotundus</i>	Cyperaceae	Motha	Herb
35	<i>Datura stramonium</i>	Solanaceae	Dhatura	Herb
36	<i>Desmodium gangeticum</i>	Papilionaceae	Salwan	Shrub
37	<i>Dioscorea bulbifera</i>	Dioscoreaceae	Ratalu	Herb
38	<i>Eclipta prostrata</i>	Asteraceae	Bhangra	Herb
39	<i>Ephedra gerardiana</i>	Ephedraceae	Someni	Shrub
40	<i>Equisetum debile</i>	Equisetaceae	Jortor	Pteridophyte
41	<i>Euphorbia indica</i>	Euphorbiaceae	Dodal	Herb
42	<i>Ficus carica</i>	Moraceae	Anjir	Shrub
43	<i>Fragaria nubicola</i>	Rosaceae	Budimeva	Herb
44	<i>Fraxinus excelsior</i>	Oleaceae	Ash	Tree
45	<i>Fumaria indica</i>	Fumariaceae	Pit Papra	Herb
46	<i>Galium aparine</i>	Rubiaceae	Mandakha	Herb
47	<i>Gaultheria trichophylla</i>	Eriaceae	Neeli buti	Shrub
48	<i>Geranium pusillum</i>	Geraniaceae	Ratanjot	Herb
49	<i>Hyoscyamus niger</i>	Solanaceae	Khurasani	Herb
50	<i>Hypericum perforatum</i>	Hypericaceae	Kasni	Herb
51	<i>Indigofera hebeptala</i>	Papilionaceae	Tork	Shrub
52	<i>Juglans regia</i>	Juglandaceae	Khor	Tree
53	<i>Juniperus communis</i>	Pinaceae	Chuch	Shrub
54	<i>Jasminum officinale</i>	Oleaceae	Chameli	Shrub
55	<i>Lantana camara</i>	Verbenaceae	Gendi	Shrub
56	<i>Lonicera hispida</i>	Caprifoliaceae	Loony	Shrub
57	<i>Luffa cylindrica</i>	Cucurbitaceae	Ghiatori	Herb
58	<i>Melia azedarach</i>	Meliaceae	Darek	Tree
59	<i>Manth longifolia</i>	Labiatae	Jungli pudina	Herb
60	<i>Mentha spicata</i>	Labiatae	Pudina	Herb
61	<i>Morus alba</i>	Moraceae	Shiatut	Tree
62	<i>Nepeta cataria</i>	Lamiaceae	Cataria	Herb
63	<i>Nerium indicum</i>	Apocynaceae	Kaner	Shrub

64	<i>Olea ferruginea</i>	Oleaceae	Kahu	Tree
65	<i>Oxalis acetosella</i>	Oxalidaceae	Rakta pushpa	Herb
66	<i>Oxalis corniculata</i>	Oxalidaceae	Amrulsak	Herb
67	<i>Paeonia emodi</i>	Ranunculaceae	Mamekh	Herb
68	<i>Perilla frutescens</i>	Labiatae	Bhanjira	Herb
69	<i>Phyllanthus niruri</i>	Euphorbiaceae	Bhuiyan anvala	Herb
70	<i>Pinus roxburghii</i>	Pinaceae	Chir	Tree
71	<i>Plantago ovata</i>	Plantaginaceae	Isabgol	Herb
72	<i>Podophyllum emodi</i>	Berberidaceae	Bankakri	Herb
73	<i>Polygonum barbatum</i>	Polygonaceae	Jalbahar	Herb
74	<i>Potentilla collectiana</i>	Rosaceae	Chitti Jari	Herb
75	<i>Primula denticulata</i>	Primulaceae	Zanghali	Herb
76	<i>Punica granatum</i>	Punicaceae	Daruna	Shrub
77	<i>Pyrus communis</i>	Rosaceae	Nashpati	Tree
78	<i>Quercus baloot</i>	Fagaceae	Reen	Tree
79	<i>Ricinus communis</i>	Euphorbiaceae	Arand	Shrub
80	<i>Rubus niveus</i>	Rosaceae	Kala hinsalu	Shrub
81	<i>Rumex hastatus</i>	Polygonaceae	Hullah	Herb
82	<i>Salix lindleyana</i>	Salicaceae	Majnun	Tree
83	<i>Salvia officinalis</i>	Labiatae	Phulgari	Shrub
84	<i>Saussurea lappa</i>	Asteraceae	Kuth	Herb
85	<i>Scutellaria teucrifolia</i>	Labiatae	Dolaba	Herb
86	<i>Silybum marianum</i>	Asteraceae	Kandiari	Herb
87	<i>Skimmia laureola</i>	Rutaceae	Nera	Shrub
88	<i>Solanum surattense</i>	Solanaceae	Bhatkatiya	Herb
89	<i>Solanum tuberosum</i>	Solanaceae	Alu	Herb
90	<i>Tagetes erecta</i>	Asteraceae	Genda	Herb
91	<i>Tanacetum parthenium</i>	Asteraceae	Daudi	Herb
92	<i>Taraxacum officinale</i>	Asteraceae	Hundh	Herb
93	<i>Taxus baccata</i>	Taxaceae	Birmi	Tree
94	<i>Thymus serpyllum</i>	Labiatae	Banajwain	Herb
95	<i>Tussilago farfara</i>	Asteraceae	Sassi	Herb
96	<i>Ulmus wallichiana</i>	Ulmaceae	Kain	Tree

97	<i>Urtica dioica</i>	Urticaceae	Bichhu Buti	Herb
98	<i>Valeriana wallichii</i>	Valerianaceae	Mushkbala	Herb
99	<i>Verbascum thapsus</i>	Scrophulariaceae	Ban Tambaku	Herb
100	<i>Vernonia cinerea</i>	Asteraceae	Sahadevi	Herb
101	<i>Vernonia anagallis-aquatica</i>	Scrophulariaceae	Titlokia	Herb
102	<i>Virburnum cotinifolium</i>	Caprifoliaceae	Guch	Shrub
103	<i>Vinca rosea</i>	Apocyanaceae	Sadabahar	Herb
104	<i>Viola odorata</i>	Violaceae	Banafsha	Herb
105	<i>Woodfordia fruticosa</i>	Lythraceae	Dhai	Shrub
106	<i>Zanthoxylum armatum</i>	Rutaceae	Timber	Tree
107	<i>Zea mays</i>	Poaceae	Makai	Herb
108	<i>Zizyphus jujuba</i>	Rhamnaceae	Ber	Tree

**Table 3.11: Medicinal Plants used Against Animal Bites**

<b>Sr. No</b>	<b>Name of Species</b>	<b>Family</b>	<b>Local Name</b>	<b>Type</b>
1	<i>Achyranthes aspera</i>	Amaranthaceae	Lathjira	Insect bite
2	<i>Amaranthus viridis</i>	Amaranthaceae	Chaleri	Snake bite
3	<i>Desmodium gangeticum</i>	Papilionaceae	Salwan	Snake/Scorpion
4	<i>Eclipta prostrata</i>	Asteraceae	Bhangra	Scorpion stings
5	<i>Pinus roxburghii</i>	Pinaceae	Chir	Snake/Scorpion
6	<i>Ricinus communis</i>	Euphorbiaceae	Arand	Scorpion stings
7	<i>Vinca rosea</i>	Apocynaceae	Sada bahar	Wasp stings

**Table 3.12: Medicinal Plants used as Fodder**

Sr. No	Name of Species	Family	Local Name	Habit
1	<i>Aesuculus indica</i>	Hippocastanaceae	Bankhor	Tree
2	<i>Artemisia absinthium</i>	Asteraceae	Cahu	Shrub
3	<i>Berberis lyceum</i>	Berberidaceae	Sumbul	Shrub
4	<i>Bistorta amplexcaule</i>	Polygonaceae	Anjabar	Herb
5	<i>Capsella bursa-pastoris</i>	Cruciferae	Chambaraka	Herb
6	<i>Centella asiatica</i>	Umbelliferae	Brahmi Buti	Herb
7	<i>Cynadom dactylon</i>	Poaceae	Khabal	Herb
8	<i>Euphorbia indica</i>	Euphorbiaceae	Dodal	Herb
9	<i>Ficus carica</i>	Moraceae	Anjir	Tree
10	<i>Fragaria nubicola</i>	Rosaceae	Budimeva	Herb
11	<i>Fumaria indica</i>	Fumariaceae	Pit papra	Herb
12	<i>Galium aparine</i>	Rubiaceae	Mandakha	Herb
13	<i>Geranium pusillum</i>	Geraniaceae	Ratanjot	Herb
14	<i>Indigofera hebeptala</i>	Papilionaceae	Torki	Shrub
15	<i>Jasminum officinale</i>	Oleaceae	Chameli	Shrub
16	<i>Lonicera hispida</i>	Caprifoliaceae	Loony	Shrub
17	<i>Morus alba</i>	Moraceae	Shiatut	Tree
18	<i>Plantago ovata</i>	Plantaginaceae	Isabgol	Herb
19	<i>Podophyllum emodi</i>	Berberidaceae	Bankakri	Herb
20	<i>Punica granatum</i>	Punicaceae	Daruna	Tree
21	<i>Pyrus communis</i>	Rosaceae	Nashpati	Tree
22	<i>Querus baloot</i>	Fagaceae	Reen	Tree
23	<i>Tubus niveus</i>	Rosaceae	Kala hinsalu	Shrub
24	<i>Rumex hastatus</i>	Polygonaceae	Hullah	Herb
25	<i>Salvia officinalis</i>	Labiatae	Phulgari	Shrub
26	<i>Solanum tuberosum</i>	Solanaceae	Alu	Herb
27	<i>Taxus baccata</i>	Taxaceae	Birmi	Tree
28	<i>Valeriana wallichii</i>	Valerianaceae	Mushkbala	Herb
29	<i>Viola odorata</i>	Violaceae	Banafsha	Herb
30	<i>Zea mays</i>	Poaceae	Makai	Herb
31	<i>Zizyphus jujuba</i>	Rhamnaceae	Ber	Tree

**Table 3.13: Medicinal Plants used as Food**

<b>Sr. No</b>	<b>Name of Species</b>	<b>Family</b>	<b>Local Name</b>	<b>Type</b>
1	<i>Allium sativum</i>	Liliaceae	Lasun	Vegetable, Spice
2	<i>Amaranthus viridis</i>	Amaranthaceae	Chaleri	Vegetable
3	<i>Carum carvi</i>	Umbelliferae	Kalizeeri	Spice
4	<i>Chenopodium album</i>	Chenopodiaceae	Bathu	Vegetable
5	<i>Ficus carica</i>	Moraceae	Anjir	Fruit
6	<i>Fragaria nubicola</i>	Rosaceae	Budimeva	Fruit
7	<i>Luffa cylindrica</i>	Cucurbitaceae	Ghiatori	Vegetable
8	<i>Mentha longifolia</i>	Labiatae	Jungli pudina	Spice/Condiment
9	<i>Mentha spicata</i>	Labiatae	Pudina	Spice/Condiment
10	<i>Punica granatum</i>	Punicaceae	Daruna	Fruit
11	<i>Pyrus communis</i>	Rosaceae	Nashpati	Fruit
12	<i>Rubus niveus</i>	Rosaceae	Kala hinsala	Fruit
13	<i>Rumex hastatus</i>	Polygonaceae	Hullah	Condiment
14	<i>Solanum tuberosum</i>	Solanaceae	Alu	Vegetable
15	<i>Viburnum cotinifolium</i>	Caprifoliaceae	Guch	Fruit
16	<i>Zanthoxylum armatum</i>	Rutaceae	Timbar	Spice/Condiment
17	<i>Zea mays</i>	Poaceae	Makai	Flour
18	<i>Ziziphus jujuba</i>	Rhemnaceae	Ber	Fruit

**Table 3.14: Medicinal Plants used as Fuel Wood**

<b>Sr. No</b>	<b>Name of Species</b>	<b>Family</b>	<b>Local Name</b>	<b>Habit</b>
1	<i>Acacia nilotica</i>	Mimosaceae	Kikar	Tree
2	<i>Albizia lebbek</i>	Mimosaceae	Siris	Tree
3	<i>Cedrus deodara</i>	Pinaceae	Diar	Tree
4	<i>Ephedra gerardiana</i>	Ephedraceae	Someni	Shrub
5	<i>Hypericum perforatum</i>	Hypericaceae	Kasni	Shrub
6	<i>Indigofera hebeptala</i>	Papilionaceae	Torki	Shrub
7	<i>Jaglans regia</i>	Juglandaceae	Khor	Tree
8	<i>Juniperus communis</i>	Pinaceae	Petthar	Shrub
9	<i>Morus alba</i>	Moraceae	Shiatut	Tree
10	<i>Olea ferruginea</i>	Oleaceae	Kahu	Tree
11	<i>Pinus roxburghii</i>	Pinaceae	Chir	Tree
12	<i>Punica granatum</i>	Punicaceae	Daruma	Tree
13	<i>Pyrus communis</i>	Rosaceae	Nashpati	Tree
14	<i>Quercus baloot</i>	Fagaceae	Reen	Tree
15	<i>Salix lindleyana</i>	Salicaceae	Majnun	Tree
16	<i>Taxus baccata</i>	Taxaceae	Birmi	Tree
17	<i>Viburnum cotinifolium</i>	Caprifoliaceae	Guch	Shrub
18	<i>Woodfordia fruticosa</i>	Lythraceae	Dhai	Shrub
19	<i>Zizyphus jujuba</i>	Rhamnaceae	Ber	Tree



**Table 3.15 : Medicinal Plants used as Timber**

Sr. No	Name of Species	Family	Local Name	Habit
1	<i>Aesculus indica</i>	Hippocastanaceae	Bankhor	Tree
2	<i>Albizia lebeck</i>	Mimosaceae	Siris	Tree
3	<i>Cedrus deodara</i>	Pinaceae	Diar	Tree
4	<i>Juglans regia</i>	Juglandaceae	Khor	Herb
5	<i>Juniperus communis</i>	Pinaceae	Petthar	Shrub
6	<i>Morus alba</i>	Moraceae	Shiatut	Tree
7	<i>Olea ferruginea</i>	Oleaceae	Kahu	Tree
8	<i>Pinus roxburghii</i>	Pinaceae	Chir	Tree
9	<i>Quercus baloot</i>	Fagaceae	Reen	Tree
10	<i>Salix lindleyana</i>	Salicaceae	Majnun	Tree
11	<i>Taxus baccata</i>	Taxaceae	Birmi	Tree

**Table 3.16 : Medicinal Plants used in Veterinary Medicines**

Sr. No	Name of Species	Family	Local Name	Type
1	<i>Aesculus indica</i>	Hippocastanaceae	Bankhor	Fever & Colic
2	<i>Arisaema flavum</i>	Araceae	Obais	Digestive Problems
3	<i>Asparagus racemosus</i>	Liliaceae	Shatawar	Digestive Problems
4	<i>Bergenia ciliata</i>	Saxifragaceae	Pat piya	Respiratory Disorders
5	<i>Bistorta amplexicaulis</i>	Polygonaceae	Anjabar	Fever
6	<i>Cannabis sativa</i>	Cannabinaceae	Bhang	Appetizer
7	<i>Hyoscyamus niger</i>	Solanaceae	Ajwain Khurasani	Urinary Sedative
8	<i>Solanum surattense</i>	Solanaceae	Bhat katiya	Gastric Problems
9	<i>Thymus serpyllum</i>	Labiatae	Banajwain	Digestive Problems
10	<i>Viburnum cotinifolium</i>	Caprifoliaceae	Guch	Digestive Problems

**Plate # 68: *Ficus roxburghii* Wallich ex Miq.**

**Plate # 69: *Pyrus mallus* L.**

**Plate # 70: *Clematis montana* Buch.**

**Plate # 71: Fruit of *Berberis lycium* Royle.**

**Plate # 72: *Aconitum heterophyllum* Stapf.**

**Plate # 73: *Juniperus excelsa* M.B.**

**Plate # 74: *Spiraea vacciniifolia* D.Don.**

**Plate # 75: *Rosa brunonii* Lindl.**

**Plate # 76: *Abelia triflora* R. Br.****3.9 Common Folk Medicinal Recipes of Kaghan Valley:**

Even in this modern age and advanced world, a huge population of developing and under-developed countries still has to depend upon the folk-lore and traditional medicines as they live in far flung area, where the facilities of treatment are scarcely available. It is a miracle that God Almighty has bestowed upon them the best of health. The people of Kaghan Valley use medicinal plants collected from the forest areas for every kind of ailments and miraculously recover from diseases. Their health is a surprising example for the man of a modern world.

This is true that traditional knowledge is getting lost before it is tapped properly for better utility of mankind. The erosion of native ethnobotanical knowledge and its use has been ever rapid than ever before in the realm of biodynamic plants comprising medicinal, narcotic and toxic species.

Traditional knowledge refers to the knowledge, innovations and practices of indigenous and local communities around the world. Developed from experience gained over the centuries and adapted to the local culture and environment, traditional

knowledge is transmitted orally from generation to generation. It tends to be collectively owned and takes the form of stories, songs, folklore, proverbs, cultural values, beliefs, rituals, community laws, local language and agricultural practices including the development of plant species and animal breeds. Traditional knowledge is mainly of a practical nature, particularly in such fields as agriculture, fisheries, health care, horticulture and forestry.

A survey was conducted in the project area for traditional knowledge and folk recipes. It was found that aged people (above 50 years, both men and women) have maximum traditional knowledge i.e., 80%, the people (from 20 – 49 years, both men and women) have just 15% traditional knowledge and the children (up to 19 years, both boys and girls) have only 5% of traditional knowledge. But 100% of the people are familiar with the fact that plants are very important for their life and herbs have the healing power. They consider plants as natural remedies for good health.

Thirty common folk recipes which are extensively used by the people of Kaghan Valley for various ailments are as follows:

1. *Achillea millefolium* L.

**Family:** Asteraceae

**Local Name:** Gandana

**Part Used:** Whole plant

**Folklore:** An infusion is made by steeping ½ cup of the bulk herb for every 2 cup of water for 20 to 30 minutes. Then this 1 cup is taken 2 or 3 times daily. It is used for easing mucus congestion, inflammation and fever of colds, flu and other upper respiratory infections.

2. *Aesculus indica* Hook.

**Family:** Hippocastanaceae

**Local Name:** Bankhor

**Common Name:** Horse chestnut

**Part Used:** Seeds / Nuts.

**Folklore:** 5 to 20 drops of tincture are taken 3 times daily. This is used for treating haemorrhoids.

3. *Allium sativum* L.

**Family:** Liliaceae

**Local Name:** Lasan

**Common Name:** Garlic

**Part Used:** Bulbs

**Folklore:** 2 to 3 cloves are taken daily with meals either cooked or raw. This is used as an important antibiotic and antiviral remedy for colds, flu, bronchitis, pneumonia and other infections. The same remedy is used for controlling blood pressure and reducing high cholesterol.

4. *Aloe barbedensis* Mill

**Family:** Liliaceae

**Local Name:** Kuargandal

**Common Name:** Indian Aloe

**Part Used:** Resin, Gel

**Folklore:** 1 – 5 teaspoons per day of the resin, before bed is taken. Sometimes fennel seeds are added to reduce cramping. It relieves constipation and sluggish or dry bowel movements. Aloe gel is used for burns.

5. *Artemisia absinthium* L.

**Family:** Asteraceae

**Local Name:** Vilayathi ajsanthin

**Common Name:** Wormwood

**Part Used:** Whole plant

**Folklore:** An infusion is made by steeping 1 teaspoon to 1 tablespoon of the dried herb for every cup of water for 20 minutes. Then ½ to 1 cup is taken daily before meals. This is used for poor appetite, sweet cravings, stomach weakness, painful digestion, or worms.



6. *Carum carvi* L.

**Family:** Umbelliferae

**Local Name:** Kalizeeri

**Common Name:** Caraway

**Part Used:** Seeds

**Folklore:** An infusion is made by soaking a heaping teaspoon of seeds for 15 – 20 minutes in a freshly boiled up of water. This is practiced 1, 2 or 3 times daily. It relieves colic, painful digestion, bloating and a feeling of uncomfortable fullness after eating, flatulence, diarrhoea and to increase lactation.

7. *Dioscorea bulbifera* L.

**Family:** Dioscoreaceae

**Local Name:** Ratalu

**Common Name:** Wild Yam

**Part Used:** Roots and Tubers

**Folklore:** A tea is made by boiling 1 teaspoon of the herb for every cup of water for 40 minutes. Then this cup is taken 2 or 3 times daily. It is used for cramping of colic, intestinal and uterine spasms and gall bladder pain.

8. *Ephedra gerardiana* Wall. ex Stapf, 1.C.

**Family:** Ephedraceae

**Local Name:** Someni

**Common Name:** Ma Huang

**Part Used:** Twigs and branches

**Folklore:** Decoction is made by using 1 tablespoon of the herb for each cup of water and ½ to 1 cup is taken 2 to 3 times daily. It is used for relieving temporary symptoms of asthma, colds with no fever or sweating, hay fever with nasal congestion and coughs.

9. *Equisetum debile* Roxb. ex Vaucher.

**Family:** Equisetaceae

**Local Name:** Jortar

**Common Name:** Horsetail

**Part Used:** Twigs, Aerial parts

**Folklore:** 1 cup decoction is taken several times daily which is made by simmering 1 or 2 tablespoons of the cut and sifted herb for each cup of water for 8 hours. This is used internally for cystitis and prostatitis. This remedy is also useful for strengthening bones, hairs and nails.

10. *Galium aparine* L.

**Family:** Rubiaceae

**Local Name:** Mandakha/ Khanmirch

**Common Name:** Cleavers

**Part Used:** Whole plant, Aerial parts.

**Folklore:** 1 cup of infusion or 1 teaspoonful of tincture in a little water is taken 2 – 3 times daily. This is useful for cleansing the lymphatic system and shrinking swollen lymph glands. It is also used in tonsillitis, psoriasis, or other skin diseases.

11. *Hypericum perforatum* L.

**Family:** Hypericaceae

**Local Name:** Kasni

**Common Name:** St. John's Wort

**Part Used:** Flowers

**Folklore:** About 4 tablespoons of tincture are taken in the morning and 3 in evening in a little water. This remedy is recommended for relieving chronic nerve pains like peripheral neuropathy and for trauma and injuries involving nerve damage.

12. *Juniperus communis* L.

**Family:** Pinaceae

**Local Name:** Bhentri

**Common Name:** Common Juniper

**Part Used:** Ripe berries

**Folklore:** A tea is made by infusing 1 teaspoon of the berries with 6 cups of freshly boiled water for 20 minutes. Half cup of this tea is taken several times daily. This is a remedy for urinary tract infections.

13. *Mentha spicata* L.

**Family:** Labitae

**Local Name:** Pudina

**Common Name:** Peppermint

**Part Used:** Whole plant

**Folklore:** An infusion is made by steeping a small handful of the fresh herb or 1 tablespoon for every cup of water which is used 2 to 3 times daily. This is an effective remedy for easing nausea, vomiting, heartburn, morning sickness, irritable bowel syndrome and colitis.

14. *Nepeta cataria* L.

**Family:** Labiatae

**Local Name:** Cataria

**Common Name:** Catnip

**Part Used:** Whole plant, Aerial parts.

**Folklore:** A cup of strong infusion is made with 1 tablespoon of dried or fresh herb and is taken 2 to 3 times daily. It is used for colds, flu, fever and fussiness in children. The herb has mild calming, sweat releasing and digestion promoting effects.

15. *Olea ferruginea* Royle.

**Family:** Oleaceae

**Local Name:** Kahu

**Common Name:** Olive

**Part Used:** Oil from seeds

**Folklore:** 1 to 2 teaspoons of oil are used daily. This is considered a good remedy for arthritis and skin problems like eczema and psoriasis.

16. *Plantago ovata* Forsk.

**Family:** Plantaginaceae

**Local Name:** Isabgol

**Common Name:** *Psyllium* husk

**Part Used:** Seeds

**Folklore:** A decoction is made by simmering ½ cup of the fresh or dried leaves in 2 or 3 cups of water for 30 or 40 minutes. 1 or 2 cups of tea are used several times daily. This tea is used for relieving coughs, ulcers, irritable bowel, colitis, cystitis and painful urination.

17. *Ricinus communis* L.

**Family:** Euphorbiaceae

**Local Name:** Arund

**Common Name:** Castor oil

**Part Used:** Oil from seeds.

**Folklore:** 1 to 2 tablespoons of oil are taken before bed time, depending on age and weight. Castor oil is a favorite old time remedy for constipation. It is also used externally for tumors of all kinds.

18. *Rubus niveus* L.

**Family:** Rosaceae

**Local Name:** Ghuracha/ Kala hinsalu

**Common Name:** Raspberry

**Part Used:** Leaves, fruit

**Folklore:** A light decoction is made by simmering a small handful of the dried or fresh herb in 2 cups of water for a few minutes and steeping the herb for 15 minutes or so. Then a cup from this decoction is used 2 or 3 times daily. This remedy is used during pregnancy.

19. *Rumex hastatus* D.Don.

**Family:** Polygonaceae

**Local Name:** Hullah

**Common Name:** Golden dock

**Part Used:** Aerial parts

**Folklore:** A tea is made by simmering 1 teaspoon of the cut and sifted herb for every cup of water for 20 minutes. This 1 cup is taken 2 or 3 times daily. This is a good remedy for constipation or sluggish bowels or loose stools. The same is given to pregnant women also.

20. *Salix lindleyana* Wall.

**Family:** Salicaceae

**Local Name:** Majnun

**Common Name:** Willow

**Part Used:** Bark

**Folklore:** A decoction is made by simmering 1 tablespoon of the cut and sifted bark for every cup of water for 10 minutes. One cup is taken 2 or 3 times daily. This is an effective remedy for headache, fever, pain and rheumatism.

21. *Salvia officinalis* L.

**Family:** Labiatae

**Local Name:** Phulgari

**Common Name:** Sage

**Part Used:** Leaves

**Folklore:** An infusion is made by steeping 1 teaspoon of the herb for every cup of boiled water for 15 minutes. Then this 1 cup of tea is taken several times daily. This is used in cold, especially with a sore throat or excessive perspiration.

22. *Scutellaria teucrifolia* Dunn, Kew Bull.

**Family:** Labiatae

**Local Name:** Dolaba

**Common Name:** Skull cap

**Part Used:** Seeds

**Folklore:** 3 to 5 tablespoons of the liquid tincture are added in little water or tea and is taken several times daily. This is used for insomnia, headache, nervous exhaustion, muscle spasms and irritability associated with premenstrual syndrome.

23. *Silybum marianum* (L.) Gaertner

**Family:** Asteraceae

**Local Name:** Kandiari

**Common Name:** Milk Thistle

**Part Used:** Whole plant, Aerial parts

**Folklore:** 2 to 4 tablespoons of tincture are taken 2 to 3 times daily. This is a remedy for cirrhosis, hepatitis and jaundice.

24. *Tanacetum perthenium* L.

**Family:** Asteraceae

**Local Name:** Daudi

**Common Name:** Fever few

**Part Used:** Whole plant

**Folklore:** 1 to 3 tablespoons of the tincture are taken 1 to 2 times daily. This is a remedy for flu and other respiratory infections that are accompanied by fever.

25. *Taraxacum officinale* Weber.

**Family:** Asteraceae

**Local Name:** Hund

**Common Name:** Dandelion

**Part Used:** Whole plant

**Folklore:** A decoction is made by simmering 1 tablespoon of leaf or root for every cup of water which is used 2 or 3 times daily, or 2 to 4 tablespoons of tincture is taken 1 to 3 times daily. This is administered for liver cooling and other liver related problems like hepatitis, poor appetite and constipation.

26. *Ulmus wallichiana* Planch.

**Family:** Ulmaceae

**Local Name:** Kain

**Common Name:** Elm

**Part Used:** Bark

**Folklore:** Decoction of the bark is made by simmering 1 tablespoon for every cup of water and is taken 2 or 3 times daily. This remedy is recommended for soothing ulcers, gastritis, colitis, coughs and easing diarrhoea.

27. *Urtica dioica* L.

**Family:** Urticaceae

**Local Name:** Bichu buti

**Common Name:** Nettle

**Part Used:** Rhizome

**Folklore:** A decoction is made with 1 tablespoon of herb or rhizome for every cup of water by simmering for 20 to 30 minutes. Then 1 or 2 cups are used 2 or 3 times daily. It is used for hay fever, arthritis, rheumatism, anemia, cystitis and gout. The rhizomes are used to reduce prostate inflammation.

28. *Valeriana wallichii* DC

**Family:** Valerianaceae

**Local Name:** Mushkbala

**Common Name:** Great Wild Valerian

**Part Used:** Rhizome

**Folklore:** An infusion is made with 1 tablespoon of cut and sifted herb for every cup of water. Steeped for 30 minutes in a closed pot and then 1 cup is taken several times daily. It is used for calming the nervous system and to promote healthy sleep.

29. *Verbascum thapsus* L.

**Family:** Scrophulariaceae

**Local Name:** Janglia Tambaku

**Common Name:** Mullein

**Part Used:** All parts of the plant.

**Folklore:** A light decoction is made by simmering 1 tablespoon of the herb for every cup of water for 15 minutes. Then this cup is used up to several times daily. Along with this 2 to 4 drops of oil extracted from flowers are used in the ears, twice a day. It is used for lungs and other respiratory tract infections. This is also used for easing the symptoms of asthma, chronic bronchitis, dry coughs, and laryngitis.



30. *Viburnum cotinifolium* D.Don.

**Family:** Caprifoliaceae

**Local Name:** Kasar buti/ Guch

**Common Name:** True Cramp Bark

**Part Used:** Stem bark

**Folklore:** A decoction is made with 1 teaspoon of the chopped herb per cup of water and is taken 2 or 3 times daily. This is a remedy for easing menstrual cramps and intestinal cramps.

### 3.10 Conservation Status of Important Plants of Kaghan Valley

Conservation has been defined as the “management for the benefit of all life including humankind of the biosphere so that it may yield sustainable benefit to the present generation while maintaining its potential to meet the needs and aspirations of the future generations”.

Since the beginning of human civilization, mankind has gained subsistence in a close relationship with nature. Large pressure of growing population coupled with industrial activities have increased the demand for food, fodder and fuel wood which in turn, have inevitably led to rapid change in forest cover particularly in developing countries. Like wise, over exploitation and unscientific management of forests in Pakistan have caused much reduction in the forest land.

Plants are a very valuable natural resource because of the role they play in human life. Plants play an important role in securing economic independence and livelihood security to the millions of people whose lives revolve around the collection, processing and growth of these plants. However, in recent times there has been a rapid decline in floristic diversity due to various reasons. In Kaghan Valley there are two basic and main causes of the loss of floristic diversity i.e.

- i) Natural Causes
- ii) Human Causes

**3.10.1 Natural Causes:**

Natural causes threaten floristic diversity in different ways i.e., in the form of hailstorms, drought, snowfall and earthquake etc.

**3.10.2 Human Causes:**

The most threatening damage to the floristic diversity is from human beings and livestock. Human beings are the main threat to the forests in Kaghan Valley. They damage the forests in many ways. Some of them are as follows:

- a) Removal of fuel wood
- b) Illicit cutting of timber
- c) Encroachment on forest lands
- d) Lopping for fodder
- e) Torch wood
- f) Grazing, grass cutting and fires
- g) Tourism
- h) Commercial exploitation of medicinal plants.

**3.10.2.1 Removal of fuel wood:**

Diversity of plant species is threatened largely by their consumption as fuel wood in Kaghan Valley. Many precious trees and shrubs are being destructed for this purpose annually. One of the common priorities of men, women and children of Kaghan Valley is the cutting and collection of fuel wood, because this is the sole energy resource for them. A bulk of wood is always stored in each house especially during the winter months.

**3.10.2.2 Illicit cutting of timber:**

Cutting of trees for construction purposes is a very common practice in Kaghan Valley. The use of precious wood in houses is considered as a symbol of status and high class. This trend among individuals has very badly damaged the floristic diversity of the Valley. A large number of saw machines are working in the Valley. Among them only few are registered and legal, while the rest are illegal. Manufacture of furniture, doors, windows and antiques is commonly practiced in the Valley. It is also commonly used for the construction of bridges as well.

**3.10.2.3 Encroachment on forest lands:**

Because of difficult living condition and poor economy, there is a general trend among the people to clear the forests and the land is broken for subsistence cultivation and habitation. This problem is also slowly challenging plant diversity in the Valley.

**3.10.2.4 Lopping for fodder:**

This problem is challenging floristic diversity in the same way as that of fuel wood. Fodder is gathered in large quantities to nourish the livestock especially during the winter months.

**3.10.2.5 Torch wood:**

Many precious pine trees have been lost by this practice. The trees in forests are continuously hacked away at the base bit by bit until a large cavity appears and the tree is eventually blown down by the wind.

**3.10.2.6 Grazing, Grass cutting and fires:**

Intensive grazing exists in the forests and pastures of Kaghan Valley. Any abrupt and complete closure of these forests for grazing at the moment or in near future hardly seems feasible due to political interference and dependence of locals as well as nomads rearing their livestock in these forests since long. Another problem is of uncontrolled fires. Floristic diversity is at high risk because of these joint problems.

**3.10.2.7 Tourism:**

People from all around the country and abroad prefer to visit Kaghan Valley, because of cold climate and scenic beauty which exerts a big pressure on forests in the form of fuel wood for heating, cooking purposes and new constructions. Hotels, restaurants, tourist resorts and guest houses can be seen in very large numbers at Balakot, Shogran, Mahandri, Kaghan and Naran. People prefer to stay at Shogran and Naran because of better hotel facilities, which results in immense pressure on plant resources.

**3.10.2.8 Commercial exploitation of Medicinal Plants:**

Previously medicinal plants were collected to meet the local needs of people, but during the last 6 – 8 years commercial exploitation of medicinal plants very badly affected medicinal plant wealth of Kaghan Valley. Many plant species, which were previously considered secure, are now a days at the threatened.

Photographs of various aspects related with conservation status issues are presented in plates # 77 to 94.

Few glimpses of floristic diversity are shown in plates # 68 to 76 and 95 to 100.

**Plate # 77: Deforestation by Timber Mafia.**

**Plate # 78: Grazing at Lake Saif ul Malook.**

**Plate # 79: Fodder storage in the Valley.**

**Plate # 80: Road construction at Babusar- Chilas road, as continuous need in this area.**

**Plate # 81: Wooden Bridge: A typical local facility of this area.**

**Plate # 82: Timber Mafia: A major deforestation activity.**

**Plate # 83: Waste Wood for fuel purpose.**

**Plate # 84: Fodder: *Taxus wallichiana* (Zucc.) Pilger.**

**Plate # 85: Timber wood logged, that will be supplied to Govt. Timber Market, Goharabad, Havelian.**

**Plate # 86: Grazing (Alpine Pasture) at Lalazar.**



**Plate # 87: Logs being loaded, as a major timber trade activity.**

**Plate # 88: Fodder transportation for storage facility.**

**Plate # 89: Timber wood storage for trade purpose.**

**Plate # 90: Agricultural Tools still being used in Kaghan Valley.**

**Plate # 91: Wooden logs camouflaged by Timber Mafia.**

**Plate # 92: Seasonal nomads in Alpine pasture at Gittidas.**

**Plate # 93: Terracing of land. A usual practice in the Valley.**

**Plate # 94: Grazing of cattle in the Valley.**

Comprehensive surveys were conducted in the study area to workout the conservation status of some plants of economic value. The data was collected in accordance with IUCN criteria but with modifications.

First of all the threatened plant species were sorted out by field observations and information from local people. Then those plant species were given different ranks from 0 – 6. After this the conservation status score of a plant species at different localities was added, multiplied with its rank and then divided by total number of localities visited i.e., 10.

The localities visited for tracing conservation status are as follows:

- i) Balakot
- ii) Kewai
- iii) Shogran
- iv) Siri Paye Track
- v) Mahandri
- vi) Kaghan
- vii) Naran
- viii) Jalkhad
- ix) Basel
- x) Babusar villages

The plant species were finally categorized according to IUCN criteria. (2001).

The data was gathered by adopting questionnaire method. Complete results are shown in Table 3.17 and Figure 3.4. The results have shown that the entire threatened flora is of ethnobotanical value and these plants are utilized for various purposes in the Valley. There are 30 threatened plant species in Kaghan Valley, (comprising herbs, shrubs and trees) of which 3 plant species are Critically Endangered, 14 are Endangered, 10 are Vulnerable and 3 are Near Threatened. Thus 27.77% of the total ethnobotanically valued plants of Kaghan Valley are at risk, of which 2.77% are critically endangered, 12.96% are endangered, 9.25% are vulnerable and 2.77% are near threatened. Comparison between these categories is also highlighted in Figure. 3.4

**Table 3.17: Conservation Status of Some Plants of Kaghan Valley.**  
Localities Visited

Sr. No	Plant Species	Local Name	Balakot	Kewai	Shogran	Siri Paye Track	Mahandri	Kaghan	Naran	Jalkhad	Basel	Babu Sar Villages	Conservation Status	Availability in last 10 years.
1	<i>Acer caesium</i>	Trekan	-	-	+	+	+	+	+	+	-	-	3 V	Decreased
2	<i>Aconitum hetrophyllum</i>	Atis	-	-	+	+	-	-	-	-	+	+	1.2 E	Decreased
3	<i>Artemisia absinthium</i>	Cahu	+	+	+	-	-	+	-	+	+	-	3 V	Persistent
4	<i>Berberis lycium</i>	Simblu	+	+	+	-	+	+	+	-	-	-	3 V	Persistent
5	<i>Berginia ciliata</i>	Patpiya	-	-	+	+	-	+	-	-	+	-	1.2 E	Persistent
6	<i>Carum carvi</i>	Kalizeeri	-	+	+	-	-	+	+	-	-	-	1.2 E	Decreased
7	<i>Celtis austaralis</i>	Batkarar	+	+	-	-	+	+	+	+	-	-	3 V	Decreased
8	<i>Colchicum luteum.</i>	Surinjan	+	-	+	-	-	+	+	-	-	+	2 E	Persistent
9	<i>Datura stramonium</i>	Datura	+	+	-	-	+	-	+	+	-	+	3 V	Persistent
10	<i>Dioscorea deltoides</i>	Ratalu	+	-	+	+	-	+	+	-	-	-	2 E	Persistent
11	<i>Ephedra gerardiana</i>	Someni	-	-	-	+	-	-	-	+	+	+	1.2 E	Decreased
12	<i>Fraxinus excelsior</i>	Sum	-	-	+	+	-	+	-	-	-	-	0.6C E	Decreased
13	<i>Geranium wallichii</i>	Ratanjot	-	-	+	+	-	+	+	-	+	-	2 E	Persistent
14	<i>Hyoscymus niger</i>	Ajwain khurasani	-	-	-	-	-	+	-	+	+	+	1.2 E	Decreased
15	<i>Juniperus communis</i>	Chalali	-	-	+	-	-	+	+	-	-	+	1.2 E	Decreased
16	<i>Lonicera hispida</i>	Loony	+	-	+	-	-	+	+	+	-	+	3 V	Persistent
17	<i>Paeonia amodi</i>	Mamaikh	-	-	+	+	-	+	+	+	+	-	3 V	Persistent
18	<i>Podophyllm emodi</i>	Bankakri	-	-	+	+	+	+	+	-	-	-	2 E	Persistent
19	<i>Potentilla collectiana</i>	Chiti jari	+	+	+	-	+	+	+	-	-	+	4.2 NT	Persistent
20	<i>Prunus padus</i>	Kalakath	-	-	+	+	+	+	+	-	-	-	2 E	Persistent

21	<i>Quercus baloot</i>	Reen	-	+	+	-	+	+	+	-	-	+	3 V	<b>Decreased</b>
22	<i>Saussurea lappa</i>	Kuth	+	-	+	-	-	+	-	-	+	-	1.2 E	<b>Decreased</b>
23	<i>Salix lindyana</i>	Majnun	+	-	+	-	+	+	+	+	-	+	4.2 NT	<b>Decreased</b>
24	<i>Skimmia laureola</i>	Ner	-	-	+	+	+	+	+	-	-	+	3 V	<b>Persistent</b>
25	<i>Taxus wallichiana</i>	Bermi	-	-	+	+	-	-	-	-	-	-	0.2 CE	<b>Decreased</b>
26	<i>Thymus serpyllum</i>	Banjawain	-	-	+	-	-	+	+	+	-	-	1.2 E	<b>Decreased</b>
27	<i>Ulmus wallichiana</i>	Kain	-	-	+	+	-	-	-	-	-	-	0.2 CE	<b>Decreased</b>
28	<i>Valeriana wallichii</i>	Muskbala	+	-	+	+	+	+	-	-	+	+	4.2 NT	<b>Persistent</b>
29	<i>Verbascum thapsus</i>	Jangli tambaku	+	-	-	-	+	+	+	-	+	+	3 V	<b>Decreased</b>
30	<i>Zanthoxylum armatum</i>	Timber	+	+	+	-	-	+	+	-	-	-	2 E	<b>Persistent</b>

**Note:** + sign shows the presence of a species in specific locality and – sign shows its absence.

Conservation Status Scale:

Extinct	0
Critically Endangered	$0 < CE \leq 1$
Endangered	$1 < E \leq 2$
Vulnerable	$2 < V \leq 3$
Rare	$3 < R \leq 4$
Near Threatened	$4 < NT \leq 5$
Secure	$5 < S \leq 6$

### 3.11 Conservation of Floristic Diversity

A following conservation effort was made to conserve the floristic diversity of Kaghan Valley.

#### 3.11.1 Ex – Situ Conservation:

Propagation and maintenance of different species under partially or completely controlled conditions is known as Ex – Situ Conservation. This is method of conservation of species outside their natural habitats. It involves preservation of endangered plants in botanic gardens, gene banks, laboratories or nurseries, so that the genetic characteristics are maintained in alive organisms. Ex – situ conservation approach is useful and necessary when the population of a species is likely to be extinct or it has got high education value or it is facing a high pressure in wild habitat or it is to be propagated largely for commercial, recreational, aesthetic or other purposes.

With the same concept in mind, seeds of the following threatened plants were collected and were handed over to the officials of Forest Nursery at Besian near Balakot for propagation and regeneration.

- i) *Colchicum luteum.*
- ii) *Hyoscymus niger.*
- iii) *Aconitum heterophyllum*
- iv) *Geranium wallichii*
- v) *Paeonia emodi.*



**Plate # 95: *Trillium govanianum* D.Don.**

**Plate # 96: *Impatiens edgeworthii* Hook. f.**

**Plate # 97: *Senecio chrysanthemoides* DC.**

**Plate # 98: *Andrachne cordifolia* (Dcne) Muell.**

**Plate # 99: *Polygonatum multiflorum* L.**

**Plate # 100: *Otostegia limbata* (Bth.) Boiss.**

## DISCUSSION

### 4.1 People and Plants

Plants exert multifarious influences on the mode of human life. They provide numerous products and materials for the use of mankind in myriad ways. Among them, their medicinal use fetches specifically greater significance in the man's life, since they provide materials which help in curing disease. They also provide nourishment and protective substances for the good health of human beings. Because of this fact, people have been using plant products as medicine for curing variety of diseases since the time immemorial.

The people and plant relationship is as old as the life itself. Human life always remained dependent upon plant life in one form or another. Over the last few decades, relationships between people and their planet, including its plants, have been transformed. Previously, a vast majority of people lived in rural areas and extensively utilized the locally found plants, both wild and cultivated. Subsequently, people worldwide have become part of ever more extensive economic, cultural and social systems. As this has been happening the pressure on Earth's natural resources has become greatly increased because of tremendous rise in the population rate of human beings. Thus massive exploitation of resources is a common phenomenon now-a-days.

In the modern time, medicinal plant resources are being depleted by the increase of population and excessive biotic activities. If this trend of constant depletion of medicinal plants persists, this may cause an acute paucity of the resources of medicinal plants in future and pose a serious threat to the physical well being of mankind. Hence, the study of plants as a source of medicine has become more important in the context of present global trade scenario, where the cost of allopathic medicines are likely to be beyond the reach of common man. So more folklore of our indigenous knowledge of medicine should be explored and availability of such plants should also be surveyed in each and every part of the country.

There exists a considerable diversity in the flora of Kaghan Valley. Bryophytes are represented by 6 species, Pteridophytes by 53 species, Gymnosperms by 12 and Angiosperms by 775 species (i.e., Monocots 136 species and Dicots 639 species). It manifests the typical plant diversity of Himalayan region of Kaghan Valley. Apart from many other important medicinal plants of the Himalayan areas, *Thymus limnaris*

in alpine zone, *Dioscorea* sp and *Paeonia emodi* in moist temperate forests, *Geranium wallichianum* in transitional zone between dry temperate and moist temperate and *Asperagus adscendens* and *Litsea chinensis* are worth mentioning plants of the Valley and their sustainable use in the area maintained. Similar studies were conducted by Trojan, *et al.* (1997). They concluded that numerical methods of faunistical research make possible estimation of species diversity and analysis of taxocoene structure. This enables a new approach to the problems of species diversity protection. The most important issue is the preservation of endangered and vulnerable species. Shinwari and Khan (2000) mentioned that *Asperagus adscendes* and *Berberis lycium* are vulnerable to harvesting in Margalla Hills National Park Islamabad.

The Biodiversity Convention accepted in 1992 suggests the establishment of biodiversity monitoring, which is necessary both for timely realization of measures for biodiversity conservation and for the recognition of the effect of the global changes of environment on biota. The basic level of the monitoring is that of a landscape. The suggestion is substantiated to use the network of local floras. The criteria for selection of local floras for monitoring purposes are given along with the scheme for passporting such local floras and the programme of their examination and periodical re-examination. Priority at the creation of such network is given to protected areas and biological stations. (Yurtsev, 1997).

## 4.2 Analysis of Soil from Different Localities

Chemical analysis of soil from major sites of Kaghan Valley shows that there exists a variation of edaphic factor in different localities (Table, 3.1). Soil factor clearly contributes a lot on the type of vegetation growing in it. According to Whiteford, *et al.* (1998), conservation of soil and water were considered key processes in healthy ecosystems and maintenance of biodiversity and productivity as important functions of healthy ecosystems.

This chemical analysis of soil can be used as a tool if and when artificial propagation/in-vitro propagation or ex-situ conservation of important plants of those localities is required. For example, *Paeonia emodi* and *Geranium wallichianum* community grows well in soil where NO<sub>3</sub>-N is 0.22, PO<sub>4</sub>.P is 6.25, K is 89, pH is 7.50. ECe is 0.16, Organic matter is 2.10 and Texture is clay loam, as shown in Table 3.1, Sr. No. 2. (Ahmed *et al.* 2006) conducted a quantitative phytosociological survey in 184 sampling stands in various climatic zones of Himalayan forests of Pakistan. Based

on floristic composition and importance value, 24 different communities and 4 monospecific forest vegetation were recognized. Quantitative description and their population structure were presented. Many communities showed similar floristic composition, however, differed in quantitative values. Vegetation of forest ground flora was also presented. The growth development and distribution of plants and their communities are greatly influenced by the chemistry of soil. (Hussain, 1989).

The physical and chemical characteristics of the soil from experimental site were analyzed by Ahmad, *et al.* (2008). They studied the status of plant diversity at Kufri (Soone Valley) Punjab, Pakistan and prevailing threats therein.

### **4.3 Ethnobotanical Findings**

Ethnobotanical survey of Kaghan Valley has shown that 108 plants are traditionally used by the local communities (Table 3.10) and a large proportion among them possesses multiple uses. They have medicinal value and used for various ailments, used for animal bites, as fodder, as food, as fuel wood, timber, veterinary medicines and other miscellaneous uses. Among these ethnobotanically important plants, Angiosperms are dominant and represented by 100 plant species and 53 families, (i.e., Monocots, 9 species and 5 families, Dicots, 91 species and 48 families), followed by Gymnosperms with 6 species and 4 families and Pteridophytes 2 species and 2 families. (Table 3.10).

Studies of similar nature were conducted by Ibrar *et al.* (2007). They collected ethnobotanical information on 97 plant species from Ranyal Hills District Shangla, Pakistan. These plants were classified for their traditional medicinal and economic uses. Many of those plants had more than one local use. There were 37 fuel species, 37 forage/fodder species, 31 medicinal species, 18 edible species, 12 species used for making shelter, 10 vegetable species, 9 poisonous species, 7 ornamental species, 6 timber wood species, 4 furniture wood species, 4 species used for fencing, 4 honey bee plants, 3 species for agricultural tools, 2 species used as flavoring agents, 2 species for making mats and baskets, 2 species used with religious belief, 2 species for cleaning teeth, 1 species as tea substitute, 1 fiber yielding species, 1 species as adhesive, 1 irritant species and 1 species for making pens. It indicates the reliance and dependence of local people on their surrounding natural resources. It is essential to maintain the sustainable use of plants for future.

Almost similar information was recorded by Hussain *et al.* (2007) from Mastuj, District Chitral, Pakistan. They concluded that there were 111 species of 46 families including 39 Dicot (98 spp), 5 monocot (11 species) and 2 gymnosperms (2 species). Family Asteraceae (11 species), Papilionaceae (10 spp.) and Rosaceae (9 spp.) were important families in number of species. The traditional uses revealed that there were 90 fodder, 52 medicinal, 40 firewood, 19 vegetable, 15 thatching/fencing, 13 timber and 9 fruit species. Two species including *Haloxylon griffithii* and *Vaccaria pyramidata* are used for making soap; while 4 are used in basketry, 4 species are preferred furniture wood species and some 8 species are used for making agricultural implements. Further study is required to quantify the availability of traditionally important medicinal and forage plants and to suggest the possible management of the natural resources.

People of Kaghan Valley heavily rely on plants to fulfill their local needs. The people lead a very simple life because of the poverty factor. They have to manage all their requirements from the indigenous resources. Life remains arrested during the winter months but on the approach of spring and summer season, activities are generated by the influx of nomads and tourists. There is a tremendous shortage of health care facilities in the Valley. There was just single hospital in Balakot for the entire region and was destroyed in October 2005 Earthquake.

Kaghan Valley is blessed with a variety of wild plants, which are being used for medicinal purposes. People prefer to find solution of health problems themselves. They frequently use different plants for various ailments. Ethnomedicinal survey shows that how people use those remedies for health related problems, especially digestion, respiratory tract infections, nervous system, women related diseases, urine problems, heart related diseases and skin problems etc. Similar studies were conducted by Goodman and Ghafoor (1992) in Baluchistan province of South Western Pakistan. They collected information of about 114 plant species used by the village dwellers for nutritional, utilitarian and medicinal purposes. Zaman and Khan (1970) described hundred drug plants of West Pakistan each with its family, botanical Names, local Names, description, constituents, action and uses. Information on medicinal plants from various regions of Pakistan have established a base for further research with respect to conservation, pharmacological and other aspects of medicinal plants.

Leopratti and Lattanzi (1994) studied 27 medicinal plants of ethnobotanical value in Makran, South Waziristan. Hoking (1958, 1962) carried out studies on

medicinal plants of Pakistan. (Shinwari, 2000) conducted ethnobotanical study in Margalla Hills, National Park to record the native uses of these plants. (Ahmad, 2007) conducted a study to highlight medicinally important plants around motorway (M-2), Pakistan. (Sheikh, *et al.* 2002) recorded 153 plant species belonging to 38 families and 113 genera from Naltar Valley, Northwestern Karakorums, Pakistan. 24 plant species emerged as ethnobotanically important for medicinal uses and some commercial uses. Although sporadic information on medicinal plants exists from different parts of Pakistan, yet there is a need for thorough collection of data on ethnobotany of remote areas such as Kaghan Valley and Northern Areas of Pakistan. Especially, the areas of Karakoram and Himalayan ranges in Pakistan.

The medicinal plant wealth of Kaghan Valley is either vulnerable or endangered by the use of these plants for other purposes apart from medicinal use. The results have shown that there is a massive exploitation of medicinal plants both locally (for domestic use) and commercially (export). The problem is even more serious in the context of use of these plants for other purposes also i.e., for grazing, fodder, food, fuel- wood, timber, veterinary medicine and other miscellaneous uses. These results are presented in tables 3.12, 3.13, 3.14, 3.15, and 3.16 respectively to reveal the potential of this area. Shinwari and Khan (1999) studied ethnobotanical conservation status of Margalla Hills National Park, Islamabad and found that the inhabitants always used medicinal plants for various ailments and have for a long time been dependent on surrounding plant resources for their food, shelter, fodder, health care and other cultural purposes. However, encroaching industrialization and the accompanying changes in their life styles are responsible for the decrease of practice in the local use of plants for medicine. Similarly, Scherrer, *et al.* (2005) studied traditional plant use in the areas of Monte Vesole and Ascea, Cilento National Park, Italy. In total, 63 plant species were documented as medicinal, 49 as food and 22 as craft plants. 775 species of Angiosperms from Kaghan Valley (Table 3.3) revealed that the area of Kaghan Valley represents one of the highest medicinal plant producing areas in Pakistan.

#### **4.3.1 Plant Species used Against Animal Bites**

The people of Kaghan Valley use plants like *Achyranthus aspera*, *Amaranthus viridis*, *Desmodium gangeticum*, and *Eclipta prostrate*, etc. in case of animal bites. Complete results are given in Table 3.11. These plant species are considered useful for snake bites and scorpion stings. (Ibrar, 2003) has given a list of 15 plants which are



used against different animal bites by the people of Moist Temperate Himalayas Pakistan.

### 4.3.2 Fodder Species of Kaghan Valley

The collection of fodder is also one of the essential needs of the people of Valley as they have to feed their livestock. The results revealed that (as shown in Table 3.12) there are many important plant species which are threatened due to grazing, over utilization and agricultural extension for crops. It is quite unfortunate and shocking situation as observed at Lalazar. A historical picnic place and a natural reserve for scientists and tourists has now been mostly converted into agricultural land and the area now has lost most of its scenic beauty and losing attraction of tourists and scientists as most of the valuable common species have perished from this area. I suggest through my study to the Department of Forest, Ministry of Environment and Tourism to protect and save this area from further destruction. If a person who had visited this area 10 years ago and if he visits this area in present situation, probably he would not recognize that this is the same area he has visited 10 years ago. For instance *Euphorbia* species are rarely available in this locality apart from other common plant species.

Tree fodder collection starts in mid March when little grass fodder is available. Herbaceous fodder predominates from late May to late October. Grasses are selectively harvested especially in June – July. Some species are favored for special purposes. That is the reason why certain plants like *Aesculus indica*, *Artemisia absinthum*, *Berberis lyceum* and *Bistorta amplexicaulis*, etc. are threatened by this practice. From late autumn to spring very little fodder is available in the Valley. The nomads migrate to the plain areas and the settled people feed their livestock with the fodder, which was harvested during summer and was stored for winter use. Winter fodder is also available from wheat and maize crop residues. Fodder systems were studied at Ayubia, Pakistan and it was found that there are about 42,000 people in 6000 households living close to the park and depending upon its resources, principally for fodder and fuel wood. Jabeen (1999). Many have small farms and keep a handful of animals – buffalo, cattle, goats and horses. All of these animals are stall fed in winter, with some of the oxen and non-milking buffaloes being released into the park in summer for free range grazing. Apart from fodder and fuel wood, the people collect leafy vegetables such as Kunji (*Dryopteris stewartii*) from the park for their own consumption, as well as morel mushrooms *Morchella esculenta* (two varieties: Kali

and Surkh guchi) to sell. (Jabeen, 1999; Aumeeruddy – Thomas, *et al.*, 2004).

### 4.3.3 Plant Species Used as Food

There are some plant species (both wild and cultivated) which are used as food by the people. The results given in Table 3.13 revealed that 18 plant species are used as food. Among them 5 are used as vegetable i.e, *Allium sativum*, *Amaranthus viridis*, *Chenopodium album*, *Luffa cylindrical* and *Solanum tuberosum*, 7 as fruits i.e, *Ficus carica*, *Fragaria nubicola*, *Punica granatum*, *Pyrus communis*, *Rubus niveus*, *Viburnum cotinifolium* and *Zizyphus jujuba*, 5 as spice/condiment, i.e, *Carum carvi*, *Mentha longifolia*, *Mentha spicata*, *Rumex hastatus* and *Zanthoxylum armatum*, and 1 for making flour, i.e, *Zea mays*. Similar studies were conducted by (Tardio, *et al.* 2005) in Spain and found that 123 vascular species belonging to 31 families are used as vegetables, fruits and in making of beverages. They also discussed some ecological and cultural aspects of the collection of wild plants for food along with the relationships between food and medicinal uses of some species.

### 4.3.4 Timber and Fuel Wood Consumption

In Kaghan Valley there exists a massive and ruthless destruction of trees for fuel wood and timber. Wood is the only source of fuel for cooking and heating purposes. Lavish use of timber for construction purposes is also a traditional practice. The results given in Table 3.14 and 3.15 clearly indicate that some valuable plant species are threatened by this dual problem. There is a dire need to provide people with alternate energy resources to reduce this ever increasing pressure on plants. Secondly measures should be taken to stop the lavish use of timber and existing laws and rules should be revised to control this trend. Fuel wood is collected with the help of sickle and axe, while timber wood is processed in saw machines or manually by two-man peg-toothed cross cut saw. Scants and logs are made and transported through water, collected at the transit sites and for further transportation mules are used. The plant species which are most commonly valued for timber wood are Deodar (*Cedrus deodara*), Biar (*Pinus wallichiana*), Fir (*Abies pindrow*), Spruce (*Picea smithiana*) and Chir (*Pinus roxburghii*). Similar results were obtained by Shah. *et al.* (2007) in Siran Valley, Pakistan. They recorded that 71 plant species belonging to 50 genera and 32 families are utilized as fuel wood and 54 species belonging to 39 genera and 27 families are utilized as timber. Three tree species *Quercus incana*, *Cedrus deodara* and *Taxus wallichiana* have been found endangered. Similar studies were conducted by Khan. *et al.* (1996) in Hindukush Himalayas region of Pakistan. Hussain, *et al.* (2006)

worked on traditional medicinal and economic uses of Gymnosperms of Kaghan Valley, Pakistan. They concluded that the inhabitants of the area use medicinal plants for various purposes and have for a long time been dependent on surrounding plant resources for their food, shelter, fodder, healthcare and other cultural purposes. They found *Pinus roxburghii*, *P. wallichiana*, *Cedrus deodara*, *Abies Pindrow* and *Taxus wallichiana* as prominent gymnosperms of the valley which are not only a source of timber but also utilized as fuel wood and medicinal purposes.

For sustainable utilization of the forest products of Kaghan Valley, there is an urgent need to consider the following recommendations.

- i) To overcome the problem of fuel shortage there is an urgent need to grow more and fast growing native and exotic species.(with care and consideration).
- ii) There is a need to spread awareness among the local people about the importance of biodiversity and conservation and they must be educated about the hazards of such disaster.
- iii) There is an urgent need to explore alternate energy resources to reduce indiscriminate use and cutting for fuel purposes. Perhaps gas stoves may be distributed to locals.
- iv) There exists a tremendous potential in Kaghan Valley for the establishment of small and medium sized dams. This aspect need to be explored for the generation of electricity.
- v) Forest Department needs to play an active role in stopping and checking unauthorized cutting by timber mafia, overgrazing and browsing, deliberate fires, collusive thefts and pre-planned jungle fires.

#### **4.3.5 Ethnoveterinary Medicines**

The people of Kaghan Valley and nomads frequently use different plants for the treatment of their animals. The people of Kaghan due to their constant association with forest environment and animals have evolved knowledge by trial and error and have developed their own way of treating animals. Different plants are used for different ailments, as given in Table 3.13. For example *Aesculus indica* is used for fever and colic, *Arisaema flavum* for digestive problems and *Berginia ciliata* for respiratory disorders, etc. Similar studies were conducted by Deora, *et al.* (2004) in North-West Part of Udaipur, District (Raj) India, and Tosh, (2004).

Palynological and Ethnobotanical studies were conducted by Hussain, *et al.* (2006) of *Adhatoda vasica* (Acanthaceae) from Kaghan Valley. Similarly Palynological and Ethnobotanical studies of genus *Pinus* from Hazara, N.W.F.P. Pakistan were conducted by Hussain, *et al.* (2008). Palynological and Ethnobotanical studies of *Jacaranda mimosifolia* (Bignoniaceae) from Kaghan Valley, NWFP, Pakistan, were conducted by Hussain, *et al.* 2006. Similar studies of *Alnus nitida* (Betulaceae) from the same site were conducted by Hussain, *et al.* (2006). A few preliminary and basic studies on Ethnobotany of Kaghan Valley have been conducted on this wide spread and difficult area. During my studies I have found that the most useful source of ethnobotanical information is the presence of seasonal nomads (Bakarwals/ Gujars). These people live on high altitudes, alpine meadows with their sheeps, goats, and cattle for spring and summer season (May-August). They collect medicinal plants mostly for sale and for their own use. These Himalayan ranges are very difficult to approach and economically expensive. It is not easy to extract indigenous knowledge from these nomads. There are still some remote areas between Lulusar Lake and Babusar Pass. Mount Makra needs further studies on this aspect in future.

#### **4.3.6 Miscellaneous Uses of Plant Species**

Apart from major ethnobotanical uses, the people of Kaghan Valley use plant species in a variety of ways, for example, plants are used for making implements, they are used to make bags, mats and baskets, they are used for poison preparation, they are used to repel evils (a folk belief) and they are used in making walking sticks etc. All such uses can be regarded as miscellaneous uses. Many researchers have conducted ethnobotanical studies of different regions. For example, Ethnobotanical studies of economically important plants of Gilgit and surrounding areas were conducted by Qureshi, *et al.* 2003 and Ethnobotanical studies from Karakoram regions in Northern Areas of Pakistan were conducted by Awan, *et al.* 2003. Both of them have given a number of ways in which plants are used in these regions.

#### 4.4 Folk Medicinal Recipes of Kaghan Valley

Traditional folk recipes of Kaghan Valley were also documented during the present study. The results have shown that there are 30 different folk recipes which are used by the people of the Valley. Preparation, dosage, uses and part used were also recorded along with Local Name, Common Name, Family and Botanical Name of the plant species. It is exciting to mention that sometimes the same plants are used for different ailments but preparation and dosage differ from one another. 30 plant species belonging to 19 Angiospermic families, 2 Gymnospermic families and 1 Pteridophytic family were documented. Among the angiospermic families, Asteraceae is the dominant one with 5 plant species followed by Labiatae with 4 plant species and Liliaceae with 2 plant species. The rest of the families were represented only once. Similar studies were conducted by Shah & Khan, (2006) of Siran Valley, Mansehra, Pakistan.

Herbal drugs have always fascinated the majority of population. According to WHO, the global market of the medicinal herbs and herbs products is about US\$ 62 billion and had been enhanced by the Year 2005 at the level of US\$ 5 trillion. Pakistan has got more than 4000 different plant species and out of them 1100 has been pointed out to be medicinal in nature but only 350 – 456 plant species have entered into bulk herbal manufacturing and raw material market. (Rizvi & Saeed, 2005). In Pakistan, the cultivation and collection of medicinal plants have been as indigenous and export is individual businessman – consumer activity. Only some limited information published by PFI on the regeneration, market survey of medicinal plants, from different regions of Pakistan is available. (Usmanghani, 2000). Controversy still exists in many cases regarding correct identification of medicinal plants, source of procurement, common adulterants and substitutes of crude drugs etc. This is mostly because of the drug trade that has slipped into the hands of people not scientifically trained (Rizvi, 2001). Pakistan is amongst the eight leading countries, which exports medicinal plants. According to the Export Promotion Bureau, there was an export of over 8,500 tones of medicinal herbs in 1999, which fetched a petty amount of US\$ 6 million as compared to US\$ 31 million spent on the import of herbal products. (Gilani, 2001). Market survey of medicinal plants of Kaghan Valley was conducted to record the buying and selling rate of these plants. The results given in Table 3.9 revealed that there exists a huge difference between the purchase and sale rate of plants.

The collector receives a nominal amount for all his hard work and the

purchaser enjoys all the profit and benefits by deceiving simple illiterate people. There is an urgent need to educate the collector about the collection, drying, curing, storing, preservation, packing, transportation and marketing etc. of these plants because the people are ignorant and they are unaware about the importance of these factors. A bulk of the plant material is lost because of negligence and careless approach. The 640 hectare large Los Tuxtlas rain forest reserve in Mexico was analyzed for the commercial potential of its 860 native flowering plant species. Excluding plants with medicinal or chemical use, 91 species (10.6%) are found in the market and an additional 72 species (8.4%) are considered to have market potential. The use categories and purposes are also given. (Manriquez, *et al.* 1997).

#### **4.5 Medicinal Plant Conservation Issues**

In Kaghan Valley there exists a remarkable stress of anthropogenic factors, which resulted in the depletion of floristic diversity in general and medicinal flora in particular. The severity of the condition can be elucidated from the Table 3.17 and Figure 3.4. The results have shown that 27.77% of ethnobotanically important plants of Kaghan Valley are at risk, of which 2.77% are critically endangered, 12.96% are endangered, 9.25% are vulnerable and 2.77% are near threatened. In Kaghan Valley due to removal of fuel wood, illicit cutting of timber, encroachment on forest land, road construction, lopping for fodder, overgrazing, fires, tourism and commercial exploitation of medicinal plants have resulted in depletion of valuable plants. Therefore, it has been felt that there is an urgent need for conservation, of ex-situ and in-situ cultivation of these valuable and threatened species by establishing high altitude nurseries in their natural habitat, so that natural scenic beauty of the area could be maintained and above all this valuable flora of the Himalayan region could be conserved. Many researchers have focused on this aspect and conducted similar studies. (Ahmad & Waseem, 2004) worked on conservation status of some medicinal plants of the salt range. (Olorode, 2004) conducted studies on plant genetic resources in Nigeria.

Conservationists believe that by the year 2050, one fifth of the world flora will either be extinct or severely genetically eroded. There is a need for conservation and propagation of alpine and sub-alpine medicinal plants of North West Himalayas. (Joshi and Rawat, 1997). Key causes of tropical deforestation were investigated using cross-sectional data for 90 developing countries for the period 1981 – 1990. Regression results revealed that deforestation is associated with both development and scarcity.

Deforestation accelerates with expanding infrastructure, trade, debt, investment in human capital base and resource based economic expansion. On the other hand, absolute and relative scarcities – manifested by growing population pressures, food and land shortages, fuel wood dependency, and inequalities in access to land – are also key factors in explaining forest loss. (Lise, 1998). Historical and ecological data from north-central Massachusetts suggest that widespread of intensive human disturbance after European settlement led to a shift in forest composition and obscured regional patterns of species abundance. (Fuller, 1998). Similarly conservation of plant diversity in China was analyzed by (Jiantian, 1998) and pointed out continuing threats to the diversity of natural vegetation through the large scale felling of forests and overgrazing of grasslands with ensuing erosion and desertification in some areas. It is possible to make use of large amounts of fuel from the forest with retained or perhaps even improved environmental status. (Anna, 1998).

The floristic diversity is the prime source for entire humanity in the form of food, medicines, clothing, housing and spiritual inspiration. The biological diversity that hardly finds any use today may prove to be very useful tomorrow. It may prove needful and essential. Sustainable advances in biological productivity will not be possible without access to the existing biological diversity. Therefore, there is an urgent need to take conservation measures to conserve and protect existing richness of biological diversity for future. The conservation of biological diversity can be viewed as a form of natural insurance against present and future events like climate change that may devastate the present biological diversity.

Plants are very valuable living resource, exhaustible if uncontrollably exploited and sustainable only if utilized with great care and wisdom. Plants are being used in all aspects of human life. Their conservation needs prime importance.

One reason for conserving plants is to keep options open for the discovery of new uses. A similar argument holds for traditional botanical knowledge – if conserved, this knowledge remains available for the use of future generations. The medical is one field in which plants surely still have much more to offer. New medications are sorely needed to control those pathogens that are becoming genetically resistant to current treatments. (Lewis, 2003).

Nature conservation needs to be underpinned by basic values that appeal to the deepest levels of the human mind and spirit. Materialistic arguments – based upon utility or financial income – are important, but not enough. Human economies change

and so do valuations of plants, so it would surely be foolish to base conservation purely on current economic values. The moral is that, wherever they are working, plant conservationists need to approach the involvement of local people in conservation schemes, starting with those aspects of plant world in which the local people are interested.

Without an understanding of nature, bio-diversity will be misused and its very existence threatened. Scientific research can only concentrate on a few species, while many more are being destroyed before they can even be classified. It would be very useful to tap the knowledge of indigenous people, a knowledge long ignored by scientists, who have only recently begun to recognize the advanced knowledge of native cultures. So far very little consideration has been given to the knowledge of indigenous people and peasants.

For indigenous people in developing countries like Pakistan where exploitation of environment is necessary for survival, help is needed in constructing alternatives for sustainable development, in order to make biodiversity conservation more profitable than biodiversity destruction. Multiple uses of forests, development of agro-forestry, silviculture and sustainable exploitation of wild species of flora are some of the alternatives that should be considered. These wild lands contain immense biological resources of benefit to humankind. These genetic resources are also potentially highly profitable if developed with scientific, economic and technological assistance. Governments and institutions will not be able to achieve the conservation of biodiversity unless rural and urban communities are involved in decision-making processes and in the management of their environment and natural resources. Thus problems of biodiversity, conservation of natural resources and the environment are problems concerning governments and the general population alike.



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## ANNEXURE – 1

### Questionnaire for Ethnobotanical Survey

#### **Biodata of Informant:**

Name:

Age:

Gender:

Education:

Date:

#### **Information about the Plant:**

Local Name of Plant:

Botanical Name:

Locality of collection:

Uses of the Plant:

Quantities harvested/day/month/year:

Who collect the Plant? (Men/Women/Children)

Why collected?

Which part is collected?

How the plant is collected?

Is it sold?

To whom it is sold?

What kinds of post harvest processes are practiced?

#### **Local Price/Kg in Rs.:**

Quantity sold each year:

Availability status of plant in last 10 years:

(Increased/Decreased/persistent).

Any conservation effort on the part of locals:

Any other observation:



## ANNEXURE – 2

### Questionnaire for Fuel Wood Consumption Survey

#### **Biodata of Informant:**

Name:

Age:

Gender:

Education:

Date:

#### **Information about the Plant:**

Local Name of Plant used for fuel wood:

Botanical Name:

Locality of collection:

% age of use:

Who collect fuel wood? (Men/Women/Children)

When and from where it is collected?

Is it sold?

Quantity consumed per day: Summer: Winter:

Quantity consumed per annum:

Status of fuel wood consumption during last 10 years.

(Increased/Decreased/No Change.)

Any other observation:

## ANNEXURE – 3

### Questionnaire for Conservation Status Survey

#### **Biodata of Informant:**

Name:

Age:

Gender:

Education:

Date:

#### **Information about the Plant:**

Local Name of Plant:

Botanical Name:

Which part is collected?

Utility of the plant:

Present availability status:

Availability status during the last 10 years:

(Increased / Decreased / Persistent)

Major causes of decrease:

Any conservation effort by collector / community:

Name of most threatened plant species:

Any Extinct plant species:

Yes / No.

If yes, which one and why?

Any other observation:

## ANNEXURE – 4

### Questionnaire for Medicinal Plants Market Survey

#### **Biodata of Informant:**

Name of Vendor:

Age:

Education:

Date:

Type of Vendor: Permanent / Temporary

Total Number of species traded:

Number of suppliers:

Number of employees:

#### **Information about the Drug Plant:**

Local Name of Plant:

Botanical Name:

Part Used:

Price/Kg Rs:

Purchase Rate =

Sale Rate =

Availability:

Increased / Decreased:

Demand:

Increased / Decreased:

Exported to: Please mention Name of city:

Condition of Plants: fresh /dried / preserved:

Brought to market: Daily / Weekly / Occasionally:

Present sale comparison with past: more /less / same.

Who sell it to you: middle man / collector?

Any other observation:

**ANNEXURE – 5**

**Label for Herbarium Sheets**

**Quaid-i-Azam University Islamabad Herbarium**

**Flora of Kaghan Valley (N.W.F.P.) Pakistan**

Number:

Name:

Common Name:

Family:

Locality:

District:

Age:

Use:

Altitude:

Slope:

Soil:

Vegetation type:

Associated Plants:

Habitat:

Distribution:

Abundance:

Other Data:

Collector's Name:

Date:

## ANNEXURE – 6

### Important Destinations of Kaghan Valley along with Distance (Km) and Height (Ft).

<u>From</u>	<u>To</u>	<u>Km</u>	<u>Localities</u>	<u>Height(Ft)</u>
Islamabad –	Balakot	194	Balakot	3226
Balakot –	Shogran	32	Musa ka Musalah	13400
Shogran –	Siri	6	Shogran	7750
Shogran –	Paye	9	Lalazar	10590
Balakot –	Paye	41	Lulusar lake	11200
Balakot –	Kewai	23	Dodipat lake	11500
Balakot –	Paras	28	Saif ul Maluk	10500
Paras –	Sharan	15	Aansu lake	13000
Balakot –	Sharan	43	Kunhar lake	7500
Balakot –	Mahandri	45	Naran	8200
Balakot –	Manoor	76	Kaghan	7500
Balakot –	Kaghan	63	Malika Parbat	17390
Kaghan –	Naran	23	Siri	8500
Balakot –	Naran	86	Paye	9500
Naran –	Saif ul Maluk	8	Noori Top	13100
Balakot –	Lalazar	104	Mahandri	5000
Naran –	Lalazar	18	Sharan	7500
Naran –	Basel	47	Babusar Pass	13684
Naran –	Dodipat lake	60	Basel	9300
Basel –	Dodipat lake	13	Shinkihari Hut	8500
Naran –	Lulusar lake	52	Manoor	12200
Naran –	Babusar Pass	73		
Balakot –	Babusar Pass	159		