PHYTOSOCIOLOGICAL AND ETHNOBOTANICAL APPRAISAL OF KABAL VALLEY SWAT WITH ESPECIAL REFERENCE TO PLANT BIODIVERSITY CONSERVATION

MOHAMMAD ILYAS

(09-arid-1824)

Department of Botany

Faculty of Sciences

Pir Mehr Ali Shah

Arid Agriculture University Rawalpindi

Pakistan

2015

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by

MOHAMMAD ILYAS
(09-arid-1824)

A thesis submitted in partial fulfillment of
the requirements for the degree of

Doctor of Philosophy

in

Botany

Department of Botany
Faculty of Sciences
Pir Mehr Ali Shah
Arid Agriculture University Rawalpindi
Pakistan

2015

CERTIFICATION

I hereby undertake that this research is an original one and no part of this thesis falls under plagiarism. If found otherwise, at any stage, I will be responsible for the consequences.

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Supervisor: _____
(Dr. Rahmatullah Qureshi)

Member: _____
(Prof. Dr. Muhammad Arshad)

Member: _____
(Prof. Dr. Sarwat Naz Mirza)

Chairman: _____

Dean: _____

Director Advanced Studies: _____

DEDICATION

To all those who have devoted their lives for the cause of biodiversity conservation, this humble piece of work is dedicated with affection

CONTENTS **Page**

LIST OF TABLES

LIST OF FIGURES

ACKNOWLEDGEMENTS

All praises be to the 'Almighty Allah', the most benevolent, ever merciful whose blessings enabled me to complete this task. My heartiest tributes are also due to Hazrat Muhammad (Peace be upon him) whose teachings and guidance enlightened our conscious about the importance of biodiversity conservation.

My sweet parents are worthy to be given the credit of decorating my life with the ornament of knowledge. Their keen interest, useful advices, encouragement, financial support and whole hearted prayers are the basic source of my success.

The credit of this work really goes to my honourable research supervisor Dr. Rahmatullah Qureshi, Associate Professor, Department of Botany, PMAS Arid Agriculture University, Rawalpindi, Pakistan, who suggested and approved the topic for me, provided step by step guidance, encouraged me throughout and critically reviewed the manuscript. I am highly indebted to him for sparing valuable time from his hectic schedule.

I am also indebted to members of my supervisory committee, Prof. Dr. Muhammad Arshad, Chairman, Department of Botany, PMAS Arid Agriculture University, and Prof. Dr. Sarwat Naz Mirza, Registrar, PMAS Arid Agriculture University for their kind attitude and encouragement during this project.

I feel a profound sense of gratitude for Stephan Hennekens, Alterra, Green World Research, Wageningen, The Netherlands for his generous provision of TURBOVEG to me free of cost. My friends Dr. Javed Iqbal, Lab Manager at Louisiana State University, USA and Mr. Shah Hussain in Los Angeles, USA, provided me with the softwares PC-ORD and CANOCO respectively. Mr. Naveed Akhtar, PhD scholar at Department of Vegetation & Phytodiversity Analysis, University of Göttingen, Germany helped me a lot in understanding the use of computer softwares and interpretation of the data. Mr. Zahidullah, PhD scholar at Department of Plant Sciences, Quaid-i-Azam University, Islamabad helped me a great deal in identification of plants, especially the monocotyledons, while Naeem Akhtar and Mr. Adnan of NUST helped me in preparing GIS maps.

I acknowledge a particular depth of gratitude to Mr. Fazal Hussain and other staff at Agricultural Research Station, North, Minogra for providing me climatic data and facilities to analyze the soil samples.

I can't forget the cooperation of my lab fellows, Dr. Gul Rahim, Dr. Mubashrah Munir, Ms. Humaira Shaheen, Ms. Mehmooda Manazir, Mr. Muhammad Maqsood, Mr. Waseem Ahmad, Mr. Faisal and Ms. Rehana Kouser, who provided me full support in the time of need.

My brothers Mr. Fazli Wahab, Mr. Muhammad Usman, Mr. Muhammad Younis, Mr. Zia-ul-Haq and Mr. Izhar-ul-Haq always accompanied me to the rigorous field study trips. My sisters took a lot of pain in drying, preserving and arranging the plant specimens for preparing the herbarium sheets. My wife and kids bothered the negligence without any complains while I was busy with my thesis write up.

Last but not the least I am grateful to the people of my research area for their hospitality, help in collecting vegetation data and sharing their indigenous knowledge of plants. They shared with me all that they knew about the biodiversity and concealed nothing; without their help it would be almost impossible to complete this project.

MUHAMMAD ILYAS

Abstract

Kabal valley, district Swat, Pakistan is rich in plant biodiversity, but little attempt has been made to evaluate it scientifically. To fill this research gap, the present study was conducted for phytosociological and ethnobotanical enumerations of the existing plant wealth of the study area. The vegetation was surveyed through random stratified sampling during September 2010 to July 2013. In all, the data of 314 relevés were stored in the database software TURBOVEG version 2.101 and analyzed through Two Way Indicator Species Analysis (TWINSPAN) by using the host program JUICE version 7.0.99 and correlated with edaphic, topographic and environmental variables using Detrenched Correspondence Analysis (D.C.A). Nine different plant communities such as 1) Nasturtium-Paspalum-Veronica in Wetland, 2) Abies-Picea-Viburnum Coniferous Forest, 3) Pinus-Quercus-Berberis Mixed Forest, 4) Pinus-Indigofera Blue Pine Forest, 5) Celtis-Olea-Cynodon Sacred Groves Broad Leaved Forest, 6) Diosperos-Pinus-Quercus Mid Hill Degraded Forest, 7) Dodonaea-Isidon-Berberis Xeromorphic Scrub, 8) Pinus-Quercus-Galium Protected Chir Pine Forest and 9) Isodon-Berberis-Indigofera Montane scrub were established influenced by different topographic and edaphic factors. The pattern in the species and relevés data set and its relationship with the environmental variables was determined by Detrended Correspondence Analysis (DCA) in Canoco 4.5. Therophytes (43.94%) and Hemicryptophytes (21.31%) were the dominant life forms while Nanophylls (33.72%), Microphylls (28.32%) and Leptophylls (24.53%) were the dominant leaf size classes of the area. Biodiversity was assessed by using species richness, Shannon-Wiener diversity index, species evenness; while the conservation status of useful plants was ascertained according to IUCN categories. In all, 820 species distributed across 497 genera and 136 families were identified during the study period. Besides, some of the interesting flora such as *Silene indica* var.

cashmeriana, Geranium Swatense, Impatience pallida, Gratiola officinalis and *Vernoca hederifolia* are reported for the first time from Swat, Pakistan. The flora includes 31 ferns, 8 gymnosperms, 184 monocots and 597 dicots.

With reference to ethnobotanical study, local inhabitants utilized native flora to fulfill their eight major use categories. Most of the species were used as folk medicine (344 spp., 75.94%), miscellaneous 216 spp., 47.68%), food (205 spp., 45.25%), fodder (153 spp., 33.77%), fuel (94 spp., 20.75%), ethno-veterinary (90 spp., 19.87), tools (63 spp., 13.91%) and construction (41 spp., 9.05%).

The findings of the study will help foresters, range land managers, medicinal plant growers and collectors, ecologists and conservationists to improve the bioresource base and socioeconomic conditions of the people.

Chapter 1

GENERAL INTRODUCTION

1.1 THE STUDY AREA:

1.1.1 Location and description

Kabal valley is part of tehsil Kabal that is situated in the North West of District Swat at a distance of about 15 kms from Saidu Sharif. The area lies between 34°43′ to 35° North and 72°07′ to 72°21′ East in Swat district. The average elevation of the area varies from 833 to 3012 meters from the mean sea level. The valley is open on the southern side towards the river Swat while from three sides, i.e. east, north and west it is surrounded by an arc shaped series of hills having different elevations and aspects. The series of hills from western part of the Hundu Raj (Trans-Himalaya) series of Hindu Kush mountain range (Ahmed and Siraj-ud-Din, 1996). The valley opens from the southern side at the bank of the River Swat and runs northwards to culminate in Manrai hills. The valley is typically U-shaped, surrounded by southwardly offshoots of Manrai hills, which are named according to locality like Girbanr hills, Mahak-Naranjpura hills, Drad-Taran hills, Shalkho Sar hills, Boki Sar, Rashid Banr, Sar Tooro Ghar and Banr Kandaw, Dandi, Salain Sar, Kharawo Morcha, Jawar Kandaw, Sailey Banda, Saparey, Toora Sata, Chor-Penawrai, Tall-Dardyal hills, Mian Beeley Banr, Bazoono Dherai, Maha Banr, Khanjaro Sar, Qalagai hills, Manjey Kandaw and Jambeka. The highest peak is Salain Sar with an altitude of 3012m.

The hills surrounding the valley have sent zigzag offshoots into the valley forming smaller sub-valleys called “Daras” like Mahak-Naranjpura Dara, Muhammad Baig Dara, Nemakai-Shabeka Dara, Drad-Taran Dara, Manrai Dara, Tall-Dardyal, Mian

Beeley, Tangai Awara-Ashari, Manja-Qalagai, Teghak-Ramorgai Dara and Sumsail Dara.

The main valley and the subsidiaries are an outcome of running water. The low lying areas of the valley are alluvial pans traversed by seasonal streams. The main stream which runs almost in the middle of the valley and joins the River Swat is Deolai Khwar. This stream is formed by joining of smaller tributaries like Mahak Khwar, Manrai Khwarh, Qalagai Khwarh and Manjey Khwarh. The fast flowing water cuts the upper water courses deeply and flows the load of washed away materials. As the gradient in upper courses is greater, so the erosion is on a larger scale, especially during monsoon rains when seasonal floods are common in the streams. The fast flowing water, which is laden with big rolling boulders and stones to cause heavy destruction in the upper courses. The loaded material is deposited in the low lying areas where the gradient is low, resulting in alluvial soils. Because of indigenously formed irrigation channels from these streams, the low lying areas are regularly irrigated and are very fertile, supporting a variety of crops, vegetables and fruit orchards. The valley consists of nine union councils in tehsil Kabal, district Swat. The valley is bounded in the south by river Swat, in the east by tehsil Matta, in the north by district Dir and in the west by tehsil Shamozi and district Dir (Fig. 1.1)

1.1.2 Geology:

Geologically the hills are of recent origin and forms part of the southern stretch of Kohistan Island arc which is delineated on the South from the northern tip of the Indian plate marginal mass by a Himalayan mega shear called the Main Mantle Thrust, the southern suture (Tahirkheli, 1982). The area mainly contains the rocks of Hornblenditic and Schistose groups. The former group is represented by meta-sedimentary rocks, amphibolites, meta-diurites, pegmatites and granites while the later

group is represented by chloritic schists, Chloritoid schists, quartz-mica-carbonate schists and marble. Both these groups are Siluro-Devonian in origin (Zeb, 1970). The rocks exposed in the area are characterized by felsic zones which are more or less parallel with the general foliation in the country rock and extend discontinuously. The rock types are covered with unconsolidated quaternary sediments composed of clay, silt, cobbles and boulders. The clay, sand and silt mainly cover the slopes and valleys and are interspersed with pebbles, cobbles and boulders. The boulders are concentrated alone along the stream and nala beds. With economic point of view the area is geologically important for the presence of china clay at Shalhand and building material elsewhere (Moosvi *et al.*, 1974; Dipietro *et al.*, 1993).

1.1.3 Soil

The soils of Kabal valley are residual as well as transported. Broken shallow residual soils are present along the steep forest slopes. Under sub-humid conditions the soils are highly leached and have high organic contents. In the mountainous valleys soils are formed from the alluvial infills of streams. Such soils are calcareous silt loam with low organic content. In the temperate zone, under the forest cover the soils have a high organic content and are sandy loam type. In general the soils have more sand and silt content with a very small fraction of clay. In general the soils are slightly acidic except the soil of the wetlands which are slightly alkaline. At the foot of the hills colluvial deposits are formed by the action of gravity, which are generally gravely and stony. The average depth of the topsoil is very low reaching up to 30 centimeters only, but due to high content of organic matter and humus the color is dark brown to very dark grayish brown.

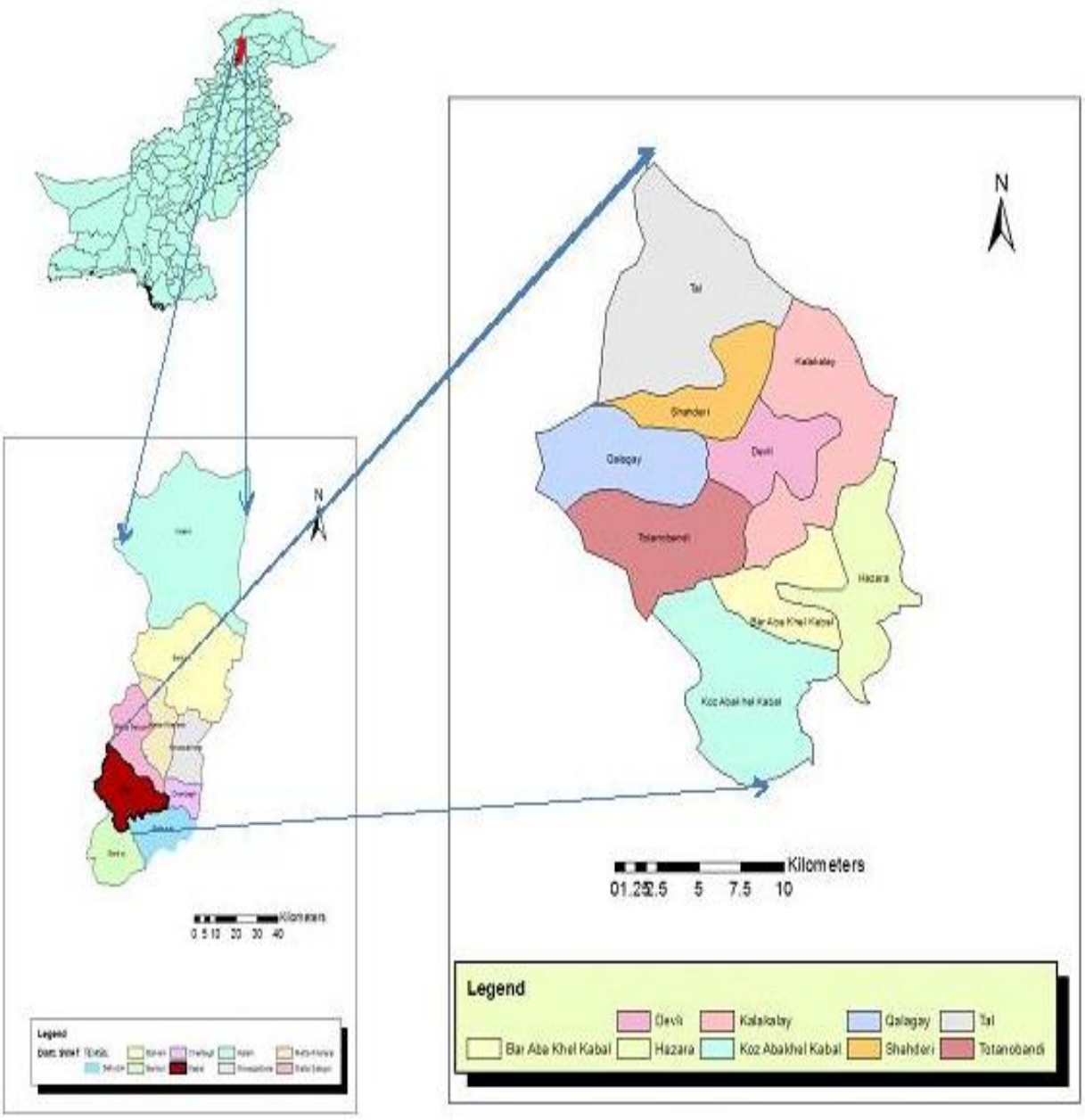

Fig. 1.1. Location and demographic map of Kabal valley, Swat, Pakistan.

1.1.4 Climate

Climatically the valley falls within the subtropical zone but due to variation in the topography, altitude, aspect and vegetation cover the climate gradually change into the montane temperate zone. There is no meteorological station in the study area. The nearest station is the Agriculture Research Station (North) in Mingora at a distance of about 2 kms from the study area in the south. Due to small altitudinal and latitudinal difference between the research area and Mingora, the meteorological data for Mingora is considered to reflect the near most situations that would prevail in the area, if not the same. An average of the meteorological date collected from 2010-2013 (4 years) is given in Table 1.1.

1.1.4.1 Temperature

The mean daily maximum and minimum temperature of a year are 24.4°C and 10.7°C respectively. June and July are the hottest months of the year with a mean daily maximum temperature of 34.5°C and 32.6°C respectively. The highest maximum temperatures in these months are 40°Cand 39°Crespectively. Winter season is comparatively long extended over November to April. January is the coldest month of the year with mean daily maximum of 14.3°C and mean daily minimum of 1.8°C. Lowest minimum temperature in January is -3^0C.

1.1.4.2 Rain fall

The mean monthly rainfall of the year is 82.9 mm. Maximum rain falls in the months of February and March (102.6 and 146 mm respectively) and then in Monsoon season (July and August) with 148.2 mm in July and 118.1 mm in August.May and June with 56.1 mm and 45.7 mm respectively in summer while October and November with 40.3mm and 23.9 mm respectively in autumn season are the driest months of the year. Annual rainfall is 995 mm and the average number of rainy days per year is 67.5.

Table 1.1Average Climatic data collected by weather station, ARSN, Minogra, Swat from 2010-2013 (4 years).

Month	Temperature (°c)				Rainfall		Relative Humidity (%)
	Extremes		Mean daily		Mean Total (mm)	Mean no. of rainydays	
	Max.	Min.	Max.	Min.			
JANUARY	19	-3	14.3	1.8	94.4	6.4	69.3
FEBRUARY	21	-2	15.1	2.7	102.6	6.7	72.1
MARCH	26	2	19.5	6.8	146.0	9.4	69.8
APRIL	32	4	24.2	10.5	85.3	6.2	70.4
MAY	37	10	30.4	14.8	56.1	4.6	63.9
JUNE	40	14	34.5	18.4	45.7	3.6	58.3
JULY	39	16	32.6	20.2	148.2	9.1	72.7
AUGUST	35	15	30.8	18.9	118.1	8.4	81.0
SEPTEMBER	33	10	29.7	15.8	68.8	4.5	71.6
OCTOBER	31	5	25.8	11.7	40.3	2.7	64.8
NOVEMBER	26	1	20.4	4.6	23.9	2.4	58.1
DECEMBER	21	-2	15.8	2.4	65.6	3.5	62.4
ANNUAL VALUES	-	-	-	-	995	67.5	-
MEAN MONTHLY	30	5.8	24.4	10.7	82.9	5.6	67.9

1.1.4.3 Snow fall

Snowfall occurs during the winter season from November to April with maximum snowfall in the month of February. The thickness may reach up to 1.5 meters and water equivalent to almost 300 mm. The gradual melting of snow ensures adequate soil moisture for most part of the short summer growing season.

1.1.4.4 Relative humidity

Relative humidity show variations, with altitude, aspect and vegetation cover, but as a general July, August, September and February with 72.7,81,71.6 and 72.1 % relative humidity respectively are more wet months than the others. November and June with an average relative humidity of 58.1% and 58.3% are the relatively drier months of the year (Table 1.1)

1.1.5 Hydrography

In Kabal valley, the largest stream is Deolai Khwar which runs almost in the middle of the valley and joins the River Swat at Gham Jabba village in the south. Many small tributaries like Kolalai Khwar, Mabanr Khwar, Torroki khwar, Manrai Khwar, Ashari Khwar, Manjey Khwar and Mahak Khwar merge into Deolai khwar. Water from many perennial and some seasonal springs flow into these streams along with the seepage from melting snow and thus the streams contain water throughout the year sufficient enough for irrigation of the low lying areas. An irrigation canal from the River Swat called Nekbekhail canal also irrigate part of the valley. Most of the cultivated land is rain fed. Rainfall and snowfall are the main sources of precipitation. The local people, especially in the hilly areas, construct small mud-stone dams in the paths of water courses to store the water and use it for irrigation, and drinking of livestock.

1.1.6 Natural vegetation

According to Champion *et al.*. (1965) and Beg (1975), the natural vegetation of Kabal valley can be classified as:

1. **Broad leaved forests:** These forests are located in the so called plain areas of the valley and are represented in the Muslim graveyards only. Characteristic species are *Olea ferruginea*, *Celtis eriocarpa* and *Bosea amherstiana*.
2. **Montane Subtropical forest:** With two sub types, i.e. Chir pine forests (Climatic) and subtropical scrub (Degraded) this vegetation type is situated at lower altitudes.
3. **Montane temperate forests:** With five sub types, i.e. low level, Blue pine forest, mixed coniferous forest, Deodar forests, Moru Oak forest and secondary blue pine forests, this type is situated at higher altitudes.

1.1.7 Wildlife

Kabal valley was a favorable habitat for a variety of wild animals until recent past up to nineteen seventies due to the almost virgin and thick forest especially in the hilly areas. After the extensive deforestation, many wild animal species like the black bear, musk deer, pheasants, etc. have left the area. Still, a variety of wild fauna are found in the area. Mammals include hares, jackals, foxes, rats, mouse, bats, porcupine and monkeys. Birds include wild pigeons, doves, sparrows, swallows, mynahs, nightingales, kestrel, crow, kingfisher and chakor. Among reptiles snakes, lizards and varanus are more common. The area is rich in Arthropod fauna represented by crabs, millipedes, centipedes, spiders, rich variety of butterflies, grass hoppers, locust, beetles, walking sticks, flying pins, praying mantis, ants and variety of mosquitoes and flies.

Wetlands near the River Swat and stream use to be a favorable abode for migratory bird like teal, cranes and wild ducks.

1.1.8 Brief history

The past history of Kabal valley is collected by discussions with the local aged people who have witnessed the changing face of the vegetation of the area. In Pahtu language "Kabal" is the local name of Bermuda grass (*Cynodon dactylon*). As this grass is dominating the low lying areas of the valley therefore the area was called as Kabal.Mahmud of Ghazna is said to have attacked the area during his famous military invasions of Indian sub-continent. Some Muslim graveyard like Hazrat Matori Baba and Gur Banr Baba are said to be the graves of the martyrs in those battles. After the establishment of the reign of Maingul Abdul Wadood, Wali-e-Swat, famous as Badshah Sahib in 1919, in the princely state of Swat, Kabal valley remained integral part of the state. According to the local people the area enjoyed thick, stratified vegetation up to the era of Wali-e-Swat (1919-69). Because of strict rules and fear of punishment the people were reluctant to cut the trees from the forest (Rome, 2008). According to the people the tree layer at lower altitudes contained *Pinus roxburghi* (Nakhtar), *Olea feruginea* (Khona), *Morus alba* (Toot) *Pyrus pashia* (Tangai), *Celtis eriocarpa* (Tagha), *Diospyros lotus* (Amlook), *Quercus incana* (Banj) and *Ficus palmata (*Inzar*).*

The shrub layer was very thick and contained *Berberis lycium* (Kwaray), *Indigofera heterantha* (Ghwareja), *Isodon rugosus* (speerkay) and *Cotinus coggyria* (Falebay). The herb layer at this zone was dominated by *Achyranthes aspera* (Jishkay) *Rumex hastatus* (Tarookay) *Origanum vulgare (*Shamakay*), Micromeria biflora* (Naray shamakay) species of *Artemisia* (Tarkha), etc.

At higher elevations, the vegetation cover was even thicker. The tree layer was having a complete canopy. The herb and shrub layers were so thick that passing through

them were difficult. The tree layer in this zone consisted of *Pinus wallichiana (*Peeuch), *Cedrus deodara* (Ranzra), *Quercus incana* (Spin banj), *Taxis wallichiana* (Banrya) *Aesculus indica* (Jawaz) and *Prunus cornuta (*Badara*)* while the shrub layercontained *Viburnum gr*and*iflorum (*Khapyanga*), Indigofera heterantha* (Ghurreja), *Rosa brunoni* (Khurach), *Contoneaster racemiflorus*(Kharawa), *Sageretia thea (*Mamanra) and *Desmodium elegans* (Talbahay). Climbers such as C*lematis connate* (zeelai) and *Hedera nepalensis (*Phallol zeelai) were very common in the past. The herb layer was contained a variety of grasses, forbs, sedges and ferns. Sciophytes constituted a complete carpet as ground flora. According to the local inhabitants the grounds flora also contained a variety of mushrooms, truffles and Morels especially in Monsoon and spring rainy season.The forests were rich in wild fruits like Raspberry, Black berry, fig, barberry, mulberry, walnuts, wild persimmon, olives and other fruits of local importance. Wild persimmons (Amlook) and walnut used to be a source of income when sold till the recent past.According to local people rainfall and snow fall were frequent and heavy in the past.

The biotic interference in the form of deforestation, fuel wood extraction and overgrazing started after the merger of Swat state in Pakistan (1969) and intensified in the last ten to fifteen years after the construction of metalled and jeepable roads and population explosion. Situation became worst in the recent years between 2006-2009, due to eitherreligious extremism or military action (Qamar *et al.*, 2010) Forests were ruthlessly cut by extremist for short term income generation. Many parts of the area which were once covered with thick vegetation, present a deserted look now. According to the aboriginals, if the trend of deforestation continues at the present pace, then the valley will soon becomes barren and lifeless.

1.1.9 People

Projected human population derived from District Census Report (DCR, 1999) is almost 0.4 million. Population density is 17.9 persons per hectare. Average house hold size is 9.9 persons per house. Average annual growth rate is 3.4 percent. Thickly populated villages are Chindakhwara, Kanju, Hazara, Kotlai, Totano Bandai, Sirsinai, Deolai, Kala kalay, Shah Dheri, Bala Samai and Dardyal. Predominant population is rural. Ethnically, the inhabitants are Neikbekhail which is an offshoot of Yousafzai pathans of the Afgan origin. Maingan, Molan and Pirachas are also intermingled with the main tribes. Besides these Gujjars (cow herders), Ajars and Shpoonkeys (shepherds) are living in small hamlets, however, their life is nomadic in nature that is concerned with the grazing of their cattle (Rome, 2008).

Pashtu is the main language in the territority, while Kohistani Gojri is spoken in some hilly areas. Average literacy rate is 36.1 percent. Majority of the people are illiterate and lead a simple life. Shalwar qamees is the common dress of both sexes supplemented by a large chadar in woman. The people are hardworking and straight forward. Main sources of income are agriculture (60%), followed by service abroad (30%), business (5%), service inland (2%) and others (3%).

1.1.10 Land use

The total reported area of tehsil Kabal is 40026 hectares. The land use pattern is shown in the Table 1.2.

Table 1.2: Land use statistics of the study area.

S.No.	Land use status	Area in hectares
1	Cultivated area	20722
	i. Irrigated	6238
	ii. Non-irrigated	14484
2	Uncultivated area	19304
	i. Waste area	390
	ii. Forest area	5477
	iii. Area not available for cultivation	13437
3	Total area	40026

Source: Department of Agriculture Extension, Swat.

1.1.11 Agro-ecology

The agricultural economy of the study area is mainly dependant on rain. Corn, beans and rice are the main crops of the area. Wheat production does not fulfill the local requirements. The rice crops and the agricultural land in the low lying areas are irrigated by the water of the streams and permanent springs found in the furrows. Fruit trees like pears, peaches, plums, persimmon and apples are grown in the irrigated areas and at marginal fields. Minor crops of the area include potato, tomato, mustard, ground nut, lentil, mash bean and onion. Old means of agriculture like farmyard manure, locally made plough drawn by bullocks, threshing by the trampling of bullocks, manual hoeing and weeding are still a common practice in the area. Small mud stone dams are

constructed in the path of low output water bodies for the storage of water used for irrigation and drinking by cattle, sheep and goats. Clover and millet is cultivated for fresh and dry fodder purposes. Grasses from hillsides are harvested as dry fodder for winter season. Almost every house hold keep a cow or buffalo for milk production. People in hilly areas keep herds of sheep, goat and cattle.

1.1.12 Biotic factor

The vegetation of Kabal valley is under severe biotic pressure in the form of deforestation, fuel wood extraction, felling, lumbering overgrazing and terrace cultivation. Man and the domestic animals like sheep, goat and cows are the major biotic factors affecting the vegetation of the area. Man is the strongest and most skilled biotic factor who is exploiting the area for his immediate needs. *Cedrus deodara, Pinus wallichiana, Picea smithiana* and *Taxus wallichiana* are the preferred species for timber wood. *Pinus roxburghi, Morus nigra, Platanus orientalis* and *Juglans regia* are the next in order of preference.

Due to local needs, demand and high prices of timber the forest is ruthlessly cut and tree felled with no care for future. The rate of regeneration is very low as compared to the extraction and as a result the vegetation cover is declining, and climatic conditions deteriorating, Loss of precipitation, habitat deterioration, acceleration of erosion, loss of productivity, loss of wild life and flooding have progressed as a consequence. Famous flood of 2010 is an evidence of this drastic change. The fuel wood extraction also has the same effect. Overgrazing is responsible for adversely affecting the palatable part of vegetation. Thousands of goats, sheep and cows of the local people and shepherds graze in all parts of the hills especially in summer seasons. These animals closely graze upon all parts of the plants including flower and seeds reducing the future chance of regeneration of susceptible species. The trampling of soil

has also lead to the increased chances of erosion. Clearing of forest for terrace cultivation has also significantly changed the face of vegetation. The terraces remain fertile for some years but gradually become less fertile due to nutrient depletion and finally become barren due to erosion.

1.2 PHYTOSOCIOLOGY:

Vegetation is a unit which possesses characteristic physiognomic structure which differentiates it from other such units (Hussain and Ilahi, 1991). It is the general effect produced by the growth of some or all species in various combinations forming associations or communities. The major features of vegetation reside in its quantitative structural characters because of their obvious influence on all kinds of associated life. The vegetation comprises plant diversity, climate and soil which are related to each other. The variation in any one of these components may cause a change in the associated other component. Plant community is an association and interaction of plant species within a designated geographical unit, which forms a relatively uniform patch, distinguishable from neighboring patches of different vegetation types. The components of each plant community are influenced by soil type, topography, climate and human disturbance. The existence and establishment of a community reflects the plant type and habitat condition under which they develop (Malik, 1986).

Phytosociology deals with plant communities, their composition and development due to interrelationships between the species (Allaby, 2004). It is well established discipline which describes the diversity of plant communities. From early decades of last century, phytosociologists have tried to apply a standard approach for sampling and characterizing vegetation types (Braun Blanquet, 1928) and to formulate a framework for naming and organizing them within a syntaxonomic hierarchy of associations, alliances, orders and classes (Weber *et al.*, 2000). However later on, an

enormous phyto-sociological literature has accumulated with diverse proposals for classifying many kinds of vegetation throughout the world. Now a days, phytosociologists are trying to resolve higher levels of complexity in vegetation composition, by describing whole successional units (vegetation series) or in general, vegetation complexes. Other developments include the use of multivariate statistics like Two Way Indicator Species Analysis (Hill, 1979) for classification of communities, Detrenched Correspondence Analysis (ter Braak and Smilauer, 2002) for showing the sampling points and species on two dimensional and three dimensional graphs and Canonical Correspondence Analysis (CCA) for the definition of communities and their environmental interpretations.

1.3 ETHNOBOTANY:

Human plant interaction and indigenous knowledge is as old as human civilization itself but the term "ethnobotany" was for the first time used by American Botanist John W. Harshburger in 1896, defining it as "the study of plants used by the primitive and aboriginal people". Since then, it has been defined as the traditional knowledge of indigenous communities about their surrounding plants that study how the people of a particular culture and region make use of indigenous plants. Ethnobotany includes relationships of people and plants. The definition of ethnobotany can be sum up in four words i.e. People, Plants, Interactions and Uses. The ethnobotanists explore how plants are used as food, shelter, medicine, clothing, hunting and in religious ceremonies. It is the science, which studies the relationship between a given society and its environment, particularly the plant world.

Ethnobotany is necessarily multidisciplinary science, drawing together knowledge from anthropology, botany, archaeology, geography, medicine, linguistics, economics, landscape architecture, and pharmacology. This multidisciplinary approach

gives ethnobotanists more insight into the management of plant biodiversity reserves in a period of tremendous environmental stress. Today the field of ethnobotany requires a variety of skills: botanical training for the identification and preservation of plant specimens; anthropological training to understand the cultural concepts around the perception of plants; linguistic training, at least enough to transcribe local terms and understand native morphology, syntax, and semantics (Schultes and Reis, 1995).

Recent trends in the field of ethnobotany are the use of quantitative approach including use value indexation, multivariate statistical analysis and associating information with floristic and phytosociological inventories. It is a fact that ethnobotany is a relatively new discipline and has been progressed very slowly in accumulating systematic knowledge and generating theories and hypotheses, but it is now advancing towards becoming a more experimental science particularly in response to self-criticisms and reflections on what directions the field should be taking (Albuquerque, 2009). The discipline is recognized worldwide and many research works have been completed.

1.4 BIODIVERSITY AND CONSERVATION:

Plants are the priceless gift of the nature (Ayub *et al.,* 2004) and floral biodiversity and land are a loan, which has been provided to us for the use and benefit of future generations. Biodiversity refers to almost every aspect of living world, applying it across a range of spatial and temporal scales encompassing variability within individuals, communities, ecosystems, traits including all organisms (Mace,2005). Pakistan has been provided with diverse climatic, soil types and different ecological zones which support rich plant diversity. The country has rich flora of about 6,000 species of flowering plants, 128 Pteridophytes, 23 Gymnosperms, 1140 Monocots including 576 grasses and 4492 dicots (Stewart, 1972).

Plants provide ready made food, medicines for ailment, fodder and forage for animals, fuel wood for burning, flowers for aesthetics and celebration, raw materials for many industries, timber for construction and many more useful items (Shah, 2007). So, human life is directly or indirectly dependent on local vegetation (Delcourt, *et al.*. 1986). Humans are using these natural resources in some parts of the globe very ruthlessly and one such area is the Kabal valley.

Assessment of regional biodiversity and threats posed to it is one of the main focuses of international community, including the International Union for Conservation of Nature (IUCN). As a symbol of global recognition, 2010 has been declared as The International Year of Biodiversity and the decade 2011-2020 as the decade of biodiversity by UNO.

Chapter 2

FLORISTIC ENUMERATION AND PHYTOSOCIOLOGY

2.1. INTRODUCTION

Floristic composition is the variety of individual species that occur in a stand or region. Knowledge of the floristic composition and structure of communities is critical to understanding the greater dynamics of ecosystems. Floristic checklists are often the only source of botanical information for a particular area and may serve as a useful starting point for more detailed study (Keith, 1988). Because of their conciseness, the listing of species is easy to handle and less time consuming (Saima *et al.,* 2009) that aids in the identification and correct naming of species, essential resources for biodiversity estimates and biogeographic studies. Furthermore, this information provides important public outreach and fundamental information to use in addressing the biodiversity crisis (Funk *et al.,* 2007).

As a scientific discipline phytosociology deals with plant communities, their classification, their composition and development due to the interrelationships between the constituent species and their relation to the physical environment (Allaby, 2004). It has provided effective methods for vegetation analysis that have been applied in vegetation mapping, ecosystem services evaluation and biodiversity conservation (Rieley and Page, 1990; Ewald, 2003; Biondi, 2011). Habitat variation, time and biotic interactions determine the distribution of individuals of the same and different plant species in a community (Khan *et al.,* 2013c). The health of any ecosystems is dependent on plant biodiversity (Ruiz *et al.,* 2008) and thus the vegetation classification is a prerequisite for ecosystem management and biodiversity conservation.

Phytosociological field methods allow ecologists to calculate diversity indices, richness and abundance of plant species in an ecosystem, which not only helps them to decide on conservation priorities, but also their role as indicators of particular habitat types (Whittaker *et al.*, 2001; Greig-Smith, 2010). Moreover, frequency, constancy and fidelity analyses help to identify the threatened species and those habitats which needs more care (Baillie, 2004; Hester and Brooker, 2007; Zou *et al.*, 2007; Khan *et al.*, 2013b).

Phytosociology originated with the Swiss ecologist Josias Braun-Blanquet (1884–1980) in Europe.In 1915, Braun-Blanquet defined the plant community as a group of plants having characteristic species and a stability to the prevailing environment (Podani, 2006). The plant community of a region is a function of many factors such as time, altitude, slope, latitude, aspect, rainfall, soil composition and humidity, all of which play a role in its formation and composition (Kharkwal *et al.*, 2005). Vegetation composition of an area is studied by various sampling methods. The choice of sampling methods used in a phytosociological study depends on the types of data required, the objective of the study, the physiognomy of the vegetation, the geomorphology of the region, the available resources and time (Moore and Chapman, 1986; Biondi, 2011). Enough number of samples should be taken using statistical tools to give a clear picture of the vegetation of that area.

The most common quantitative sampling methods is the quadrat method. A quadrat that encloses the minimal area is called a relevé. The quadrat method was started by Frederick Edward Clements (Weaver and Clements, 1966). In each relevé the individual plants are counted and their abundance is determined. This may be adapted in a variety of ways for analyzing almost any type of vegetation. Species composition, frequency, cover and abundance are the most important characteristics for sampling

within relevés (Cox, 1996; Khan *et al.,* 2013a). After collection, the phytosociological data is analyzed by using statistical methods. Multivariate statistical techniques help ecologists to discover structure in the data set and to find the effects of environmental factors on the assemblages of species (Bergmeier, 2002; Anderson *et al.,* 2006).

Use of computer has made it easier to handle and analyze a large ecological data set with a range of statistical programs and to present the results in more precise and comprehensive way. Software packages such as TURBOVEG (Hennekens and Schaminee, 2001), JUICE (Tichý,2002), TWINSPAN, DECORANA (Hill, 1979; Hill and Gauch,1980), CANOCO (ter Braak, 1989; ter Braak and Smilauer, 2002) and PC-ORD (McCune, 1986; McCune and Mefford,1999; Grandin, 2006) are examples of packages used for storing vegetation data, classification and ordination in quantitative ecology (Gilliam and Elizabeth, 2003; Kent, 2012). Community data are summarized by constructing ordination graphs in a two dimensional space, in which similar samples and species are placed close together and dissimilarones far apart from each other (Gauch, 2010). Detrended correspondence analysis (DCA), principal components analysis (PCA) and canonical correspondence analysis (CCA) are themost widely used classification and ordination techniques todetermine plant community structure, ecological gradients, diagnostic species, and the significance of the relationships between floristic and environmental data (Hill and Gauch, 1980; terBraak, 1987; Kent, 2012; Khan *et al.,* 2013b). Phytosociological knowledge needs to be taken concomitantly with equally important rigorous ethnobotanical analysis for proper management and conservation of biodiversity (Khan *et al.,* 2013b).

There is dire need to study, document and map the vegetation of diverse areas from Pakistan according to international standards, to provide a baseline for effective

plant conservation strategies and sustainable development. Kabal Valley Swat is one of such important areas; therefore it was selected for the present study.

2.2 REVIEW OF LITERATURE

For thorough understanding of vegetation or plant community, observations and descriptions are generally followed by quantitative measurements. Such quantitative data provides an insight to composition and structure of community and allows satisfactory comparison of species, group of species within a community or between communities. Various quantitative methods have been, therefore, evolved for analyzing plant communities (Hussain, 1989).

The effect of plot size on the ordination of vegetation samples was tested in Czech forests and grasslands. Smaller plots tended to produce less stable ordination patterns especially in data sets with low β-diversity and species cover-abundances. Vegetation with large β-diversityand data sets from plots of different sizes can be used for ordination. However for homogenous data set with low β-diversity differences in plot size could distort the real vegetation differentiation in ordination pattern (Otypkova and Chytry, 2006). Paal *et al.*. (2008) classified floodplain forests of Estonia using two different approaches after recording data from 79 sample plots. They established six plant communities viz., *Tilia cordata-Mercurialis perennis, Ulmus laevis-Allium ursimum, Populus tremula-Convallaria majalis, Alnus incana-Cirsium oleraceum, Alnus glutinosa-Filipendula ulmaria* and *Alnus glutinosa-Carex acutiformis*, using the method of cluster analysis and Principal Component Analysis. They also established another classification system by TWINSPAN analysis and found that the communities belonged to Querco-Fagetea, Alno-Ulmion and to Alnetea glutinosae, Alnion. They concluded that despite different approaches of the two classification systems, the results were similar. Siefert *et al.* (2012) indicated that vegetation-environment relationships

depend on the spatial scale of observation and there is a transition from a primarily edaphic influence to a primarily climatic influence on plant community composition and structure with increasing spatial scale.

Perveen and Hussain (2007) carried out studies for plant biodiversity and phytosociology of the Gorakh hills, Khirthar range. Sindh, Pakistan and reported 74 plant species of 62 genera and 34 families from the area. They identified three plant communities harboring rocky streambed, rocky slope and hilltop. Chamaephytes were the dominant life form followed by phanerophytes, therophytes and hemicryptophytes. They observed lower grazing pressure at higher altitudes than the lower ones. Malik *et al.*. (2007) recognized 13 plant communities, consisting of 77 species in Pir Chinasi Hills of Azad Jammu and Kashmir. They pinpointed climate, soil conditions and biotic interference as the main determinants of vegetation pattern, among which soil chemical composition was the most significant factor. Qureshi (2008) assessed the vegetation of Sawan Wari of Nara desert, Pakistan by using quadrat method and recognized five plant communities in different habitats. He identified *Phragmites-Typha-Saccharum* community in wetlands, *Calligonum-Dipterygium-Salvadora* community in desert, *Saccharum-Pluchea-Typha* community in marshland, *Desmostachya-Brachiaria-Cynodon* community in agricultural lands and *Salvdora-Desmostachya-Prosopis* community in protected forest. In all 136 species of vascular plants belonging to 73 genera and 44 families were recorded from the area.

In Chotiari wetland complex, district Sanghar, Sindh, Pakistan, vegetation survey was conducted by Qureshi *et al.*. (2009) using line intercept method and identified 66 species of plants belonging to 50 genera and 23 families from the area which constituted 10 plant communities on the basis of Summed Dominance Ratio (SDR). The plant communities were *Fagonia-Senna-Calotropis, Pluchea-Dactyloctenium.Ochthochloa, Dactyloctenium-Desmostachya-Pluchea, Calotropis-*

Acacia-Alhagi, Dactyloctenium aegypticum, Indigofera, Desmostachya- Gynandropsis, Desmostachya-Dactyloctenium-Indigofera, Dactyloctenium scindicum, and *Indigofera sessiliflora-Dactyloctenium-Indigofera argentea,* occupying different localities and habitats in the area.

In the habitat of endangered Himalayan grey goral (*Naemorhedus goral*) located in parts of Pakistan and Azad Kashmir, phytosociological studies were conducted by Fakhr-i-Abbas *et al.*. (2009) using transect method, TWINSPAN and Sorenson's coefficient of similarity. They recognized *Pinus roxburghii* as the indicator species of the area. Other species with relatively higher constancy were *Dodonaea viscose, Carissa opaca, Acacia modesta, Myrsine africana, Aristida cyanantha* and *Cynodon dactylon*. They established eight plant communities in the area which shared high similarity indices. Siddiqui *et al.*. (2009) undertook phytosociological studies of Chir pine (*Pinus roxburghii*) in Lesser Himalayas and Hindu Kush range of Pakistan at an elevation of 750-1700 meters and found that out of the 13 stands studied *Pinus roxburghii* formed pure vegetation in 12 stands and was associated with *Quercus incana* in one stand. In their opinion the forests were on the verge of vanishing if not properly protected from the current overexploitation stress. According to Ahmad *et al.* (2012) coniferous forests in Pakistan are declining at a rate of 1.27% per annum since 1992, while according to Qamar *et al.* (2012) 13% of the forest cover present in 2001 was damaged between 2001 and 2009 mainly due to conflict between the militant hard line extremists and Pakistan army in district Swat and Shangla.

Phytosociology, structure and diversity of the steppe vegetation in Hindukush Mountains, Northern Pakistan was studied by Peer *et al.*. (2007) using Two Way Indicator Species Analysis (TWINSPAN) and Canonical Correspondence Analysis (CCA). They identified eleven plant communities belonging to four vegetation types

from the area, determined by variation in altitude, geographical position, grazing intensity and organic matter content of the soil.

The floristic diversity and ecological characteristics of 45 wetland sites on dry southern slopes of the Alborz Mountains, Northern Iran, along an altitudinal gradient has been explored by Naqinezhad *et al.*. (2009), using one way ANOVA, Pearson 'r' and Detrenched Correspondence Analysis/Canonical Correspondence Analysis (DCA/CCA). The study reported 310 plant taxa with 35 endemics or sub-endemics. Chamaephytes were the dominant life form of the upper mountain areas. Altitude was the primary detrimental factor for floristic composition. They noticed gradual decrease in soil pH with increasing altitude.

Multivariate analysis of vegetation of Chapursan valley, Gilgit, Pakistan was done by Wazir *et al.*. (2008) using Detrenched Correspondence Analysis (DCA) axis-1 and 2 determined by Spearman Rank Correlation. On the basis of cluster analysis they determined five vegetation types which were crassulecient steppes, chamaephytic steppes, erme, moist sub-alpine pastures and riverine pseudo-steppes. The vegetation types differed from each other on the basis of species composition determined by edaphic and topographic factors.

Multivariate analysis of environmental and vegetation data of Ayub National Park, Rawalpindi was done by Jabeen and Ahmad (2009) using ordination techniques. Out of the total 44 species recorded 10 most abundant species were responsible for more than 15% cover. Two Way Indicator Species Analysis (TWINSPAN) resulted in two major community types; Detrenched Correspondence Analysis (DCA) analysis resulted in four major plant communities while Canonical Correspondence Analysis (CCA) results confirmed species correlation and association with soil electrical conductivity, pH and heavy metals.

Ahmad *et al*.. (2010) analyzed the vegetation along Motorway (M-2), Pakistan by using Braun-Blanquet approach, through TWINSPAN and DECORANA softwares and recognized two major and 16 sub-communities from the area. They recorded 227 vascular plant species belonging to 75 families, out of which 129 were herbs, 38 were shrubs/sub-shrubs and 60 were trees. *Cynodon dactylon, Calotropis procera, Cenchrus ciliaris, Heteropogon contortus, Bothrichloa pertusa* and *Rhynchosia minima* were the dominant plant species, among which the first four mentioned species occupied 35.9% cover of the sampled area.

Vegetation communities of urban open spaces viz., green belts, gardens and parks of Islamabad city were assessed by Ali and Malik (2010). They reported 162 plant species belonging to 137 genera and 58 families. Based on Two Way Indicator Species Analysis (TWINSPAN), they identified four main community types showing overlap in ordination space indicating somewhat homogeneous nature of the vegetation. They observed *Pinus roxburghii* and *Grewia asiatica* as more prevalent in green belts, *Dalbrgia sisso* and *Acacia nilotica* in undisturbed green places and *Brousonetia papyrifera* and *Populus euphratica* along the drains of the city. Detrenched correspondence analysis indicated invasive species as influencing vegetation distribution along axis-1 in the ordination and urban development along axis-2.

The vegetation response to topographical and soil gradient was assessed along three catenal sequences of Wigierski National Park, Poland. Using soil factor, phytosociological analysis and Ellenberg indicator values, correlation between 23 variables allowed distinguishing six statistically significant groups of variables with main ordination groups being the percentage share of species indicating relatively dry, slightly moist soils, combined share of these species, altitude and relative elevation. The first two axes of a Principal Component Analysis (PCA) were strongly related to soil moisture and elevation (axis-1) and to soil fertility (axis-2) which together accounted

for more than 60% variability (Solon *et al.,* 2007). In rangelands of Lasem, Iran, Tamartash *et al.* (2010) determined topography as the main factor influencing the distribution of plants in different communities.

Based on importance values, Farooq *et al.* (2010) established Pinus-Abies-Sophora, Pinus-Abies, Abies-Cedrus and Abies-Pinus communities in Push Ziarat area, South Waziristan, Pakistan, which contained economically valuable plants that were under severe anthropogenic pressure. Anthropogenic influences are positively correlated with the deterioration of ecosystem in Naran valley, Pakistan (Khan *et al.,* 2012).

Ababou *et al.* (2010) established a relationship between the main soil factor i.e. percentage of $CaCO_3$ and electrical conductivity on the distribution of species in Lowe Cheliff, Algeria by analyzing data from 133 releves through k-means classification and using phi coefficient. The six vegetation units extracted from synoptic table were exclusively related to electrical conductivity and $CaCO_3$ had a secondary role. The main determinants of vegetation distribution and diversity in south-eastern Zimbabwe were soil moisture, soil depth, geology and slope that were responsible for 52% variation in the species data (Mapaure, 2012).

Vegetation-environmental complex of coniferous forests in moist temperate zones of Pakistan, classified by TWINSPAN and DECORANA determined elevation as the most significant factor for over storey trees while elevation, aspect, canopy cover and soil pH as significant for under storey vegetation distribution (Siddiqui *et al.,* 2010).

In the lesser Himalayan subtropical forest of Bagh, Azad Kashmir, the different components of diversity varied with altitude as determined by DCA analysis. The vegetation was negatively affected by anthropogenic influences like grazing and deforestation (Shaheen *et al.,* 2011).

Using numerical classification and ordination techniques Slezak *et al.* (2011) delimited fourteen vegetation types with two variants and two communities in the Stiavnicke Vrchy mountains, Slovakia which were primarily determined by soil nutrients and moisture content.

Ahmad *et al.* (2010) studied six ecologically diverse sites in open scrub rangelands of sub-mountainous Himalayan plateaus, Soon valley, Pakistan and found that enough soil moisture, suitable temperature and availability of macro-nutrients during summer resulted in maximal complexity of communities followed by autumn and spring, while there was minimum diversity because of the reverse in environmental factors. Spatially the community differences were due to soil physico-chemical properties.

Ahmad and Quratulain (2011) recorded 59 species belonging to 32 families from Ayubia National Park, Pakistan and classified them into two major communities i.e. *Hedera nepalensis-Adiantum caudatum* and *Plantago major-Rumex nepalensis* based on TWINSPAN. In semi-arid Zimbabwe, species richness was higher in undisturbed sites than disturbed sites, where extensive herbivory and arid conditions were attributed to the retarded rate of woody vegetation succession (Gotosa *et al.*, 2013). Manhas *et al.* (2009) classified plant species and communities in wetland ecosystem of Doon valley, Himalaya, India by TWINSPAN and pointed out that the distribution, dominance and survival of species is governed by soil moisture and flooding period.

Vegetation analysis of Sutan-Chay basin in Iran through cluster analysis and CCA ordination revealed six associations with altitude playing the leading role in determining association types. Soil pH, soil texture, clay percentage and aspect also had significant effect on delineation of plant associations (Gajoti *et al.*, 2010).

Species composition, diversity, equitability, richness and concentration of dominance of tree species along altitudinal gradient in *Monotheca buxifolia* forests of district Dir were documented by Khan *et al.* (2010) which highlighted the significance of altitude, aspect and anthropogenic influences for variation in all components of species diversity.

Gomaa *et al.* (2012) reported 71 species of weeds belonging to 61 genera and 22 families from Al-Jouf province, Saudi Arabia. Based on TWINSPAN the weeds formed four community types. Species richness variation was related to micro-heterogeneity of habitat while soil characteristics were mainly responsible for community structure and diversity. McGranahan *et al.* (2013) pointed out that agricultural expansion has eliminated a large proportion of the native land cover and severely degraded the natural vegetation in Grand River Grassland, Missouri, USA. On the basis of multivariate analysis, they pinpointed the invasion of exotic plant species and grazing as the main factors responsible for community delineation while soil composition had a secondary effect.

Four micro-habitat types with different community types were delineated in Achhro Thar of Nara desert, Pakistan on the basis of topography, physiognomy and species composition. Seventy six species of 58 genera and 26 families were recorded in the four communities. Therophytes were the dominant life form followed by phanerophytes and hemicryptophytes (Qureshi and Ahmad, 2010).

From Hail region of Saudi Arabia El-Ghanim *et al.* (2010) identified 124 species of plants belonging to 34 families where therophytes and chamaephytes were the dominant life forms. TWINSPAN and DECORANA classified the vegetation into seven groups that differed from each other in species richness and diversity indices. Community analysis of *Quercus baloot* forests in district Dir, Pakistan was conducted by Khan (2012), using agglomerative cluster analysis and DCA ordination. Three sub-

types were determined dominated by *Quercus baloot* only, *Quercus baloot* with *Olea ferruginea* and *Quercus baloot* with *Quercus dilatata.* Anthropogenic disturbances were found to be the main factor governing different community types besides edaphic, topographic and environmental factors in the area.

In Naran valley, Pakistan, Khan *et al.* (2013) identified 198 species of 150 genera at 144 sampling points that constituted five community types mainly determined by aspect and altitude as revealed by Indicator Species Analysis and DCA. Plant species diversity was optimal at mid-hill elevations. Decline in species diversity was attributed to anthropogenic pressure and environmental stress.

2.3. MATERIALS AND METHODS

2.3.1. PHYSIOGNOMY

Several pre-analysis tours were made to the area to get acquaintance with the physiognomy, form, topography and aspect of the vegetation. On the basis of physiognomy, altitude, aspect and topography, the area was divided into different zones for vegetation analysis. Random stratified design was used to survey the vegetation.

2.3.2. PLANT COLLECTION

The area was visited through transect walks from 2010-2013, for the collection of plant specimens.During the survey, plant specimens were collectedin triplicate, pressed, dried and mounted on standard herbarium sheets. Angiosperms and Gymnosperms were identified with the help of *Flora of Pakistan* (Nasir and Ali, 1970-1989; Ali and Nasir, 1989-1991; Ali and Qaiser, 1995-2013), while Pteridophytes were identified with the help of Cryptogamic Flora of Pakistan (Nakaiki and Malik, 1992, 1993). Nomenclature for taxa basically follows the above-mentioned Floras but the

accepted names were further validated from The Plant List and The International Plant Names Index (Anon., 2013a, b).The preserved specimens on standard herbarium sheets were assigned voucher numbers and deposited in the herbarium of Pir Mehr Ali Shah, Arid Agriculture University, Rawalpindi, Pakistan.

2.3.3. PHYTOSOCIOLOGICAL STUDIES

The study area was surveyed once in a month starting from September, 2010 till August, 2013. Sites with least human intervention were selected for sampling. Species minimal area/number curve rule (Hussain, 1989) was used to determine the plot (*relevé*) size and number for each site. A quadrat that encloses the minimal area is called a relevé. A total of 314 *relevés* were studied. Distribution of all the relevé is shown in Fig. 2.1.

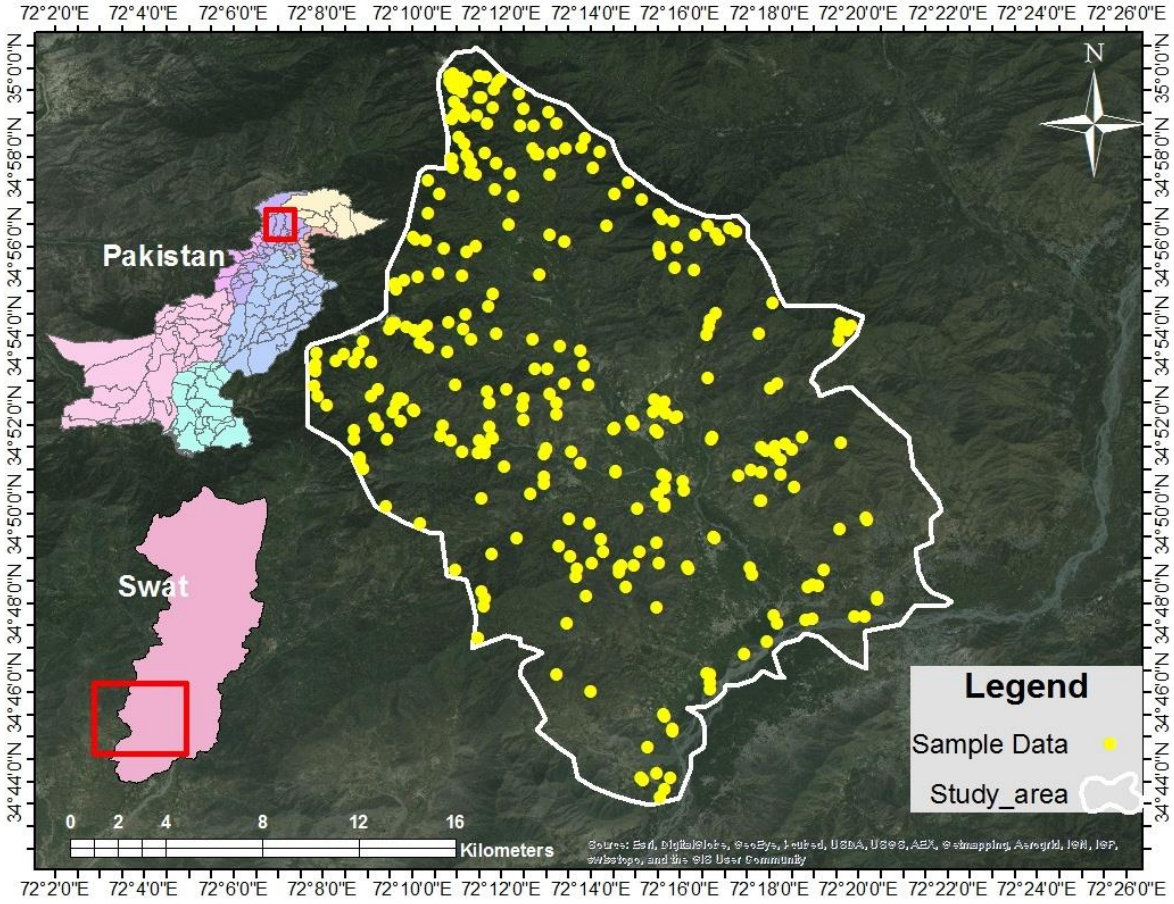

Fig. 2.1: Distribution of sampling points (relevé) in the study area.

Following parameters were measured in each *relevé*.

2.3.3.1 Cover-abundance scale

In order record cover-abundance value, the modified method of Braun-Blanquet (Barkman, 1964) was used as follows:

Score	Cover
0	Taxa absent from quadrat
r	Taxa represented by one or few individuals, <5% cover
+	Taxa represented by a few (<5) shoots, <5% cover
1	Taxa represented by many (>5) shoots, <5% cover
2m	Very abundant
2a	5 –12.5% cover
2b	12.5 - 25% cover
3	25 - 50% cover
4	50 – 75% cover
5	75 – 100% cover

2.3.3.2 Data storage and analysis

Furthermore, geographic coordinates, altitude, exposure, and slope gradient was recorded for each relevé using Global Positioning System (GPS). Data from 314 relevés was stored in the database software TURBOVEG V. 2.101 (Hennekens & Schaminee, 2001) and exported as standard XML files to JUICE V. 7.0.99 ((Tichý, 2002). The same was classified and sorted using modified Two Way Indicator Species Analysis

(TWINSPAN) as designed by Roleček *et al.* (2009) in host programs JUICE to create realistic species-relevé associations. Five pseudospecies cut levels (0, 2, 5, 10 and 20) and Whittaker's beta-diversity (Whittaker, 1960) was set as TWINSPAN parameters for producing clusters. Threshold levels for fidelity, frequency and cover were set as 30-60, 30-60 and 10-50 respectively to highlight diagnostic, constant and dominant species of each association. The associations were named after two or three species having highest fidelity/constancy values and the main habitat type of the location. Associations were mapped using ArcGIS 9 (McCoy, 2004).

2.3.3.3 Soil analysis

Soil was collected form at least three randomly selected areas in each *relevé* up to a depth of 15cm and thoroughly mixed to make a composite mixture. About one kilogram from the mix was packed in ploythene bags and labeled. The physical and chemical analyses of soils were conducted in the soil testing laboratory, Agricultural research station, Minogra, Swat.Soil texture was determined by hydrometer method as described by Koehler *et al.*. (1984). pH was determined in 1:5 soil water suspension using pH meter (Mclean, 1982). Lime was determined by acid neutralization method (Black, 1965). Soil organic mater was determined by using standardized solution of $FeSO_4$ and $K_2Cr_2O_7$ as given by Nelson and Sommer, (1982). AB-DTPA or Mehlic No.3 extractable P and K was determined in samples on the basis of pH of soil samples. That in case of low pH (7 and below 7), Mehlic-3 extractant was used while for pH grater than 7 AB-DTPA extractant was used.

2.2.3.4 Diversity indices

Following diversity indices were used to quantify the plant diversity in each community.

2.3.3.4.1 Species richness

It is calculated as the total number of species in a community and is denoted by S.

2.3.3.4.2 Simpson diversity index

It corresponds to the number of randomly selected pairs of individuals that must be drawn from a community in order to have an even chance of obtaining a pair with both individuals of the same species (Hussain, 1989). It is calculated as;

$$D = \frac{\sum n(n-1)}{N(N-1)}$$

Where *D*= Simpson index, *N*= Number of individuals of all species and *n*= Number of individuals of a species

The obtained values were converted to 1-D for presentation.

2.3.3.4.3 Shannon-Wiener diversity index

It is the average degree of uncertainty of predicting the species of a given individual picked up from a community. It is calculated by the following formula as given by Singh *et al.*. (2008).

$$H' = -\sum_{i=1}^{s} p_i \ln p_i$$

Where *H'* =Shannon-Wiener Diversity Index, p_i = Decimal fraction of individuals belonging to i-th species

2.2.3.4.4 Species Evenness: It is the relative abundance or proportion of individuals among the species (Singh *et al.*, 2008). It will be worked out as:

$$E = H'/\ln S$$

Where E: Species Evenness, H'= Value of Shannon Diversity index, *lnS*= Total number of species

2.3.3.5 Vegetation Ordination

Relationships of relevé, species and the environmental variables were found by Detrended Canonical Analysis (DCA) available in software packages CANOCO v. 4.5 (ter Braak and Šmilauer, 2002) and shown as a two dimensional graph using CANODRAW v. 4.

2.3.3.6 Life form (Biological spectrum)

The life form classes and their percentage in each association were marked by following the work of Raunkiaer (1934), Hussain *et al.* (1995) and Batalha and Martins (2002). The major life form classes are as follows:

1. Macrophanerophytes (MP): Tree species in which the buds are born more than 2m above ground surface.
2. Nanophanerophytes (NP): Shrubs with buds situated 0.25 to 2m above the ground surface.
3. Chamaephytes (Ch): Their perennating buds are situated below 25 cms above ground surface.
4. Hemicryphotophytes (HC): Herbaceous perennials whose aerial portion die at the end of growing season leaving perennating bud at or just beneath ground surface.
5. Geo phytes (G): plants whose over wintering parts and buds are situated below ground surface as bulb, tuber, rhizome etc.
6. Hydrophytes (H): Species with buds that lie under water.

7. Lianas (L): Climbers and wines are placed in this group.
8. Therophytes (Th): Annual, seed producing plants that complete their life cycle in one year.

2.3.3.7 Leaf Spectra

The leaf size was calculated according to the procedure of Cain and Castro (1959) as follows:

$$Leaf\ area = \frac{\text{Lengh x Breadth x 2}}{3}$$

The leaves were classified accordingly into the following types:-

Class-I	Leptophyll (L)	=25mm^2
Class-II	Nanophyll (N)	=25 x 9 = 225mm^2
Class-III	Microphyll (Mi)	=25 x 9 x 9 = 2025 mm^2
Class-IV	Mesophyll (Me)	=25 x 9 x 9 x 9 = 18225mm^2
Class-V	Macrophyll (Ma)	=25 x 9 x 9 x 9 x 9 = 164025mm^2

2.4. RESULTS

2.4.1. FLORISTIC ENUMERATION:

The vascular flora of Kabal valley, district Swat, Pakistan consisted of 820 species belonged to 497 genera and 137 families. These are distributed in various groups in which ferns were 33 species, 8 species of gymnosperms, 184 species monocotyledons and 595 species were dicotyledons (Table 2.1). Since the study area is located in the Hindukush mountain range with the elevational ranges of 836 to 3012 meters above sea level, there was good diversity of flora in terms of size compared with

the District Swat as well as the whole country. Table 2.2 indicated census of the flora with respect to different group recorded from the study area. It revealed that the area contributed 14.2% of the total flora of Pakistan and 51% of the flora of Swat. Comparing with the flora of Pakistan, Gymnosperms and ferns were richly found in the territory (34.8% and 25.8%, respectively) due to moderate precipitation, followed by monocotyledons (16.1%) and dicotyledons (13.2%).

Table 2.1: Floristic composition of vascular flora in Kabal valley.

Group	**Families**	**Genera**	**Species**
Pteridophytes	9	18	33
Gymnosperms	3	7	8
Monocotyledons	28	111	184
Dicotyledons	97	361	595
Total	137	497	820

Table 2.2: Comaprision of the flora of Kabal Valley with their proportionate in District Swat and Pakistan.

Plant Group	Number of Species			Species percentage compared to	
	Kabal valley (Area=40026hec.)	Swat district (Stewart, 1967) (Area=533700hec.)	Pakistan (Stewart, 1972) (Area=79.61mill. hec.)	Swat district (Area=7.5%)	Pakistan (Area=0.05%)
Pteridophytes	33	55	128	60.0	25.8
Gymnosperms	8	13	23	61.5	34.8
Monocotyledons	184	306	1140	60.1	16.1
Dicotyledons	595	1167	4492	51.0	13.2
Total	820	1541	5783	53.2	14.2

Poaceae was found the largest family with 98 species that contributed 11.95% of the total flora, followed by Asteraceae (70 spp., 8.54%), Fabaceae (48 spp., 5.85%), Lamiaceae (42 spp., 5.12%), Rosaceae (36 spp., 4.39%), Brassicaceae (33 spp.,4.02%), Cyperaceae (31 spp., 3.78%), Apiaceae (21 spp., 2.56%), Caryophyllaceae (20 spp., 2.44%), Scrophulariaceae (17 spp., 2.07%), Ranunculaceae (16 spp., 1.95%), Euphorbiaceae, Polygonaceae and Solanaceae (15 spp., 1.83% each), while rest of the families were represented by less than 14 species (Fig. 2.2). *Euphorbia* was found to be the largest genus that contributed 11 species, followed by *Cyperus* (10 species), *Astragalus* (9 species), *Carex* (8 species), *Galium* and *Persicaria* (7 species each) and *Geranium*, *Scrophularia*, *Solanum* and *Poa* (6 species each), while rest of genera shared less than 6 species.

With reference to habit, nine categories of life span of the flora were identified (Table 2.3, Fig. 2.3) in which perennial herbs had dominant fraction having 341 species (41.59%), followed by annual herbs (309 spp., 37.68%), deciduous shrubs (53 spp., 6.46%), deciduous trees (44 spp., 5.37%), climbers (22 spp., 2.68%), evergreen shrubs (20 spp., 2.44%), evergreen trees (16 spp., 1.95%), biennial herbs (8 spp., 0.98%) and parasites (7 spp., 0.85%).

Comparing with the flora of Swat and Anotated Catalogue of W. Pakistan & Kashmir, 535 species (65.24%) were native to the area, 80 species (9.76%) new to Swat, 76 species (9.27%) were cultivated, 70 species (8.54%) as weeds to the arable lands, 29 species (3.54%) naturalized in the area, 24 species (2.93%) new to Pakistan, four species (0.49%) were exotic invasive and two species (0.24%) recently inrtoduced in the area (Table 2.2 , Fig. 2.4).

Table 2.3: Floristic list of the vascular plants of Kabal valley, Swat, Pakistan

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
Pteridophytes					
1. Adiantaceae	*1. Adiantum capillus-veneris* L.	MI-1009	PH	MS	Native
	2. Adiantum caudatum L.	MI-1010	PH	MS	Native
	3. Adiantum gravesii Hance	MI-1011	PH	R	New to Pakistan
	4. Adiantum incisum Forssk.	MI-1014	PH	R	Native
	5. Adiantum venustum D. Don	MI-1012	PH	F	Native
	6. Cheilanthes pteridioides C. Chr.	MI-1013	PH	R	Native
	7. Doryopteris decipiens (Hook.) J. Sm.	MI-1342	PH	R	New to Pakistan
	8. Onychium contiguum Wall. ex C. Hope	MI-1015	PH	F	Native
	9. Pellaea nitidula (Hook.) Baker	MI-1344	PH	R	Native
2. Aspleniaceae	*10. Asplenium adiantum-nigrum* L.	MI-1066	PH	R	Native
	11. Asplenium septentrionale (L.) Hoffm.	MI-1609	PH	C	Native
	12. Asplenium trichomanes L.	MI-1067	PH	R	Native
	13. Ceterach dalhousiae (Hook.) C. Chr.	MI-1068	PH	R	Native
3. Dennstaedtiaceae	*14. Microlepia strigosa* (Thunb.) Presl	MI-1224	PH	F	New to Swat
	15. Pteridium aquilinum (L.) Kuhn	MI-1225	PH	F	Native
4. Dryopteridaceae	*16. Cyrtomium caryotideum* (Wall. ex Hook. & Grev.) C. Presl	MI-1682	PH	MS	Native
	17. Dryopteris filix-mas (L.) Schott	MI-1227	PH	MS	Native
	18. Dryopteris juxtaposita H. Christ	MI-1228	PH	F	Native
	19. Dryopteris stewartii Fraser-Jenk.	MI-1683	PH	F	N. Pak
	20. Polystichum aculeatum (L.) Schott	MI-1684	PH	F	Native
	21. Polystichum platyphyllum (Willd.) C. Presl	MI-1685	PH	F	New to Pakistan
	22. Polystichum polyblepharum (Roem. ex Kunze) C. Presl	MI-1686	PH	F	New to Pakistan
5. Equisetaceae	*23. Equisetum arvense* L.	MI-1234	PH	MS	Native
	24. Equisetum hyemale L.	MI-1235	PH	WC	Native
	25. Equisetum ramosissimum Desf.	MI-1687	PH	S	Native
6. Hypodematiaceae	*26. Hypodematium crenatum* (Forssk.) Kuhn	MI-1266	PH	R	Native
7. Marsileaceae	*27. Marsilea polycarpa* Hook. & Grev.	MI-1315	PH	M	Native
8. Pteridaceae	*28. Pteris cretica* L.	MI-1474	PH	MS	Native
	29. Pteris vittata L.	MI-1475	PH	MS	Native
9. Woodsiaceae	*30. Athyrium attenuatum* (Wall. ex C.B.	MI-1817	PH	F	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	Clarke) Tagawa				
	31. Athyrium filix-femina (L.) Roth.	MI-1810	PH	F	Native
	32. Athyrium vidalii (Franch. & Sav.) Nakai	MI-1811	PH	F	New to Pakistan
	33. Gymnocarpium dryopteris (L.) Newman	MI-1812	PH	F	New to Pakistan
Gymnosperms					
10. Cupressaceae	*34. Cupressus sempervirens* L.	MI-1202	ET	GY	Cultivated
	35. Juniperus communis L. var. *saxatilis* Pallas	MI-1203	ES	E	Native
11. Pinaceae	*36. Abies pindrow* Royle	MI-1375	ET	F	Native
	37. Cedrus deodara (Roxb. ex D. Don) G. Don	MI-1376	ET	F	Native
	38. Picea smithiana (Wall.) Boiss.	MI-1377	ET	F	Native
	39. Pinus roxburghii Sargent	MI-1378	ET	F	Native
	40. Pinus wallichiana A. B. Jackson	MI-1379	ET	F	Native
12. Taxaceae	*41. Taxus wallichiana* Zucc	MI-1566	ET	F	Native
Monocotyledons					
13. Agavaceae	*42. Agave americana* L	MI-1016	PH	H	Cultivated
14. Alismataceae	*43. Alisma plantago-aquatica* L.	MI-1018	PH	M	Native
	44. Sagittaria trifolia L.	MI-1019	PH	M	Native
15. Alliaceae	*45. Allium ampeloprasum* var. *porrum* (L). Regel	MI-1020	PH	A	Native
	46. Allium cepa L	MI-1021	BH	A	Cultivated
	47. Allium jacquemontii Kunth	MI-1022	AH	D	Native
	48. Allium porrum L.	MI-1023	AH	A	Native
	49. Allium sativum L.	MI-1024	AH	A	Cultivated
16. Amaryllidaceae	*50. Ixiolirion tataricum* (Pall.) Herb.	MI-1037	PH	A	Weed
	51. Narcissus tazetta L.	MI-1038	PH	GY	Native
17. Araceae	*52. Acorus calamus* Linn	MI-1052	PH	WC	Native
	53. Arisaema flavum (Forsk.) Schott	MI-1053	PH	F	Native
	54. Arisaema jacquemontii Blume	MI-1054	PH	F	Native
	55. Colocasia esculenta (L.) Schott	MI-1055	PH	WC	Cultivated
18. Asparagaceae	*56. Asparagus adscendens* Roxb.	MI-1062	PH	D	Native
	57. Asparagus filicinus Buch.-Ham. ex D. Don	MI-1063	PH	F	Native
	58. Asparagus officinalis L	MI-1064	PH	H	Cultivated
	59. Asparagus setaceus (Kunth) Jessop	MI-1608	PH	F	N. Pak.
19. Asphodelaceae	*60. Aloe vera* (L.) Burm. f.	MI-1065	PH	H	Cultivated
20. Cannaceae	*61. Canna indica* L.	MI-1159	PH	H	Cultivated
21. Colchicaceae	*62. Colchicum luteum* Baker	MI-1181	PH	GY, F	Native
22. Commelinaceae	*63. Commelina benghalensis* L.	MI-1182	AH	A	Weed
	64. Commelina paludosa Blume	MI-1183	PH	M	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	65. Tradescantia pallida (Rose) D.Hunt	MI-1184	PH	H	Cultivated
23. Convallariaceae	*66. Polygonatum geminiflorum* Decne.	MI-1664	PH	F	Native
	67. Polygonatum multiflorum (L.) All.	MI-1185	PH	F	Native
	68. Polygonatum verticillatum (L.) All.	MI-1186	PH	F	Native
24. Cyperaceae	*69. Bulbostylis densa* (Wall. ex Roxb.) Hand.-Mazz.	MI-1669	AH	M	Native
	70. Carex acutiformis Ehrh.	MI-1206	PH	WC	Native
	71. Carex canescens L.	MI-1670	PH	F	Native
	72. Carex cardiolepis Nees	MI-1671	PH	F	Native
	73. Carex foliosa D. Don	MI-1672	PH	F	Native
	74. Carex nivalis Boott	MI-1673	PH	F	Native
	75. Carex psychrophila Nees	MI-1674	PH	F	Native
	76. Carex sanguinea Boott	MI-1675	PH	D	Native
	77. Carex schlagintweitiana Boeck.	MI-1676	PH	D	Native
	78. Cyperus alopecuroides Rottb.	MI-1207	PH	M	Native
	79. Cyperus articulatus L.	MI-1208	PH	M	Native
	80. Cyperus compressus L.	MI-1209	AH	S	Native
	81. Cyperus difformis L.	MI-1211	AH	S	Native
	82. Cyperus esculentus L.	MI-1677	PH	S	Native
	83. Cyperus glomeratus L.	MI-1210	AH	S	Weed
	84. Cyperus iria L.	MI-1678	AH	M	Weed
	85. Cyperus niveus Retz.	MI-1212	PH	D	Native
	86. Cyperus rotundus L.	MI-1213	PH	W	Weed
	87. Cyperus serotinus Rottb.	MI-1679	PH	WC	Native
	88. Eleocharis palustris (L.) Roem. & Schult.	MI-1214	PH	M	Native
	89. Eriophorum comosum (Wall.) Nees	MI-1215	PH	R	New to Pakistan
	90. Fimbristylis bisumbellata (Forssk.) Bubani	MI-1216	AH	S	Native
	91. Kobresia laxa Nees	MI-1680	PH	R	Native
	92. Kyllinga brevifolia Rottb.	MI-1217	PH	M	Native
	93. Kyllinga nemoralis (J.R.Forster & G. Forster) Dandy ex Hutch. & Dalziel	MI-1218	PH	M	Native
	94. Pycreus flavescens (L.) Reichenb.	MI-1219	AH	M	Native
	95. Pycreus polystachyos (Rottb.) P. Beauv.	MI-1220	PH	M	Native
	96. Pycreus pumilus (L.) Nees	MI-1221	AH	M	Native
	97. Pycreus sanguinolentus (Vahl) Nees	MI-1222	AH	M	Native
	98. Schoenoplectus litoralis (Schrad.) Palla	MI-1681	PH	S	Native
	99. Schoenoplectus mucronatus (L.) Palla	MI-1223	PH	M	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
25. Haemodoraceae	*100. Ophiopogon intermedius* D. Don	MI-1260	PH	F	Native
26. Hyacinthaceae	*101. Scilla griffithii* Hochr.	MI-1263	PH	GY	Native
27. Hydrocharitaceae	*102. Hydrilla verticillata* (L. f.) Royle	MI-1264	PH	M	Native
28. Iridaceae	*103. Iris germanica* L.	MI-1267	PH	GY	Cultivated
	104. Iris hookeriana Foster	MI-1268	PH	E	Native
	105. Moraea sisyrinchium (L.) Ker Gawl.	MI-1269	PH	A	Weed
29. Juncaceae	*106. Juncus articulatus* L.	MI-1271	PH	M	Native
	107. Juncus bufonius L.	MI-1272	AH	S	Native
	108. Juncus inflexus L.	MI-1273	PH	M	Native
30. Lemnaceae	*109. Lemna minor* L.	MI-1304	AH	WC	Naturalized
31. Liliaceae	*110. Gagea pakistanica* Levichev & Ali	MI-1709	PH	D	Native
	111. Lilium polyphyllum D.Don	MI-1710	PH	F	Native
	112. Notholirion thomsonianum (D. Don) Stapf	MI-1305	PH	WC	Native
	113. Tulipa clusiana DC	MI-1306	PH	A	Native
32. Orchidaceae	*114. Dactylorhiza hatagirea* (D.Don) Soo	MI-1715	PH	F	Native
	115. Epipactis helleborine (L.) Crantz	MI-1716	PH	F	Native
	116. Epipactis veratrifolia Boiss. & Hohen.	MI-1717	PH	F	Native
	117. Goodyera repens (L.) R. Br.	MI-1718	PH	F	New to Swat
	118. Habenaria digitata Lindl.	MI-1337	PH	F	New to Swat
33. Poaceae	*119. Acrachne racemosa* (Heyne ex Roem. & Schult.) Ohwi	MI-1384	AH	A	Weed
	120. Agrostis gigantea Roth	MI-1744	PH	F	Native
	121. Agrostis stolonifera L.	MI-1385	PH	F	Native
	122. Agrostis vinealis Schreb.	MI-1745	PH	D	Native
	123. Alopecurus myosuroides Huds.	MI-1386	AH	M	Weed
	124. Apluda mutica L.	MI-1387	PH	A	Native
	125. Aristida adscensionis L.	MI-1388	AH	D	Native
	126. Aristida cyanantha Nees ex Steud.	MI-1389	PH	D	Native
	127. Arthraxon prionodes (Steud.) Dandy	MI-1390	PH	A	Native
	128. Arundinella nepalensis Trin.	MI-1746	PH	D	New to Swat
	129. Arundo donax L.	MI-1391	PH	WC	Naturalized
	130. Avena fatua L.	MI-1392	AH	A	Weed
	131. Avena sativa L.	MI-1747	AH	A	Weed
	132. Bothriochloa bladhii (Retz.) S.T.	MI-1393	PH	D	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	Blake				
	133. Brachiaria eruciformis (J.E. Smith) Griseb.	MI-1748	AH	A	Native
	134. Brachiaria ramosa (L.) Stapf.	MI-1394	AH	A	Weed
	135. Brachiaria reptans (L.) C.A.Gardner & C.E.Hubb.	MI-1749	AH	A	Weed
	136. Brachypodium distachyon (L.) P. Beauv.	MI-1750	AH	W	Native
	137. Brachypodium sylvaticum (Huds.) P. Beauv.	MI-1395	AH	GY	Native
	138. Bromus catharticus Vahl	MI-1751	AH	W	Naturalized
	139. Bromus oxyodon Schrenk	MI-1752	AH	W	Native
	140. Bromus pectinatus Thunb.	MI-1396	AH	R	Native
	141. Cenchrus ciliaris L.	MI-1397	PH	D	Native
	142. Chrysopogon gryllus (L.) Trin.	MI-1398	PH	D	Native
	143. Chrysopogon serrulatus Trin.	MI-1753	PH	D	Native
	144. Cymbopogon jwarancusa (Jones) Schult.	MI-1754	PH	D	Native
	145. Cymbopogon martini (Roxb.) Wats.	MI-1399	PH	D	Native
	146. Cynodon dactylon (L.) Pers.	MI-1400	PH	G, S, W	Native
	147. Dactylis glomerata L.	MI-1401	PH	F, E	Native
	148. Dactyloctenium aegyptium (L.) Willd.	MI-1402	AH	W	Weed
	149. Desmostachya bipinnata (L.) Stapf	MI-1403	PH	D	Native
	150. Dichanthium annulatum (Forssk.) Stapf	MI-1404	PH	G, D	Native
	151. Digitaria ciliaris (Retz.) Koel	MI-1405	AH	S	Native
	152. Digitaria sanguinalis (L.) Scop.	MI-1755	AH	S	Native
	153. Digitaria violascens Link	MI-1406	AH	S	Native
	154. Echinochloa colona (L.) Link	MI-1407	AH	A	Weed
	155. Echinochloa crus-galli (L.) P. Beauv.	MI-1408	AH	M	Weed
	156. Eleusine indica (L.) Gaertn.	MI-1409	AH	W	Weed
	157. Elymus semicostatus (Nees ex Steud.) Meld.	MI-1756	PH	D	New to Swat
	158. Eragrostis cilianensis (All.) Lut. ex F.T. Hubbard	MI-1410	AH	W	Native
	159. Eragrostis pilosa (L.) P. Beauv.	MI-1411	AH	W	Native
	160. Eragrostis tenella (L.) P. Beauv. ex Roem. & Schult.	MI-1757	AH	W	Naturalized
	161. Eulaliopsis binata (Retz.) C.E. Hubbard	MI-1412	PH	D	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	162. Hemarthria compressa (L.f) R. Br.	MI-1413	PH	MS	Native
	163. Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult.	MI-1414	PH	D	Native
	164. Hordeum murinum L.	MI-1415	AH	S	Native
	165. Hordeum vulgare L.	MI-1758	AH	A	Cultivated
	166. Hyparrhenia hirta (L.) Stapf	MI-1416	PH	D, G	Native
	167. Imperata cylindrica (L.) Raeuschel.	MI-1417	PH	W	Native
	168. Isachne himalaica Hook.f.	MI-1418	PH	M	Native
	169. Leptochloa panicea (Retz.) Ohwi	MI-1419	AH	W	Naturalized
	170. Lolium perenne L.	MI-1421	PH	F	Native
	171. Lolium persicum Boiss. & Hohen.	MI-1420	AH	F	Native
	172. Lolium temulentum L.	MI-1422	AH	A	Weed
	173. Lygeum spartum L.	MI-1759	PH	D	New to Swat
	174. Oryza sativa L.	MI-1820	AH	A	Cultivated
	175. Panicum antidotale Retz.	MI-1424	PH	D	Naturalized
	176. Parapholis incurva (L.) C.E. Hubbard	MI-1760	AH	D	New to Swat
	177. Paspalidium flavidum (Retz.) A. Camus	MI-1425	PH	W, G	Naturalized
	178. Paspalum dilatatum Poir.	MI-1426	PH	A	Naturalized
	179. Paspalum paspalodes (Michx.) Scribner	MI-1427	PH	M	Native
	180. Pennisetum flaccidum Griseb.	MI-1761	PH	D	Native
	181. Pennisetum glaucum (L.) R. Br.	MI-1428	AH	A	Cultivated
	182. Pennisetum orientale L.C. Rich.	MI-1429	PH	D	Native
	183. Pennisetum purpureum Schumach.	MI-1762	PH	A	New to Pakistan
	184. Phalaris minor Retz.	MI-1430	AH	A	Native
	185. Phleum paniculatum Huds.	MI-1431	AH	W	Native
	186. Piptatherum gracile Mez	MI-1432	PH	GY	Native
	187. Piptatherum laterale Munro ex Regel	MI-1763	PH	F	New to Swat
	188. Piptatherum munroi (Stapf) Mez	MI-1764	PH	F	New to Swat
	189. Poa alpina L.	MI-1433	PH	E	Native
	190. Poa annua L.	MI-1434	AH	W	Weed
	191. Poa bulbosa L.	MI-1435	PH	D, W	Weed
	192. Poa infirma H. B. K.	MI-1436	AH	W	Weed
	193. Poa polycolea Stapf.	MI-1765	PH	F	Native
	194. Poa pratensis subsp. *angustifolia* (L.) Gaud.	MI-1766	PH	F	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	195. Polypogon fugax Ness ex Steud.	MI-1437	AH	W	Weed
	196. Polypogon monspeliensis (L.) Desf.	MI-1438	AH	W	Weed
	197. Polypogon viridis (Gouan) Breistr.	MI-1767	PH	F	Native
	198. Psilurus incurvus (Gouan) Schinz & Thell.	MI-1768	AH	W	Native
	199. Rostraria cristata (L.) Tzvelev	MI-1769	AH	W	Weed
	200. Rottboellia exaltata (L.) L.f.	MI-1770	AH	A	Naturalized
	201. Saccharum spontaneum L.	MI-1439	PH	S	Native
	202. Sclerochloa dura (L.) P. Beauv.	MI-1440	AH	W	Native
	203. Setaria pumila (Poir.) Roem. & Schult.	MI-1441	AH	A	Weed
	204. Setaria verticillata (L.) P. Beauv.	MI-1442	AH	W	Invasive
	205. Setaria viridis (L.) P. Beauv.	MI-1443	AH	A, GY	Weed
	206. Sorghum bicolor (L.) Moench.	MI-1444	AH	A	Cultivated
	207. Sorghum halepense (L.) Pers.	MI-1445	PH	A	Native
	208. Stipagrostis ciliata (Desf.) De Winter	MI-1771	PH	D	New to Swat
	209. Themeda anathera (Nees ex Steud.) Hack.	MI-1446	PH	G, D	Native
	210. Tragus roxburghii Panigrahi	MI-1447	AH	D	Native
	211. Trikeraia hookeri (Stapf) Bor	MI-1816	PH	D	New to Swat
	212. Trisetum spicatum (L.) Richt	MI-1772	PH	W	Native
	213. Triticum aestivum L.	MI-1818	AH	A	Cultivated
	214. Urochloa panicoides P. Beauv.	MI-1773	AH	W	Naturalized
	215. Vulpia myuros (L.)C.C.Gmel.	MI-1448	AH	S	Native
	216. Zea mays L.	MI-1819	AH	A	Cultivated
34. Pontederiaceae	*217. Monochoria vaginalis* (Burm. f.) Presl	MI-1465	PH	M	Naturalized
35. Potamogetonaceae	*218. Potamogeton crispus* L.	MI-1467	PH	WC	Native
	219. Potamogeton nodosus Poiret	MI-1468	PH	M	Native
	220. Potamogeton perfoliatus L.	MI-1469	PH	WC	Native
36. Smilacaceae	*221. Smilax glaucophylla* Klotzsch	MI-1550	C	F	Native
37. Sparganiaceae	*222. Sparganium erectum* L.	MI-1802	PH	M	Naturalized
38. Trilliaceae	*223. Trillium govanianum* Wall. ex Royle	MI-1571	PH	F	Native
39. Typhaceae	*224. Typha latifolia* L.	MI-1572	PH	M	Native
40. Xanthorrhoeaceae	*225. Hemerocallis fulva* (L.) L.	MI-1592	PH	MS	Naturalized
Dicotyledons					
41. Acanthaceae	*226. Barleria cristata* L.	MI-1001	DS	D	Native
	227. Dicliptera bupleuroides Nees in	MI-1002	PH	GY	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	Wall.				
	228. Justicia adhatoda L.	MI-1003	ES	GY, D	Native
	229. Justicia peploides (Nees) T. Anders.	MI-1004	AH	A	Weed
	230. Justicia vahlii Roth	MI-1005	AH	A	Weed
	231. Ruellia tuberosa L.	MI-1006	PH	M	Naturalized
	232. Strobilanthes urticifolia Wall. ex Kuntze	MI-1007	DS	F	Native
42. Aceraceae	*233. Acer cappadocicum* Gleditsch	MI-1008	DT	F	Native
43. Aizoaceae	*234. Trianthema portulacastrum* L.	MI-1017	AH	A	Weed
44. Amaranthaceae	*235. Achyranthes aspera* L.	MI-1025	PH	GY, S, W	Weed
	236. Achyranthes bidentata Blume	MI-1026	AH	F	Weed
	237. Alternanthera pungens Kunth	MI-1027	PH	W	Naturalized
	238. Alternanthera sessilis (L.) DC.	MI-1028	AH	S	Native
	239. Amaranthus graecizans L.	MI-1029	AH	A	Native
	240. Amaranthus hybridus L.	MI-1030	AH	A	Native
	241. Amaranthus retroflexus L.	MI-1031	AH	A	Native
	242. Amaranthus spinosus L.	MI-1032	AH	A	Native
	243. Amaranthus viridis L.	MI-1033	AH	A, W	Native
	244. Bosea amherstiana (Moq.) Hook. f.	MI-1034	DS	GY	Native
	245. Celosia argentea L.	MI-1035	AH	A, S	Weed
	246. Digera muricata (L.) Mart.	MI-1036	AH	A	Weed
45. Anacardiaceae	*247. Cotinus coggyria* Scop.	MI-1039	DS	D	Native
	248. Pistacia integerrima J. L. Stewart ex Brandis	MI-1040	DT	F	Native
	249. Rhus punjabensis J.L. Stewart ex Brandis	MI-1041	DT	F	Native
46. Apiaceae	*250. Aegopodium alpestre* Ledeb.	MI-1042	PH	D	Native
	251. Angelica glauca Edgew.	MI-1594	PH	F	Native
	252. Anthriscus nemorosa (M. Bieb.) Spreng.	MI-1595	PH	D	Native
	253. Bunium persicum (Boiss.) Fedtsch.	MI-1596	AH	E	Native
	254. Bupleurum falcatum L.	MI-1043	PH	D	Native
	255. Conium maculatum L.	MI-1597	AH	WC	Naturalized
	256. Coriandrum sativum L.	MI-1044	AH	A	Cultivated
	257. Eryngium coeruleum M-Bieb.	MI-1045	AH	S	Native
	258. Foeniculum vulgare Mill.	MI-1046	PH	A	Cultivated
	259. Heracleum cachemiricum C.B. Clarke	MI-1598	PH	D	Native
	260. Heracleum candicans Wall. ex DC.	MI-1599	PH	D	Native
	261. Heracleum canescens Lindl.	MI-1047	PH	D	Native
	262. Oenanthe javanica (Blume) DC.	MI-1600	AH	M	Native
	263. Pimpinella diversifolia DC.	MI-1601	PH	F	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	264. Prangos pabularia Lindl.	MI-1048	PH	D	Native
	265. Scandix pecten-veneris L.	MI-1049	AH	A, W	Weed
	266. Selinum filicifolium (Edgew.) E. Nasir	MI-1602	PH	D	Native
	267. Seseli libanotis (L.) W. Koch	MI-1603	PH	F	Native
	268. Sium latijugum C.B. Clarke	MI-1050	PH	WC	Native
	269. Torilis japonica (Houtt.) DC.	MI-1604	AH	W	Weed
	270. Zosima absinthifolia (Vent.) Link	MI-1813	PH	D	Native
47. Apocynaceae	*271. Nerium oleander* L.	MI-1051	ES	S	Native
48. Araliaceae	*272. Hedera nepalensis* K. Koch	MI-1056	C	F	Native
49. Asclepiadaceae	*273. Calotropis procera* subsp. *hamiltonii* (Wight) Ali	MI-1057	ES	D	Native
	274. Cynanchum auriculatum Royal ex Wight	MI-1605	C	F	Native
	275. Periploca aphylla Dcne	MI-1060	ES	D	Native
	276. Periploca hydaspidis Falc.	MI-1606	C	D	Native
	277. Vincetoxicum arnottianum (Wight) Wight	MI-1607	PH	D	Native
	278. Vincetoxicum hirundinaria Medicus	MI-1061	PH	D	Native
50. Asteraceae	*279. Achillea millefolium* L.	MI-1069	PH	E	Native
	280. Adenostemma lavenia (L.) Kuntze	MI-1610	AH	F	New to Swat
	281. Anaphalis margaritacea (L.) Benth.	MI-1070	AH	R	New to Swat
	282. Anaphalis viridis Cumm.	MI-1071	AH	F	New to Pakistan
	283. Artemisia capillaris Thunb.	MI-1611	DS	D	Native
	284. Artemisia dubia Wall. ex Besse	MI-1612	AH	F	Native
	285. Artemisia scoparia Waldst. & Kit.	MI-1072	DS	S, D	Native
	286. Artemisia vulgaris L.	MI-1073	PH	F, D	Native
	287. Aster alpinus L.	MI-1074	PH	E	New to Pakistan
	288. Aster altaicus Willd.	MI-1075	PH	D	Native
	289. Aster falconeri (C.B.Clarke) Hutch.	MI-1613	PH	G	New to Swat
	290. Aster flaccidus Bunge	MI-1614	PH	E	New to Swat
	291. Bidens biternata (Lour.) Merr. et Sherff	MI-1076	AH	W, GY	Native
	292. Bidens radiata Thuill.	MI-1615	AH	M	New to Pakistan
	293. Calendula arvensis L.	MI-1077	AH	W, A	Weed
	294. Carpesium abrotanoides L.	MI-1078	AH	W	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	295. Carpesium cernuum L.	MI-1079	AH	O	Weed
	296. Carthamus lanatus L.	MI-1080	AH	W	Native
	297. Carthamus oxyacantha Bieb.	MI-1081	AH	A	Weed
	298. Centaurea iberica Trev.	MI-1082	AH	S	Native
	299. Cichorium intybus L.	MI-1083	PH	A	Weed
	300. Cirsium arvense (L.) Scop.	MI-1084	PH	W	Native
	301. Cirsium falconeri (Hook. f.) Petr.	MI-1085	PH	E	Native
	302. Cnicus benedictus L.	MI-1086	AH	A	Weed
	303. Conyza bonariensis (L.) Cronq.	MI-1087	AH	W, A	Weed
	304. Conyza canadensis (L.) Cronq.	MI-1088	AH	GY, W	Native
	305. Conyza stricta Willd.	MI-1089	AH	S	Native
	306. Cousinia thomsonii C.B.Clarke	MI-1616	BH	D	Native
	307. Crepis foetida L.	MI-1617	PH	F	Native
	308. Crepis lignea (Vaniot) Babc.	MI-1618	PH	F	New to Pakistan
	309. Crepis multicaulis Ledeb.	MI-1619	PH	D	Native
	310. Echinops sphaerocephalus L.	MI-1090	PH	D	New to Swat
	311. Eclipta prostrata (L.) L.	MI-1091	AH	M	Native
	312. Filago hurdwarica (Wall. ex DC.) Wagenitz	MI-1620	AH	D	Native
	313. Galinsoga parviflora Cav.	MI-1092	AH	W	Native
	314. Gnaphalium uliginosum L.	MI-1093	AH	F	New to Swat
	315. Helianthus annuus L.	MI-1094	AH	A	Cultivated
	316. Helianthus tuberosus L.	MI-1095	PH	A	Native
	317. Hieracium umbellatum L.	MI-1621	PH	F	Native
	318. Inula sp.	MI-1423	AH	F	New to Swat
	319. Lactuca dissecta D.Don	MI-1622	AH	D, W	Native
	320. Lactuca floridana (L.) Gaertn.	MI-1096	AH	D, W	Native
	321. Lactuca serriola L.	MI-1097	AH	W	Native
	322. Launaea nudicaulis (L.) Hook.f.	MI-1623	PH	W	Native
	323. Launaea procumbens (Roxb.) Ramayya & Rajagopal	MI-1098	PH	W, D	Native
	324. Leontopodium himalayanum DC.	MI-1099	PH	F	New to Swat
	325. Matricaria aurea (Loefl.) Schultz-Bip.	MI-1100	AH	W	New to Swat
	326. Matricaria matricarioides (Less.) Porter ex Britton	MI-1101	AH	W	New to Swat
	327. Myriactis nepalensis Less.	MI-1624	PH	F	New to Swat

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	328. Myriactis wallichii Less.	MI-1625	AH	F	Native
	329. Myriactis wightii DC.	MI-1626	AH	F	New to Pakistan
	330. Onopordum acanthium L.	MI-1102	AH	W	Native
	331. Parthenium hysterophorus L.	MI-1103	AH	W	Invasive
	332. Phagnalon rupestre (L.) DC.	MI-1627	PH	D	New to Pakistan
	333. Prenanthes brunoniana Wall. ex DC.	MI-1628	PH	MS	New to Swat
	334. Saussurea alpina (L.) Candolle	MI-1629	PH	E	New to Pakistan
	335. Saussurea heteromalla (D.Don) Hand.-Mazz.	MI-1630	AH	W	Invasive
	336. Senecio chrysanthemoides DC.	MI-1104	PH	E	Native
	337. Serratula pallida DC.	MI-1631	PH	D	Native
	338. Sigesbeckia orientalis L.	MI-1105	AH	MS	New to Swat
	339. Silybum marianum (L.) Gaertn.	MI-1106	AH	W	Native
	340. Sonchus arvensis L.	MI-1107	AH	W	Native
	341. Sonchus asper (L.) Hill	MI-1108	AH	W	Native
	342. Sonchus oleraceus L.	MI-1109	AH	W	Native
	343. Symphyotrichum squamatum (Spreng.) G.L.Nesom	MI-1632	AH	WC	New to Swat
	344. Tagetes minuta L.	MI-1633	AH	W	Invasive
	345. Taraxacum officinale F.H. Wigg	MI-1110	PH	W, E	Native
	346. Tragopogon pratensis L.	MI-1111	BH	D	Native
	347. Xanthium strumarium L.	MI-1112	AH	W	Native
	348. Youngia japonica (L.) DC.	MI-1634	AH	W	Native
51. Balsaminaceae	*349. Impatiens bicolor* Royle	MI-1113	AH	MS	Native
	350. Impatiens brachycentra Kar. & Kir.	MI-1114	AH	F	Native
	351. Impatiens edgeworthii Hook. f.	MI-1115	AH	F	Native
	*352. Impatiens gl*and*ulifera* Royle	MI-1116	AH	WC	Native
	353. Impatiens pallida Nutt.	MI-1117	AH	F	New to Pakistan
52. Berberidaceae	*354. Berberis lycium* Royle	MI-1118	DS	D, F	Native
53. Betulaceae	*355. Alnus nitida* (Spach) Endl.Gen.	MI-1119	DT	WC	Native
54. Boraginaceae	*356. Anchusa arvensis subsp. orientalis* (L.) Nordh.	MI-1120	AH	A	New to Swat
	357. Arnebia decumbens (Vent.) Coss. & Kral	MI-1121	AH	D	Native
	358. Buglossoides arvensis (L.) Johnston	MI-1122	AH	A	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	359. Cynoglossum glochidiatum Wall. ex Benth.	MI-1635	AH	F	Native
	360. Cynoglossum lanceolatum Forssk.	MI-1123	AH	W, S	Native
	361. Gastrocotyle hispida (Forssk.) Bunge	MI-1636	AH	A	New to Swat
	362. Hackelia macrophylla (Brand) I.M. Johnston	MI-1124	PH	F	Native
	363. Heliotropium europaeum L.	MI-1125	AH	D	Native
	364. Heliotropium strigosum Willd.	MI-1126	PH	D	Native
	365. Nonea edgeworthii A. DC	MI-1127	AH	D, A	Native
	366. Onosma hispida Wall. ex G. Don	MI-1128	PH	D	Native
	367. Pseudomertensia parvifolia (Decne.) Riedl	MI-1637	PH	D	Native
	368. Trichodesma indicum (L.) R. Br.	MI-1129	PH	D	Native
55. Brassicaceae	*369. Alliaria petiolata* (M. Bieb.) Cavara & Grande	MI-1130	AH	W, GY	Native
	370. Arabidopsis himalaica (Edgew.) O.E. Schulz	MI-1131	AH	E	Native
	371. Arabidopsis stricta (Camb.) N. Busch	MI-1638	AH	E, S	Native
	372. Arabidopsis thaliana (L.) Heynh.	MI-1132	AH	E, D	Native
	373. Arabis amplexicaulis Edgew.	MI-1639	PH	D	New to Swat
	374. Arabis bijuga G. Watt	MI-1640	PH	D	Native
	375. Arabis tibetica Hook. f. & Thoms.	MI-1641	PH	D	Native
	376. Barbaraea vulgaris R.Br.	MI-1133	BH	W	Native
	377. Brassica juncea (L.) Czern. et Coss.	MI-1134	AH	A	Native
	378. Brassica napus L.	MI-1135	AH	A	Cultivated
	379. Brassica rapa subsp. campestris (L.) Clapham	MI-1136	AH	A	Cultivated
	380. Capsella bursa-pastoris (L.) Medik.	MI-1137	AH	A, W, S	Weed
	381. Cardamine flexuosa With.	MI-1139	AH	W	Native
	382. Cardamine impatiens L.	MI-1138	AH	W	Native
	383. Cardaria draba (L.) Desv.	MI-1642	PH	A	Weed
	384. Cardaria pubescens (C.A.Mey.) Rollins	MI-1643	PH	W	New to Swat
	385. Coronopus didymus (L.) Smith	MI-1140	AH	W	Native
	386. Descurainia sophia (L.) Webb ex Prantl	MI-1644	AH	D	Native
	387. Eruca sativa Mill.	MI-1645	AH	A	Native
	388. Isatis costata C.A.Mey.	MI-1646	BH	D	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	389. Lepidium apetalum Willd.	MI-1141	BH	A, W, S	Native
	390. Lepidium sativum L.	MI-1142	AH	A	Cultivated
	391. Malcolmia africana (L.) R. Br.	MI-1647	AH	D	Native
	392. Nasturtium officinale R. Br.	MI-1143	PH	M, WC	Native
	393. Neslia paniculata subsp. *thracica* (Velen.) Bornm.	MI-1144	AH	A	Weed
	394. Raphanus sativus L.	MI-1145	BH	A	Cultivated
	395. Rorippa indica (L.) Hiern	MI-1146	AH	W	Native
	*396. Rorippa isl*and*ica* (Oeder) Borbas	MI-1147	AH	M	Native
	397. Sinapis alba L.	MI-1648	AH	A	New to Swat
	398. Sisymbrium altissimum L.	MI-1148	AH	W	Native
	399. Sisymbrium irio L.	MI-1149	AH	W	Native
	400. Sisymbrium orientale L.	MI-1150	AH	W	Native
	401. Thlaspi arvense L.	MI-1151	AH	D, S	Native
56. Buddlejaceae	*402. Buddleja crispa* Benth.	MI-1152	DS	D	Native
57. Buxaceae	*403. Buxus wallichiana* Baill.	MI-1153	ES	F	Native
	404. Sarcococca saligna (D.Don) Muell.-Arg.	MI-1154	ES	F	Native
58. Cactaceae	*405. Opuntia monacantha* Haw.	MI-1155	ES	D, W	Native
59. Caesalpinaceae	*406. Caesalpinia decapetala* (Roth) Alston	MI-1156	DS	A	Native
60. Campanulaceae	*407. Campanula pallida* Wall	MI-1157	AH	D	Native
	408. Campanula tenuissima Dunn	MI-1649	PH	R, C	New to Swat
61. Cannabaceae	*409. Cannabis sativa* L.	MI-1158	AH	W, GY	Native
62. Capparidaceae	*410. Cleome viscosa* L.	MI-1160	AH	A	Native
63. Caprifoliaceae	*411. Lonicera japonica* Thunb.	MI-1650	C	F	New to Swat
	412. Lonicera myrtillus Hook. f. & Thoms.	MI-1161	DS	F	Native
	413. Viburnum cotinifolium D. Don	MI-1162	DS	F	Native
	*414. Viburnum gr*andi*florum* Wall. ex DC.	MI-1163	DS	F	Native
64. Caryophyllaceae	*415. Arenaria neelgerrensis* Wight & Arn.	MI-1651	AH	E, G	Native
	416. Arenaria serpyllifolia L.	MI-1164	AH	E	Native
	417. Cerastium dahuricum Fisch.	MI-1165	PH	E, F	Native
	418. Cerastium fontanum Baumg.	MI-1166	PH	A	Native
	419. Cerastium glomeratum Thuill.	MI-1167	AH	A	Native
	420. Dianthus caryophyllus L.	MI-1652	PH	H	Cultivated
	421. Dianthus crinitus Sm.	MI-1168	PH	D	Native
	422. Lepyrodiclis tenera Boiss.	MI-1653	AH	F	New to

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					Swat
	423. Petrorhagia alpina (Habl.) P. W. Ball & Heywood	MI-1654	AH	D	Native
	424. Sagina apetala Arduino	MI-1655	AH	W, MS	Native
	425. Silene conoidea L.	MI-1169	AH	A	Weed
	426. Silene indica var. *cashmeriana* (Majumdar) Y. Nasir	MI-1656	PH	E	New to Swat
	427. Silene viscosa (L.) Pers.	MI-1170	PH	E, G	Native
	428. Silene vulgaris (Moench) Garcke	MI-1171	PH	E, F	Native
	429. Spergularia media (L.) Presl	MI-1657	PH	WC	Native
	430. Stellaria holostea L.	MI-1658	PH	A	New to Pakistan
	431. Stellaria media (L.) Vill.	MI-1172	AH	W. GY	Weed
	432. Stellaria uliginosa Murr.	MI-1659	PH	E	Native
	433. Vaccaria hispanica (Miller) Rauschert	MI-1660	AH	A	Native
	434. Velezia rigida L.	MI-1714	AH	D	Native
65. Celastraceae	*435. Euonymus hamiltonianus* Wall. in Roxb.	MI-1173	ES	F	Native
	436. Euonymus pendulus Wall.	MI-1661	ET	F	New to Swat
	437. Maytenus royleanus (Wall. ex Lawson) Cufodontis	MI-1174	DS	D	Native
	438. Maytenus wallichiana (Spreng.) Raju & Babu	MI-1662	DS	F	New to Swat
66. Ceratophyllaceae	*439. Ceratophyllum demersum* L.	MI-1663	PH	WC	Native
67. Chenopodiaceae	*440. Chenopodium album* L.	MI-1175	AH	S, D, GY	Native
	441. Chenopodium ambrosioides L.	MI-1176	AH	W, S	Native
	442. Chenopodium botrys L.	MI-1177	AH	S	Native
	443. Chenopodium murale L.	MI-1178	AH	D	Native
	444. Kochia scoparia (L.) Schrad.	MI-1179	AH	H	Cultivated
	445. Spinacia oleracea L.	MI-1180	AH	A	Cultivated
68. Convolvulaceae	*446. Convolvulus arvensis* L.	MI-1187	C	A	Native
	447. Ipomoea eriocarpa R. Br.	MI-1188	C	A, F	Native
	448. Ipomoea hederacea Jacq.	MI-1665	C	A	Native
	449. Ipomoea purpurea (L.) Roth	MI-1189	C	A	Native
69.Cornaceae	*450. Cornus macrophylla* Wall. ex Roxb.	MI-1190	DT	F, GY	Native
70. Crassulaceae	*451. Hylotelephium ewersii* (Ledeb.) H. Ohba	MI-1191	PH	D, E	Native
	452. Rosularia adenotricha (Wall. ex Edgew.) Jansson & Rech.f.	MI-1666	PH	R	Native

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	453. Sedum hispanicum L.	MI-1192	PH	R	Native
71. Cucurbitaceae	*454. Bryonia monoica* Aitch. & Hemsl.	MI-1667	C	D	Native
	455. Citrullus lanatus (Thunb.) Mats. & Nakai	MI-1193	AH	A	Cultivated
	456. Cucumis melo subsp. *agrestis* (Naud.) Grebensc.	MI-1194	AH	W, A, S	Weed
	457. Cucumis sativus L.	MI-1195	AH	A	Cultivated
	458. Cucurbita maxima Duch. ex Lam.	MI-1196	AH	A	Cultivated
	459. Lagenaria siceraria (Molina) Standley	MI-1197	AH	A	Cultivated
	460. Luffa acutangula (L.) Roxb.	MI-1198	AH	A	Cultivated
	461. Momordica charantia L.	MI-1199	AH	A	Cultivated
	462. Solena amplexicaulis (Lam.) Gandhi	MI-1200	C	F	Native
	463. Trichosanthes cucumerina L.	MI-1201	AH	A	Cultivated
72. Cuscutaceae	*464. Cuscuta capitata* Roxb.	MI-1668	P	P	New to Swat
	465. Cuscuta europaea L.	MI-1204	P	P	Native
	466. Cuscuta gigantea Griff.	MI-1058	P	P	New to Swat
	467. Cuscuta reflexa Roxb.	MI-1205	P	P	Native
73. Dipsacaceae	*468. Scabiosa c*and*ollei* DC.	MI-1226	PH	D	Native
74. Ebenaceae	*469. Diospyros kaki* L. f	MI-1229	DT	A	Cultivated
	470. Diospyros lotus L.	MI-1230	DT	F	Native
75. Elaeagnaceae	*471. Elaeagnus umbellata* Thunb.	MI-1231	DS	F, D	Native
76. Elatinaceae	*472. Bergia ammannioides* Heyne ex Roth	MI-1232	AH	S	New to Swat
77. Euphorbiaceae	*473.* And*rachne cordifolia* (Wall. ex Decne.) Muell. Avg.	MI-1236	DS	F	Native
	474. Chrozophora tinctoria (L.) Raf.	MI-1237	AH	D	Native
	475. Euphorbia falcata subsp. *falcata* L.	MI-1688	AH	A	Native
	476. Euphorbia granulata Forssk.	MI-1238	AH	A	Weed
	477. Euphorbia helioscopia L.	MI-1239	AH	W, A	Weed
	478. Euphorbia heterophylla L.	MI-1689	AH	S	New to Swat
	479. Euphorbia hirta L.	MI-1240	AH	D, W	Native
	480. Euphorbia hypericifolia L.	MI-1690	AH	F	New to Swat
	481. Euphorbia indica Lam.	MI-1241	AH	A	Native
	482. Euphorbia maddenii Boiss.	MI-1691	AH	F	Native
	483. Euphorbia peplus L.	MI-1059	AH	A, W	New to Swat
	484. Euphorbia prostrata Ait.	MI-1242	AH	W, D, A	Weed

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	485. Euphorbia wallichii Hook. f.	MI-1243	PH	E, F	Native
	486. Phyllanthus fraternus Webster	MI-1244	AH	A	Weed
	487. Ricinus communis L.	MI-1245	ES	D	Native
78. Fabaceae	*488. Astragalus alpinus* L.	MI-1724	PH	E, G	New to Pakistan
	*489. Astragalus c*and*olleanus* Royle ex Benth.	MI-1725	DS	D	Native
	490. Astragalus densiflorus Kar. & Kir.	MI-1726	PH	E	New to Swat
	491. Astragalus depressus L.	MI-1727	PH	E	New to Pakistan
	492. Astragalus filicaulis Kar. & Kir.	MI-1343	AH	F	New to Swat
	493. Astragalus graveolens Buch.-Ham.ex Benth.	MI-1728	PH	E, D	Native
	494. Astragalus leucocephalus Graham ex Benth.	MI-1729	PH	D	Native
	495. Astragalus pyrrhotrichus Boiss.	MI-1730	PH	D	Native
	496. Astragalus rhizanthus Royle ex Benth.	MI-1731	PH	D	Native
	497. Astragalus tribulifolius Benth. ex Bunge	MI-1732	PH	G, D	Native
	498. Crotalaria medicaginea Lamk.	MI-1345	PH	D	Native
	499. Dalbergia sissoo Roxb.	MI-1346	DT	A	Cultivated
	500. Desmodium elegans DC.	MI-1347	DS	F, D	Native
	501. Indigofera heterantha var. gerardiana (Wall. ex Baker) Ali	MI-1348	DS	F	Native
	502. Indigofera heterantha var. heterantha (Brandis) Baker	MI-1349	DS	F, D	Native
	503. Indigofera linifolia (L.f.) Retz	MI-1733	AH	D	Native
	504. Lablab purpureus (L.) Sweet	MI-1350	AH	A	Cultivated
	505. Lathyrus aphaca L.	MI-1351	AH	A	Weed
	506. Lathyrus hirsutus L.	MI-1352	AH	A	Weed
	507. Lathyrus pratensis L.	MI-1353	PH	F	Native
	508. Lathyrus sphaericus Retz	MI-1734	AH	D	Native
	509. Lens culinaris Medic.	MI-1354	AH	A	Cultivated
	510. Lespedeza juncea (L.f.) Pers.	MI-1355	PH	D	Native
	511. Lotus corniculatus L.	MI-1356	PH	G, D	Native
	512. Medicago falcata L.	MI-1735	AH	D	Native
	513. Medicago lupulina L.	MI-1357	AH	E, G	Native
	514. Medicago minima (L.) L.	MI-1358	AH	S	Native
	515. Medicago orbicularis (L.) Bart.	MI-1359	AH	D, S	Native
	516. Medicago polymorpha L.	MI-1360	AH	A, G, W	Weed

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	517. Melilotus alba Desr.	MI-1736	AH	A, F	New to Swat
	518. Melilotus indica (L.) All.	MI-1361	AH	W, A, G	Native
	519. Oxytropis cachemiriana Cambess.	MI-1737	PH	D	New to Swat
	520. Oxytropis thomsonii Bunge	MI-1738	PH	D	New to Swat
	521. Phaseolus lunatus L.	MI-1362	AH	A	Cultivated
	522. Phaseolus vulgaris L.	MI-1363	AH	A	Cultivated
	523. Pisum sativum L.	MI-1364	AH	A	Cultivated
	524. Robinia pseudo-acacia L.	MI-1365	DT	A	Naturalized
	*525. Trifolium alex*and*rianum* L.	MI-1366	AH	A	Cultivated
	526. Trifolium repens L.	MI-1367	PH	G, E, MS	Native
	527. Trifolium resupinatum L.	MI-1368	AH	A	Cultivated
	528. Trigonella foenum-graecum L.	MI-1369	AH	A	Cultivated
	529. Trigonella monantha ssp. *incisa* (Benth.) Ali	MI-1739	AH	D	Native
	530. Vicia bithynica (L.) L.	MI-1740	AH	A	New to Swat
	531. Vicia monantha Retz.	MI-1741	AH	W	Native
	532. Vicia sativa L.	MI-1370	AH	A, W	Weed
	533. Vigna mungo (L.) Hepper	MI-1371	AH	A	Cultivated
	534. Vigna radiata (L.) Wilczek	MI-1372	AH	A	Cultivated
	535. Vigna unguiculata (L.) Walp.	MI-1373	AH	A	Cultivated
79. Fagaceae	*536. Quercus baloot* Griff.	MI-1246	ET	D	Native
	537. Quercus dilatata Royle	MI-1247	ET	F	Native
	538. Quercus incana Roxb.	MI-1248	ET	F	Native
	539. Quercus semecarpifolia Smith	MI-1249	ET	F	Native
80. Fumariaceae	*540. Corydalis diphylla* Wall.	MI-1250	PH	F	Native
	541. Fumaria indica (Hausskn.) Pugsley	MI-1251	AH	A	Weed
81. Gentianaceae	*542. Gentianodes argentea* (Royle ex D.Don) Omer, Ali & Qaiser	MI-1692	AH	E, G	Native
	543. Gentianodes olivieri (Griseb.) Omer, Ali & Qaiser	MI-1252	PH	D	Native
	544. Swertia cordata (G.Don) Clarke	MI-1253	AH	E, G	Native
82. Geraniaceae	*545. Erodium cicutarium* (L.) L'Herit, ex Aiton	MI-1254	AH	S	Native
	546. Geranium collinum Steph. ex Willd.	MI-1693	PH	F	Native
	547. Geranium lucidum L.	MI-1255	AH	W	Native
	548. Geranium nepalense Sweet	MI-1256	AH	F	Native
	549. Geranium ocellatum Camb.	MI-1694	AH	A	Native
	550. Geranium rotundifolium L.	MI-1257	AH	W	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	551. Geranium Swatense Schönb.-Tem.	MI-1258	PH	F	Native
	552. Pelargonium zonale L'Herit ex Soland.	MI-1259	PH	GY, H	Cultivated
83. Grossulariaceae	*553. Ribes himalense* Decne.	MI-1695	DS	F	New to Swat
84. Hamamelidaceae	*554. Parrotiopsis jacquemontiana* (Dcne.) Rehder	MI-1261	DS	F	Native
85. Hippocastanaceae	*555. Aesculus indica* (Wall.ex Camb.) Hook.f.	MI-1262	DT	F	Native
86. Hypericaceae	*556. Hypericum perforatum* L.	MI-1265	PH	D	Native
87. Juglandaceae	*557. Juglans regia* L.	MI-1270	DT	A	Naturalized
88. Lamiaceae	*558. Ajuga bracteosa* Wall. ex Benth.	MI-1274	PH	D	Native
	559. Ajuga parviflora Benth.	MI-1275	AH	F, R	Native
	560. Anisomeles indica (L.) O. Kuntze	MI-1276	PH	S	Native
	561. Calamintha debilis (Bunge) Benth.	MI-1277	AH	S, F	New to Swat
	562. Clinopodium umbrosum (M. Bieb.) C. Koch	MI-1278	PH	D	Native
	563. Clinopodium vulgare L.	MI-1279	PH	D	Native
	564. Elsholtzia ciliata (Thunb.) Hylander	MI-1696	AH	F	Native
	565. Eremostachys superba Royle ex Benth.	MI-1280	PH	D	Native
	566. Galeopsis bifida Boenn.	MI-1697	AH	F	New to Swat
	567. Isodon coetsa (Buch. -Ham. ex D. Don) Kudo	MI-1698	PH	F	Native
	568. Isodon rugosus (Wall. ex Benth.) Codd	MI-1281	DS	D	Native
	569. Lamium album L.	MI-1282	PH	F	Native
	570. Lamium amplexicaule L.	MI-1283	AH	A	Weed
	571. Leonurus cardiaca L.	MI-1699	AH	M	Native
	572. Leucas cephalotes (Roth) Spreng	MI-1284	AH	F	Native
	573. Leucas lanata Benth.	MI-1285	PH	F	Native
	574. Lycopus europaeus L.	MI-1286	AH	M, WC	Native
	575. Marrubium vulgare L.	MI-1287	PH	F, D	Native
	576. Mentha longifolia (L.) L.	MI-1288	PH	WC, S	Native
	577. Mentha spicata L.	MI-1289	PH	A	Cultivated
	578. Micromeria biflora (Buch.-Ham. ex D. Don) Benth.	MI-1290	PH	D	Native
	579. Nepeta cataria L.	MI-1700	PH	D	New to Swat
	580. Nepeta erecta (Boyle ex Benth.)	MI-1291	PH	F	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	Benth.				
	581. Nepeta govaniana (Wall. ex Benth.) Benth.	MI-1701	PH	F	Native
	582. Nepeta laevigata (D. Don) Hand.-Mazz	MI-1292	PH	F	Native
	583. Ocimum basilicum L.	MI-1293	AH	H	Cultivated
	584. Origanum vulgare L.	MI-1294	PH	D	Native
	585. Otostegia limbata (Benth.) Boiss.	MI-1295	DS	D	Native
	586. Phlomis bracteosa Royle ex Benth.	MI-1702	PH	F	Native
	587. Prunella vulgaris L.	MI-1296	PH	MS	Native
	588. Salvia lanata Roxb.	MI-1297	PH	D	Native
	589. Salvia moocroftiana Wall. ex Benth.	MI-1298	PH	D	Native
	590. Salvia nubicola Wall. ex Sweet	MI-1299	PH	F	Native
	591. Salvia plebeia R. Br.	MI-1703	AH	W, S	Weed
	592. Scutellaria chamaedrifolia Hedge & Paton	MI-1300	PH	D	New to Swat
	593. Stachys emodi Hedge	MI-1704	PH	D	Native
	594. Stachys floccosa Benth.	MI-1705	PH	D	Native
	595. Stachys palustris L.	MI-1706	PH	F	New to Swat
	596. Stachys parviflora Benth.	MI-1301	PH	D	Native
	597. Teucrium royleanum Wall. ex Benth.	MI-1707	PH	F	Native
	598. Teucrium stocksianum Boiss.	MI-1302	PH	D	Native
	599. Thymus linearis Benth.	MI-1303	PH	D, E	Native
89. Lentibulariaceae	*600. Utricularia aurea* Lour.	MI-1708	PH	M	New to Swat
90. Linaceae	*601. Linum corymbulosum* Reichenb.	MI-1711	AH	D	Native
	602. Reinwardtia indica Dumort.	MI-1712	DS	R	Native
91. Loranthaceae	*603. Viscum album* L.	MI-1307	P	P	Native
92. Malvaceae	*604. Abelmoschus esculentus* (L.) Moench	MI-1308	AH	A	Cultivated
	605. Alcea rosea L.	MI-1309	AH	H, GY	Cultivated
	606. Hibiscus cannabinus L.	MI-1310	AH	A	Cultivated
	607. Hibiscus syriacus L.	MI-1311	DS	A, H	Cultivated
	608. Malva neglecta Wallr.	MI-1312	AH	A, W	Weed
	609. Malva parviflora L.	MI-1313	AH	A	Cultivated
	610. Malvastrum coromendelianum (L.) Garcke	MI-1314	AH	W, GY	Native
93. Meliaceae	*611. Melia azedarach* L.	MI-1316	DT	A, D	Native
94. Mimosaceae	*612. Acacia modesta* Wall.	MI-1317	DT	D	Native
	613. Acacia nilotica (L.) Delile	MI-1318	DT	D	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
95. Molluginaceae	*614. Mollugo nudicaulis* Lamk.	MI-1319	AH	S	New to Swat
	615. Mollugo pentaphylla L.	MI-1713	AH	S	New to Swat
96. Moraceae	*616. Broussonetia papyrifera* (L.) L'Herit. ex Vent.	MI-1320	DT	A	Naturalized
	617. Ficus carica L.	MI-1321	DT	A	Cultivated
	618. Ficus palmata Forssk.	MI-1322	DT	D	Native
	619. Ficus sarmentosa Bush: Ham. ex J.E. Smith	MI-1323	C	MS	Native
	620. Morus alba L.	MI-1324	DT	A	Native
	621. Morus macroura Miq.	MI-1325	DT	A	Cultivated
	622. Morus nigra L.	MI-1326	DT	A, D	Native
97. Myrsinaceae	*623. Myrsine africana* L.	MI-1327	ES	D, F	Native
98. Myrtaceae	*624. Eucalyptus camaldulensis* Dehnh.	MI-1328	ET	D, A	Introduced
	625. Myrtus communis L.	MI-1329	ES	MS	Native
99. Nyctaginaceae	*626. Boerhavia procumbens* Banks ex Roxb.	MI-1330	PH	D, S	Native
	627. Mirabilis jalapa L.	MI-1331	AH	GY, H	Naturalized
100. Oleaceae	*628. Jasminum humile* L.	MI-1332	DS	D	Native
	629. Jasminum officinale L.	MI-1333	DS	D, F	Native
	630. Olea ferruginea Royle	MI-1334	ET	GY, D	Native
101. Onagraceae	*631. Epilobium hirsutum* L.	MI-1335	PH	M	Native
	632. Oenothera rosea L' Her. ex Ait.	MI-1336	AH	W, S	Native
102. Orobanchaceae	*633. Orobanche alba* Steph.	MI-1338	P	P	Native
	634. Orobanche cernua Loefl.	MI-1719	P	P	Native
103. Oxalidaceae	*635. Oxalis corniculata* L.	MI-1339	AH	W, GY	Native
	636. Oxalis pes-caprae L.	MI-1720	PH	D	New to Swat
104. Paeoniaceae	*637. Paeonia emodi* Wall. ex Royle	MI-1340	PH	F	Native
105. Papaveraceae	*638. Papaver dubium* L.	MI-1721	AH	A	Native
	639. Papaver hybridum L.	MI-1341	AH	A	Native
	640. Papaver pavoninum C.A. Mey.	MI-1722	AH	A	Native
	641. Papaver somniferum L.	MI-1723	AH	A	Cultivated
106. Parnassiaceae	*642. Parnassia nubicola* ssp. *occidentalis* E.S-Temesy	MI-1742	PH	F	Native
107. Phytolaccaceae	*643. Phytolacca latbenia* (Moq.) Walter	MI-1374	PH	F	Native
108. Plantaginaceae	*644. Plantago lagopus* L.	MI-1743	AH	E, G	New to Swat
	645. Plantago lanceolata L.	MI-1380	PH	A, W	Weed
	646. Plantago major L.	MI-1381	PH	F	Native
109. Platanaceae	*647. Platanus orientalis* L.	MI-1382	DT	WC	Naturalized
110. Plumbaginaceae	*648. Limonium macrorhabdon* Kuntze	MI-1383	PH	D, C	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
111. Podophyllaceae	*649. Podophyllum emodi* Wall. ex Royle	MI-1449	PH	F	Native
112. Polygalaceae	*650. Polygala abyssinica* R.Br. ex Fresen	MI-1450	PH	D, E, R	Native
	651. Polygala crotalarioides DC.	MI-1774	PH	D	New to Swat
	652. Polygala erioptera DC.	MI-1775	PH	D	New to Swat
113. Polygonaceae	*653. Bistorta amplexicaulis* (D. Don) Green	MI-1451	PH	F	Native
	654. Fallopia dumetorum (L.) Holub	MI-1452	C	F	Native
	655. Persicaria capitata (Buch.-Ham. ex D. Don) H. Gross	MI-1453	AH	WC	Native
	656. Persicaria glabra (Willd.) M. Gómes	MI-1454	AH	M	Native
	657. Persicaria hydropiper (L.) Delarbre	MI-1455	AH	M	Native
	658. Persicaria lapathifolia (L.) Delarbre	MI-1456	AH	M	Native
	659. Persicaria maculosa S. F. Gray	MI-1457	AH	M	Native
	660. Persicaria mitis (Schrank) Assenov	MI-1458	AH	M	Native
	661. Persicaria nepalensis (Meisn.) H. Gross	MI-1459	AH	WC	Native
	662. Polygonum aviculare L.	MI-1460	AH	G, W	Native
	663. Polygonum paronychioides C. A. Mey. ex Hohen	MI-1776	PH	D	Native
	664. Polygonum plebeium R. Br.	MI-1461	AH	S	Native
	665. Rumex dentatus L.	MI-1462	AH	A, W	Weed
	666. Rumex hastatus D. Don	MI-1463	PH	D	Native
	667. Rumex nepalensis Spreng.	MI-1464	PH	F	Native
114. Portulacaceae	*668. Portulaca oleracea* L.	MI-1466	AH	A	Weed
115. Primulaceae	*669. Anagallis arvensis* L.	MI-1470	AH	W, A, D	Weed
	670. Andr*osace foliosa* Dcne. ex Duby	MI-1471	PH	E, G	Native
	671. Andr*osace rotundifolia* Hardwicke	MI-1472	PH	D	Native
	672. Lysimachia chenopodioides Watt ex Hook. f.	MI-1777	PH	M	New to Swat
	673. Lysimachia pyramidalis Wall.	MI-1778	AH	M	New to Swat
	674. Primula denticulata Smith	MI-1473	PH	E, G	Native
116. Punicaceae	*675. Punica protopunica* Balf. F.	MI-1476	DS	D	Native
117. Ranunculaceae	*676. Aconitum laeve* Royle	MI-1477	PH	F	Native
	677. Adonis aestivalis L.	MI-1779	AH	A	Weed

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	678. Aquilegia pubiflora Wall. ex Royle	MI-1478	PH	F	Native
	679. Caltha alba Camb.	MI-1479	PH	WC	Native
	680. Ceratocephala falcata (L.) Pers.	MI-1780	AH	D	Native
	681. Clematis barbellata Edgew.	MI-1795	C	D	New to Swat
	682. Clematis grata Wall.	MI-1480	C	A, D	Native
	683. Clematis graveolens Lindl	MI-1781	C	D	Native
	684. Clematis montana Buch. -Ham. ex DC	MI-1782	C	F	Native
	685. Delphinium denudatum Wall. ex Hook. & Thoms.	MI-1481	PH	F	Native
	686. Delphinium vestitum Wall. ex. Royle	MI-1783	PH	F	New to Swat
	687. Ranunculus arvensis L.	MI-1482	AH	W, A	Weed
	688. Ranunculus laetus Wall. ex Hook.f. & Thoms.	MI-1483	PH	E, G	Native
	689. Ranunculus muricatus L.	MI-1484	AH	W, A	Weed
	690. Ranunculus sceleratus L.	MI-1485	AH	WC	Native
	691. Thalictrum cultratum Wall.	MI-1486	PH	F	Native
118. Rhamnaceae	*692. Rhamnus triquetra* (Wall.) Brandis	MI-1784	DT	F	Native
	693. Sageretia thea (Osbeck) M.C. Johnston	MI-1487	DS	D	Native
	694. Ziziphus jujuba Mill.	MI-1488	DT	A, D	Cultivated
	695. Ziziphus nummularia (Burm. f.) Wight & Arn.	MI-1489	DS	D	Native
	696. Ziziphus oxyphylla Edgew.	MI-1490	DS	D	Native
	697. Ziziphus spina-christi (L.)Willd.	MI-1491	DT	D	New to Swat
119. Rosaceae	*698. Agrimonia eupatoria* L.	MI-1492	AH	F	Native
	699. Cotoneaster affinis Lindl.	MI-1493	DS	F	Native
	700. Cotoneaster microphyllus Wall. ex Lindl.	MI-1495	ES	D	Native
	701. Cotoneaster nummularius Fisch. & C.A. Mey.	MI-1494	DS	F	Native
	702. Cotoneaster racemiflorus (Desf.) K. Koch	MI-1785	DS	D	Native
	703. Cydonia oblonga Mill.	MI-1496	DT	A	Cultivated
	704. Duchesnea indica (Andrews) Focke	MI-1497	PH	WC, MS	Native
	705. Eriobotrya japonica (Thunb.) Lindl.	MI-1498	ET	A	Cultivated
	706. Fragaria nubicola (Hook.f.) Lindl. ex Lacaita	MI-1499	PH	F	Native
	707. Geum urbanum L.	MI-1500	PH	F	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	708. Malus domestica Borkh.	MI-1501	DT	A	Cultivated
	709. Potentilla argentea L.	MI-1502	PH	D	Native
	710. Potentilla nepalensis Hook. f.	MI-1503	PH	F	Native
	711. Potentilla reptans L.	MI-1786	PH	F	Native
	712. Potentilla supina L.	MI-1504	AH	MS, S	Native
	713. Prunus armeniaca L.	MI-1505	DT	A	Cultivated
	714. Prunus cerasoides D.Don	MI-1506	DT	F	Native
	715. Prunus cornuta (Wall. ex Royle) Steud.	MI-1507	DT	F	Native
	716. Prunus domestica L.	MI-1508	DT	A	Cultivated
	717. Prunus persica (L.) Batsch	MI-1509	DT	A	Cultivated
	718. Pyrus communis L.	MI-1510	DT	A	Cultivated
	719. Pyrus pashia Buch.-Ham. ex D. Don	MI-1511	DT	D	Native
	720. Rosa brunonii Lindl.	MI-1512	DS	F	Native
	721. Rosa chinensis Jacq.	MI-1513	DS	H	Cultivated
	722. Rosa moschata Herrm.	MI-1514	DS	A	Native
	723. Rosa webbiana Wall. ex Royle	MI-1515	DS	F	Native
	724. Rubus ellipticus Sm.	MI-1516	DS	F, D	Native
	725. Rubus fruticosus L.	MI-1519	DS	A, D	Native
	726. Rubus niveus Thunb.	MI-1517	DS	D	Native
	727. Rubus ulmifolius subsp. *sanctus* (Schreb.) Sudre	MI-1518	DS	F	Native
	728. Sanguisorba minor Scop.	MI-1520	PH	D	New to Swat
	729. Sibbaldia procumbens L.	MI-1521	PH	E, G	Native
	730. Sorbaria tomentosa (Lindl.) Rehder	MI-1522	DS	F	Native
	731. Sorbus aria Crantz	MI-1523	DT	F	New to Pakistan
	732. Spiraea bella Sims.	MI-1787	DS	F	New to Swat
	733. Spiraea canescens D. Don	MI-1524	DS	D, F	Native
120. Rubiaceae	*734. Galium aparine* L.	MI-1525	AH	W	Native
	735. Galium asperuloides Edgew.	MI-1526	AH	F	Native
	736. Galium divaricatum Pourr. ex Lam.	MI-1527	AH	W	New to Swat
	737. Galium elegans Wall. ex Roxb.	MI-1528	PH	W, A	Native
	738. Galium rotundifolium L.	MI-1788	PH	F	Native
	739. Galium tenuissimum M. Bieb.	MI-1789	AH	W	Native
	740. Galium tricornutum Dandy	MI-1790	AH	W, A	Native
	741. Rubia cordifolia L.	MI-1529	C	A, GY	Native
121. Rutaceae	*742. Citrus sinensis* (L.) Osbeck	MI-1530	ET	A	Cultivated

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	743. Skimmia laureola (DC.) Sieb. & Zucc. ex Walp.	MI-1791	ES	F	Native
	744. Zanthoxylum armatum DC.	MI-1531	DS	D	Native
122. Salicaceae	*745. Populus ciliata* Wall. ex Royle	MI-1532	DT	A, WC	Naturalized
	746. Populus nigra L.	MI-1533	DT	A, WC, S	Naturalized
	747. Salix babylonica L.	MI-1534	DT	A, WC, S	Native
	748. Salix flabellaris Andersson	MI-1792	DS	F	Native
	749. Salix tetrasperma Roxb.	MI-1535	DT	A, WC, S	Naturalized
123. Sapindaceae	*750. Cardiospermum halicacabum* L.	MI-1536	AH	A	Native
	751. Dodonaea viscosa (L.) Jacq.	MI-1537	ES	D	Native
124. Sapotaceae	*752. Monotheca buxifolia* (Falc.) A. DC.	MI-1538	DS	D	Native
125. Saxifragaceae	*753. Bergenia ciliata* (Haw.)Sternb.	MI-1539	PH	R, C	Native
	754. Saxifraga sibirica L.	MI-1540	PH	E	Native
126. Scrophulariaceae	*755. Gratiola officinalis* L.	MI-1793	PH	M	New to Swat
	756. Kickxia ramosissima (Wall.) Janch.	MI-1541	PH	R	Native
	757. Leptorhabdos parviflora (Benth.) Benth.	MI-1794	AH	WC	Native
	758. Mazus japonicus (Thunb.) O. Kuntze	MI-1542	AH	F, S	New to Swat
	759. Scrophularia canina L.	MI-1796	PH	D	New to Pakistan
	760. Scrophularia dentata Royle ex Benth.	MI-1797	PH	WC	New to Swat
	761. Scrophularia exserta Pennell	MI-1798	PH	F	Native
	762. Scrophularia nodosa L.	MI-1799	PH	WC, M	Native
	763. Scrophularia sp.	MI-1814	PH	WC	New to Swat
	764. Scrophularia umbrosa Dum.	MI-1543	PH	M	New to Pakistan
	765. Verbascum thapsus L.	MI-1544	BH	D, S	Native
	766. Veronica anagallis-aquatica L.	MI-1545	PH	M	Native
	767. Veronica hederifolia L.	MI-1800	AH	GY	Native
	768. Veronica laxa Benth.	MI-1546	PH	F	Native
	769. Veronica persica Poir.	MI-1801	AH	W, A	Native
	770. Veronica polita Fries	MI-1547	AH	W, A	Native
	771. Wulfenia amherstiana Benth.	MI-1548	PH	F, R	Native
127. Simaroubaceae	*772. Ailanthus altissima* (Mill.) Swingle	MI-1549	DT	A, D	Naturalized
128. Solanaceae	*773. Capsicum annuum* L.	MI-1551	AH	A	Cultivated
	774. Capsicum frutescens L.	MI-1552	AH	A	Cultivated
	775. Cestrum nocturnum L.	MI-1553	DS	H	Cultivated
	776. Datura stramonium L.	MI-1554	AH	S, W	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	777. Lycopersicon esculentum Miller	MI-1555	AH	A	Cultivated
	778. Nicotiana tabacum L.	MI-1556	AH	A	Cultivated
	779. Physalis divaricata D. Don	MI-1557	AH	A, S	Weed
	780. Physalis peruviana L.	MI-1558	AH	A	Naturalized
	781. Solanum melongena L.	MI-1559	AH	A	Cultivated
	782. Solanum nigrum L.	MI-1560	AH	A, W, S, GY	Weed
	783. Solanum pseudo-capsicum L.	MI-1561	PH	H, GY	Naturalized
	784. Solanum surattense Burm. f.	MI-1562	PH	S, W	Native
	785. Solanum tuberosum L.	MI-1563	PH	A	Cultivated
	786. Solanum villosum (L.) Moench	MI-1564	AH	A, S, GY	Weed
	787. Withania somnifera (L.) Dunal	MI-1565	PH	D	Native
129. Thymelaeaceae	*788. Daphne mucronata* Royle	MI-1567	ES	D	Native
	789. Daphne papyracea Wall. ex Steud	MI-1803	ES	F	Native
	790. Wikstroemia canescens Meisn.	MI-1568	DS	F, D	Native
130. Tiliaceae	*791. Corchorus olitorius* L.	MI-1569	AH	A	Native
	792. Grewia optiva Drummond ex Burret	MI-1570	DT	D	Native
131. Ulmaceae	*793. Celtis caucasica* Willd.	MI-1573	DT	GY	Native
	794. Celtis eriocarpa Decne.	MI-1574	DT	GY	Native
	*795. Celtis tetr*andr*a* Roxb.	MI-1575	DT	GY, D	Naturalized
	796. Ulmus wallichiana Planch.	MI-1576	DT	F	Native
132. Urticaceae	*797. Debregeasia saeneb* (Forssk.) Hepper & J.R.I.Wood	MI-1577	ES	WC	Native
	798. Girardinia palmata (Forssk.) Gaudich.	MI-1578	DS	F	New to Swat
	799. Parietaria alsinaefolia Delile	MI-1815	AH	D	New to Swat
	800. Pilea umbrosa Blume	MI-1579	PH	F, MS	Native
	*801. Pouzolzia pent*andr*a* (Roxb.) Benn.	MI-1233	PH	M	New to Swat
	802. Urtica dioica L.	MI-1580	PH	W, S	Native
133. Valerianaceae	*803. Valeriana hardwickii* Wall.	MI-1804	PH	F	New to Swat
	804. Valeriana jatamansi Jones	MI-1581	PH	F	Native
	805. Valeriana pyrolifolia Decne.	MI-1582	PH	F	Native
	806. Valerianella muricata (Stev.) Baxt.	MI-1805	AH	D	New to Swat
	807. Valerianella szovitsiana Fisch. & C.A. Mey.	MI-1806	AH	D	Native
134. Verbenaceae	*808. Duranta repens* L.	MI-1807	ES	H	Cultivated
	809. Lantana camara L.	MI-1583	ES	GY, H	Naturalized
	810. Phyla nodiflora (L.) Greene	MI-1584	PH	S, W	Native

Family	Plant species	Voucher No.	Habit*	Habitat**	Status
	811. Verbena officinalis L.	MI-1585	PH	S, W	Weed
	812. Verbena tenuisecta Briq.	MI-1586	PH	GY, H	Introduced
	813. Vitex negundo L.	MI-1587	DS	GY, D	Native
135. Violaceae	*814. Viola betonicifolia* Sm.	MI-1588	PH	MS	Native
	815. Viola canescens Wall. ex Roxb.	MI-1589	PH	F	Native
136. Vitaceae	*816. Ampelopsis vitifolia* (Boiss.) Planch.	MI-1808	C	D	New to Swat
	817. Parthenocissus quinquefolia (L.) Planch	MI-1809	C	F	New to Swat
	818. Vitis jacquemontii Parker	MI-1590	C	F	Native
	819. Vitis vinifera L.	MI-1591	C	A	Cultivated
137. Zygophyllaceae	*820. Tribulus terrestris* L.	MI-1593	AH	D, S, W	Weed

Legend: *Habit: PH (Perennial herb), AH (Annual herb), DS (Diciduous shrub), ES (Evergreen shrub), DT (Diciduous tree), ET (Evergreen tree), C (Climber), P (Parasite)

**Habitat: A (Arable lands), W (Waste places), G (Grasslands), O (Orchards), F (Forests), M (Marshes), WC (Water courses), D (Drier slopes), S (Snady stream/river sides), C (Cliffs), MS (Moist, shady places), R (Rock crevices), E (Exposed ridges), GY (Grave yards), P (Parasites), H (Home gardens).

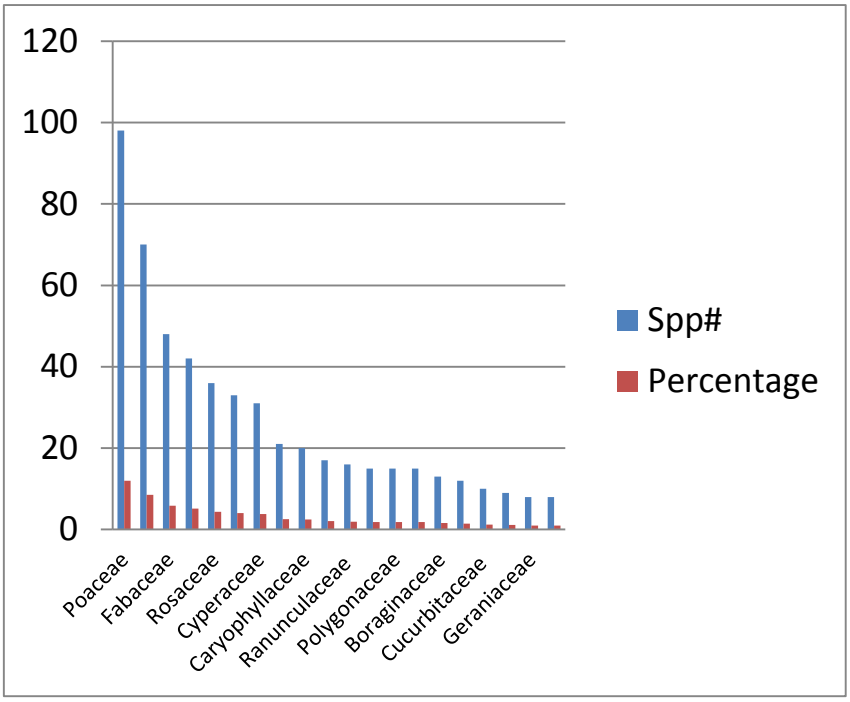

Fig. 2.2. . Top 20 families of the vascular flora of Kabal valley.

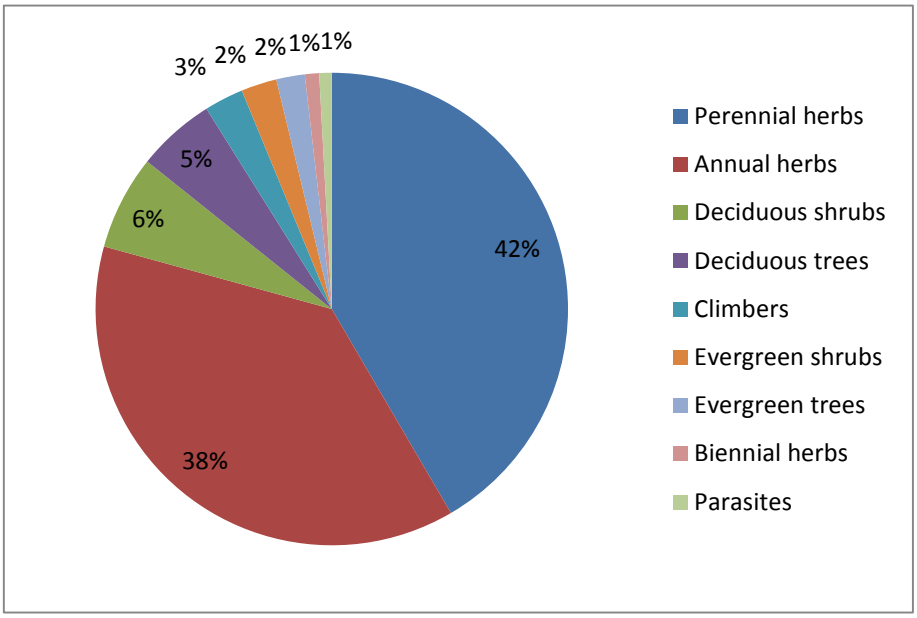

Fig. 2.3: Habit forms of the flora of Kabal valley.

Comparing the flora of Pakistan, to the best of our knowledge, *Adiantum gravesii, Doryopteris decipiens, Polystichum platyphyllum, P. polyblepharum, Athyrium vidalii, Gymnocarpium dryopteris, Eriophorum comosum, Pennisetum purpureum, Anaphalis viridis, Aster alpinus, Bidens radiata, Crepis lignea, Myriactis wightii, Phagnalon rupestre, Saussurea alpina, Impatiens pallida, Stellaria holostea, Astragalus alpinus, A. depressus, Sorbus aria, Scrophularia canina* and *S. umbrosa* are supposed to be new records for Pakistan (Table 2.3).

As far as to the contribution to the flora of Swat, *Trikeraia hookeri, Adenostemma lavenia, Anaphalis margaritacea, Aster falconeri, A. flaccidus, Echinops sphaerocephalus, Gnaphalium uliginosum, Leontopodium himalayanum, Matricaria aurea, M. matricarioides, Myriactis nepalensis, Prenanthes brunoniana, Sigesbeckia orientalis, Symphyotrichum squamatum, Anchusa arvensis* subsp. *Orientalis, Gastrocotyle hispida, Arabis amplexicaulis, Cardaria pubescens, Sinapis alba, Campanula tenuissima, Lonicera japonica, Lepyrodiclis tenera, Silene indica* var. *cashmeriana, Euonymus pendulus, Maytenus wallichiana, Cuscuta capitata, C. gigantea, Bergia ammannioides, Euphorbia heterophylla, E. hypericifolia, E. peplus, Astragalus densiflorus, A. filicaulis, Melilotus alba, Oxytropis cachemiriana, O. thomsonii, Vicia bithynica, Calamintha debilis, Nepeta cataria, Scutellaria chamaedrifolia, Stachys palustris, Utricularia aurea, Mollugo nudicaulis, M. pentaphylla, Oxalis pes-caprae, Plantago lagopus, Polygala crotalarioides, P. erioptera, Lysimachia chenopodioides, L. pyramidalis, Clematis barbellata, Delphinium vestitum, Ziziphus spina-christi, Sanguisorba minor, Spiraea bella, Galium divaricatum, Gratiola officinalis, Mazus japonicus, Scrophularia dentata, Girardinia palmata, Parietaria alsinaefolia, Pouzolzia pent*andr*a, Valeriana hardwickii,*

Valerianella muricata, *Ampelopsis vitifolia* and *Parthenocissus quinquefolia* are reported for the first time from the district Swat (Table 2.3).

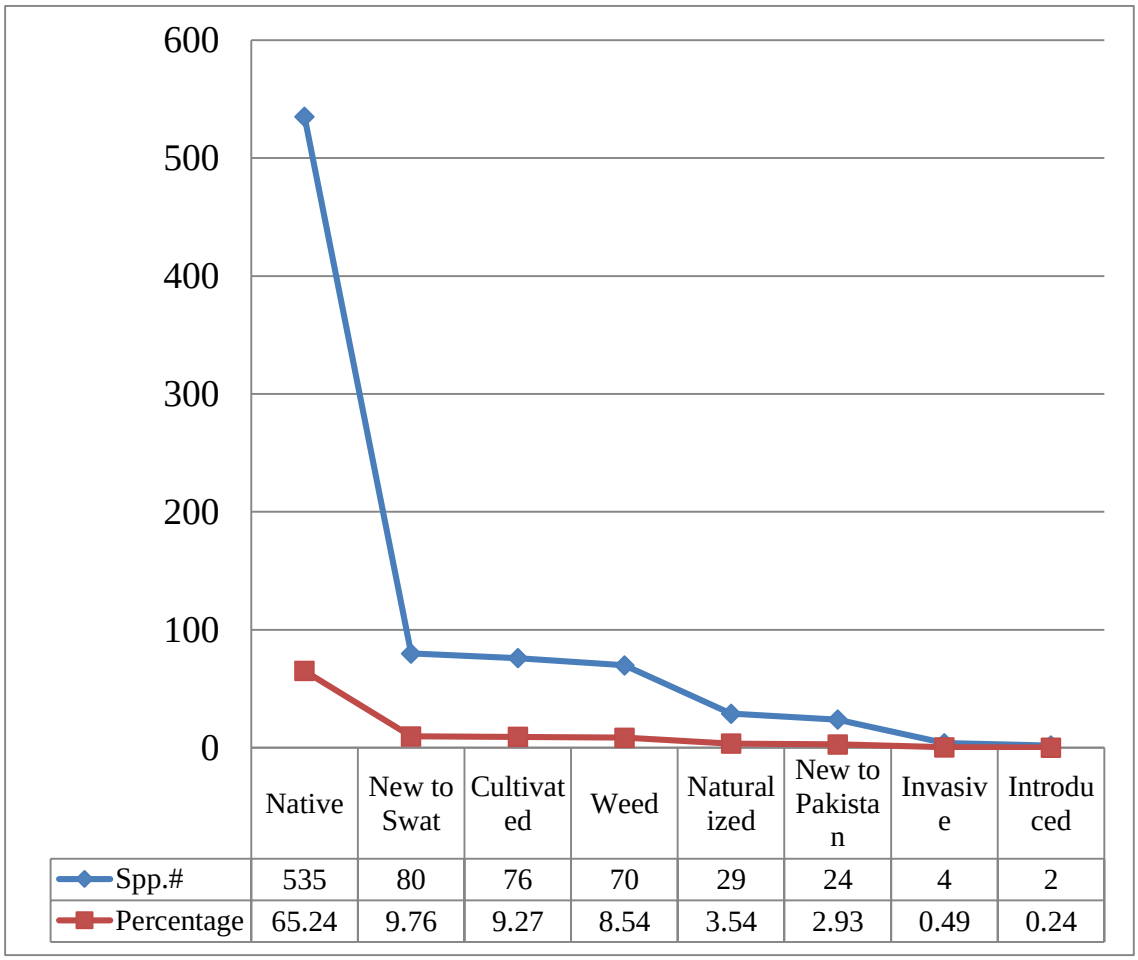

Fig. 2.4: Regional status of the flora of Kabal valley.

2.4.2 PHYTOSOCIOLOGY

Based on the modified TWINSPAN classification, five pseudospecies cut levels (0,2,5,10 and 20) and Whittaker's beta diversity as classification parameters, the following nine associations were separated at 13.753% dissimilarity (Fig. 2.5). Synoptic table of associations showing fidelity values of species which are significant at $p<0.05$ after the Fischer exact test and percentage frequencies are shown in Table 2.4. The distribution of the associations in the area is shown on the GIS map (Fig. 2.6) as well as in the cluster dendogram (Fig. 2.7).

2.4.2.1 Associations

1. Nasturtium-Paspalum-Veronica (NPV) wetland association:

This association comprised of 18 relevé that contained 107 species confined to wetland habitats near the River Swat and Deolai Khwarh stream and spread over an altitudinal range of 836-1783m. The soil parameters (Table 2.5) reveals that the soil type of this association was silt loam with a major proportion of silt (58.9±2.39) having slightly alkaline nature (pH=7.92±0.2). There was higher soil moisture content in this association (43.2±3.2%) with the lowest amount of potassium (52.6±17.9ppm). Overall, the vegetation cover percentage was 66.4±5.9 with the major contribution of herb layer (58.6±6.37%), however shrub layer has the lowest value (3.9±5%). The species richness varied between 9-23 (15.9±3.9). Mean Shannon-Wiener and Simpson diversity were 2.35±0.31 and 0.86±0.06 respectively. Species evenness was 0.86±0.07 (Table 2.6).

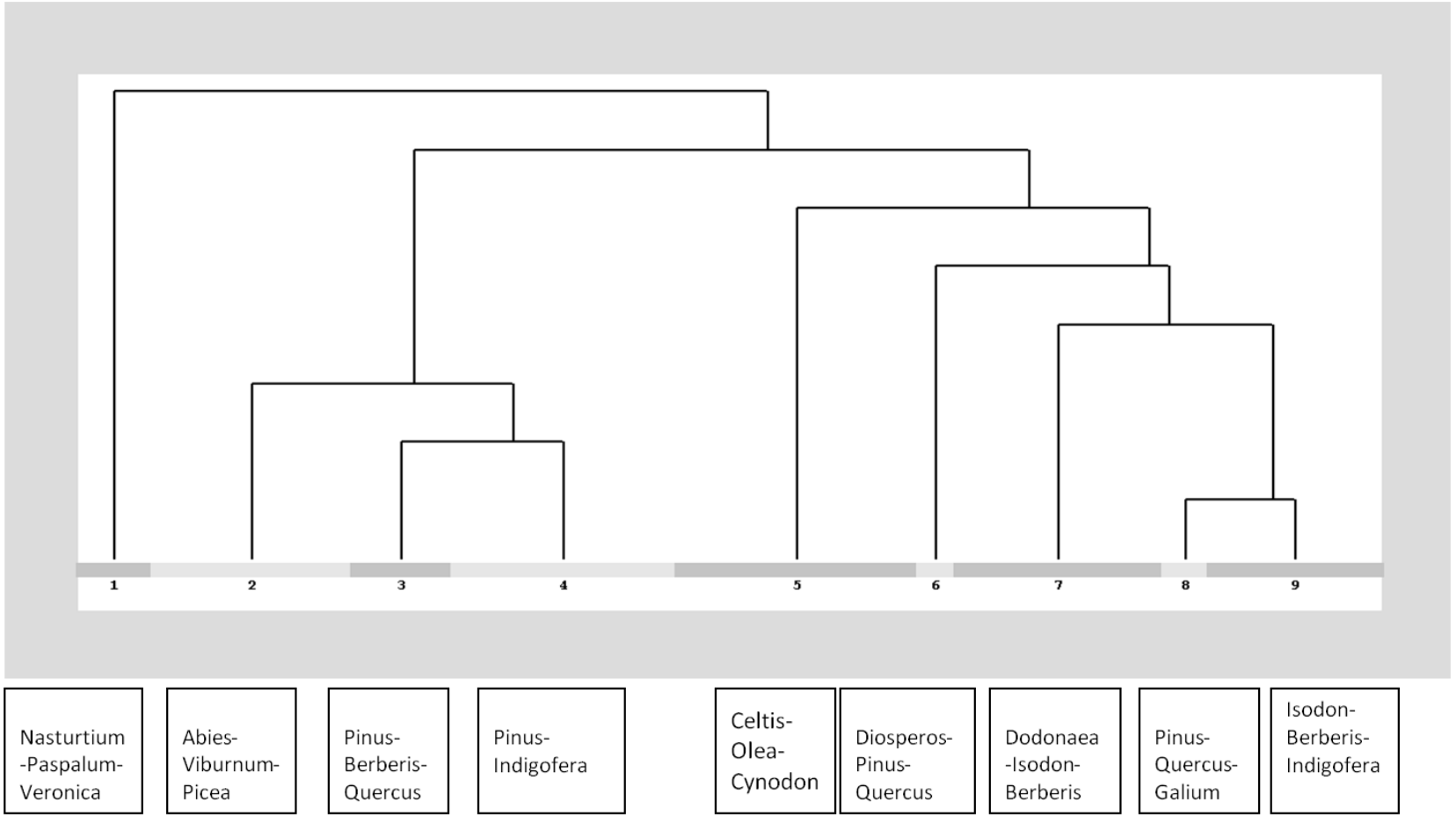

Fig. 2.7: Cluster dendrogram of nine association of Kabal valley, Swat.

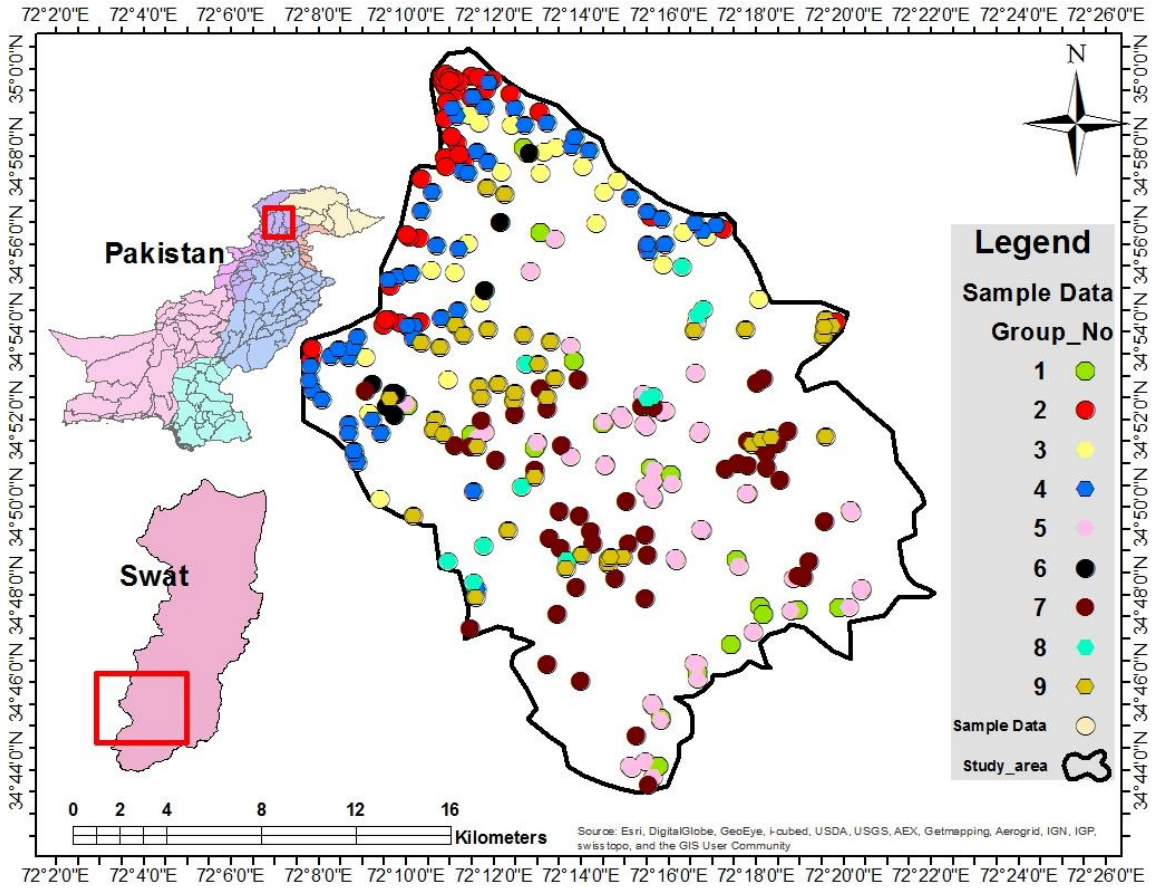

Fig. 2.6: Distribution of the nine associations in Kabal valley Swat.

The diagnostic species with fidelity values were *Nasturtium officinale* (80.8), *Paspalum paspalodes* (70.5), *Veronica anagallis-aquatica* (69.7), *Cyperus difformis* (56.9), *Populus nigra* (56.6), *Persicaria hydropiper* (56.6), *Salix babylonica* (51.6), *Marsilea polycarpa* (51.6), *Eclipta prostrata* (42.7), *Salix tetrasperma* (46.1), *Kyllinga nemoralis* (46.1), *Persicaria mitis* (46.1),), *Echinochloa crus-galli* (46.1), *Eleocharis palustris* (46.1), *Rosa moschata* (39.8), *Alisma plantago-aquatica* (39.8), *Bidens radiata* (39.8), *Commelina paludosa* (39.8), *Cyperus articulatus* (39.8), *Juncus articulatus* (38.0), *Debregeasia saeneb* (36.8) and *Alternanthera sessilis* (32.6). Based on frequency values (Table 2.4), some of the species were constant throughout the area such as *Nasturtium officinale* (67), *Paspalum paspalodes* (61), *Veronica anagallis-aquatica* (50), *Cyperus difformis* (39), *Populus nigra* (33), *Juncus articulatus* (33) and *Persicaria hydropiper* (33). Six species were the most dominant based on their frequencies having higher cover values than the threshold. These were *Nasturtium officinale* (17), *Paspalum paspalodes* (22), *Populus nigra* (6), *Salix tetrasperma* (6), *Sparganium erectum* (6) and *Typha latifolia* (11).

2. Abies-Picea-Viburnum (APV) coniferous forest association:

This association was represented by 48 relevés. A total of 189 species were recorded in this association. This association is situated on higher altitudinal range between 2197-3012m. Latitudinally too this association occupied northern parts of the higher mountains between 34.89°-35°N (Table 2.5). The association was represented in Shalkho Sar, Rashid Banrh, Salain Sar, Top of Tall-Dardyal hills, Khanjaro Sar and Qalagai Sar (Fig.). The slope angle varied between 0-45°. The soils in this association were of sandy loam textue with 52.0±8.8% sand, 42.5±9.1% silt and 5.11±1.8% clay(Table 2.5). with reference to pH, the soils of this association were slightly acidic with 6.03±0.46 pH value. Moisture content was 34.2±3.1. Such soils contained

8.17±1.26% $CaCO_3$, 2.6±1.4% organic matter, 0.13±0.07% Nitrogen, 3.6±3.5ppm Phosphorus and 164.3±104ppm Potassium (Table 2.5).

The coverage of different plant groups/types is comipled in Table 2.5 that reveals that mean total cover was 69.5±9.9% with mean tree cover of 26.9±22.9%, shrub cover 17.0±14.3% and herb cover 50.0±11.3%, while, 10.8±6.3% area was covered with bare rocks. Species richness varied between 9-30 (18.9±5.2), Shannon-Wiener index was 2.4±0.4, Simpson index was 0.85±0.1 and evenness index was 0.83±0.1 (Table 2.6).

Diagnostic species in this association with their respective fidelity values were *Abies pindrow* (60.7), *Picea smithiana* (53.6), *Viburnum gr*and*iflorum* (53.3), *Gentianodes argentea* (58.1), *Poa alpina* (56.4), *Arisaema jacquemontii* (55.9), *Senecio chrysanthemoides* (52.7), *Plantago lagopus* (52.4), *Cirsium falconeri* (52.4), *Euphorbia wallichii* (50.4), *Potentilla nepalensis* (49.2), *Rumex nepalensis* (46.8), *Achillea millefolium* (42.7), *Androsace foliosa* (42.7), *Quercus semecarpifolia* (40.4), *Rosa webbiana* (40.0), *Ranunculus laetus* (40.0), *Cerastium dahuricum*(38.1), *Sibbaldia procumbens* (38.1), *Taxus wallichiana* (35.6) *Iris hookeriana* (35.5), *Trillium govanianum* (35.5 and *Silene indica* var. *cashmeriana* (32.6)

On the basis of frequency percentage (Table 2.4), some of the species constantly showed their presence such as *Abies pindrow* (60), *Picea smithiana* (50), *Viburnum gr*and*iflorum* (60), *Arisaema jacquemontii* (50), *Poa alpina* (46), *Rumex nepalensis* (46) *Gentianodes argentea* (38), *Plantago lagopus* (38), *Potentilla nepalensis* (38), *Pinus wallichiana* (35), *Cirsium falconeri* (33), *Euphorbia wallichii* (33), and *Senecio chrysanthemoides* (31).

Table 2.4: Synoptic table with percentage frequency and fidelity index (phi coefficient) as superscript (9 columns) alongwith life forms and leaf spectra

Group No.	1	2	3	4	5	6	7	8	9		
Association	**NPV$**	**APV**	**PQB**	**PI**	**COC**	**DPQ**	**DIB**	**PQG**	**IBI**		
No. of relevés	18	48	24	54	58	9	50	11	42	**LF***	**LS****
Diagnostic species of associations											
Nasturtium officinale	**67** $^{80.8}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	H	Mi
Paspalum paspalodes	**61** $^{70.5}$	. $^{---}$	. $^{---}$	. $^{---}$	3 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	HC	N
Veronica anagallis-aquatica	**50** $^{69.7}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	H	Mi
Cyperus difformis	**39** $^{56.9}$	. $^{---}$	. $^{---}$	. $^{---}$	2 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	HC	N
Populus nigra	**33** $^{56.6}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	MC	Me
Juncus articulatus	**33** $^{38.0}$	. $^{---}$	. $^{---}$	2 $^{---}$	7 $^{---}$	11 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	HC	LP
Persicaria hydropiper	**33** $^{56.6}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	T	Mi
Abies pindrow	. $^{---}$	**60** $^{60.7}$	. $^{---}$	20 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	MP	LP
Picea smithiana	. $^{---}$	**50** $^{53.6}$	. $^{---}$	19 $^{11.3}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	MP	LP
Arisaema jacquemontii	. $^{---}$	**50** $^{55.9}$	. $^{---}$	15 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	G	Me
Rumex nepalensis	. $^{---}$	**46** $^{46.8}$	. $^{---}$	22 $^{16.0}$	2 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	G	Me
Poa alpina	. $^{---}$	**46** $^{56.4}$	. $^{---}$	7 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	2 $^{---}$	HC	LP
Gentianodes argentea	. $^{---}$	**38** $^{58.1}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	T	LP
Plantago lagopus	. $^{---}$	**38** $^{52.4}$	. $^{---}$	6 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	T	Mi
Potentilla nepalensis	. $^{---}$	**38** $^{49.2}$	. $^{---}$	9 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	HC	N
Euphorbia wallichii	. $^{---}$	**33** $^{50.4}$	. $^{---}$	4 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	HC	Mi
Cirsium falconeri	. $^{---}$	**33** $^{52.4}$	. $^{---}$	2 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	T	Me
Senecio chrysanthemoides	. $^{---}$	**31** $^{52.7}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	G	Me
Sarcococca saligna	6 $^{---}$	. $^{---}$	**50** $^{39.6}$	19 $^{13.9}$	2 $^{---}$	22 $^{---}$	. $^{---}$	. $^{---}$	10 $^{---}$	NP	Mi
Spiraea bella	. $^{---}$	2 $^{---}$	**33** $^{46.7}$	2 $^{---}$	. $^{---}$	11 $^{---}$	. $^{---}$	. $^{---}$	. $^{---}$	NP	N

Adiantum venustum	. ---	12 ---	4 ---	**35** **44.5**	. ---	. ---	. ---	. ---	. ---	HC	N
Pteridium aquilinum	. ---	17 13.7	. ---	**31** **39.6**	. ---	. ---	. ---	. ---	. ---	HC	N
Rosa brunonii	. ---	6 ---	12 ---	**30** **36.5**	. ---	11 ---	. ---	9 ---	2 ---	NP	Mi
Cynodon dactylon	. ---	4 ---	4 ---	2 ---	**71** **64.9**	11 ---	20 ---	. ---	2 ---	HC	LP
Celtis eriocarpa	. ---	. ---	. ---	. ---	**52** **68.3**	. ---	. ---	. ---	. ---	MP	Mi
Vitex negundo	. ---	. ---	. ---	. ---	**50** **65.5**	. ---	2 ---	. ---	. ---	NP	Mi
Oxalis corniculata	. ---	2 ---	. ---	2 ---	**38** **45.9**	22 ---	4 ---	. ---	5 ---	T	N
Dicliptera bupleuroides	. ---	. ---	4 ---	. ---	**38** **51.2**	. ---	2 ---	9 ---	2 ---	HC	N
Daphne mucronata	. ---	. ---	4 ---	. ---	**36** **38.9**	. ---	14 ---	18 ---	7 ---	NP	N
Achyranthes aspera	. ---	. ---	. ---	. ---	**36** **54.5**	. ---	. ---	. ---	2 ---	Ch	Mi
Maytenus royleanus	. ---	. ---	. ---	. ---	**36** **33.5**	. ---	24 14.7	9 ---	14 ---	NP	N
Artemisia scoparia	. ---	. ---	. ---	. ---	**33** **45.0**	. ---	10 ---	. ---	. ---	Ch	LP
Bosea amherstiana	. ---	. ---	. ---	. ---	**31** **51.8**	. ---	. ---	. ---	. ---	NP	Mi
Diospyros lotus	. ---	. ---	25 21.9	4 ---	. ---	**100** **65.9**	. ---	27 16.3	. ---	MP	Me
Rumex hastatus	. ---	. ---	. ---	. ---	12 ---	**56** **25.8**	14 ---	18 ---	26 20.8	Ch	N
Andrachne cordifolia	. ---	. ---	12 ---	2 ---	. ---	**56** **46.4**	. ---	18 ---	2 ---	NP	Mi
Ficus palmata	. ---	. ---	8 ---	. ---	28 30.2	**44** **20.9**	2 ---	18 ---	10 ---	MP	Me
Pennisetum orientale	. ---	. ---	25 18.8	6 ---	3 ---	**33** **16.6**	2 ---	. ---	21 20.4	HC	LP
Ficus sarmentosa	. ---	. ---	4 ---	. ---	. ---	**33** **43.6**	. ---	9 ---	. ---	L	Mi
Girardinia palmata	. ---	. ---	. ---	. ---	. ---	**33** **49.1**	. ---	. ---	2 ---	Ch	Me
Astragalus graveolens	. ---	. ---	. ---	6 ---	. ---	**33** **39.4**	. ---	. ---	. ---	Ch	N
Jasminum officinale	. ---	. ---	25 30.1	2 ---	. ---	**33** **25.2**	. ---	9 ---	5 ---	NP	N
Pilea umbrosa	6 ---	10 ---	12 ---	4 ---	2 ---	**33** **23.0**	. ---	. ---	. ---	G	Me
Zanthoxylum armatum	. ---	. ---	. ---	. ---	5 ---	**33** **26.4**	2 ---	. ---	12 16.6	NP	Mi
Dodonaea viscosa	. ---	. ---	. ---	. ---	12 ---	. ---	**72** **66.7**	27 ---	10 ---	NP	Mi
Periploca aphylla	. ---	. ---	. ---	. ---	3 ---	. ---	**44** **59.6**	. ---	. ---	NP	LP
Otostegia limbata	. ---	. ---	. ---	. ---	9 ---	. ---	**40** **48.7**	. ---	5 ---	NP	N
Aristida adscensionis	. ---	. ---	. ---	. ---	3 ---	. ---	**38** **52.8**	. ---	2 ---	HC	LP
Galium aparine	. ---	2 ---	. ---	. ---	21 26.7	. ---	4 ---	**55** **36.5**	. ---	T	LP
Viola canescens	. ---	. ---	8 ---	9 ---	5 ---	. ---	. ---	**45** **35.0**	2 ---	HC	Mi
Myrsine africana	. ---	. ---	. ---	9 ---	2 ---	. ---	2 ---	**36** **26.1**	14 15.4	NP	N

Taraxacum officinale	. ---	19 12.6	4 ---	4 ---	17 11.8	11 ---	6 ---	**36 16.9**	2 ---	HC	Mi
Stellaria media	. ---	. ---	. ---	. ---	26 35.2	. ---	6 ---	**36 21.9**	. ---	T	N

Diagnostic species of two or more associations

Viburnum grandiflorum	. ---	**60 53.3**	. ---	**35 25.2**	. ---	. ---	. ---	. ---	. ---	NP	Me
Quercus incana	. ---	. ---	**50 37.0**	. ---	2 ---	22 ---	. ---	**73 38.7**	24 17.0	MP	Me
Olea ferruginea	. ---	. ---	. ---	. ---	**69 53.4**	**33 ---**	26 ---	18 ---	29 ---	MP	Mi
Rubus fruticosus	22 ---	. ---	4 ---	. ---	17 13.9	**33 14.7**	6 ---	**45 24.4**	5 ---	NP	Mi
Sageretia thea	. ---	. ---	17 ---	. ---	7 ---	. ---	4 ---	**36 18.9**	**31 31.3**	NP	N
Pinus wallichiana	. ---	35 ---	**88 36.2**	**96 66.0**	. ---	. ---	. ---	9 ---	7 ---	MP	LP
Quercus dilatata	. ---	. ---	**50 32.2**	**31 25.6**	. ---	**56 22.1**	2 ---	9 ---	10 ---	MP	Mi
Indigofera heterantha v. gerardiana	. ---	29 ---	**42 ---**	**72 40.8**	3 ---	22 ---	8 ---	18 ---	57 22.3	NP	LP
Isodon rugosus	. ---	. ---	**33 ---**	19 ---	5 ---	11 ---	**58 29.5**	18 ---	**81 46.7**	NP	N
Origanum vulgare	. ---	12 ---	8 ---	**30 18.2**	5 ---	11 ---	4 ---	**36 ---**	**33 19.7**	HC	N
Cotoneaster racemiflorus	. ---	. ---	. ---	2 ---	**36 29.7**	**33 ---**	8 ---	**45 16.9**	**26 13.3**	NP	N
Pinus roxburghii	. ---	. ---	29 ---	. ---	12 ---	**56 17.2**	**30 14.3**	**91 36.8**	**26 ---**	MP	LP
Berberis lycium	. ---	10 ---	**58 18.4**	30 ---	. ---	**33 ---**	**44 14.1**	**36 ---**	**67 32.3**	NP	N

Other species

Chrysopogon serrulatus	. ---	. ---	. ---	. ---	. ---	. ---	28 30.1	9 ---	29 28.0	HC	LP
Cymbopogon martini	. ---	. ---	4 ---	. ---	. ---	. ---	2 ---	. ---	26 43.5	HC	LP
Themeda anathera	. ---	. ---	4 ---	4 ---	. ---	. ---	14 13.6	9 ---	21 24.2	HC	LP
Micromeria biflora	. ---	. ---	. ---	. ---	10 ---	11 ---	28 27.3	9 ---	19 12.7	HC	LP
Heteropogon contortus	. ---	. ---	4 ---	. ---	2 ---	11 ---	14 15.5	. ---	19 22.5	HC	LP
Hypericum perforatum	. ---	. ---	8 ---	4 ---	. ---	11 ---	4 ---	. ---	17 23.2	Ch	N
Cynoglossum lanceolatum	. ---	. ---	. ---	. ---	14 18.8	. ---	. ---	9 ---	17 20.7	T	Mi
Polygala abyssinica	. ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	17 35.2	Ch	LP
Quercus baloot	. ---	. ---	4 ---	. ---	10 ---	. ---	8 ---	9 ---	17 17.5	MP	Mi
Cyperus niveus	. ---	. ---	. ---	2 ---	. ---	. ---	14 20.1	. ---	14 18.7	HC	LP
Sedum hispanicum	. ---	. ---	25 21.1	4 ---	5 ---	. ---	6 ---	9 ---	14 12.0	HC	N
Rubus niveus	. ---	. ---	17 17.0	2 ---	. ---	. ---	2 ---	18 ---	14 18.7	NP	Mi
Arthraxon prionodes	. ---	. ---	4 ---	. ---	10 12.4	. ---	4 ---	. ---	14 17.5	HC	LP

Indigofera heterantha v. heterantha	. ---	. ---	. ---	. ---	. ---	. ---	18 $^{27.0}$	. ---	14 $^{17.5}$	NP	LP
Scabiosa candollei	. ---	. ---	. ---	. ---	. ---	. ---	14 $^{21.5}$	. ---	14 $^{20.0}$	G	Mi
Galium divaricatum	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	12 $^{28.7}$	T	LP
Buddleja crispa	. ---	. ---	4 ---	2 ---	. ---	11 ---	4 ---	. ---	12 $^{19.5}$	NP	Mi
Clinopodium vulgare	. ---	2 ---	4 ---	. ---	2 ---	11 ---	4 ---	. ---	12 $^{18.0}$	T	N
Plantago lanceolata	. ---	2 ---	12 ---	4 ---	19 $^{21.3}$	. ---	. ---	9 ---	12 ---	HC	Mi
Pellaea nitidula	. ---	. ---	8 ---	2 ---	. ---	22 $^{16.5}$	2 ---	9 ---	12 $^{16.6}$	HC	LP
Salvia lanata	. ---	. ---	4 ---	. ---	. ---	. ---	2 ---	. ---	12 $^{25.8}$	HC	Mi
Scutellaria chamaedrifolia	. ---	. ---	12 ---	7 ---	. ---	. ---	4 ---	. ---	12 $^{14.2}$	HC	N
Teucrium stocksianum	. ---	. ---	. ---	. ---	5 ---	. ---	28 $^{34.5}$	9 ---	12 ---	Ch	N
Hyparrhenia hirta	. ---	. ---	. ---	. ---	. ---	. ---	8 ---	18 ---	12 $^{18.0}$	HC	LP
Cotinus coggyria	. ---	. ---	. ---	. ---	. ---	. ---	16 $^{24.3}$	9 ---	12 $^{14.2}$	NP	Mi
Phagnalon rupestre	. ---	. ---	4 ---	2 ---	. ---	11 ---	. ---	9 ---	10 $^{17.4}$	T	N
Ajuga bracteosa	. ---	. ---	. ---	. ---	7 ---	. ---	22 $^{29.1}$	. ---	10 ---	HC	Mi
Limonium macrorhabdon	. ---	. ---	. ---	. ---	. ---	. ---	16 $^{27.6}$	. ---	10 ---	HC	Mi
Dichanthium annulatum	. ---	. ---	4 ---	. ---	24 $^{25.4}$	. ---	16 ---	9 ---	10 ---	HC	LP
Achyranthes bidentata	. ---	. ---	29 $^{34.4}$	2 ---	2 ---	. ---	. ---	9 ---	10 ---	T	Mi
Delphinium denudatum	. ---	. ---	8 ---	9 ---	. ---	11 ---	. ---	9 ---	10 ---	T	N
Astragalus tribulifolius	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	10 $^{28.9}$	HC	LP
Eriophorum comosum	. ---	. ---	. ---	. ---	. ---	. ---	4 ---	. ---	10 $^{21.9}$	HC	LP
Dactylis glomerata	. ---	. ---	4 ---	11 $^{15.9}$	. ---	. ---	. ---	18 ---	10 ---	HC	LP
Serratula pallida	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	10 $^{28.9}$	T	Mi
Bothriochloa bladhii	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	9 ---	10 $^{19.4}$	HC	LP
Androsace rotundifolia	. ---	. ---	4 ---	9 $^{12.9}$	. ---	. ---	4 ---	. ---	10 ---	HC	Mi
Dianthus crinitus	. ---	. ---	. ---	. ---	. ---	. ---	6 ---	. ---	10 $^{19.4}$	G	LP
Bupleurum falcatum	. ---	. ---	4 ---	2 ---	. ---	11 ---	10 $^{14.0}$	. ---	10 ---	HC	N
Pyrus pashia	. ---	. ---	. ---	. ---	. ---	22 $^{17.5}$	4 ---	27 $^{24.6}$	10 $^{12.9}$	MP	Mi
Tragopogon pratensis	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	7 $^{20.6}$	T	N
Asparagus adscendens	. ---	. ---	. ---	. ---	9 ---	. ---	4 ---	18 ---	7 ---	Ch	LP
Nepeta cataria	. ---	. ---	. ---	4 ---	. ---	. ---	2 ---	. ---	7 $^{15.0}$	HC	N
Arisaema flavum	. ---	. ---	12 ---	15 $^{20.1}$	. ---	22 ---	. ---	. ---	7 ---	G	Me

Adiantum capillus-veneris	. ---	. ---	8 ---	. ---	3 ---	22 19.9	. ---	. ---	7 ---	HC	N
Carex cardiolepis	. ---	. ---	8 ---	4 ---	. ---	. ---	2 ---	. ---	7 ---	HC	LP
Bidens biternata	. ---	. ---	8 ---	4 ---	19 27.1	. ---	. ---	. ---	7 ---	T	N
Medicago minima	. ---	. ---	. ---	. ---	. ---	. ---	4 ---	. ---	7 17.4	T	LP
Spiraea canescens	. ---	. ---	8 ---	4 ---	2 ---	22 16.5	. ---	18 ---	7 ---	NP	N
Carex schlagintweitiana	. ---	2 ---	8 ---	7 ---	. ---	. ---	. ---	18 ---	7 ---	HC	LP
Astragalus pyrrhotrichus	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	. ---	7 17.4	Ch	N
Cuscuta capitata	. ---	. ---	4 ---	4 ---	. ---	. ---	2 ---	. ---	7 ---	T	LP
Lespedeza juncea	. ---	. ---	8 ---	. ---	7 ---	. ---	8 ---	. ---	7 ---	Ch	LP
Cotoneaster nummularia	. ---	. ---	21 16.3	17 18.2	3 ---	11 ---	. ---	9 ---	7 ---	NP	N
Potentilla reptans	. ---	4 ---	8 ---	7 ---	. ---	. ---	. ---	. ---	7 ---	HC	N
Aristida cyanantha	. ---	. ---	. ---	. ---	. ---	. ---	8 17.0	. ---	7 ---	HC	LP
Artemisia vulgaris	. ---	10 ---	4 ---	20 20.0	7 ---	. ---	2 ---	9 ---	7 ---	Ch	Mi
Oenothera rosea	. ---	2 ---	8 ---	4 ---	10 14.8	. ---	. ---	. ---	5 ---	T	N
Cirsium arvense	. ---	. ---	17 31.0	. ---	. ---	. ---	. ---	. ---	5 ---	T	Mi
Scrophularia canina	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	5 20.4	T	N
Myriactis nepalensis	. ---	6 ---	8 ---	6 ---	. ---	. ---	. ---	. ---	5 ---	T	Mi
Colchicum luteum	. ---	. ---	. ---	6 ---	14 18.8	. ---	6 ---	. ---	5 ---	G	N
Wikstroemia canescens	. ---	. ---	25 30.1	9 ---	. ---	. ---	. ---	. ---	5 ---	NP	N
Parrotiopsis jacquemontiana	. ---	4 ---	4 ---	19 29.4	. ---	. ---	. ---	. ---	5 ---	NP	Mi
Ziziphus oxyphylla	. ---	. ---	. ---	. ---	. ---	. ---	8 19.4	. ---	5 ---	NP	N
Jasminum humile	. ---	. ---	8 ---	. ---	9 ---	. ---	6 ---	9 ---	5 ---	NP	N
Euphorbia prostrata	. ---	. ---	. ---	. ---	9 13.2	. ---	8 ---	. ---	5 ---	T	LP
Crotalaria medicaginea	. ---	. ---	. ---	. ---	. ---	. ---	8 19.4	. ---	5 ---	T	LP
Conyza canadensis	6 ---	. ---	17 17.0	. ---	12 17.6	. ---	. ---	. ---	5 ---	T	N
Valeriana hardwickii	. ---	. ---	4 ---	2 ---	. ---	. ---	. ---	. ---	5 ---	G	Mi
Sanguisorba minor	. ---	. ---	8 ---	9 14.3	. ---	11 ---	2 ---	. ---	5 ---	T	N
Trigonella monantha s. incisa	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	5 15.4	T	LP
Impatiens edgeworthii	. ---	10 ---	8 ---	7 ---	2 ---	11 ---	. ---	. ---	5 ---	T	Mi
Oxytropis cachemiriana	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	5 20.4	T	LP
Silene vulgaris	. ---	. ---	4 ---	4 ---	. ---	. ---	. ---	. ---	5 ---	G	N

Solanum nigrum	. ---	. ---	. ---	. ---	24 39.4	11 ---	. ---	. ---	5 ---	T	Mi
Amaranthus viridis	. ---	. ---	. ---	. ---	19 33.5	11 ---	. ---	. ---	5 ---	T	Mi
Aegopodium alpestre	. ---	. ---	8 ---	. ---	. ---	11 ---	6 ---	. ---	5 ---	T	N
Thymus linearis	. ---	12 ---	29 19.2	28 28.3	. ---	. ---	. ---	. ---	5 ---	HC	LP
Ampelopsis vitifolia s. vitifolia	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	5 20.4	L	Me
Heracleum canescens	. ---	. ---	4 ---	7 ---	. ---	22 19.9	. ---	. ---	5 ---	Ch	Me
Lotus corniculatus	. ---	. ---	12 18.2	4 ---	. ---	. ---	2 ---	. ---	5 ---	HC	LP
Desmodium elegans	. ---	. ---	12 15.3	4 ---	. ---	11 ---	2 ---	9 ---	5 ---	NP	Mi
Eryngium coeruleum	6 ---	. ---	. ---	. ---	3 ---	. ---	. ---	9 ---	5 ---	T	N
Ziziphus jujuba	. ---	. ---	. ---	. ---	10 19.4	11 ---	. ---	9 ---	5 ---	MP	N
Viburnum cotinifolium	. ---	4 ---	4 ---	7 ---	. ---	. ---	. ---	18 ---	5 ---	NP	Me
Asplenium adiantum-nigrum	. ---	2 ---	4 ---	4 ---	3 ---	. ---	. ---	9 ---	5 ---	HC	N
Morus nigra	. ---	. ---	. ---	. ---	17 29.5	. ---	2 ---	9 ---	5 ---	MP	Me
Brachiaria reptans	. ---	. ---	. ---	. ---	5 ---	. ---	2 ---	. ---	5 ---	T	N
Smilax glaucophylla	. ---	. ---	4 ---	. ---	. ---	. ---	. ---	9 ---	5 ---	L	Mi
Crepis lignea	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	. ---	5 15.4	T	N
Bryonia monoica	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	5 15.4	L	Me
Apluda mutica	. ---	. ---	8 ---	. ---	14 21.5	. ---	2 ---	9 ---	5 ---	HC	LP
Gagea pakistanica	. ---	. ---	. ---	. ---	7 ---	. ---	8 ---	18 ---	5 ---	G	N
Cheilanthes pteridioides	. ---	. ---	4 ---	. ---	. ---	. ---	4 ---	9 ---	5 ---	HC	LP
Launaea nudicaulis	. ---	. ---	4 ---	. ---	. ---	. ---	8 15.1	9 ---	5 ---	T	Me
Vincetoxicum hirundinaria	. ---	. ---	. ---	4 ---	. ---	. ---	2 ---	. ---	5 ---	G	N
Campanula pallida	. ---	. ---	12 ---	6 ---	. ---	. ---	6 ---	9 ---	5 ---	T	N
Amaranthus graecizans	. ---	. ---	. ---	. ---	7 17.3	. ---	. ---	9 ---	2 ---	T	N
Zosima absinthifolia	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	9 ---	2 ---	T	LP
Oxytropis thomsonii	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	9 ---	2 ---	T	LP
Pseudomertensia parvifolia	. ---	. ---	8 ---	2 ---	2 ---	11 ---	2 ---	18 17.5	2 ---	HC	N
Vicia monantha	. ---	. ---	. ---	. ---	9 20.6	. ---	. ---	9 ---	2 ---	T	LP
Euphorbia hirta	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	. ---	2 ---	T	N
Epipactis veratrifolia	. ---	12 26.8	. ---	2 ---	. ---	. ---	. ---	. ---	2 ---	G	Mi
Epilobium leptophyllum	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	T	LP

Trichodesma indicum	. ---	. ---	. ---	. ---	. ---	. ---	20 $^{39.0}$	. ---	2 ---	T	Mi
Lygeum spartum	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	T	LP
Calamintha debilis	. ---	2 ---	. ---	4 ---	. ---	. ---	. ---	. ---	2 ---	HC	N
Indigofera linifolia	. ---	. ---	. ---	. ---	3 ---	. ---	6 ---	. ---	2 ---	T	LP
Cerastium glomeratum	. ---	. ---	. ---	. ---	10 $^{19.4}$	. ---	6 ---	. ---	2 ---	T	N
Verbascum thapsus	. ---	. ---	4 ---	. ---	5 ---	. ---	6 ---	. ---	2 ---	T	Me
Piptatherum munroi	. ---	. ---	. ---	6 ---	. ---	11 ---	. ---	9 ---	2 ---	HC	LP
Carex psychrophila	. ---	19 $^{25.0}$	. ---	13 $^{15.2}$	. ---	. ---	. ---	. ---	2 ---	HC	LP
Launaea procumbens	. ---	. ---	. ---	. ---	. ---	. ---	8 $^{22.3}$	. ---	2 ---	T	Mi
Ailanthus altissima	. ---	. ---	. ---	. ---	21 $^{35.5}$	. ---	4 ---	. ---	2 ---	MP	Mi
Rubus ulmifolius	. ---	4 ---	17 $^{14.3}$	19 $^{26.4}$	. ---	. ---	. ---	. ---	2 ---	NP	Mi
Boerhavia procumbens	. ---	. ---	. ---	. ---	7 $^{13.1}$	. ---	6 ---	. ---	2 ---	HC	N
Galinsoga parviflora	. ---	. ---	29 $^{34.4}$	2 ---	9 ---	. ---	. ---	. ---	2 ---	T	N
Galium tricornutum	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	2 ---	T	LP
Lolium perenne	. ---	8 ---	4 ---	9 $^{14.3}$	. ---	. ---	. ---	. ---	2 ---	T	N
Pteris cretica	. ---	. ---	. ---	. ---	. ---	22 $^{32.1}$	. ---	9 ---	2 ---	HC	Mi
Polygonum paronychioides	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	HC	LP
Vincetoxicum arnottianum	. ---	. ---	. ---	2 ---	2 ---	. ---	6 ---	. ---	2 ---	G	Mi
Filago hurdwarica	. ---	. ---	. ---	. ---	5 ---	. ---	4 ---	. ---	2 ---	T	N
Scrophularia species	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	T	Mi
Reinwardtia indica	. ---	. ---	. ---	. ---	. ---	. ---	. ---	18 $^{33.7}$	2 ---	Ch	N
Malcolmia africana	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	T	N
Euonymus pendulus	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	MP	Me
Phleum paniculatum	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	T	N
Poa bulbosa	. ---	. ---	4 ---	. ---	12 $^{18.9}$	11 ---	2 ---	18 ---	2 ---	HC	N
Brachypodium distachyon	. ---	. ---	. ---	. ---	9 $^{16.4}$	. ---	2 ---	18 $^{17.5}$	2 ---	T	N
Poa annua	. ---	2 ---	. ---	. ---	24 $^{36.1}$	. ---	2 ---	18 ---	2 ---	T	LP
Conyza stricta	. ---	. ---	8 ---	2 ---	. ---	. ---	4 ---	. ---	2 ---	T	LP
Parapholis incurva	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	HC	LP
Carex acutiformis	17 $^{33.8}$	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	HC	N
Trigonella monantha	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	T	LP

Potentilla argentia	. ---	2 ---	. ---	4 ---	2 ---	. ---	. ---	9 ---	2 ---	T	N
Descurainia sophia	. ---	. ---	. ---	2 ---	. ---	. ---	2 ---	. ---	2 ---	T	LP
Rubus ellipticus	. ---	. ---	. ---	. ---	. ---	. ---	6 18.3	. ---	2 ---	NP	Mi
Clinopodium umbrosum	. ---	. ---	4 ---	4 ---	. ---	. ---	. ---	. ---	2 ---	HC	N
Isatis costata	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	Ch	Mi
Kickxia ramosissima	. ---	. ---	. ---	. ---	2 ---	. ---	8 19.4	. ---	2 ---	HC	N
Parietaria alsinaefolia	. ---	. ---	. ---	. ---	. ---	. ---	. ---	9 ---	2 ---	T	N
Calendula arvensis	. ---	. ---	. ---	. ---	3 ---	. ---	2 ---	18 22.6	2 ---	T	Mi
Crepis multicaulis	. ---	. ---	. ---	. ---	. ---	11 ---	. ---	18 28.7	2 ---	T	Mi
Arenaria serpyllifolia	. ---	27 32.2	. ---	15 13.1	2 ---	. ---	. ---	. ---	2 ---	T	LP
Cotoneaster affinis	. ---	2 ---	4 ---	7 16.0	. ---	. ---	. ---	. ---	2 ---	NP	N
Sonchus asper	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	2 ---	T	Me
Adenostemma lavenia	. ---	4 ---	. ---	4 ---	. ---	. ---	. ---	. ---	2 ---	T	Mi
Melilotus indica	. ---	. ---	. ---	. ---	3 ---	. ---	. ---	9 ---	2 ---	T	LP
Prangos pabularia	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	Ch	LP
Astragalus rhizanthus	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	Ch	LP
Gentianodes olivieri	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	T	LP
Geranium nepalense	. ---	6 ---	. ---	6 ---	. ---	. ---	. ---	. ---	2 ---	HC	Mi
Bromus oxyodon	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	. ---	2 ---	T	N
Pistacia chinensis s. Integerrima	. ---	. ---	21 27.1	. ---	5 ---	22 17.5	. ---	. ---	2 ---	MP	Mi
Tagetes minuta	. ---	. ---	. ---	. ---	10 26.2	. ---	. ---	. ---	2 ---	T	N
Scrophularia nodosa	. ---	. ---	12 25.1	. ---	. ---	11 ---	. ---	. ---	2 ---	G	N
Celtis caucasica	. ---	. ---	. ---	. ---	17 35.6	. ---	. ---	. ---	2 ---	MP	Mi
Carthamus lanatus	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	. ---	2 ---	T	N
Asplenium trichomanes	. ---	. ---	. ---	. ---	14 26.6	22 17.5	. ---	. ---	2 ---	HC	LP
Geranium collinum	. ---	. ---	. ---	2 ---	3 ---	. ---	. ---	9 ---	2 ---	HC	Mi
Amaranthus retroflexus	. ---	. ---	. ---	. ---	19 31.7	22 ---	2 ---	. ---	2 ---	T	Mi
Veronica hederifolia	. ---	. ---	. ---	. ---	7 20.2	. ---	. ---	. ---	2 ---	T	N
Quercus baloot	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	MP	Mi
Astragalus candolleanus	. ---	. ---	. ---	. ---	5 ---	. ---	10 16.9	9 ---	2 ---	Ch	LP
Adiantum caudatum	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	HC	N

Alnus nitida	17 29.7	. ---	. ---	. ---	. ---	11 ---	. ---	. ---	2 ---	MP	Me
Juglans regia	. ---	. ---	21 33.4	2 ---	. ---	11 ---	. ---	. ---	2 ---	MP	Me
Adiantum incisum	. ---	. ---	4 ---	. ---	2 ---	22 25.5	2 ---	. ---	2 ---	HC	N
Anthriscus nemorosa	. ---	6 13.5	. ---	4 ---	. ---	. ---	. ---	. ---	2 ---	T	N
Silene conoidea	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	2 ---	T	N
Ceterach dalhousiae	. ---	. ---	. ---	. ---	17 35.6	. ---	. ---	. ---	2 ---	HC	Mi
Nepeta govaniana	. ---	2 ---	. ---	6 ---	. ---	11 ---	. ---	. ---	2 ---	HC	N
Celtis tetrandra	. ---	. ---	. ---	. ---	14 31.2	. ---	. ---	. ---	2 ---	MP	Mi
Marrubium vulgare	. ---	2 ---	. ---	6 ---	. ---	. ---	. ---	9 ---	2 ---	HC	N
Chenopodium album	. ---	. ---	4 ---	. ---	22 37.5	. ---	2 ---	. ---	2 ---	T	N
Lactuca serriola	. ---	. ---	. ---	. ---	3 ---	. ---	. ---	. ---	2 ---	T	Me
Grewia optiva	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	MP	Me
Chenopodium murale	. ---	. ---	4 ---	. ---	. ---	. ---	6 15.3	. ---	2 ---	T	N
Barleria cristata	. ---	. ---	. ---	. ---	3 ---	22 19.9	8 13.4	. ---	2 ---	Ch	Mi
Clematis grata	. ---	. ---	4 ---	. ---	7 17.3	. ---	. ---	. ---	2 ---	L	Mi
Stachys floccosa	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	HC	N
Sorghum halepense	. ---	. ---	. ---	. ---	9 18.3	22 21.4	. ---	. ---	2 ---	G	N
Morus alba	6 ---	. ---	. ---	. ---	14 24.8	11 ---	2 ---	. ---	2 ---	MP	Me
Arenaria neelgerrensis	. ---	8 15.6	4 ---	4 ---	. ---	. ---	. ---	. ---	2 ---	T	LP
Elsholtzia ciliata	. ---	. ---	. ---	2 ---	. ---	11 ---	2 ---	. ---	2 ---	Ch	Mi
Strobilanthes urticifolia	. ---	4 ---	17 18.1	6 ---	2 ---	22 15.6	. ---	. ---	2 ---	Ch	Me
Melia azedarach	. ---	. ---	. ---	. ---	24 41.2	. ---	. ---	9 ---	2 ---	MP	N
Papaver pavoninum	6 ---	. ---	. ---	. ---	3 ---	. ---	4 ---	. ---	. ---	T	Mi
Alternanthera pungens	. ---	. ---	. ---	. ---	3 16.8	. ---	. ---	. ---	. ---	T	N
Allium ampeloprasum var. porrum	. ---	. ---	. ---	. ---	9 23.3	. ---	2 ---	. ---	. ---	G	LP
Urtica dioica	. ---	12 15.4	4 ---	7 ---	7 ---	. ---	. ---	. ---	. ---	G	Mi
Digitaria sanguinalis	. ---	. ---	. ---	. ---	7 23.9	. ---	. ---	. ---	. ---	HC	N
Arabidopsis stricta	. ---	. ---	. ---	2 ---	3 ---	. ---	2 ---	. ---	. ---	T	N
Nerium oleander	. ---	. ---	. ---	. ---	3 ---	. ---	2 ---	. ---	. ---	NP	Mi
Ruellia tuberosa	6 ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	G	Mi
Ziziphus nummularia	. ---	. ---	. ---	. ---	7 20.2	. ---	2 ---	. ---	. ---	NP	N

Sagina apetala	.	---	.	---	.	---	.	---	3	16.8	.	---	.	---	.	---	.	---	T	LP
Calotropis procera s. hamiltonii	.	---	.	---	.	---	.	---	.	---	.	---	6	22.6	.	---	.	---	NP	Me
Ceratocephala falcata	.	---	.	---	.	---	.	---	.	---	11	---	4	---	.	---	.	---	T	LP
Tragus roxburghii	.	---	.	---	.	---	.	---	2	---	.	---	2	---	.	---	.	---	HC	LP
Veronica persica	.	---	.	---	.	---	.	---	14	23.1	11	---	8	---	.	---	.	---	T	LP
Cnicus benedictus	.	---	.	---	.	---	.	---	2	---	.	---	2	---	.	---	.	---	T	Me
Torilis japonica	.	---	.	---	.	---	.	---	5	16.5	.	---	2	---	.	---	.	---	T	LP
Medicago polymorpha	.	---	.	---	.	---	.	---	22	39.4	.	---	4	---	.	---	.	---	T	N
Galium elegans	.	---	2	---	.	---	4	---	5	---	.	---	.	---	.	---	.	---	T	N
Acacia modesta	.	---	.	---	.	---	.	---	17	29.5	.	---	8	---	.	---	.	---	MP	LP
Orobanche alba	.	---	.	---	.	---	2	---	.	---	.	---	2	---	.	---	.	---	T	LP
Verbena tenuisecta	.	---	.	---	.	---	.	---	3	16.8	.	---	.	---	.	---	.	---	T	LP
Polygala erioptera	.	---	.	---	.	---	.	---	.	---	.	---	2	---	.	---	.	---	T	LP
Cymbopogon jwarancusa	.	---	.	---	.	---	.	---	3	---	.	---	4	---	.	---	.	---	HC	LP
Stachys parviflora	.	---	.	---	.	---	.	---	2	---	.	---	10	25.7	.	---	.	---	Ch	Mi
Buglossoides arvensis	.	---	.	---	.	---	.	---	5	16.5	.	---	2	---	.	---	.	---	T	LP
Adonis aestivalis	.	---	.	---	.	---	.	---	2	---	.	---	2	---	.	---	.	---	T	LP
Cousinia thomsonii	.	---	.	---	.	---	.	---	2	---	.	---	8	22.3	.	---	.	---	T	Mi
Barbaraea vulgaris	.	---	.	---	.	---	.	---	.	---	.	---	2	---	.	---	.	---	T	N
Medicago orbicularis	.	---	.	---	.	---	.	---	.	---	.	---	2	---	.	---	.	---	T	N
Linum corymbulosum	.	---	.	---	.	---	.	---	.	---	.	---	8	26.1	.	---	.	---	Ch	LP
Artemisia capillaris	.	---	.	---	.	---	.	---	9	16.4	.	---	8	13.4	.	---	.	---	Ch	LP
Cichorium intybus	.	---	.	---	.	---	.	---	3	---	.	---	2	---	.	---	.	---	G	Me
Carthamus oxyacantha	.	---	.	---	.	---	.	---	.	---	.	---	2	---	.	---	.	---	T	Mi
Cenchrus ciliaris	.	---	.	---	.	---	.	---	.	---	.	---	6	22.6	.	---	.	---	HC	LP
Salvia moocroftiana	.	---	.	---	.	---	.	---	9	---	.	---	18	28.6	.	---	.	---	HC	Me
Ziziphus spina-christi	.	---	.	---	.	---	.	---	.	---	.	---	2	---	.	---	.	---	MP	N
Lathyrus aphaca	.	---	.	---	.	---	.	---	3	---	.	---	2	---	.	---	.	---	T	N
Eremostachys superba	.	---	.	---	.	---	.	---	.	---	.	---	2	---	.	---	.	---	Ch	Me
Tribulus terrestris	.	---	.	---	.	---	.	---	.	---	.	---	6	22.6	.	---	.	---	T	LP
Rostraria cristata	.	---	.	---	.	---	.	---	.	---	.	---	4	18.4	.	---	.	---	T	N

Eulaliopsis binata	. ---	. ---	. ---	. ---	. ---	. ---	8 $^{26.1}$	. ---	. ---	HC	LP
Rorippa indica	6 ---	. ---	. ---	. ---	3 ---	. ---	. ---	. ---	. ---	T	Mi
Papaver hybridum	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	Mi
Ipomoea eriocarpa	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	Mi
Ixiolirion tataricum	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	. ---	. ---	G	N
Galium tenuissimum	. ---	2 ---	. ---	6 ---	. ---	11 ---	2 ---	. ---	. ---	T	LP
Heracleum cachemiricum	. ---	. ---	4 ---	4 ---	. ---	. ---	2 ---	. ---	. ---	Ch	Mi
Eucalyptus camaldulensis	. ---	. ---	. ---	. ---	. ---	. ---	10 $^{29.2}$	. ---	. ---	MP	Mi
Erodium cicutarium	. ---	. ---	. ---	. ---	3 ---	. ---	4 ---	. ---	. ---	T	LP
Heliotropium strigosum	. ---	. ---	. ---	. ---	. ---	. ---	6 $^{22.6}$	. ---	. ---	T	N
Cotoneaster microphyllus	. ---	. ---	. ---	2 ---	. ---	. ---	2 ---	. ---	. ---	NP	LP
Justicia adhatoda	. ---	. ---	. ---	. ---	29 $^{46.4}$	. ---	4 ---	. ---	. ---	NP	Me
Corchorus olitorius	. ---	. ---	. ---	. ---	7 $^{23.9}$	. ---	. ---	. ---	. ---	T	Mi
Justicia vahlii	. ---	. ---	. ---	. ---	3 $^{16.8}$	. ---	. ---	. ---	. ---	T	N
Neslia apiculata	. ---	. ---	. ---	. ---	3 $^{16.8}$	. ---	. ---	. ---	. ---	T	N
Phyllanthus fraternus	. ---	. ---	. ---	. ---	12 $^{31.7}$	. ---	. ---	. ---	. ---	T	LP
Eragrostis cilianensis	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	LP
Leonurus cardiaca	17 $^{33.8}$	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	Mi
Piptatherum gracile	. ---	. ---	. ---	. ---	17 $^{38.1}$	. ---	. ---	. ---	. ---	HC	LP
Commelina benghalensis	. ---	. ---	. ---	. ---	12 $^{31.7}$	. ---	. ---	. ---	. ---	T	Mi
Polypogon fugax	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	LP
Chenopodium botrys	. ---	. ---	4 ---	. ---	12 $^{28.8}$	. ---	. ---	. ---	. ---	T	N
Trianthema portulacastrum	6 ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	N
Sisymbrium altissimum	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	LP
Coronopus didymus	6 ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	LP
Justicia peploides	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	N
Verbena officinalis	6 ---	. ---	. ---	. ---	17 $^{35.6}$	. ---	. ---	. ---	. ---	T	Mi
Cleome viscosa	. ---	. ---	. ---	. ---	7 $^{23.9}$	. ---	. ---	. ---	. ---	T	N
Kyllinga brevifolia	22 $^{40.6}$	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	N
Paspalum dilatatum	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	HC	N
Acrachne racemosa	. ---	. ---	. ---	. ---	7 $^{23.9}$	. ---	. ---	. ---	. ---	T	N

Brachiaria eruciformis	. ---	. ---	. ---	. ---	3 16.8	. ---	. ---	. ---	. ---	T	LP
Sigesbeckia orientalis	6 ---	. ---	. ---	. ---	3 ---	. ---	. ---	. ---	. ---	T	Me
Schoenoplectus litoralis	17 33.8	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	N
Scrophularia dentata	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	Mi
Trifolium repens	6 ---	21 33.7	. ---	4 ---	2 ---	. ---	. ---	. ---	. ---	HC	N
Sclerochloa dura	. ---	. ---	. ---	. ---	3 16.8	. ---	. ---	. ---	. ---	T	LP
Melilotus alba	. ---	2 ---	4 ---	2 ---	2 ---	. ---	. ---	. ---	. ---	T	N
Juncus bufonius	17 33.8	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	LP
Lathyrus hirsutus	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	N
Phyla nodiflora	11 16.6	. ---	. ---	. ---	7 17.3	. ---	. ---	. ---	. ---	T	N
Lamium amplexicaule	. ---	. ---	. ---	. ---	3 16.8	. ---	. ---	. ---	. ---	T	N
Equisetum ramosissimum	11 25.7	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	HC	LP
Digitaria violascens	. ---	. ---	. ---	. ---	3 16.8	. ---	. ---	. ---	. ---	HC	N
Convolvulus arvensis	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	Mi
Sonchus oleraceus	. ---	. ---	. ---	. ---	3 16.8	. ---	. ---	. ---	. ---	T	Me
Mentha longifolia	17 29.7	. ---	. ---	. ---	3 ---	. ---	. ---	. ---	. ---	HC	N
Leptorhabdos parviflora	. ---	. ---	. ---	2 ---	2 ---	. ---	. ---	. ---	. ---	T	Mi
Cyperus glomeratus	6 ---	. ---	4 ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	N
Portulaca oleracea	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	T	N
Lolium temulentum	. ---	. ---	. ---	. ---	7 23.9	. ---	. ---	. ---	. ---	T	N
Datura stramonium	. ---	. ---	4 ---	. ---	7 20.2	. ---	. ---	. ---	. ---	T	Me
Euphorbia helioscopia	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	T	N
Veronica polita	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	T	LP
Cyperus compressus	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	N
Polygonum plebejum	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	T	LP
Solanum pseudo-capsicum	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	Mi
Sinapis alba	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	Mi
Cucumis melo s. agrestis v. Agrestis	. ---	. ---	. ---	. ---	3 16.8	. ---	. ---	. ---	. ---	T	Me
Medicago falcata	. ---	. ---	. ---	. ---	3 16.8	. ---	. ---	. ---	. ---	T	N
Broussonetia papyrifera	. ---	. ---	. ---	. ---	3 16.8	. ---	. ---	. ---	. ---	MP	Me
Hemerocallis fulva	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	G	Me

Persicaria glabra	6 ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Delphinium vestitum	. ---	. ---	8 27.8	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Vicia sativa	. ---	. ---	. ---	. ---	10 29.3	. ---	. ---	. ---	. ---	T	LP
Echinochloa colona	17 29.7	. ---	. ---	. ---	3 ---	. ---	. ---	. ---	. ---	T	N
Angelica glauca	. ---	10 23.6	8 ---	. ---	. ---	. ---	. ---	. ---	. ---	Ch	Mi
Populus ciliata	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	MP	Me
Ranunculus muricatus	. ---	. ---	. ---	. ---	3 16.8	. ---	. ---	. ---	. ---	T	Mi
Lysimachia pyramidalis	6 ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Polygonum aviculare	11 ---	2 ---	4 ---	. ---	10 19.4	. ---	. ---	. ---	. ---	T	N
Ribes himalense	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	NP	Mi
Fimbristylis bisumbellata	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	LP
Mazus japonicus	. ---	6 ---	4 ---	6 ---	2 ---	. ---	. ---	. ---	. ---	T	Mi
Juncus inflexus	6 ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	LP
Rumex dentatus	. ---	4 ---	4 ---	. ---	12 24.1	. ---	. ---	. ---	. ---	T	Me
Xanthium strumarium	. ---	. ---	. ---	. ---	12 31.7	. ---	. ---	. ---	. ---	T	Me
Alternanthera sessilis	28 32.6	. ---	. ---	. ---	10 17.7	. ---	. ---	. ---	. ---	T	N
Typha latifolia	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	Me
Eleusine indica	. ---	. ---	. ---	. ---	10 29.3	. ---	. ---	. ---	. ---	T	N
Cyperus serotinus	6 ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	LP
Fumaria indica	. ---	. ---	. ---	. ---	12 31.7	. ---	. ---	. ---	. ---	T	LP
Carex foliosa	. ---	8 22.9	4 ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	LP
Alisma plantago-aquatica	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	Mi
Cardamine flexuosa	6 ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Silybum marianum	6 ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Ma
Pycreus polystachyos	6 ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Kobresia laxa	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	N
Commelina paludosa	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Desmostachya bipinnata	. ---	. ---	. ---	. ---	7 17.3	. ---	4 ---	. ---	. ---	HC	Mi
Petrorhagia alpina	. ---	. ---	. ---	. ---	. ---	. ---	4 18.4	. ---	. ---	T	LP
Cyperus iria	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Chrozophora tinctoria	. ---	. ---	. ---	. ---	3 ---	. ---	4 ---	. ---	. ---	T	Mi

Vulpia myuros	.	---	.	---	.	---	.	---	3	---	.	---	6	15.3	.	---	.	---	T	LP
Lathyrus sphaericus	.	---	.	---	.	---	.	---	.	---	.	---	4	18.4	.	---	.	---	T	N
Arnebia decumbens	.	---	.	---	.	---	.	---	5	13.6	.	---	4	---	.	---	.	---	T	LP
Mollugo nudicaulis	17	33.8	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	T	LP
Bergia ammannioides	11	25.7	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	T	LP
Hydrilla verticillata	17	39.8	.	---	.	---	.	---	.	---	.	---	.	---	.	---	.	---	H	LP
Platanus orientalis	6	---	.	---	.	---	.	---	.	---	.	---	.	---	.	---	.	---	MP	Me
Papaver dubium	.	---	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	T	Mi
Eclipta prostrata	28	42.7	.	---	4	---	.	---	2	---	.	---	.	---	.	---	.	---	T	Mi
Brachypodium sylvaticum	.	---	.	---	4	---	.	---	2	---	.	---	.	---	.	---	.	---	T	N
Dryopteris filix-mas	.	---	.	---	4	---	.	---	.	---	.	---	.	---	.	---	.	---	HC	Me
Notholirion thomsonianum	.	---	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	G	Mi
Cyperus rotundus	.	---	.	---	.	---	.	---	22	43.7	.	---	.	---	.	---	.	---	G	N
Galium acutum	.	---	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	T	LP
Potentilla supina	.	---	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	T	N
Setaria viridis	.	---	.	---	.	---	.	---	21	41.9	.	---	.	---	.	---	.	---	T	Mi
Alopecurus myosuroides	17	22.1	.	---	.	---	.	---	9	18.3	.	---	.	---	.	---	.	---	T	N
Euphorbia peplus	.	---	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	T	N
Pelargonium zonale	.	---	.	---	.	---	.	---	21	41.9	.	---	.	---	.	---	.	---	Ch	Me
Lycopus europaeus	11	25.7	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	T	Mi
Imperata cylindrica	.	---	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	HC	N
Hordeum murinum	.	---	.	---	.	---	.	---	3	16.8	.	---	.	---	.	---	.	---	T	N
Malvastrum coromendelianum	.	---	.	---	.	---	.	---	24	45.4	.	---	.	---	.	---	.	---	T	Mi
Celosia argentea	.	---	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	T	Mi
Leptochloa panicea	.	---	.	---	.	---	.	---	2	---	.	---	.	---	.	---	.	---	T	LP
Alliaria petiolata	.	---	.	---	.	---	.	---	22	43.7	.	---	.	---	.	---	.	---	T	Mi
Narcissus tazetta	.	---	.	---	.	---	.	---	22	43.7	.	---	.	---	.	---	.	---	G	Mi
Persicaria maculosa	11	32.5	.	---	.	---	.	---	.	---	.	---	.	---	.	---	.	---	T	Mi
Isachne himalaica	11	32.5	.	---	.	---	.	---	.	---	.	---	.	---	.	---	.	---	H	LP
Mollugo pentaphylla	6	---	.	---	.	---	.	---	.	---	.	---	.	---	.	---	.	---	T	LP
Matricaria matricarioides	.	---	4	---	4	---	.	---	.	---	.	---	.	---	.	---	.	---	T	LP

Colocasia esculenta	6 ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	G	Ma
Withania somnifera	. ---	. ---	. ---	. ---	7 23.9	. ---	. ---	. ---	. ---	Ch	Me
Monochoria vaginalis	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	Mi
Mirabilis jalapa	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	Ch	Me
Pycreus flavescens	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Conyza bonariensis	. ---	. ---	4 ---	. ---	9 23.3	. ---	. ---	. ---	. ---	T	N
Carpesium cernuum	. ---	. ---	4 ---	. ---	9 23.3	. ---	. ---	. ---	. ---	T	Me
Potamogeton crispus	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	N
Sonchus arvense	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	T	Me
Moraea sisyrinchium	. ---	. ---	. ---	. ---	9 26.7	. ---	. ---	. ---	. ---	G	N
Cedrus deodara	. ---	. ---	4 ---	20 39.3	. ---	. ---	. ---	. ---	. ---	MP	LP
Myriactis wallichii	. ---	2 ---	4 ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Athyrium vidalii	. ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	N
Arabis bijuga	. ---	6 23.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	LP
Aesculus indica	. ---	2 ---	8 ---	17 30.5	. ---	. ---	. ---	. ---	. ---	MP	Me
Stachys palustris	. ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	. ---	Ch	N
Juniperus communis	. ---	8 26.7	. ---	. ---	. ---	. ---	. ---	. ---	. ---	NP	LP
Geranium ocellatum	. ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Rhamnus triquetra	. ---	2 ---	. ---	6 17.4	. ---	. ---	. ---	. ---	. ---	MP	Mi
Crepis foetida	. ---	2 ---	. ---	6 17.4	. ---	. ---	. ---	. ---	. ---	T	N
Valeriana jatamansi	. ---	10 ---	4 ---	26 36.5	. ---	. ---	. ---	. ---	. ---	G	Mi
Veronica laxa	. ---	25 28.8	. ---	20 22.8	. ---	. ---	. ---	. ---	. ---	HC	N
Utricularia aurea	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	LP
Iris germanica	. ---	. ---	. ---	. ---	9 26.7	. ---	. ---	. ---	. ---	G	Ma
Lonicera japonica	. ---	2 ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	L	N
Piptatherum laterale	. ---	. ---	. ---	4 17.6	. ---	. ---	. ---	. ---	. ---	HC	LP
Aster alpinus	. ---	10 29.9	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Amaranthus hybridus	. ---	. ---	8 15.5	. ---	2 ---	22 28.3	. ---	. ---	. ---	T	Mi
Polystichum platyphyllum	. ---	4 ---	4 ---	2 ---	. ---	. ---	. ---	. ---	. ---	HC	N
Fallopia dumetorum	. ---	. ---	. ---	. ---	. ---	22 46.6	. ---	. ---	. ---	L	Mi
Impatiens pallida	. ---	8 26.7	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi

Duchesnea indica	. ---	. ---	8 15.5	. ---	3 ---	11 ---	. ---	. ---	. ---	HC	N
Agrostis gigantea	. ---	. ---	. ---	4 ---	. ---	11 ---	. ---	. ---	. ---	HC	LP
Poa polycolea	. ---	10 14.6	4 ---	11 17.3	. ---	. ---	. ---	. ---	. ---	T	N
Prunus cornuta	. ---	2 ---	. ---	24 43.3	. ---	. ---	. ---	. ---	. ---	MP	Me
Galium asperuloides	. ---	12 12.4	. ---	22 32.3	. ---	. ---	. ---	. ---	. ---	T	N
Sorbaria tomentosa	. ---	12 12.4	8 ---	19 25.1	. ---	. ---	. ---	. ---	. ---	NP	Mi
Asparagus setaceus	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	G	LP
Paeonia emodi	. ---	4 ---	4 ---	17 30.5	. ---	. ---	. ---	. ---	. ---	G	Me
Onychium contiguum	. ---	2 ---	4 ---	15 30.2	. ---	. ---	. ---	. ---	. ---	HC	LP
Maytenus wallichiana	. ---	6 ---	. ---	19 32.9	. ---	. ---	. ---	. ---	. ---	NP	N
Cardamine impatiens	17 33.8	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Lactuca dissecta	. ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Cuscuta gigantea	. ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	. ---	T	LP
Cynanchum auriculatum	. ---	2 ---	. ---	6 17.4	. ---	. ---	. ---	. ---	. ---	G	N
Caltha alba	. ---	6 23.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	Mi
Dryopteris stewartii	. ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	N
Leucas cephalotes	. ---	. ---	8 18.1	4 ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Skimmia laureola	. ---	8 26.7	. ---	. ---	. ---	. ---	. ---	. ---	. ---	NP	Mi
Myriactis wightii	. ---	2 ---	4 ---	4 ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Hieracium umbellatum	. ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	Mi
Podophyllum emodi	. ---	10 26.4	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	G	Me
Dactyloctenium aegyptium	11 16.6	. ---	. ---	. ---	7 17.3	. ---	. ---	. ---	. ---	T	N
Viscum album	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	NP	N
Ranunculus laetus	. ---	23 40.0	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Asparagus filicinus	. ---	2 ---	4 ---	6 14.4	. ---	. ---	. ---	. ---	. ---	G	LP
Galium rotundifolium	. ---	10 21.2	. ---	6 ---	. ---	. ---	. ---	. ---	. ---	T	N
Pimpinella diversifolia	. ---	4 ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	Ch	Mi
Saussurea alpina	. ---	. ---	. ---	4 17.6	. ---	. ---	. ---	. ---	. ---	G	Me
Arabis amplexicaulis	. ---	2 ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	T	N
Primula denticulata	. ---	12 26.8	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	HC	Me
Wulfenia amherstiana	. ---	10 23.6	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	HC	Me

Fragaria nubicola	. ---	10 ---	4 ---	22 32.3	. ---	. ---	. ---	. ---	. ---	HC	N
Silene viscosa	. ---	6 ---	4 ---	15 26.1	. ---	. ---	. ---	. ---	. ---	G	N
Stachys emodi	. ---	2 ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	HC	N
Microlepia strigosa	. ---	4 18.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	N
Buxus wallichiana	. ---	6 15.8	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	NP	LP
Arabidopsis himalaica	. ---	10 26.4	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	T	N
Silene indica v. cashmeriana	. ---	17 32.6	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	G	Mi
Solena amplexicaulis	. ---	. ---	4 ---	4 ---	. ---	. ---	. ---	. ---	. ---	L	Me
Saxifraga sibirica	. ---	8 22.9	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	HC	LP
Androsace foliosa	. ---	21 42.7	. ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	Mi
Astragalus alpinus	. ---	6 18.8	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	HC	LP
Epipactis helleborine	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	G	Mi
Artemisia dubia	. ---	2 ---	8 ---	11 22.5	. ---	. ---	. ---	. ---	. ---	T	LP
Heliotropium europaeum	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	9 ---	. ---	T	Mi
Geranium rotundifolium	. ---	. ---	. ---	. ---	17 35.6	. ---	. ---	9 ---	. ---	HC	Mi
Pennisetum flaccidum	. ---	. ---	12 16.6	9 17.5	. ---	. ---	. ---	9 ---	. ---	HC	LP
Arabidopsis thaliana	. ---	6 15.8	. ---	2 ---	. ---	. ---	. ---	9 ---	. ---	T	N
Anchusa arvensis s. orientalis	. ---	. ---	. ---	. ---	12 28.8	. ---	. ---	9 ---	. ---	T	N
Viola betonicifolia	. ---	. ---	8 ---	4 ---	2 ---	. ---	. ---	9 ---	. ---	G	Mi
Clematis graveolens	. ---	. ---	. ---	. ---	. ---	11 ---	. ---	9 ---	. ---	L	N
Oxalis pes-caprae	. ---	. ---	. ---	. ---	. ---	. ---	. ---	9 29.7	. ---	HC	N
Onosma hispida	. ---	. ---	. ---	. ---	. ---	. ---	6 18.3	9 ---	. ---	HC	Mi
Poa infirma	. ---	. ---	. ---	. ---	9 18.3	. ---	4 ---	9 ---	. ---	T	LP
Punica granatum	. ---	. ---	. ---	. ---	2 ---	. ---	4 ---	9 ---	. ---	NP	Mi
Heracleum candicans	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	9 ---	. ---	Ch	Mi
Lepidium apetalum	. ---	. ---	. ---	. ---	19 37.6	. ---	. ---	9 ---	. ---	T	Mi
Prunella vulgaris	11 ---	2 ---	29 29.0	7 ---	2 ---	22 ---	. ---	9 ---	. ---	HC	Mi
Allium jacquemontii	. ---	. ---	. ---	. ---	. ---	. ---	6 18.3	9 ---	. ---	G	N
Anagallis arvensis	. ---	. ---	. ---	. ---	10 21.3	. ---	4 ---	9 ---	. ---	T	N
Vitis jacquemontii	. ---	. ---	12 28.8	. ---	. ---	. ---	. ---	9 ---	. ---	L	Me
Capsella bursa-pastoris	. ---	. ---	. ---	. ---	2 ---	. ---	2 ---	9 ---	. ---	T	N

Scilla griffithii	. ---	. ---	. ---	2 ---	21 35.5	. ---	2 ---	9 ---	. ---	G	N
Nonea edgeworthii	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	9 ---	. ---	T	N
Valerianella szovitsiana	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	18 33.7	. ---	T	N
Bromus pectinatus	. ---	. ---	. ---	. ---	5 ---	. ---	10 15.4	27 24.6	. ---	T	LP
Cardaria pubescens	. ---	. ---	4 ---	2 ---	2 ---	. ---	2 ---	9 ---	. ---	T	Mi
Rosularia adenotricha	. ---	. ---	. ---	. ---	2 ---	. ---	4 ---	18 25.3	. ---	HC	LP
Leucas lanata	. ---	4 ---	17 17.0	7 ---	2 ---	22 ---	. ---	9 ---	. ---	HC	N
Pteris vittata	. ---	. ---	. ---	. ---	. ---	11 ---	. ---	9 ---	. ---	HC	Mi
Carex sanguinea	6 ---	. ---	. ---	2 ---	2 ---	. ---	. ---	9 ---	. ---	HC	LP
Salvia plebeia	. ---	. ---	. ---	. ---	7 20.2	. ---	. ---	9 ---	. ---	T	Mi
Arabis tibetica	. ---	. ---	. ---	. ---	2 ---	. ---	4 ---	9 ---	. ---	T	N
Thlaspi arvense	. ---	. ---	. ---	. ---	7 15.0	. ---	4 ---	9 ---	. ---	T	N
Cannabis sativa	. ---	. ---	. ---	. ---	21 37.4	. ---	2 ---	9 ---	. ---	T	Me
Scandix pecten-veneris	. ---	. ---	. ---	. ---	9 23.3	. ---	. ---	9 ---	. ---	T	LP
Ulmus wallichiana	. ---	2 ---	. ---	6 17.4	. ---	. ---	. ---	. ---	. ---	MP	Me
Lepyrodiclis tenera	. ---	. ---	. ---	6 21.6	. ---	. ---	. ---	. ---	. ---	T	N
Rottboellia exaltata	. ---	. ---	17 34.6	2 ---	. ---	. ---	. ---	. ---	. ---	HC	Mi
Salix tetrasperma	22 46.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	MP	Mi
Equisetum arvense	11 ---	. ---	12 20.0	2 ---	. ---	11 ---	. ---	. ---	. ---	HC	LP
Cynoglossum glochidiatum	. ---	10 13.4	4 ---	13 20.2	. ---	. ---	. ---	. ---	. ---	T	Mi
Bistorta amplexicaulis	. ---	6 ---	12 ---	13 20.2	. ---	. ---	. ---	. ---	. ---	HC	Me
Nepeta laevigata	. ---	4 ---	8 ---	6 ---	. ---	. ---	. ---	. ---	. ---	HC	N
Carex canescens	. ---	12 19.2	4 ---	9 12.9	. ---	. ---	. ---	. ---	. ---	HC	LP
Impatiens brachycentra	. ---	. ---	8 ---	7 ---	3 ---	22 18.6	. ---	. ---	. ---	T	Mi
Rosa webbiana	. ---	23 40.0	4 ---	2 ---	. ---	. ---	. ---	. ---	. ---	NP	Mi
Debregeasia saeneb	28 36.8	. ---	8 ---	. ---	. ---	22 19.9	. ---	. ---	. ---	NP	Me
Impatiens bicolor	11 ---	. ---	25 35.7	. ---	. ---	22 18.6	. ---	. ---	. ---	T	Mi
Selinum filicifolium	. ---	2 ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	Ch	LP
Epilobium hirsutum	22 23.7	. ---	12 ---	. ---	5 ---	22 16.5	. ---	. ---	. ---	HC	N
Ajuga parviflora	. ---	4 ---	4 ---	9 15.8	. ---	22 18.6	. ---	. ---	. ---	T	Mi
Spergularia media	11 18.8	2 ---	8 15.5	. ---	. ---	. ---	. ---	. ---	. ---	T	LP

Malva neglecta	. ---	. ---	. ---	. ---	7 20.2	11 ---	. ---	. ---	. ---	T	Mi
Bergenia ciliata	. ---	12 19.2	. ---	11 17.3	. ---	. ---	. ---	. ---	. ---	HC	Me
Cornus macrophylla	. ---	. ---	4 ---	. ---	3 ---	11 ---	. ---	. ---	. ---	MP	Me
Hackelia macrophylla	. ---	6 ---	4 ---	7 ---	. ---	11 ---	. ---	. ---	. ---	T	Mi
Anaphalis viridis	. ---	4 ---	4 ---	11 22.5	. ---	. ---	. ---	. ---	. ---	G	Mi
Salix babylonica	28 51.6	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	MP	Mi
Ophiopogon intermedius	. ---	. ---	. ---	. ---	. ---	11 32.9	. ---	. ---	. ---	HC	N
Medicago lupulina	. ---	17 30.4	. ---	6 ---	. ---	. ---	. ---	. ---	. ---	T	LP
Phlomis bracteosa	. ---	10 21.2	. ---	6 ---	. ---	. ---	. ---	. ---	. ---	HC	Me
Euphorbia falcata	. ---	. ---	. ---	6 21.6	. ---	. ---	. ---	. ---	. ---	T	N
Kyllinga nemoralis	22 46.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Digitaria ciliaris	. ---	. ---	8 15.5	. ---	3 ---	11 ---	. ---	. ---	. ---	HC	N
Eleocharis palustris	22 46.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	LP
Polygonatum multiflorum	. ---	4 ---	. ---	9 21.7	. ---	. ---	. ---	. ---	. ---	G	Me
Clematis montana	. ---	. ---	. ---	6 21.6	. ---	. ---	. ---	. ---	. ---	L	Mi
Digera muricata	6 ---	. ---	. ---	. ---	5 16.5	. ---	. ---	. ---	. ---	T	Mi
Cerastium dahuricum	. ---	17 38.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Hypodematium crenatum	. ---	. ---	. ---	4 17.6	. ---	. ---	. ---	. ---	. ---	HC	LP
Parnassia nubicola	. ---	17 28.5	. ---	7 ---	. ---	. ---	. ---	. ---	. ---	G	Mi
Lysimachia chenopodioides	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	N
Rhus punjabensis	. ---	. ---	. ---	. ---	. ---	11 32.9	. ---	. ---	. ---	NP	Mi
Ipomoea purpurea	. ---	. ---	4 ---	. ---	. ---	11 ---	. ---	. ---	. ---	T	Mi
Phytolacca latbenia	. ---	. ---	. ---	6 21.6	. ---	. ---	. ---	. ---	. ---	T	Me
Aster falconeri	. ---	10 29.9	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Polygonatum geminiflorum	. ---	6 15.8	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	G	Mi
Taxus wallichiana	. ---	21 35.6	. ---	6 ---	. ---	. ---	. ---	. ---	. ---	MP	LP
Carex nivalis	. ---	. ---	4 ---	4 ---	. ---	. ---	. ---	. ---	. ---	HC	LP
Agrimonia eupatoria	. ---	15 25.6	. ---	7 ---	. ---	. ---	. ---	. ---	. ---	T	N
Bidens radiata	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	N
Arundo donax	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	Ma
Gnaphalium uliginosum	. ---	2 ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	T	LP

Daphne papyracea	. ---	4 ---	. ---	7 18.3	. ---	. ---	. ---	. ---	. ---	NP	Mi
Geranium lucidum	. ---	2 ---	4 ---	4 ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Salix flabellaris	. ---	6 23.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	NP	Mi
Potamogeton perfoliatus	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	N
Aquilegia pubiflora	. ---	12 16.6	. ---	15 22.9	. ---	. ---	. ---	. ---	. ---	G	Mi
Hylotelephium ewersii	. ---	. ---	. ---	7 24.9	. ---	. ---	. ---	. ---	. ---	HC	N
Prenanthes brunoniana	. ---	. ---	. ---	7 24.9	. ---	. ---	. ---	. ---	. ---	T	LP
Physalis divaricata	. ---	. ---	. ---	. ---	12 28.8	11 ---	. ---	. ---	. ---	T	Mi
Teucrium royleanum	. ---	6 ---	12 14.1	9 14.3	. ---	. ---	. ---	. ---	. ---	Ch	N
Rubia cordifolia	. ---	. ---	4 ---	. ---	5 13.6	11 ---	. ---	. ---	. ---	Ch	N
Sibbaldia procumbens	. ---	17 38.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	N
Ranunculus arvensis	. ---	. ---	. ---	. ---	3 ---	11 ---	. ---	. ---	. ---	T	Mi
Agrostis stolonifera	. ---	2 ---	. ---	7 18.3	. ---	11 ---	. ---	. ---	. ---	HC	LP
Geum urbanum	. ---	15 22.3	. ---	11 15.9	. ---	. ---	. ---	. ---	. ---	T	N
Plantago major	11 ---	12 12.4	12 ---	13 14.2	. ---	. ---	. ---	. ---	. ---	HC	Me
Chrysopogon gryllus s. echinulatus	. ---	2 ---	12 14.1	13 23.4	. ---	. ---	. ---	. ---	. ---	HC	N
Geranium Swatense	. ---	19 27.8	. ---	11 13.5	. ---	. ---	. ---	. ---	. ---	HC	Mi
Echinops sphaerocephalus	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	T	Mi
Robinia pseudo-acacia	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	MP	Mi
Acacia nilotica	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	MP	LP
Onopordum acanthium	. ---	. ---	. ---	. ---	9 23.3	. ---	2 ---	. ---	. ---	T	Me
Tulipa clusiana	. ---	. ---	. ---	. ---	21 39.5	. ---	2 ---	. ---	. ---	G	Mi
Pycreus sanguinolentus	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Solanum surattense	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	HC	Me
Ricinus communis	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	NP	Me
Amaranthus spinosus	. ---	. ---	. ---	. ---	9 23.3	. ---	2 ---	. ---	. ---	T	Mi
Periploca hydaspidis	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	L	LP
Trisetum spicatum	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	T	N
Orobanche cernua	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	T	LP
Chenopodium ambrosioides	6 ---	. ---	. ---	. ---	17 33.3	. ---	2 ---	. ---	. ---	T	Mi
Monotheca buxifolia	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	NP	N

Artemisia scoparia	. ---	. ---	. ---	. ---	. ---	. ---	2 ---	. ---	. ---	Ch	LP
Euonymus hamiltonianus	. ---	4 ---	12 15.3	9 15.8	. ---	. ---	. ---	. ---	. ---	NP	Mi
Schoenoplectus mucronatus	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	N
Swertia cordata	. ---	12 20.8	4 ---	7 ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Salvia nubicola	. ---	4 ---	4 ---	7 16.0	. ---	. ---	. ---	. ---	. ---	HC	Me
Lamium album	. ---	15 25.6	. ---	7 ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Lemna minor	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	LP
Leontopodium himalayanum	. ---	8 13.9	. ---	9 17.5	. ---	. ---	. ---	. ---	. ---	T	LP
Trillium govanianum	. ---	15 35.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	G	Me
Iris hookeriana	. ---	15 35.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	G	Me
Campanula tenuissima	. ---	8 26.7	. ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	N
Hedera nepalensis	. ---	. ---	17 23.8	9 17.5	. ---	. ---	. ---	. ---	. ---	L	Mi
Corydalis diphylla	. ---	6 ---	. ---	7 16.0	. ---	. ---	. ---	. ---	. ---	G	LP
Lilium polyphyllum	. ---	6 23.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	N
Prunus cerasoides	. ---	. ---	. ---	7 24.9	. ---	. ---	. ---	. ---	. ---	MP	Mi
Anaphalis margaritacea	. ---	. ---	. ---	9 27.9	. ---	. ---	. ---	. ---	. ---	G	N
Rorippa islandica	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Polygonatum verticillatum	. ---	8 19.9	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	G	Mi
Aster flaccidus	. ---	8 19.9	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	T	N
Persicaria lapathifolia	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Achillea millefolium	. ---	21 42.7	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	LP
Athyrium attenuatum	. ---	2 ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	HC	N
Poa pratensis s. angustifolia	. ---	15 25.6	. ---	7 ---	. ---	. ---	. ---	. ---	. ---	T	LP
Sparganium erectum	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	Me
Gratiola officinalis	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	LP
Elaeagnus umbellata	. ---	. ---	8 21.8	2 ---	. ---	. ---	. ---	. ---	. ---	NP	Mi
Lolium persicum	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Marsilea polycarpa	28 51.6	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	N
Lonicera myrtillus	. ---	8 26.7	. ---	. ---	. ---	. ---	. ---	. ---	. ---	NP	LP
Polystichum aculeatum	. ---	2 ---	. ---	7 21.2	. ---	. ---	. ---	. ---	. ---	HC	N
Saccharum spontaneum	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	HC	Mi

Bunium persicum	. ---	6 23.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	LP
Ceratophyllum demersum	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	LP
Oenanthe javanica	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Astragalus depressus	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	HC	LP
Cyperus articulatus	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Aconitum laeve	. ---	8 26.7	. ---	. ---	. ---	. ---	. ---	. ---	. ---	G	Mi
Avena fatua	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	T	N
Brachiaria ramosa	. ---	. ---	. ---	. ---	7 23.9	. ---	. ---	. ---	. ---	T	Mi
Setaria pumila	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	T	N
Dryopteris juxtaposita	. ---	2 ---	8 15.5	4 ---	. ---	. ---	. ---	. ---	. ---	HC	N
Ranunculus sceleratus	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Seseli libanotis	. ---	2 ---	4 ---	2 ---	. ---	. ---	. ---	. ---	. ---	G	LP
Centaurea iberica	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	T	Me
Inula species	. ---	8 19.9	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	T	Me
Carpesium abrotanoides	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	T	Me
Urochloa panicoides	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	T	N
Punica granatum	. ---	. ---	. ---	. ---	5 20.6	. ---	. ---	. ---	. ---	NP	Mi
Sagittaria trifolia	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	Me
Persicaria nepalensis	. ---	8 22.9	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	HC	Mi
Polystichum polyblepharum	. ---	2 ---	8 18.1	2 ---	. ---	. ---	. ---	. ---	. ---	HC	N
Quercus semecarpifolia	. ---	19 40.4	. ---	. ---	. ---	. ---	. ---	. ---	. ---	MP	Me
Impatiens glandulifera	. ---	6 13.5	8 ---	2 ---	. ---	. ---	. ---	. ---	. ---	T	Me
Echinochloa crus-galli	22 46.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Potamogeton nodosus	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	Mi
Athyrium filix-femina	. ---	4 ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	HC	N
Pouzolzia pentandra	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	H	N
Isodon coetsa	. ---	2 ---	4 ---	. ---	. ---	11 ---	. ---	. ---	. ---	Ch	Mi
Persicaria capitata	11 ---	2 ---	8 ---	2 ---	. ---	11 ---	. ---	. ---	. ---	T	Mi
Asplenium septentrionale	. ---	4 18.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	N
Euphorbia maddenii	. ---	4 ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	T	N
Symphyotrichum squamatum	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	LP

Persicaria mitis	22 46.1	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Nepeta erecta	. ---	19 19.5	4 ---	22 27.2	. ---	. ---	. ---	. ---	. ---	HC	Mi
Solanum villosum	. ---	. ---	. ---	. ---	10 26.2	11 ---	. ---	. ---	. ---	T	Mi
Sorbus aria	. ---	2 ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	NP	Me
Polygala crotalarioides	. ---	4 ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	Ch	LP
Dactylorhiza hatagirea	. ---	6 18.8	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	G	Mi
Acer cappadocicum	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	MP	Me
Habenaria digitata	. ---	2 ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	T	Mi
Valeriana pyrolifolia	. ---	4 ---	. ---	4 ---	. ---	. ---	. ---	. ---	. ---	G	Mi
Stellaria uliginosa	. ---	4 ---	4 ---	2 ---	. ---	. ---	. ---	. ---	. ---	HC	LP
Astragalus densiflorus	. ---	2 ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	T	LP
Rosa moschata	17 39.8	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	NP	Mi
Bulbostylis densa	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Pycreus pumilus	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Cyperus alopecuroides	11 32.5	. ---	. ---	. ---	. ---	. ---	. ---	. ---	. ---	HC	N
Goodyera repens	. ---	8 26.7	. ---	. ---	. ---	. ---	. ---	. ---	. ---	G	Mi
Sium latijugum	. ---	8 26.7	. ---	. ---	. ---	. ---	. ---	. ---	. ---	T	N
Astragalus leucocephalus	. ---	. ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	T	LP
Lathyrus pratensis	. ---	4 ---	. ---	2 ---	. ---	. ---	. ---	. ---	. ---	T	N

Legend: 1.NPV (Nasturtium-Paspalum-Veronica), 2.APV (Abies-Picea-Viburnum) , 3.PQB (Pinus-Quercus-Berberis), 4.PI (Pinus-Indigofera), 5.COC (Celtis-Olea-Cynodon), 6.DPQ (Diosperos-Pinus-Quercus), 7.DIB (Dodonaea-Isodon-Berberis), 8. PQG (Pinus-Quercus-Galium), 9.IBI (Isodon-Berberis-Indigofera), *. LF (Life form): T (Therophyte), HC (Hemicryptophyte), NP (Nanophanerophyte), MP (Macrophanerophyte), G (Geophyte), Ch (Chamaephyte), L (Liana),**. LS (Leaf size): LP (Leptophyll), N (Nanophyll), Mi (Microphyll) Ma (Macrophyll)

Table 2.5: Environmental variables and cover percentage of vegetation layers in the nine associations of Kabal valley, Swat.

Parameters	ASSOCIATIONS								
	1. NPV	**2. APV**	**3. PQB**	**4. PI**	**5. COC**	**6. DPQ**	**7. DIB**	**8. PQG**	**9. IBI**
Altitude (m)	1079.17±271.7	2657.96±200.04	1956.25±153.84	2281.43±165.57	1063.26±167.91	1671.44±71.42	1274.36±172.81	1514.09±186.87	1634.71±269.96
Slope (degrees)	0.00	28.98±17.17	26.04±7.94	32.87±7.37	4.33±6.87	15.00±10.61	20.24±5.25	21.36±4.52	24.76±7.32
Total Cover (%)	66.39±5.89	69.48±9.91	66.88±8.18	70.09±8.10	78.71±14.19	68.89±5.46	57.70±11.96	69.09±10.20	64.52±12.63
Cover tree layer (%)	8.89±9.0	26.98±22.87	32.50±16.22	44.91±15.89	48.97±33.52	44.44±12.36	14.80±18.79	40.91±20.83	23.57±25.93
Cover shrub layer (%)	3.89±5.02	16.98±14.28	35.00±12.60	29.44±9.40	28.02±18.14	32.78±8.33	27.10±12.42	29.09±8.01	35.24±12.44
Cover herb layer (%)	58.61±6.37	54.06±11.33	45.63±9.70	46.85±8.37	56.64±13.13	47.22±5.07	37.40±10.16	40.00±8.66	42.26±9.32
Longitude	72.2683±0.05	72.1881±0.03	72.2145±0.04	72.1895±0.04	72.2642±0.04	72.1752±0.02	72.2542±0.04	72.2341±0.04	72.2302±0.05
Latitude	34.8320±0.06	34.9628±0.04	34.9359±0.04	34.9219±0.05	34.8322±0.05	34.8972±0.04	34.8356±0.04	34.8606±0.04	34.8706±0.04
Clay	3.19±1.04	5.11±1.80	7.85±3.05	6.00±3.09	11.81±4.39	4.20±1.57	8.42±5.43	7.11±5.14	9.08±5.79
Silt	58.90±2.39	42.50±9.13	45.88±8.10	42.40±9.25	44.73±9.84	50.89±6.87	14.90±9.08	26.20±11.25	19.70±10.88
Sand	37.91±2.57	52.00±8.81	46.27±8.51	51.45±8.48	42.93±11.91	44.91±7.10	76.72±11.28	66.69±9.08	70.98±10.98
Moisture	43.17±3.20	34.19±3.07	35.96±3.30	35.39±2.62	32.22±4.63	32.78±1.09	20.68±3.05	23.82±2.75	23.07±4.31
Ph	7.92±0.17	6.03±0.46	5.61±0.51	6.05±0.44	7.18±0.41	5.51±0.21	7.27±0.21	7.05±0.20	6.79±0.43
Caco3	4.33±1.86	8.17±1.26	7.26±1.53	7.12±1.46	7.41±4.61	6.03±0.67	6.03±1.55	7.20±2.39	6.95±1.89
Om	2.36±1.01	2.59±1.39	2.23±0.94	2.88±1.52	2.13±0.91	4.24±0.85	1.93±0.82	2.14±0.65	2.37±0.69
N	0.12±0.05	0.13±0.07	0.11±0.05	0.14±0.08	0.11±0.05	0.22±0.05	0.14±0.15	0.11±0.03	0.12±0.03
P	4.58±2.75	3.57±3.50	2.92±1.12	3.16±1.87	14.85±11.33	4.27±2.94	2.90±1.49	2.68±1.07	3.68±2.86
K	52.56±17.90	164.29±104.05	151.88±67.49	154.00±58.54	330.72±173.40	224.11±26.13	112.88±17.47	81.45±26.96	122.76±47.32

Table 2.6: Diversity indices of Association from Kabal valley, Swat.

Associations	No. of Releves	Species#	Diversity Indices			Evenness
			Species richness	Shannon-Wiener	Simpson	Pielou
Nasturtium-Paspalum-Veronica	18	107	15.9±3.9	2.35±.31	0.86±.06	0.86±.07
Abies-Picea-Viburnum	48	189	18.9±5.2	2.40±.38	0.85±.10	0.83±.10
Pinus-Quercus-Berberis	24	187	18.9±5.2	2.47±.39	0.87±.07	0.85±.08
Pinus-Indigofera	54	239	18.7±4.4	2.31±.35	0.84±.07	0.79±.08
Celtis-Olea-Cynodon	58	291	24.6±8.4	2.51±.36	0.85±.07	0.80±.09
Diosperos-Pinus-Quercus	9	99	19.4±4.8	2.53±.23	0.88±.04	0.86±.06
Dodonaea-Isodon-Berberis	50	203	13.8±3.6	2.09±.38	0.80±.10	0.80±.10
Pinus-Quercus-Galium	11	117	18.2±5.9	2.35±.61	0.83±.13	0.82±.11
Isodon-Berberis-Indigofera	42	224	16.2±4.3	2.23±.44	0.82±.10	0.81±.11

Species with reference to cover values higher than the threshold levels as shown in Table 2.4 reveales that *Abies pindrow* (12), *Picea smithiana* (25),*Viburnum gr*and*iflorum* (27), *Pinus wallichiana* (10), *Quercus semecarpifolia* (19), *Pteridium aquilinum* (12), *Rumex nepalensis* (6) and *Senecio chrysanthemoides* (4) were dominant.

3. Pinus-Quercus-Berberis (PQB) mixed forest association:

Based on 24 relevé, this association was found at an elevation range of 1676-2373, almost at the mid hills. It occupied a latitudinal range between 34.84-34.98°N and a longitudinal range between 72.15-72.30°E. The association was found in Drad-Taran hills, Boki Sar hills, Manrai hills, Tall-Dardyal hills, Qalagai hills and Ghakhi Bandai hills. The slopes were mostly gentle and varied between 0-35°. The soils in this association were mostly loam type, having 46.3±8.5% sand, 45.88±8.1% silt and 7.85±3.05% clay (Table 2.5). Soil moisture was 36±3.3% and pH was slightly acidic (5.61±0.51). The soils contained 7.3±1.53% $CaCO_3$, 2.23±0.94% organic matter, 0.11±0.05% nitrogen, 2.92±1.1ppm phosphorus and 152±67.5ppm potassium. Total vegetation cover was recorded as 67±8.2 %. Herb layer covered 45.6±9.7%, shrub layer covered 35±12.6% while tree layer covered 32.5±16.22% of the sampled area (Table 2.5). Species richness was ranged 12 to 33(18.9±5.2), Shannon-Wiener index was 2.47±0.4, Simpson index was 0.87±0.07 and evenness index was 0.85±0.08 (Table 2.6).

The association is an assemblage of 187 species and was named after the leading diagnostic, constant and dominant species such as *Pinus wallichian, Quercus incana* and *Berberis lycium* (Table 2.4). Diagnostic species were *Pinus wallichiana* (36.2), *Quercus incana* (37.0), *Galinsoga parviflora* (34.4), *Juglans regia* (33.4), *Quercus dilatata* (32.2), *Spiraea bella* (46.7), *Jasminum officinale* (30.1), *Wikstroemia canescens* (30.1), *Sarcococca saligna* (39.6), *Achyranthes bidentata* (34.4), *Cirsium arvense* (31.0), *Impatiens bicolor* (35.7) and *Rottboellia exaltata* (34.6)**.**

The constant species were *Pinus wallichiana* (88), *Quercus incana* (50), *Berberis lycium* (58), *Quercus dilatata* (50), *Sarcococca saligna* (50).*Indigofera heterantha* var. *gerardiana* (42), *Isodon rugosus* (33) and *Spiraea bella* (33).

Within the association, dominant species were *Pinus wallichiana* (33), *Quercus incana* (4), *Berberis lycium* (17), *Sarcococca saligna* (40), *Thymus linearis* (17), *Quercus dilatata* (8), *Indigofera heterantha* var. *gerardiana* (8), *Isodon rugosus* (4), *Apluda mutica* (4), *Impatiens bicolor* (4) and *Pennisetum flaccidum* (4).

4. Pinus-Indigofera (PI) blue pine forest association:

This association was formed based on the species and environmental data from 54 relevés. This community was located at higher elevations between 1893-2608m, forming a belt of vegetation type below the Abies-Picea-Viburnum association. It occurred in Nemakai-Shabeka, Drad-Taran, Sar Tooro Ghar, Banr Kandaw, Manrai Banr, Chor-Penawrai, Tall-Dardyal hills, Mian Beeley Banr, Maha Banr, Manjey Kandaw and Qalagai hills. It occupied an area between 34.80-34.99°N latitude and 72.13-72.29°E longitude. Slope angles were steeper and varied between 15-45°. Soils in this association were sandy loam type with 51.5±8.5% sand, 42.4±9.3% silt and 6.0±3.1% clay (Table 2.5). Mean moisture content of the soil was 35.4±2.6%. The soils were mostly with slight acidic nature with pH between 5.2-7 (6.05±0.44). The soils contained 7.1±1.5% $CaCO_3$, 2.9±1.5% organic matter, 0.14±0.08% nitrogen, 3.16±1.9ppm phosphorus and 154±58.5ppm potassium (Table 2.5).

Total vegetation cover in relevé varied between 50-85% (70±8.1). Herb and tree layers covered mean areas of 46.9±8.4 and 44.9±15.9% while shrub layer covered the least area (29.4±9.4%). Total species recorded in this association were 239. Species richness is compiled in the Table 2.6 that revealed that it was varied between 6-28 (18.7±4.4) in which Shannon-Wiener index was varied between 1.41-2.93 (2.31±0.4), Simpson index varied

between 0.67-0.93 (0.84±0.07) and evenness index varied between 0.58-0.92 (0.8±0.09). The association was named after the two species having highest fidelity and frequency values i.e *Pinus wallichiana* and *Indigofera heterantha* var. *gerardiana.*

Diagnostic species of this association were *Pinus wallichiana* (66.0), *Indigofera heterantha* var. *gerardiana* (40.8), *Adiantum venustum* (44.5), *Prunus cornuta* (43.3), *Cedrus deodara* (39.3), *Pteridium aquilinum* (39.6) *Maytenus wallichiana* (32.9), *Paeonia emodi* (30.5), *Rosa brunonii* (36.5), *Valeriana jatamansi* (36.5) *Fragaria nubicola* (32.3), *Galium asperuloides* (32.3) *Aesculus indica* (30.5), and *Onychium contiguum* (30.2) as shown in Table 2.4.

Constant species having frequencies between threshold level were *Pinus wallichiana* (96), *Indigofera heterantha* var. *gerardiana* (72), *Quercus dilatata* (31), *Viburnum gr*and*iflorum* (35), *Adiantum venustum* (35) and *Pteridium aquilinum* (31).

Dominant species with their frequencies falling in the threshold level were *Pinus wallichiana* (74), *Indigofera heterantha* var. *gerardiana* (13),*Cedrus deodara* (7), *Picea smithiana* (9), *Viburnum gr*and*iflorum* (6), *Pteridium aquilinum* (24) and *Thymus linearis* (9). This association is unique in having *Cedrus deodara* (a representative of dry temperate zone) as one of the diagnostic and dominant species (Tabel 2.4).

5. Celtis-Olea-Cynodon (COC) sacred groves broad leaved forest association:

This association represents the remnant natural vegetation of the so called low lying plain areas between an altitudinal range of 833-1510m mostly confined to Muslim graveyards, some drier stream sides and protected areas. Almost every village has one or more graveyards. The local people give sanctity and honour to shrines and graveyards and avoid using the plants in these sacred areas for their immediate needs of fuel, timber, fodder and medicinal plants, therefore the natural vegetation has been left almost safe. The

vegetation is stratified with clear tree, shrub and herb layers. Large Muslim graveyards in Kabal valley are Mian Baba in Kanju, Sre Shah Banr in Dada Hara, Mailangar Baba in Sharifabad, Shahzadgano Baba in Dagai, Akhun Baba in Akhun Kalay, Ziaray Baba and Joga Baba in Sirsinai, Qazi Baba, Hazrat Matori Baba and Gor Banr Baba in Galoch, Nazakai Baba in Nasrat, Hafizano Baba and Pacha Gul Baba in Deolai and Bodagai Baba in Bala Samai villages. The soils in this association are loam type and almost neutral in majority of sampling points with pH ranging between 6.1-8 (7.2±0.4). The soils contained 32.2±4.63% moisture, 7.4±4.6% $CaCO_3$, 2.1±0.9% organic matter and 0.11±0.05% nitrogen. Phosphorus and potassium content of the soils were highest in this association which were 14.8±11.3ppm and 330.7±173.4ppm respectively (Table 2.5).

The mean total vegetation cover was 78.7±14.2% in which mean herb layer was 56.6±13.1% and mean shrub layer was 28.0±18.1% (Table 2.5). Mean tree layer cover in this association was highest (49.0±33.5%) as compared to all other associations (Table 2.5). Similarly, species richness was also highest in this association which ranged between 11-47 (24.6±8.4). Shannon-Wiener index of diversity was 2.51±0.36, Simpson index was 0.85±0.07 and evenness index was 0.8±0.09 (Table 2.6).

Comprising of 58 relevé, this association contained the highest number of species i.e. 288. The association was named after the three species having highest fidelity, frequency and cover values (Table 2.4). Diagnostic species were *Celtis eriocarpa* (68.3), *Olea ferruginea* (53.4), *Cynodon dactylon* (64.9), *Vitex negundo* (65.5), *Achyranthes aspera* (54.5), *Bosea amherstiana* (51.8), *Dicliptera bupleuroides* (51.2), *Cyperus rotundus* (43.7), *Ailanthus altissima* (35.5), *Celtis caucasica* (35.6), *Melia azedarach* (41.2), *Daphne mucronata* (38.9), *Justicia adhatoda* (46.4), *Artemisia scoparia* (45.0), *Alliaria petiolata* (43.7), *Cannabis sativa* (37.4), *Ceterach dalhousiae* (35.6), *Chenopodium album* (37.5), *Chenopodium ambrosioides* (33.3), *Geranium rotundifolium* (35.6), *Lepidium apetalum* (37.6), *Malvastrum*

coromendelianum (45.4), *Medicago polymorpha* (39.4), *Narcissus tazetta* (43.7), *Oxalis corniculata* (45.9), *Pelargonium zonale* (41.9), *Piptatherum gracile* (38.1), *Poa annua* (36.1), *Scilla griffithii* (35.5), *Setaria viridis* (41.9), *Solanum nigrum* (39.4), *Stellaria media* (35.2), *Tulipa clusiana* (39.5) and *Verbena officinalis* (35.6).

Frequency percentage is compiled in Table 2.4 that exhibits that constant species having frequencies in the threshold level were *Celtis eriocarpa* (52), *Olea ferruginea* (69), *Cynodon dactylon* (71), *Bosea amherstiana* (31), *Cotoneaster racemiflorus* (36), *Daphne mucronata* (36), *Maytenus royleanus* (36), *Vitex negundo* (50), *Artemisia scoparia* (33), *Achyranthes aspera* (36), *Dicliptera bupleuroides* (38) and *Oxalis corniculata* (38). The dominant species in the association included *Celtis eriocarpa* (17), *Olea ferruginea* (59), *Cynodon dactylon* (10), *Acacia modesta* (10), *Bosea amherstiana* (10), *Justicia adhatoda* (14) and *Pinus roxburghii* (7).

This association is unique in the sense that some plants such as *Celtis eriocarpa*, *Bosea amherstiana*, *Narcissus tazetta*, *Malvastrum coromandelianum*, *Alliaria petiolata* and *Piptatherum gracile* are confined only to this community type and not found in any other association (Table 2.4).

6. Diosperos-Pinus-Quercus (DPQ) mid hill degraded forest association:

This association is based on 9 relevé located in a narrow belt in the valley, between 34.87-34.97°N latitudes and 72.15-72.21°E longitude and distributed in mid hill elevations between 1564-1780m. The association is represented in Qalagai hills, Shah Dheri hills, Tall-Dardyal hills and Manrai hills. The slopes were gentle with inclination ranging between 0-30°. The soils were silt loam containing 32.8±1.09% moisture (Table 2.5). The pH of the soils was of slightly acidic nature, ranging between 5.3-6 (5.5±0.21). $CaCO_3$ content was

6.03±0.67%, organic matter was 4.24±0.85%, nitrogen was 0.22±0.05%, phosphorus was 4.3±2.9ppm and potassium was 224±26.1ppm (Table 2.5).

The mean total vegetation cover was 68.95.5% in which tree layer covered 47.2±5.1%, shrub layer 32.8±8.3% and herb layer 44.4±12.4% area of the sampled plots (Table 2.5). Total species encountered in this association were 99. Species richness varied between 15-29 (19.4±4.8). Shannon-Wiener index was 2.53±0.23, Simpson index was 0.88±0.04 and evenness index was calculated as 0.86±0.06 (Table 2.6).

The association was named after three plant species *Diospyros lotus, Pinus roxburghii* and *Quercus dilatata* having highest fidelity, frequency and cover values (Table 2.4). The diagnostic species were *Diospyros lotus* (65.9), *Fallopia dumetorum* (46.6), *Ficus sarmentosa* (43.6), *Rhus punjabensis* (32.9), *Andrachne cordifolia* (46.4), *Girardinia palmata* (49.1), *Astragalus graveolens* (39.4), *Ophiopogon intermedius* (32.9) and *Pteris cretica* (32.1).

Based on frequency percentage (Table 2.4), *Diospyros lotus* was the most constant species with 100% frequency, followed by *Pinus roxburghii, Quercus dilatata, Andrachne cordifolia, Rumex hastatus* (56% each), *Ficus palmata* (44%), *Ficus sarmentosa, Olea ferruginea, Berberis lycium, Cotoneaster racemiflorus, Jasminum officinale, Rubus fruticosus, Zanthoxylum armatum, Girardinia palmata, Astragalus graveolens, Pennisetum orientale* and *Pilea umbrosa* (33% each).

The dominant species within association were *Diospyros lotus* (11), *Pinus roxburghii* (11), *Quercus dilatata* (33) *Isodon rugosus* (11), *Impatiens edgeworthii* (11) and *Rumex hastatus* (11) as shown in Table 2.4. Furthermore, *Girardinia palmata, Fallopia dumetorum, Rhus punjabensis* and *Ophiopogon intermedius* are only found in this association.

7. Dodonaea-Isodon-Berberis (DIB) xeromorphic scrub association:

This association was found on the drier foothills between altitudinal ranges of 862-1874m and was based on 50 relevés. Most of the relevés in this association had south, south-eastern or south western aspects. There were gentle slopes with angles ranging from 10-30. The association occupied mid-southern zone of the valley between 34.73-34.88°N latitudes and 72.15-72.33°E longitudes. The association was spread over the localities like Aligrama Hills, Girbanr hills, Mahak-Naranjpura hills, Gampura hills, Sar Khazano hills, Tangai Awara-Ashari hills, Tootani Bandai hills, Teeghak hills, Docut hills and Landay Ghar hills.

The soils in this association were sandy loam in nature with relatively higher percentage of sand (76.7±11.3%) than the rest of associations (Table 2.5). The silt and clay percentages were 14.9±9.1 and 8.4±5.4 respectively. Soils were slightly alkaline with a pH 7.27±0.21 and driest in this association with 20.7±3.0% moisture. Soils contained 6.0±1.6% $CaCO_3$, 1.9±0.8% organic matter, 0.14±.15% nitrogen, 2.9±1.5ppm phosphorus and 112.8±17.5ppm potassium. Amount of organic matter and nitrogen were lowest in this association (Table 2.5).

Mean vegetation cover in this association was the lowest (57.7±12.0). Tree layer covered 14.8±18.8% area, shrub layer covered 27.1±12.4% area and herb layer covered 37.4±10.2% area (Table 2.5). Total number of species was 201. Species richness in the 50 relevé varied between 6-21 and the mean is lowest (13.8±3.6) among all associations. The value of Shannon-Wiener diversity index was also lowest and measured to 2.09±0.38. Simpson diversity index was 0.8±0.1 and evenness index was also0.8±0.1 (Table 2.6).

Leading species in this association were *Dodonaea viscosa*, *Isodon rugosus* and *Berberis lycium* (Table 2.4). Diagnostic species of the association were *Dodonaea viscosa* (66.7), *Otostegia limbata* (48.7), *Periploca aphylla* (59.6), *Aristida adscensionis* (52.8), *Chrysopogon serrulatus* (30.1), *Teucrium stocksianum* (34.5) and *Trichodesma indicum* (39.0).

The constant species were *Dodonaea viscosa* (72), *Isodon rugosus* (58), *Berberis lycium* (44), *Otostegia limbata* (40), *Periploca aphylla* (44) and *Aristida adscensionis* (38). While, the dominant species were *Dodonaea viscosa* (48), *Isodon rugosus* (4), *Acacia modesta* (6), *Pinus roxburghii* (20), and *Heteropogon contortus* (4).

Since, this association is located in drier and sandy soil with south facing slope having xeric conditions; most of the species were xerophytic nature that includes *Dodonaea viscosa, Berberis lycium, Acacia modesta, Periploca aphylla, Otostegia limbata, Teucrium stocksianum, Trichodesma indicum* and *Aristida adscensionis* (Table 2.4). The association was dominated by shrubs with sporadic trees.

8. Pinus-Quercus-Galium (PQG) protected chir pine forest association:

This association is representing the remnant sub-tropical chir-pine forest type and is based on 11 relevés. This was confined to limited sites in the area and was protected from excessive human intervention by the owner landlords of the area. The association was represented in Jabagai, Nemakai-Shabeka hills, Gampora hills, Shah Dheri hills and Docut hills. It occupied mid-hill elevations between 1223-1876 and a segment of area between 34.80-34.92° N latitude and 72.18-72.28° E longitude. The slope inclination varied between 15-30° (Table 2.5).

The soils in this association were of sandy loam type having almost neutral pH (7.05±0.2) and a low fraction (23.8±2.8%) of moisture. CaCO3 content was 7.2±2.39%, organic matter was 2.14±0.6%, nitrogen was 0.11±0.03%, phosphorus was 2.7±1.1 and potassium was 81.4±27.0 (Table 2.5).

The total vegetation cover was measured as 69.0±10.2% in which tree layer was 40.9±20.3%, shrub layer was 29.1±8.0% and herb layer was 40.0±8.7% as shown in Table 2.5. Bare rocks covered least area in this association (3.2±2.5%).

A total of 117 species were recorded in this association. Species richness was varied between 6-27 with a mean value of 18.2±5.9 (Table 2.6). Shannon-Wiener index of diversity was varied from 1.13 to 2.94 (2.35±0.61), Simpson index varied between 0.55-0.93 (0.83±0.1) while evenness index varied between 0.57-0.91 (0.82±0.1).

The leading species having highest fidelity, frequency and cover were *Pinus roxburghii, Quercus incana* and *Galium aparine.* The diagnostic species of this association were *Pinus roxburghii* (36.8), *Quercus incana* (38.7), *Galium aparine* (36.5), *Reinwardtia indica* (33.7), *Valerianella szovitsiana* (33.7) and *Viola canescens* (35.0).

Constant species in this association were *Pinus roxburghii* (91), *Quercus incana* (73),*Galium aparine* (55), *Cotoneaster racemiflorus, Rubus fruticosus, Viola canescens* (45 each), *Berberis lycium,Myrsine africana, Sageretia thea,Origanum vulgare, Stellaria media* and *Taraxacum officinale* (36 each). With respect to cover percentage, overall, three species were dominant in this association such as *Pinus roxburghii* (45), *Quercus incana* (27) and *Diospyros lotus* (9).

9. Isodon-Berberis-Indigofera (IBI) montane scrub association:

This association was found at slightly higher elevations in the hilly areas between 1227-2210m. It occupied a wider latitudinal and longitudinal range within the valley. The relevé representing this association were located between 34.80-34.92°N latitudes and 72.16-72.33°E longitudes. The 42 relevé of this association were distributed in Nelawai Baba Sar, Mohammad Baig hills, Batakay hills, parts of Tangai Awara-Ashari hills, parts of Docut hills and Teeghak hills. The slopes were steeper and reached up to 40°. The soils of this association were sandy loam having an almost neutral pH (i.e. 6.8±0.43) with dried conditions (23.1±4.3% moisture). Based on soil chemical composition, there was 6.9±1.9%

CaCO3, 2.4±0.7% organic matter, 0.12±0.03% nitrogen, 3.7±2.9ppm phosphorus and 122.8±47.3ppm potassium (Table 2.5).

A total vegetation cover of the association was 64.5±12.6% in which tree layer covered 23.6±25.9% area, shrub layer covered 35.2±12.4% area and herb layer covered 42.3±9.3% area (Table 2.5). Number of species recorded in this association was 223. Species richness ranged between 7-24 (16.2±4.3). Shannon-Wiener index was 2.23±0.4, Simpson index was 0.82±0.1 and evenness index was 0.81±0.1 (Table 2.6).

The association was named after *Isodon rugosus, Berberis lycium* and *Indigofera heterantha* var.*gerardiana* based on the highest fidelity, frequency and coverage (Table 2.4). The diagnostic species of this association were *Isodon rugosus* (46.7), *Berberis lycium* (32.3), *Cymbopogon martini (43.5), Polygala abyssinica* (35.2) and *Sageretia thea* (31.3).

The constant species were *Isodon rugosus* (81), *Berberis lycium* (67), *Indigofera heterantha* var. *gerardiana* (57), *Sageretia thea* (31) and *Origanum vulgare* (33) with reference to frequency percetage (Table 2.4). Cover perentage depicted that dominant species of the association were *Isodon rugosus* (36), *Berberis lycium* (17), *Indigofera heterantha* var. *gerardiana* (10), *Olea ferruginea* (5), *Pinus roxburghii* (14), *Pinus wallichiana* (5), *Quercus incana* (7) and *Rumex hastatus* (7). The dominant plant group in this association is shrub. Though in physiognomy this assosiation resembles Dodonaea-Isodon-Berberis association but differ from the later in species composition.

2.4.2.2 Ordination:

Detrended Correspondence Analysis (DCA):

As shown in Table 2.7, the length of gradient along DCA axis-1 is longer with altitude, slope and latitude as the strongest factors along it. Along axis-2, moisture, pH and sand content are more important. Nasturtium-Paspalum-Veronica and Abies-Picea-Viburnum

associations are located far away on the ordination plot showing maximum dissimilarity between them. Dodonaea-Isodon-Berberis and Isodon-Berberis-Indigofera associations are located very closely because of maximum similarity between them.

The DCA triplot of diagnostic species, samples and environmental variables (Fig. 2.6) show that Nasturtium-Paspalum-Veronica association is strongly and positively correlated to pH gradient, longitude and moisture content along axis-2. Percentage content of clay also has a positive correlation with this association.

Table 2.7: Summery of Detrended Correspondence Analysis

Axes	1	2	3	4
Eigenvalues	0.872	0.439	0.391	0.307
Length of gradient	10.668	5.274	5.31	3.92
Species-environmental correlations	0.941	0.644	0.498	0.462
Cumulative percentage variance:				
Of species data	2.8	4.2	5.4	6.4
Of species-environmental relations	19.8	24.8	0	0
Sum of all Eigenvalues	31.309			

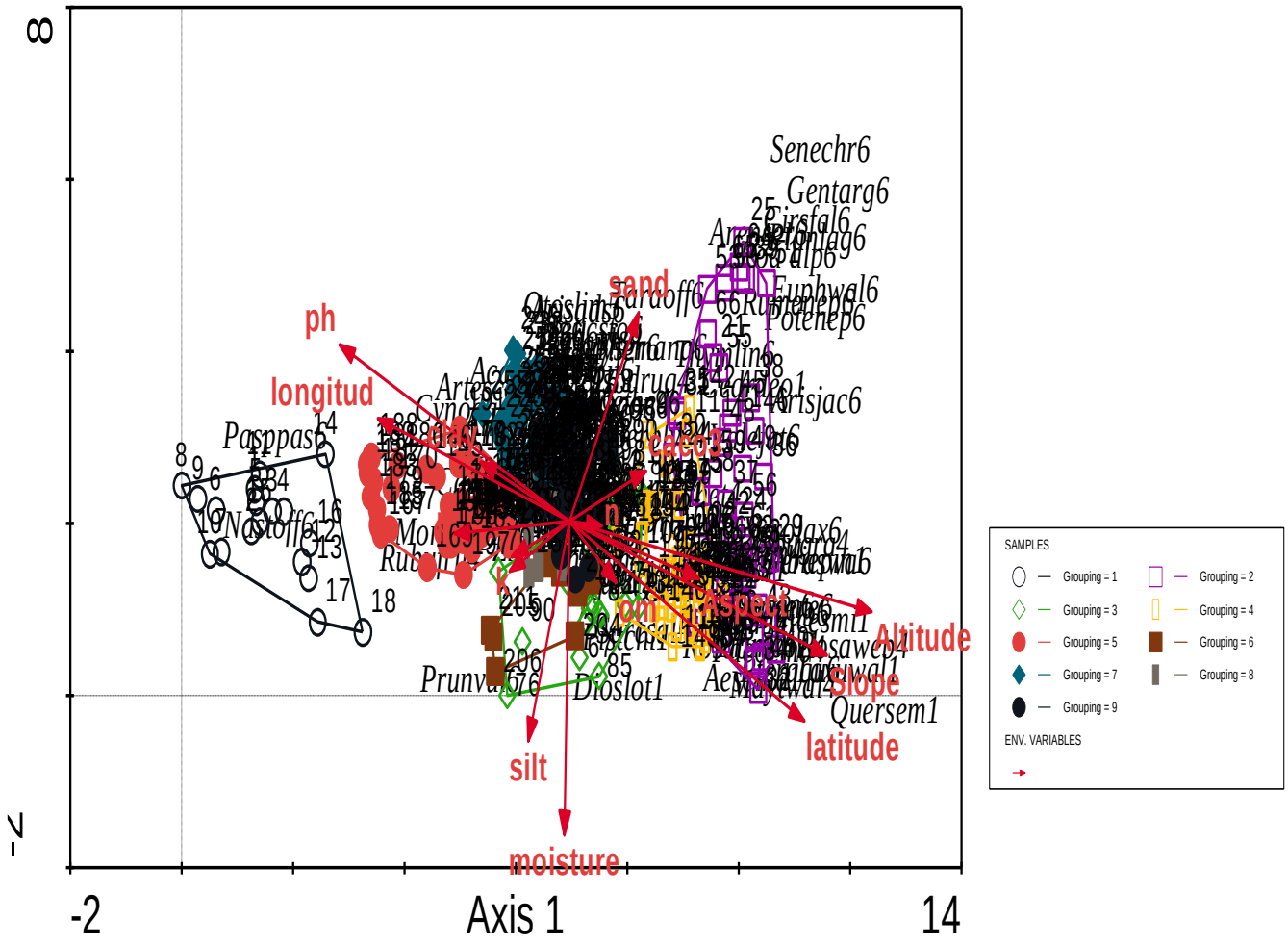

Fig. 2.6: DCA joint triplot of releves, species and environmental variables.

Along axis-2, sand content of soil was a strongest factor showing positive correlation with Abies-Picea-Viburnum association, Dodonaea-Isodon-Berberis association and Isodon-Berberis-Indigofera association, while the same was negative correlated with Pinus-Quercus-Berberis and Diosperos-Pinus-Quercus associations.

Altitude, slope and latitude are the strongest factors along axis-1, showing positive correlations with Abies-Picea-Viburnum and Pinus-Indigofera associations and negative correlation with Nasturtium-Paspalum-Veronica and Celtis-Olea-Cynodon associations.

Nitrogen content and potassium are almost uniform throughout the study area and have a negligible effect on the distribution pattern of vegetation in the area.

2.4.2.3 BIOLOGICAL SPECTRUM (LIFE FORMS):

The biological spectrum based on life form classes (Table 2.4) is given in Fig. 2.7. The detail is as follows:

1. Nasturtium-Paspalum-Veronica (NPV) wetland association:

This association is dominated by therophytes with 53.27% flora, followed by hydrophytes (20.56%), hemicryptophytes (13.08%), macrophanerophytes (6.54%), nanophnerophytes (3.74%), while geophytes were 2.8% (Fig. 2.7).

2. Abies-Picea-Viburnum (APV) coniferous forest association:

In this association, therophtes and hemicryptiphytes were dominant life forms and shared almost equal number of species with 33.86 and 30.16% flora respectively thus thus the association may be named as thero-hemicryptophytic (Fig. 2.7). It was followed by Geophytes (14.81%), nanophanerophytes (10.58%), macrophanerophytes (5.29%), chamaephytes (4.23%), whereas, lians and hydrophytes were nominal (0.53% each).

3. Pinus-Quercus-Berberis (PQB) mixed forest association:

Out of the total 187 species of this association, there were 31.55% therophytes and 30.48% hemicryptophytes thus the association is again of thero-hemicryptophytic type. Nanophanerophytes were14.44%, chamaephytes and geophytes each were 6.95%, macrophanerophytes were 6.42 and lianas were 3.21%.

4. Pinus-Indigofera (PI) blue pine forest association:

This association was hemicrypto-therophytic type, with hemicryptophytes and therophytes as the dominant life forms having 31.80 and 28.87% share respectively. Geophytes were third in order having 14.23% share. There were 12.97% nanophanerophytes, 5.86% macrophanerophytes, 4.60% chamaephytes and 1.67% lianas in this association.

5. Celtis-Olea-Cynodon (COC) sacred groves broad leaved forest association:

With 56.25% share of therophytes this association was therophytic in nature. Other life form classes in decreasing order of percentage share were hemicryptophytes (17.36%), nanophanerophytes (7.64%), geophytes (6.60%), macrophanerophytes and chamaephytes (5.90% each) and lianas (0.35%).

6. Diosperos-Pinus-Quercus (DPQ) mid hill degraded forest association:

This association was dominated by hemicryptophytes and therophytes with 27.27% and 25.25% share respectively. Among the other life forms nanophanerophytes were 17.17%, macrophanerophytes were 13.13%, chamaephytes were 10.10%, geophytes were 4.04% and lianas were 3.03%. The association was hemicrypto-therophytic.

7. Dodonaea-Isodon-Berberis (DIB) xeromorphic scrub association:

In this association therophytes were dominant with 40.30% share. Second in order of dominance were hemicryptophytes with 22.39% share. Nanophanerophytes were 14.93%,

chamaephytes were 8.96%, macrophanerophytes were 6.47%, geophytes were 5.97% and lianas were 1%. The association was thero-hemicryptophytic.

8. Pinus-Quercus-Galium (PQG) protected chir pine forest association:

Therophytes and hemicryptophytes were the dominant life forms in this association with 31.62% and 27.35% share respectively. Third in order were nanophanerophytes with 17.95% share. In this association macrophanerophytes were 10.26%, chamaephytes were 5.98% while lianas and geophytes both were 3.42% each.

9. Isodon-Berberis-Indigofera (IBI) montane scrub association:

Therophytes was a dominant life form group in this association too with 34.08% share followed by hemicryptophytes with 26.91% share. Other groups with decreasing order of dominance were nanophanerophytes (13.90%), macrophanerophytes and chamaephytes (8.97% each), geophytes (5.38%) and lianas (1.79%). This association is also a thero-hemicryptophytic.

The overall vegetation of Kabal valley is dominated by Therophytes with 43.94% contribution followed by Hemicryptophytes with 21.31% contribution. Among the other life from classes 8.91% were Nanophanerophytes, 8.47% were Geophytes, 6.57% were Macrophanerophytes, 5.55% Chamaephytes, 3.36% were Hydrophytes and 1.90% were lianas. As a whole the vegetation may be designated as Thero-hemicryptophytic.

The predominance of Therophytes and Hemicryptophytes indicate the harshness and longevity of winter season. Only the conifers and sclerophyllous ever green species remain active during the long winters.

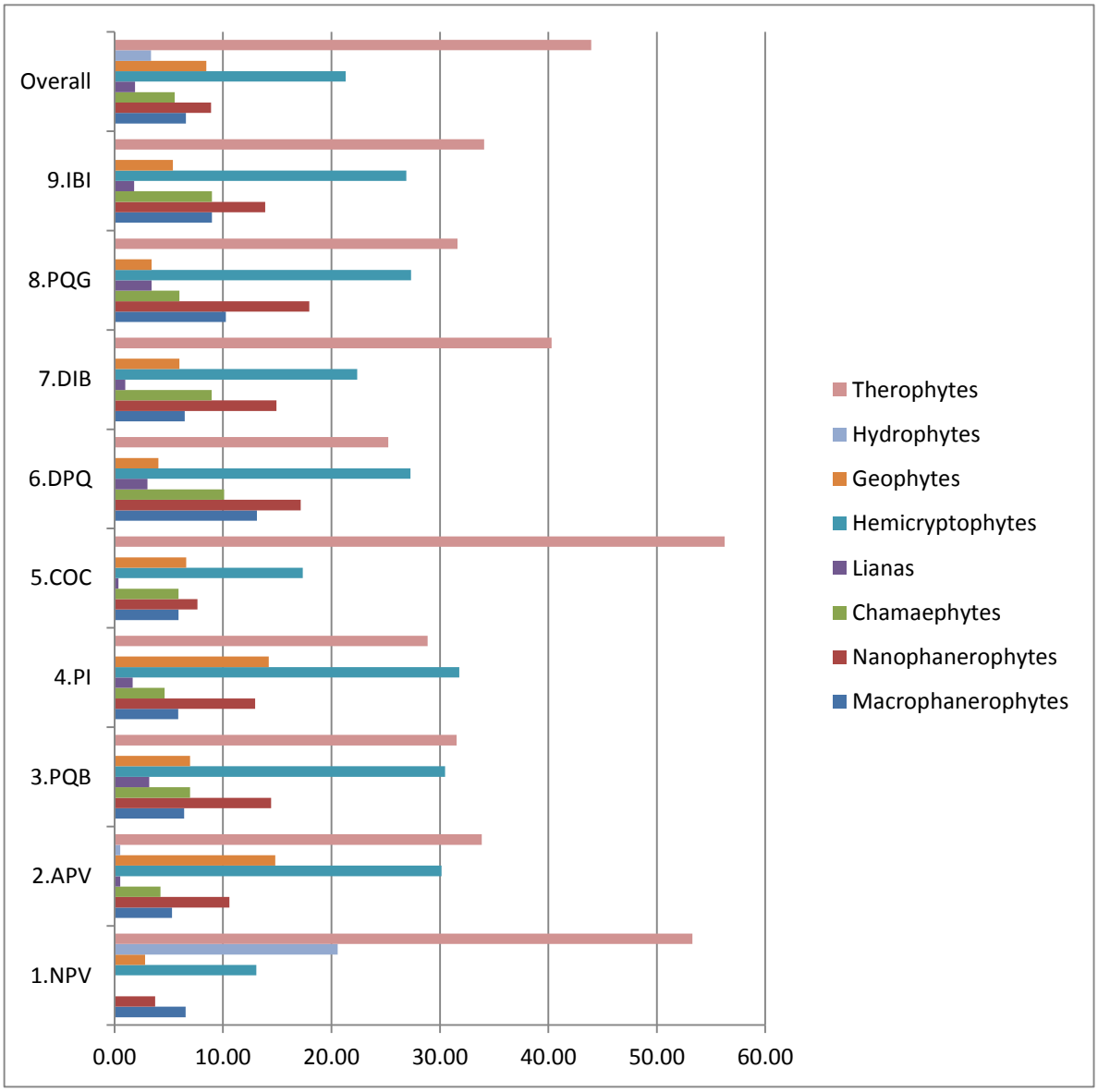

Fig. 2.7: Biological spectrum (Life form) of the vegetation of Kabal valley.

2.4.2.4 LEAF SPECTRA

The leaf spectra based on leaf size classes area given in Table 2.4 and their summary is shown in graphical form in Fig. 2.8.

1. Nasturtium-Paspalum-Veronica (NPV) wetland association:

Nanophyll leaf size class was dominant in this association with 35.51% share followed by Microphylls with 28.97% share. The association was thus Nano-microphyllous with this regard. Among other leaf size classes, Leptophylls were 19.63%, Mesophylls were 13.08% and Macrophylls were 2.80%.

2. Abies-Picea-Viburnum (APV) coniferous forest association:

In this association Nanophylls were 33.86% and Microphylls were 30.69%, therefore designated as Nano-microphyllous. Leptophylls and Mesophylls were 20.63% and 14.81% respectively. There were no macrophylls in this association.

3. Pinus-Quercus-Berberis (PQB) mixed forest association:

Out of the total 187 species of this association, more than two third were Nanophylls and Microphylls. They contributed 35.83% and 30.48% share in the association. Percentage share of other leaf size classes were 19.79% Leptophylls and 13.90% Mesophylls. Like the two previous associations, this was also Nano-microphyllous.

4. Pinus-Indigofera (PI) blue pine forest association:

This association was again Nano-microphyllous type. Nanophylls wer 35.56% and Microphylls were 28.87%. Leptophylls contributed 22.18% share and Mesophylls contributed 13.39%.

5. Celtis-Olea-Cynodon (COC) sacred groves broad leaved forest association:

With 37.15% share of Nanophylls and 28.13% of Microphylls this association was Nano-microphyllous in nature. Other leaf size classes were Leptophylls (22.57%), Mesophylls (11.81%) andMacrophylls (0.35%).

6. Diosperos-Pinus-Quercus (DPQ) mid hill degraded forest association:

In this association Microphylls were slightly higher in percentage than Nanophylls. Microphylls were 35.35% and Nanophylls were 34.34%. The association was called as Micro-naanophyllous. Leptophylls were 16.16% and Mesophylls were 14.14%.

7. Dodonaea-Isodon-Berberis (DIB) xeromorphic scrub association:

Leptophylls with 36.32% contribution were the dominant leaf size class in this association followed by Nanophylls with 32.84% share. The association was thus Lepto-nanophyllous. Microphylls and Mesophylls had a 22.89% and 7.96% share, respectively in this association.

8. Pinus-Quercus-Galium (PQG) protected chir pine forest association:

Nanophylls had a highest percentage share of 39.32% in this association. Microphylls and Leptophylls had a contribution of 27.35% and 25.64% respectively. Therefore the association was called Nano-micro-leptophyllous. Mesophylls constituted only 7.69% of the flora in this association.

9. Isodon-Berberis-Indigofera (IBI) montane scrub association:

Nanophylls were again dominating this association with 36.77% share. Leptophylls were 28.70% and Microphylls were 25.11%. Mesophylls were 9.42%. The association was designated as Nano-lepto-microphyllous.

The overall vegetation of the area is of Nano-micro-leptophyllous type dominated by Nanophylls (33.72%), Microphylls (28.32%) andLeptophylls (24.53%). Mesophylls ranked fourth position with 12.85% share while Macrophylls were least in the area with just 0.58% share (Table 4.13). Megaphylls are not represented in the area. The predominance of Nanophylls, Microphylls and Leptophyllsclearly show that small leaf size classes are prevalent in the area which indicates harsh environmental and climatic conditions of the area, in terms of long winters and low precipitation.

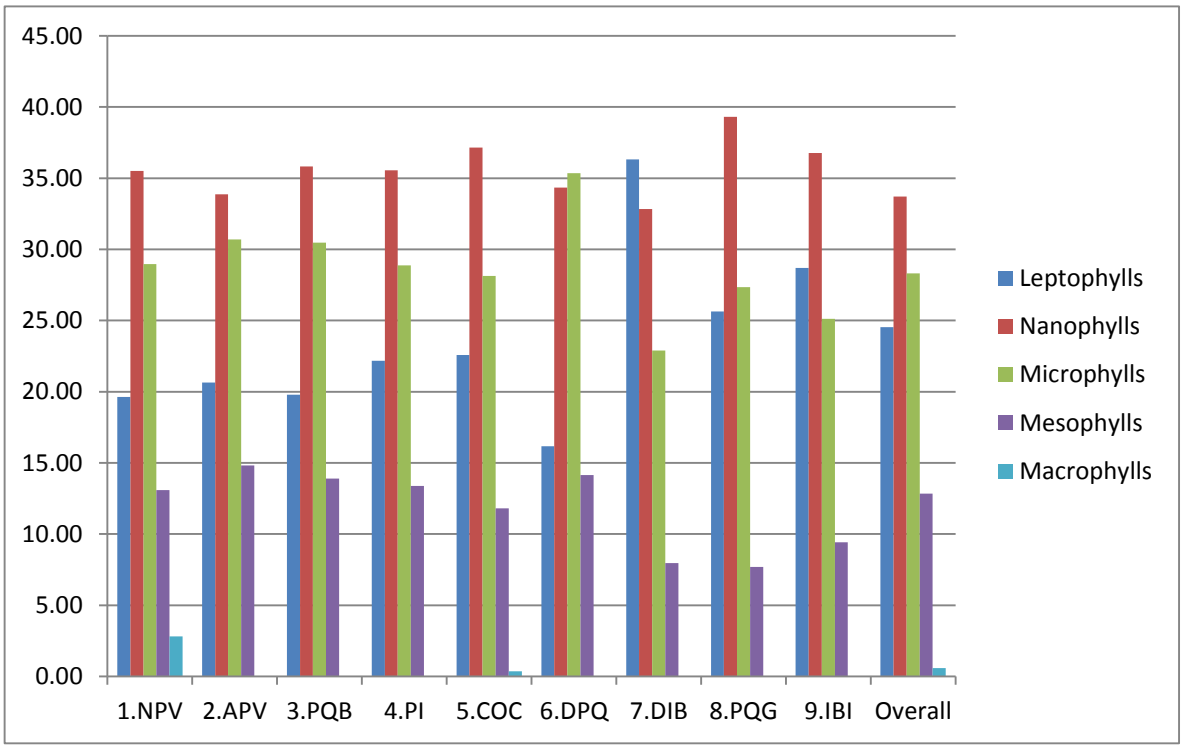

Fig. 2.8: Leaf spectra of the flora of Kabal valley, Swat.

2.5 DISCUSSION

Floristically Kabal valley is very rich in plant diversity with about 820 species so far recorded (Table 2.1). The number of vascular plant species recorded in the present study is higher than other areas of comparable size (Table 2.2). The total area of Tehsil Kabal is 40026hectares (Anon., 1999) which constitute 0.05% of thetotal area of Pakistan (79.61 mill. Hec.), but the presentlist has 820 species which constitute 14.2% of the total 5783 species as reported by Stewart (1972). The area of tehsil Kabal is 7.5% of the total Swat district (533700hec.) but the number of species is 53.2% of the total reported for the Swat state by Stewart (1967).

Many plants in the present list are new reports for Pakistan and district Swat (Table 2.3), which may be an interest model for future studies dealing with ecological, morphological, physiological, and reproductive aspects. Study of floristic composition of vegetation is crucial for conservation management by providing habitats for wildlife and contributing to the ecologically sustainable management of natural resources (Ahmad and Ehsan, 2012). A checklist of the flora provides the starting point for any extensive study in botanical terms. The present list could be an easy source of material to ethnopharmacobotanical studies, since several of the recorded species have medicinal uses in tehsil Kabal (Ahmad *et al.,* 2011). Additional research should be conducted to evaluate the intrinsic ecologicalvalues of the local flora and to incorporate characteristics of species composition with ecological functions (Zhao *et al.,* 2010). This will provide a baseline for planning proper conservation measures to safeguard the phytodiversity in face of the ever growing biotic stress.

The vegetation, climate and soil are related to each other. The variation in any one of these components may cause a change in the associated other component. The existence and establishment of a plant association reflects the plant type and habitat condition under which

they develop (Malik, 1986). The climate and vegetation of Kabal valley as a whole is of sub-tropical and temperate type (Champion *et al.,* 1965, Beg, 1975) but due to the marked differences in physiographic,edaphic and local climatic conditions in different slopes at different elevations, they support different plant formations (Ahmad, 1986). Our present work delineated nine associations with different floristic elements and micro-environmental conditions (Table 2.4). A formal syntaxonomical classification regarding the vegetation of Kabal valley was not achievable because of incomplete sampling coverage of the study area, strong seasonal variations in the vegetation, particularly in relation to ephemeral species, low abundance of many of the species encountered, taxonomic problems and strong influence of high anthropogenic pressure. Due to these problems, some of the eurpean phytosociologists have evoided in assigning syntaxonomical hierary (Weber *et al.,* 2000) to the plant communities from Pakistan (Eberhardt *et al.*, 2007; Peer *et al.*, 2007).

The species diversity depicted by different diversity indices was higher in the area as compared with other areas (Ram *et al.,* 2004; Singh *et al.,* 2008; Pokhriyal *et al.,* 2009; Hashemi, 2010; Shaheen and Shinwari, 2012; Khan *et al.*, 2012a). Amongst the associations, Celtis-Olea-Cynodon sacred grove broad leaved forests had highest species richness (24.6±8.4) and Shannon-Wiener index (H'=2.51±0.36), while Dodonaea-Isodon-Berberis xeromorphic scrub had the lowest species richness (13.8±3.6) and H' (2.09±0.38). The reasons for this difference could be degree of anthropogenic intensity on the vegetation (Consiglio *et al.,* 2006; De Bello *et al.,* 2006; Khan *et al.,* 2010) and variation in environmental conditions of the two associations (Singh *et al.,* 2008; Hashemi,2010).

The spatial distribution and floristic composition of plant associations in the area seem to be determined by a complex of environmental factors including climate, topography, soil and biotic influence. These factors undergo changes of different degrees due to interactions among themselves andresult in micro-gradients (Hanson and Churchill, 1965;

Siefert *et al.*, 2012). Variations in the environmental gradients result in the formation of numerous habitats and vegetational groups. It is therefore imperative to correlate the vegetation composition and structure of the area with environmental variables for a proper understanding of mechanism of plant distribution in an area (Kent, 2012).

Due to major influence of climate on the distribution of plant species and vegetation types from continental to regional scale, it can be expected that climate change will alter plant distribution considerably, and could strongly influence the diversity of ecosystem and species i.e. the climate determines the large scale patterns in physiognomy and potential species distribution. Other factors such as soil characteristics are important as well but they influence plant distribution on smaller scale i.e. more local scale (Bakkenes *et al.*, 2002; Siefert *et al.*, 2012). Climate can be described by numerous climate variables. These variables should at least reflect summer and winter temperature and a measure for the available moisture which are regarded as the main controlling factors for plant distribution (Leeman and Cramer, 1991). Close correlation exist between plant distribution and the extremes of temperature, humidity and precipitation excess and deficit (Perring and Walters, 1962). The climate of Kabal valley is characterized by extremes of temperature and moderate rainfall, with more rain received in spring and monsoon seasons (Table 1.1). These conditions have resulted in the establishment of characteristic stratified forests in the area (Hussain and Ilahi, 1991; Hussain *et al.*, 1997; Ilyas *et al.*, 2012).

Topography is one of the main factors that play important role in structural characteristics of vegetation (Tamartash *et al.*, 2010). Different altitudes, aspects and slopes harbour different associations. North facing slopes are moist than South facing slopes and thus harbour thick vegetation with high species diversity than south facing slopes. Same results were obtained by Hussain *et al.* (1995), Hussain *et al.* (1997), Yohay and Ronen (1999), Tamartash *et al.* (2010) and Khan *et al.* (2012). When precipitation is received; slope,

smoothness of slope, position of slop, vegetation and soil interact to control the amount of runoff and water infiltration, which in turn affect plant growth and survival. Slope, aspect and steepness also affect solar radiation received and thus the temperature at and near the ground surface (Sukopp and Werner, 1983). Slope and exposure also influence amount and type of soil accumulated (Monsen *et al.*, 2004). Consequently topography affects the vegetation indirectly by modifying other factors of the environment. The drier, steeper, south facing slopes in the hilly areas contain heliophytes like *Pinus roxburghii, Cedrus deodara, Micromera biflora, Dodonaea viscosa, Periploca aphyla,*etc while the moist, less steep, northern slope have sciophytes like *Pteridium aquilinum, Viburnum grandiflorum, Prunus cornuta, Arisaema jacquimontii,* etc. Altitudinally *Pinus roxburghii, Morus alba, Ficus palmata, Rumex hastatus, Olea ferruginea* occupied lower elevations while *Pinus wallichiana, Pteridium aquilinum, Fragaria nubicola, Viburnum gr*and*iflorum etc* occurred on higher elevation. Some species like *Berberis lycium, Indigofera heterantha* var. *gerardiana, Tarraxicum officinale* etc due to their broad ecological amplitude occupied the area form bottom to top. Species like *Bergenia ciliata, Campanula tennuissima* and *Wulfenia amhestiana* were confined to steep slopes while *Plantago lagopus, Medicago lupulina, Salvia moocroftiana* and *Erodium cicutarium* preferred flat and gentle slopes. *Abies-Picea-Viburnum* association was strongly and positively correlated with slope and altitude (Fig. 2.6).

Soil is an important factor that play key role in plant selection through evolutionary change (Barbour *et al.,* 1980). There is close relationship between the vegetation of a particular area and its soil (Ali *et al.,* 2004) and on a smaller spatial scale edaphic factor is primarily responsible for the delineation of plant communities (Siefert *et al.,* 2012). The physical properties of soil are related to depth, texture, permeability to water and water holding capacity. Soil depth (Khan *et al.,* 2011) and texture (Noor and Khatoon, 2013) are

responsible for determination of vegetation types in Western Himalayas, Pakistan. Soil texture, especially sand content was responsible for establishing Dodonaea-Isodon-Berberis and Isodon-Berberis-Indigofera associations (Fig. 2.6). Chemical characteristics exert physiological stresses on plants through their effects on plant water relations, nutrient availability and uptake and toxicity effect and due to execs of certain chemical elements. Chemical characteristics can be used to determine soil suitability include pH, salinity and concentration of total and available essential plant nutrients in the soil. Optimum pH for nutrients availability is between 5 and 7.5 with greatest availability at about 6.5 (Monsen *et al.,* 2004). The soils of Kabal valley were coarse textured with highest percentage of sand followed by silt and least clay contents. The pH of soil varied from 4.9 to 8.3 (6.64±0.78). This range of soil pH is suitable for a variety of plant species (Monsen *et al.*, 2004). A gradual decrease in soil pH was noticed with increasing altitude. This trend was also noted by Naqinezhad *et al.* (2009) in Alborz Mountains, Northern Iran. The soil type of association on wetlands was slightly alkaline with highest pH (7.92±0.2) and thus supported a vegetation type that was totally different from other associations as shown in ordination plot (Fig. 2.6). Dominant plant species in this association were *Nasturtium officinale*, *Paspalum paspalodes, Veronica anagallis-aquatica, Populus ciliata* and *Salix tetrasperma* which possess adaptations to slightly alkaline soils. High pH and soil moisture were the main determinig factors for the establishment of this association (Manhas *et al.,* 2009). The rest of communities were established on slightly acidic soils. Slight differences in the available nutrients are positively correlated with variations in community structure (Slezak *et al.,* 2011; Noor and Khatoon, 2013).

Biological spectrum (Life form) exhibits a growth form that displays an obvious relationship to main environmental factors (Batalha and Martins, 2002) and is an important physiognomic attribute which has been widely used in vegetation studies (Qadir and Shetvy,

1986; Hussain *et al.*, 1997; Devi and Sharma, 2004; Thakur *et al.,* 2012). Life from is the characteristic vegetative appearance of the plant body and its longevity (Hussain, 1992). A community existing under a given set of climatic conditions can usually be characterisized by a certain frequency distribution of life form types among its members. This distribution is called biological spectrum (Hussain, 1989). Apart from indicating habitat conditions and community structure, it also helps indicating the biotic interactions (Ilyas *et al.,* 2013). The overall vegetation of Kabal valley was dominated by Therophytes, followed by Hemicryptophytes. Hemicryptophytes are the characteristics of temperate region with cold, humid climate (Cain and Carto, 1959; Batalha and Martins, 2002), while Therophytes are the characteristics of harsh climate like deserts (Shimwell, 1971). The prevalence of Therophytes as the dominant group also indicates that the environmental conditions and/or biotic influences are probably less suited to the phanerophytes. Though the climate is potentially favourable for phanerophytes but has been changed into Therophytic by intense biotic exploitation in the form of wood extraction, felling, deforestation, overgrazing and modification of forest in the form of terrace cultivation (Shehzad *et al.,* 1999; Devi and Sharma, 2004; Zahidullah, 2004; Ilyas *et al.,* 2013). Highest number of Therophytic and Hemicryptophytic flora indicates shorter life cycle and mode of perennation due to peculiar environmental conditions and biotic factors of the area (Agrawal *et al.,* 2004).

Leaf size is another important physiognomic attribute that influences many aspects of plant function like transpiration and photosynthesis and varies greatly in response to environmental gradients (Malhado *et al.,* 2009), thus has been widely used in vegetation studies (Cain and Castro; 1959; Shimwell, 1971; Qadir and Shetvy 1986; Hussain *et al.,* 1995; Sringeswara *et al.,* 2010; Ilyas *et al.,* 2013). Leaf size knowledge may help in understanding of the physiological processes of plants and plant communities (Oosting, 1956). The vegetation of Kabal valley is dominated by Nanophylls, Leptophylls and

Microphylls. According to Cain and Castro (1959) and Shimwell (1971), Nanophylls and Microphylls are the characteristics of temperate region and Kabal valley climatically fall within this zone. The same results were obtained for other temperate forests in Pakistan (Shehzad *et al.,* 1999; Zahidullah, 2004; Ilyas *et al.,* 2013). Like Malhado *et al.* (2009) and Sringeswara *et al.* (2010) a gradual decrease in leaf size was noted with increasing altitude.

2.6 CONCLUSION

The Kabal valley was not earlier botanically explored and it was felt worthwhile to record the flora of this area. The area possesses some interesting endemic and rare species which were not previously reported from Swat and Pakistan. Thus, this comprehensive study provides a useful starting point for further ecological and bioprospective research of the area under study. This fragile ecosystem is mostly deteriorated due to anthropogenic activities such as expansion of lands for cultivation and human settlement that resulted in environmental degradation and desertification. Such activities resulted in replacement of natural vegetation by perennial non palatable species. This study could be used as reference material for ethnopharmacobotanical studies, since several of the recorded species have medicinal uses (Ahmad *et al.,* 2011; Shaheen *et al.,* 2012; Ilyas *et al.,* 2013). Additional research should be conducted to evaluate the intrinsic ecological values of the local flora and characteristics of species composition with ecological functions (Zhao *et al.,* 2010) that will provide a baseline for planning and proper conservation measures to safeguard phytodiversity which is facing ever growing biotic stress. The findings of the study will be helpful to foresters, rangeland managers, medicinal plant growers and collectors, economic botanists, ecologists, physiologists, breeders and planners in their long term strategy to conserve the natural vegetation of the area and utilize it on a sustainable basis for improving the socioeconomic conditions of the inhabitants.

Chapter 3

ETHNOBOTANICAL ENUMERATION

3.1 INTRODUCTION

Human societies have always been dependent on natural vegetation for their basic needs. Ethnobotany (the term coined by John Harshberger, 1896) is the scientific discipline that studies the interaction between plants and the indigenous people. The scope of the subject has now expanded to cover all sorts of human relationship with plants. It is now encompassed how people interact with plants in a wide range of production systems (such as farming, forestry and animal husbandry), the use of plants for various product categories (such as food, fiber, medicine and energy) and the roles of plants in religious and spiritual cultures (Pei, 2013). Understanding the intricate human, plant relationship around the globe is a key for developing appropriate ways to conserve plants. Knowledge held by local societies has proved a foundation for the development of a very wide range of industrial plant based products, for example, foods, beverages, medicines, cosmetics and others (Pei, 2013). According to statistics supplied by Greenpeace, a quarter of the world's annual production of pharmaceutical products (valued at US $ 130 billion) is based on contributions from tropical plants (Hamilton and Hamilton, 2006).

In the recent times, especially over the last two decades, ethnobotany has become more analytical, quantitative, cross disciplinary and multi-institutional. It involves botany, anthropology, ecology, economics and linguistics. Ethnobotanists are now more involved in sustainable development, conservation, cultural affirmation and the intellectual property rights of local and indigenous people. The work of the 'People and Plants Initiative, a programme of UNESCO, WWF and the Royal Botanic Gardens, Kew (1992-2004) and active in the Himalayan region, east Africa and other parts of the world, has strongly supported the

argument that community participation and traditional knowledge are very important components in efforts to achieve conservation of biodiversity and sustainable use of natural resources (Hamilton and Hamilton, 2006; Pei, 2010; Bisong and Essien, 2010; Pei, 2013). Application of ethnobotanical knowledge can lead to a strengthening of cultural diversity and conservation, greater sustainability in the exploitation of plant resources and the development of new plant products.

The treasure of knowledge about plants, as traditionally held by indigenous rural communities, is being rapidly eroded. Globalization is leading to a culturally more uniform world, with much wisdom gained by our ancestors being lost. In spite of the importance of ethnobotanical knowledge, only a fraction has so far been recorded. The inventory and documentation of ethnobotanical knowledge remain an urgent need (Hamilton and Hamilton, 2006; Pei and Huai, 2007; Tang and Gavin, 2010; Pei, 2013, Khan *et al.*, 2013a). Ethnobotanical data sets can be concomitantly analyzed with data from vegetation surveys to provide a better understanding and management of ecosystems and conservation of biodiversity (Negi, 2010; Khan *et al.*, 2013b). Research methods associated with ethnobotany can be powerful tools for working out how best cultural and biological diversity can be associated to meet the challenges of today.

Keeping in view the importance of ethnobotanical surveys, present endeavor was planned to record the indigenous knowledge of plants practiced by the local healers, natives and local herdsmen in the study area, since previously the whole Kabal Valley, Swat has not been explored ethnobotanically. Ethnoecological studies on the vegetation of Qalagai hills, Swat, which is a part of the present research area has been conducted by the author (Ilyas, 2007).

3.2 REVIEW OF LITERATURE

Though ethnobotany is a relatively new discipline and has been progressed very slowly in accumulating systematic knowledge and generating theories and hypotheses, but it is now advancing towards becoming a more experimental science, particularly in response to self-criticisms and reflections on what directions the field should be taking (Albuquerque, 2009). Research in ethnoecology has got impetus in the recent ages due to growing demand for alternative medicine, food and other daily utilities.

An Enthnobotanical study of medicinal plants in Mana Angetu district, southeastern Ethiopia was carried out by Lulekal *et al.*. (2008). Taking data from traditional medicine practitioners through semi-structured interviews, field observations, preference and direct matrix ranking, they identified 230 plant species used for different purpose among which 78.8% were used as medicinal plants. *Olea europaea* subsp. *cuspidata* has the highest direct matrix value of 125 followed by *Acacia tortolis* with value 121. They indicated deforestation, agricultural expansion and fire as the main threats to plant biodiversity of the area. Ethnobotanical study of medicinal plants used by traditional users in Villupuram district of Tamil Nadu, India was executed by Sankaranarayanan *et al.* (2010), revealing 46 plant species of 31 families used for different ailments. The most common diseases cured with ethnomedicinal plants were fever, dysentery, skin diseases, poison bites, wounds, piles and rheumatism.

Agbogidi (2010) carried out ethnobotanical survey of non-timber forest products (NTFPs) in Sapele Local Government Area of Delta State, Nigeria and recorded 150 useful species of plants and animals having various uses like medicine (76 species), food (41 species), construction (20 species) and crafts (8 species). The study highlighted the importance of biological resources for the improvement of socio-economic conditions of the local community.

Ibrar *et al.* (2007) collected enthnobotanical information about 97 plant species from Ranyal Hills, District Shangla, Pakistan and identified twenty two different local use categories. The most important categories were fuel wood and fodder/forage (37 species each) followed by medicinal plants (31 species). The majority of the plants was locally used for more than one purpose.

Barkatullah *et al.* (2009) documented enthnobotanical studies of plants from Charkolli Hills, Batkhala, district Malakand, Pakistan and recorded 100 species of 49 families used locally for different purposes. They indentified 22 local use categories with highest proportion being used as medicinal plants (66) followed by fruit and edible species (21) and fodder/ forage species (18). Due to extensive deforestation and overgrazing, they recommended proper protection of the area for conservation of plant biodiversity in the area. Ali and Qaisar (2009) conducted enthnobotanical survey of Chitral Valley, Pakistan focusing especially on medicinal plants of the area and reported 83 plants taxa used by local people for different purpose. They emphasized the need for conservation of plant resources of the area which are in danger of deterioration due to unsustainable collection methods, poor harvest methods, soil erosion and deforestation.

Qureshi and Bhatti (2009) explored the indigenous uses of members of family Amaranthaceae from Nara Desert, Pakistan. They reported six plant species of four genera used locally for different purposes. The plants are used as food, medicine, forage and fuel. Some of the uses are new addition to the enthnobotanical knowledge. Based on use value frequency *Aerva jawanica* and *A. jawaniea* var. *bovei* were the most preferred species having over all use value of 5 (22%) each followed by *Achyranthes aspera* having overall use value of 4 (17%). The remaining three species, *Digeria muricata*, *Amaranthus viridus* and *A. graecizans* had overall use value of 3(13%) each. Hayat *et al.*. (2009) documented the ethnobotany of genus *Artemisia* (family Asteracece) from Pakistan through questionnaires

and meetings with local herbalists and aboriginal people. Among the 38 species of the genus reported from Pakistan 12 were used as food, ornaments, fumigants and medicines. The species which are locally used for the mentioned purpose were *Artemisia absinthium, A. annua, A. brevifolia, A. drancunculus, A.dubia, A.herba-alba, A.japonica, A. maritima, A. roxburghiana, A. santalinifolia, A. scoparia* and *A. vulgaris*. They stressed for the sustainable utilization of these species for therapeutic purpose.

In Malam Jabba Valley, District Swat, Pakistan, Sher and Hussain (2009) reported 50 species of plants belonging to 33 families as enthnobotanically important. They also focused on the marketing of enthnobotanical resources of the area and found a 3-5 fold increase in price of medicinal plants, from collector to market. On the basis of their findings they recommended training of collectors, trade monitoring, equitable sharing of benefits, improved control on harvesting and trade, enhancement of cultivation efforts and community participation for the conservation and sustainable use of there valuable resources of the area. Afzal *et al*.. (2009) carried out enthnobotanical studies in Northern Pakistan and indentified 76 species of plants having enthnobotanical uses. They perceived a threat to some of the ecumenically important plants of the area due to over exploitation including *Morehella esculanta, Colchicum leuteum* and *Viola serpens*.

Ahmad *et al.* (2009) reported 143 plant species used for various purposes in upper Siran valley, out of which 89 have medicinal uses and 22 were considered threatened in the area. Enthnobotanical studies on useful shrubs of district Kotli, Azad Jammu Kashmir, Pakistan were executed by Ajaib *et al*.. (2010). They found 38 species of 36 genera and 25 families used by local people as medicinal, fuel, shelter, fodder/forage and agricultural tool making species. According to the study most of the plants were multipurpose.

From Hub, Balochistan, Qasim *et al*.. (2010) reported 48 halophytic species having different enthnobotanical uses they found that 56% species were used as fodder, 22% as

medicine, 5% as food, 5% for making house hold utensils, 3% for increasing milk production in cattle and 8% for other purpose. Due to dependency of the local population on plant resources, recommendations for their sustainable use and proper management are given. Qureshi *et al.*. (2010) reported the ethnomedicinal uses of 63 herbs belonging to 50 genera and 29 families from Northern part of Nara Desert, Pakistan. Local people used these plants for the treatment of fever, flue, cough, asthma, digestive troubles, piles, diabetes, urinary diseases, male sexual diseases, gynecological disease, rheumatism, ear disease, tooth problems, wounds and skin disease. Bisong and Essien (2010) while working on the ethnoecology of valuable plants in a Nigerian protected area, come up with the conclusion that a convergence of indigenous knowledge with scientific information is necessary for effective conservation of biodiversity.

Ullah *et al.* (2013) reported 50 plants of 30 families used for various ailments in Wana, South Waziristan agency, Pakistan. Kassam *et al.* (2010) pointed out that medicinal plants are indicators of indigenous knowledge in the context of political volatility and ecological change in Pamir Mountains of Afghanistan. They identified 58 plant species used for 63 different medicinal uses. Ilyas *et al.* (2013) highlighted that in remote areas of Pakistan like Qalagai hills, people are dependent on plant resources for their subsistence and are knowledgeable about their use. The people of the area used 194 plant species for 42 different use categories. Akhtar *et al.* (2013) recorded 106 plant species of ethno-medicinal importance from Miandam, Swat, out of which 80 species were indigenous and three were threatened in the area. In Malakand pass hills, Pakistan, Barkatullah and Ibrar (2011) reported 169 species of plants used for different use categories including medicinal, fodder, vegetables, fuel, fencing and veterinary medicine. Based on information gathered from 105 informants, Abbasi *et al.* (2013) identified 89 plant species used for ethno-veterinary medicines in Lesser Himalayas, Pakistan. In Naran valley, Western Himalaya, Pakistan, Khan *et al.* (2013)

reported 101 species of plants used for different medicinal purposes as revealed by data taken from 120 informants in the area.

In recent years a growing trend to use quantitative techniques and statistical applications for analyzing Ethnobotanical data has been noticed. Using the data collected from a rural community in semi arid region of Pernambuco State, Brazil, Albuquerque *et al.*. (2006) evaluated two quantitative techniques used in ethnobotanical research. They calculated relative importance of 36 woody species based on information gathered from 98 informants, by employing use value (UV) and Relative Importance (RI) techniques. Their results indicated a positive correlation between the two techniques indicating that both techniques can be interchangeably used for evaluation of ehtnobotanical knowledge. Similar quantitative ethnobotanical study was carried out in the rural community of Rio Formoso municipality, Northeastern Brazil, by Cruz Da Cunha and De Albuquerque (2006). They recorded 42 species of 26 families used in 27 different use categories. The most important uses were as timber and fuel wood. *Wouacapoua virgilioides* had the highest use value while *Tapirira guianensis, Thyrsodium schomburghianum, Schefflera morototoni* and *Dialium guianense* were the most frequent species of the area.

Fonseca–Kruel *et al.*. (2009) carried out quantitative ethnobotanical and allied ecological studies in a local fishing community of living in a *restinga* forest fragment, Arraial do Cabo Municipality, Rio de Janeiro, Brazil. They identified 41 species in 36 genders and 26 families from the sampled area among which highest use value (UV) was recorded for *Schinus terebinthifolius*. They categorized the 22 usage types into five major categories i.e. food, medicine, technology, construction and fuel wood. The most important use values involving 46% of species and 57% of families were attributed to extraction of wood for construction, fuel wood and boat repair.

Ugulu *et al.* (2009) quantitatively evaluated the ethnomedicinal plants of Izmir province, Turkey. They recorded 108 plants used for different purposes in traditional medicine. They determined informant consensus factor (F_{IC}) and the fidelity level (FL) for

each species Highest F_{IC} value of 0.82 was recorded for cold and influenza while lowest value (0.33) was recorded for hemorrhoids and enteritis. Based on percentage of plants used for different diseases, 43.5% plants were used for kidney disorders, 31.4% for stomach problems, 17.6% for cough, 17.4% for wounds healing, 15.7% for hemorrhoids and enteritis, 13.8% for cold and influenza while 10.2% were used for gall bladder ailments.

Bletter (2007) proposed a new quantitative theoretical frame work of mathematical formulas called "relational efficacy" while statistically analyzing the cross-culturally collected data from Malinke of Mali and Ashaninka of Peru regarding enthnobotanical use of plants for malaria, African sleeping sickness leishmaniasis, diabetes and asthma. According to his finding the similarity of medicinal floras was significantly greater than the similarity of general floras. The method may reduce field and laboratory time in pinpointing a plant species through out the world with highest efficacy against a particular disease.

Teklehaymanot and Giday (2010) conducted cross sectional ethnobotanical study of wild edible plant species used by semi pastoralist tribes Kara and Kwego in Lower Omo River Valley, Debub Omozone, SNNPR, Ethiopia by taking information from 10% of population of each tribe using groups discussion and semi-structural questionnaires. They recorded 38 plant species belonging to 33 genera and 23 families, used as food both at times of scarcity and plenty. Based on analysis of variance, the species richness were not significantly different ($P>0.05$) between the two tribes.

3.3 MATERIALS AND METHODS

The ethnobotanical data was collected from indigenous people by interviews, direct observations, semi-structured and structured questionnaires, participatory ethnobotanical appraisal and guided field walks/transects walks (Martin, 1995).

3.3.1 Estimation of Use Value (UV) and Extent of Knowledge based on Local Perceptions:

A total of 127 informants of both genders and classified into three age groups (<25 years, 26-50 years and > 50 years) were randomly selected for collection of ethnobotanical data. The following statistical formula was used to calculate the use value (UV) of important plant species and the relationship between people's age and the extent of their knowledge about plants (Phillips *et al.,* 1994).

$$UVs = \sum Uis/nis$$

Where *UVs* is the overall use-value of species *s.*

UV_{is} is the use-value of species's' as determined by informant *i.*

nis is the total number of informants interviewed for species *s.*

3.4 RESULTS

3.4.1 ETHNOBOTANICAL INVENTROY

In all, 453 species belonged to 119 families are identified and being used ethnobotanically by the indigenous communities of the study area to overcome their daily life requirements. The following ethnobotanical inventory is family-wise alphabetically arranged that consists of botanical and local names, habitat, part(s) utilized and ethnobotanical use(s) including recipe (if medicinal) and collection season:

Family: **1. Acanthaceae**

Botanical name: *1. Barleria cristata* L. (MI – 1001)

Local Name: Bansa

Habitat: Drier hill sides up to 1300m

Part(s) used: Leaves, whole plant, seeds

Ethnobotanical uses: Ten grams leaves are boiled in one cup (100 ml) water and given

	empty stomach in morning for blood purification and reducing blood sugar level. Fresh leaves are chewed for toothache. Twenty grams of seeds are crushed and mixed with 40 grams of honey and given orally as antidote for snake bite. The plant is grown as an ornamental because of its beautiful flowers.
Collection season:	December – May
Botanical name:	*2. Justicia adhatoda* L. (MI – 1003)
Local Name:	Baikarh
Habitat:	Muslim graveyards and drier, sandy hill sides up to 1200m.
Part(s) used:	Leaves and roots
Ethnobotanical uses:	Fresh leaves are finely crushed in mortar for several days along with plenty of water and then stirred daily and dried under shade. The concentrated extract is applied topically for snake bite, scabies and eye diseases. Fifty grams roots are boiled in 2 liters of water and given orally to cattle for the removal of intestinal worms, dysentery and respiratory pneumonia. About half cup of the leaves decoction is given two times a day to patients of pneumonia, asthma and bronchitis. Smoke of dried leaves is inhaled for asthma.
Collection season:	Summer (May – September)
Botanical name:	*3. Ruellia tuberosa* L. (MI – 1006)
Habitat:	Moist and shady waste places especially around streams, up to 900m, altitude.
Part(s) used:	Fruits, Roots and Leaves
Ethnobotanical uses:	Infusion of roots is taken orally for the treatment of urine retention and blood cleansing. Five to ten leaves are partially crushed and applied through a bandage for the relief of joint pain and muscle strains. Children play with the fruit pods, which pop when rubbed.
Collection season:	Summer (May – October)
Family:	**2. Aceraceae**
Botanical name:	*4. Acer cappadocicum* Gleditsch (MI – 1008)
Local Name:	Tarkana
Habitat:	Temperate forests from 2200 to 3000m

Part(s) used: Wood

Ethnobotanical uses: The wood is used for agricultural tool making, bedsteads making and as fuel.

Collection season: April – May

Family: **3. Adiantaceae**

Botanical name: *5. Adiantum capillus-veneris* L. (MI – 1009)

Local Name: Sumbal

Habitat: Moist, shady hill slopes, cliffs, water well walls and spring sides up to 1500 meters.

Part(s) used: Fronds (Leaves), Rhizome

Ethnobotanical uses: One hundred ml of leaves infusion is taken twice a day to suppress coughs, reduce and expel phlegm, increase perspiration and removal of gall stones. Infusion of leaves is taken orally daily and poultice applied externally on scalp for hair loss. Crushed rhizome is applied externally on snake and insect bites.

The plant is grown as ornamental.

Collection season: April – November

Botanical name: *6. Adiantum caudatum* L. (MI – 1010)

Habitat: Moist wall crevices, cliffs and along walking tracks in hilly areas.

Part(s) used: Fronds

Ethnobotanical uses: Fifty ml infusion of fresh leaves is taken twice a day orally with empty stomach to relief asthmatic cough. Equal amounts of *Momordica charantia* pericarp, *Adiantum caudatum* fronds and leaves of *Ziziphus jujuba* are grinded together and water is added in a quantity equal to the collective volume of the three herbs. The infusion is filtered through cloth and 20-30 is taken once a day early in morning to control blood sugar. Crushed leaves are externally applied for the treatment of skin diseases like eczema and boils.

Collection season: April to October

Botanical name: *7. Adiantum venustum* D. Don (MI – 1012)

Local Name: Bar Sumbal/Parsoshan

Habitat: Forest floors and moist shady slopes from 1800 – 3000 m

Part(s) used: Fronds, Rhizome

Ethnobotanical uses: Infusion of leaves is taken twice a day as expectorant and diuretic. The infusion of leaves in 20 – 30 ml quantity is taken twice a day during menstruation period to ease blood flow. The same is also administrated for contraception and abortion. A poultice of crushed rhizome slightly warmed on gentle heat and is applied externally for healing wounds, cuts, bruises and insect stings.

Collection season: May – September

Family: **4. Agavaceae**

Botanical name: *8. Agave americana* L. (MI – 1016)

Local Name: Maizari botay

Habitat: Drier waste places, roadsides and a potted house plant

Part(s) used: Whole plant, Sap from leaves and scape, leaves

Ethnobotanical uses: The sap bleeding out of the cut young leaves or scape is diluted with equal amount of water and used as purgative and diuretic. A paste of chopped leaves is applied to treat bruises.

The sap emerging after cutting the young scape is sweet in taste. The heart of young scape is eaten raw. The plant is grown in pots as ornamental.

Collection season: Throughout the year

Family: **5. Aizoaceae**

Botanical name: *9. Trianthema portulacastrum* L. (MI – 1017)

Local Name: Insut

Habitat: Weed of khareef crops and waste places

Part(s) used: Shoots, Roots

Ethnobotanical uses: Decoction of shoot is used as a remedy for snake bites and bacterial infections, when taken internally along with topical application. The same is also used to kill and expel intestinal worms and other endoparasites. The decoction taken orally and a paste of crushed shoots applied externally for a relief in rheumatism. Root powder is used as purgative, abortifacient and ease blood flow in menstruation. A decoction of shoots is also given to cattle and sheep for removing endoparasites.

The shoots are used as fodder for cattle.

Collection season: July – October

Family: **6. Alismataceae**

Botanical name: *10. Alisma plantag-aquatica* L. (MI – 1018)

Local Name: Jabai

Habitat: Marshy river and stream sides up to 1200 meters, altitude, often partially submerged.

Part(s) used: Roots, Leaves

Ethnobotanical uses: One tea spoon of powdered leaves is taken twice a day for removal and dissolution of kidney stones and increasing the volume of urine. Ten grams dried powder of roots taken with water for the treatment of rabies and tuberculosis. The same is also done for lowering blood pressure. A poultice of dried, powdered roots mixed in warm mustard (*Brassica campestris*) oil is applied externally for treating swellings, old sores and inflamed joints.

Young leaves are thoroughly cooked often in combination with *Oenanthe javanica* and used as pot herb.

Collection season: June – September

Botanical name: *11. Sagettaria trifolia* L. (MI – 1019)

Local Name: Taqay

Habitat: Marshy places near river and streams, partially submerged found up to 1100 m

Part(s) used: Leaves, root

Ethnobotanical uses: After cooking and removing the skin, the root tubers are roasted and eaten as a food.

Collection season: August – October

Family: **7. Alliaceae**

Botanical name: *12. Allium ampeloprasum* var. *porrum* (L.) Regel (MI – 1020)

Local Name: Ogakai

Habitat: A weed of Rabi crops and fallow lands

Part(s) used: Whole plant

Ethnobotanical uses: One table spoon of a paste produced by mixing the finely ground bulbs and equal amount of honey with few drops of lemon juice is taken empty stomach in the morning for reducing blood pressure,

controlling hypertension, reducing blood cholesterol and burning of extra fat in the body. Leaves and bulbs are eaten raw for increasing appetite and promoting digestion.

The whole plant is used as a salad. The leaves are grinded mixed with corn dough and baked as bread on hot griddle is eaten as a delicacy. The leaves are main ingredient in a green rice dish called "*Chukanrh*" locally. The leaves of *Allium ampeloprasum* var. *porrum*, *Medicago polymorpha*, *Carthamas oxycantha* and *Coriandrum sativum* are finely ground and cooked along with rice to prepare the green rice dish. It is eaten along with milk cream, butter and butter oil. Locally, the dish is considered a delicacy and often served to guests.

Collection season: February – April

Botanical name: *13. Allium cepa* L. (MI-1021)

Local Name: Piaz

Habitat: Cultivated as Rabi crop

Part(s) used: Bulb, leaves

Ethnobotanical uses: Bulb scales are eaten raw as salad with lunch is considered aphrodisiac but is considered to reduce libido when eaten with dinner. Finely grinded bulb scales are made into a thick paste and sugar is added to it to make it swallowable. One spoonful of paste is eaten once a day to reduce hypertension and improve the immunity of body against infections. Thinly chopped slices of onion bulb are placed alternatively with thick autumn honey in a jar. A tablespoonful of this mixture is taken thrice a day for cough control and as expectorant. A scale is squeezed and rubbed on the place of honey bee or wasp sting to eliminate the irritation and swelling. Eating of raw onion by women especially during the middle of menstrual cycle increase the chances of conception. Juice of onion scales is applied directly on bruises and burns for quick healing and removal of scars.

Young, tender leaves and bulb scales are used as salad. Bulbs are very commonly used as condiment in almost all oriental dishes. Bulbs are also used as vegetable specially the white coloured bulb

variety. Bulb scales are rubbed on scalp to reduce dandruff and promote hair growth.

Collection season: May – June

Botanical name: *14. Allium sativum* L. (MI – 1024)

Local Name: Oga

Habitat: Cultivated as Rabi crop

Part(s) used: Leaves, bulb

Ethnobotanical uses: Daily use of a single clove reduces blood cholesterol level, reduce the chances of arteriosclerosis and heart attack and normalize blood flow in the body. Half teaspoonful of garlic paste is used daily as stimulant, diaphoretic and antitussive. A clove is slightly squeezed and rubbed on eyelid bumps to eliminate them. One tablespoon of crushed garlic paste is eaten half an hour after eating some brown sugar, before going to bed, for eliminating intestinal worms. Odd number (3 – 7) cloves are sewed in a thread and tied in neck like a necklace for the treatment of whooping cough in children.

The young leaves in crushed form are an important ingredient of chutneys. The bulb cloves are used as condiment.

Collection season: April – June

Family: 8. Amaranthaceae

Botanical name: *15. Achyranthes aspera* L. (MI – 1025)

Local Name: Jishkay

Habitat: Common weed of waste places, cropland margins, graveyards and gentle sloping hill sides up to 1500 m

Part(s) used: Leaves, seeds, stem, root

Ethnobotanical uses: Leaves powder is given with water as emetic agent till vomit the eaten hazardous material. Ten ml of juice obtained from fresh leaves is administered 3 – 4 times for controlling diarrhoea. Two to three leaves are chewed for a while to give relief from toothache. Half cup of leaf decoction is used once a day for removal of kidney stones. Fresh root is boiled in water and 2 – 3 ml of the decoction is applied in vagina to induce abortion. A paste produced by finely ground fresh roots is applied externally to heal wounds and give relief in joint

pains, snake / insect / dog bites.

Main stem and dried branches are used as toothbrush.

Collection season: June – October

Botanical name: *16. Amaranthus graecizans* L. (MI – 1029)

Local Name: Chalwaye

Habitat: Weed of Khareef crops

Part(s) used: Shoot

Ethnobotanical uses: A shoot with 5 – 7 leaves is directly chewed or an extract is obtained from it which is taken for the treatment of tonsillitis and sore throat.

The shoots are used as pot herb and fodder for cattle.

Collection season: May – September

Botanical name: *17. Amaranthus spinosus* L. (MI – 1032)

Local Name: Ganrhhar

Habitat: Weed of waste places and khareef crops

Part(s) used: Shoot, seeds and root

Ethnobotanical uses: A poultice of seeds is tied through a bandage around broken bones for healing. Two to three ml of shoot extract is taken with milk 2 – 3 times a day to ease blood flow in menstruation. Two cups of a root decoction is given to cattle for increasing milk production.

Fodder for cattle and buffalos. Excessive amount can cause flatulence and diarrhoea in cattle.

Collection season: June – September

Botanical name: *18. Amaranthus viridis* L. (MI – 1033)

Local Name: Asil Chalwaye

Habitat: Very common as weed of waste places, graveyards and crop lands.

Part(s) used: Leafy shoots

Ethnobotanical uses: Decoction of shoot is used for controlling dysentery and inflammation. Shoot extract is applied externally for softening of skin, healing wounds, removal of scars from face and reducing inflammation. 10 – 15 ml concentrated water extract of the shoot is used as a vermifuge.

The leafy shoots are used as a common green, leafy vegetable.

Collection season: May – September

Botanical name: *19. Bosea amherstiana* (Moq.) Hook. f. (MI – 1034)

Local Name: Makhrhai

Habitat: Confined to protected area and graveyards up to 1100 m.

Part(s) used: Stem and branches, Fruits

Ethnobotanical uses: The leaves are crushed, slightly warmed and applied on skin sores and eczema.

The glabrous branches and stems are used in making fish traps locally known as "Chijakay". Fruit is poisonous.

Collection season: May – November

Botanical name: *20. Celosia argentia* L. (MI – 1035)

Local Name: Soorgwalay

Habitat: Common weed of Khareef crops, up to 1500 m.

Part(s) used: Whole plant, seeds

Ethnobotanical uses: Aerial parts of the plant are ground and smeared with honey to make a poultice. The poultice is applied externally for inflammation, painful abscesses and itching of skin. 5 grams seed of *Celosia argentia*, 5 grams fruit of *Morus alba*, 5 grams flowers of *Chrysanthemum* and 10 grams stem powder of *Equisetum arvense* are boiled together for 30 – 45 minutes in one litre of water or till the time half of the water is boiled. 1 – 2 tablespoon of the concoction is taken once daily for the treatment of eye diseases. Decoction of seeds with sugar is used for dysentery, bleeding haemorrhoids and diarrhoea.

Young shoots are used as potherb of lower quality and a fodder. In local culture children are named after the plant as "Soorgwalay". Children play with the seeds by putting them in fire for the cracking sound.

Collection season: June – September

Botanical name: *21. Digera muricata* (L.) Mart. (MI – 1036)

Local Name: Tandula

Habitat: Common weed of Khareef crops from plains up to 1800 m.

Part(s) used: Whole plant

Ethnobotanical uses: The young shoots of the plant are boiled and cooked in water and

	taken like a potherb for relieving stomach pain, constipation and urinary retention. 10 – 15 ml infusion of young leaves is given once a day for removal of kidney stones. The plant is a fodder for cattle. Young shoots are used as potherb.
Collection season:	May – August
Family:	**9. Amaryllidaceae**
Botanical name:	*22. Narcissus tazetta* L. (MI – 1038)
Local Name:	Gule Gangas / Gul-e-Nargas
Habitat:	Rain fed areas and Muslim graveyards
Part(s) used:	Flowers, bulbs
Ethnobotanical uses:	Ten grams of fresh bulbs are crushed and mixed with water. The infusion is used as strong emetic. Excessive use is poisonous. Chopped and squeezed bulb scales are applied externally as poultice for mastitis and boils in domestic animals like buffalos and cattle. Female babies are commonly named after its name as "Nargis". The plant is ornamental and fragrant often grown on graves. Bouquets are prepared from the flower scapes by keeping them in water vases indoor.
Collection season:	December – January
Family:	**10. Anacardiaceae**
Botanical name:	*23. Cotinus coggyria* Scop. (MI-1039)
Local Name:	Falebay
Habitat:	Subtropical hill sides and scrubs up to 2200m.
Part(s) used:	Shoots, leaves
Ethnobotanical uses:	Poultice of crushed leaves stops bleeding and helps in wound healing. One end of a woody twig of the plant is heated in fire and a sap obtained at the opposite end is rubbed on skin affected with ringworm. Dried shoots are used as fuel wood. The twigs being flexible are used in basketry.
Collection season:	April – October
Botanical name:	*24. Pistacia integerrima* J.L. Stewart ex Brandis (MI – 1040)
Local Name:	Shnai

Habitat:	Forest edges up to 1800 m
Part(s) used:	Leaf gall, bark, seeds
Ethnobotanical uses:	Dried leaf galls are ground into a powder and then mixed with honey. One spoonful of the mixture is taken before going to bed for the treatment of coughs, asthma and dysentery. Stem bark is ground and then slightly heated in olive oil. Equal amount of honey is added. One spoonful of the mixture is taken thrice a day for the treatment of fever, hepatitis, coughs, bronchitis and sleeplessness. Equal amounts of leaf galls of the plant and dried rhizomes of *Geranium Swatense* are boiled in water to make a decoction. Half teacup of decoction is taken thrice a day for the treatment of fever, cough and burring micturition. The wood is used for furniture and carving. Leaves are used as fodder for goats.
Collection season:	May – September
Botanical name:	*25. Rhus punjabensis* J.L. Stewart ex Brandis (MI – 1041)
Local Name:	Titray
Habitat:	Rare small tree found in lower hill altitudes up to 1500 m
Part(s) used:	Wood, fruit
Ethnobotanical uses:	Fruits are eaten by children. Wood is used as fuel. Goats browse upon the leaves.
Collection season:	June – August
Family:	**11. Apiaceae**
Botanical name:	*26. Bunium persicum* (Boiss) Fedtsch. (MI – 1596)
Local Name:	Toorey Zankai
Habitat:	High altitude pastures between 2200 – 3000 m
Part(s) used:	Fruit
Ethnobotanical uses:	Fruits are used as condiment.
Collection season:	August – October
Botanical name:	*27. Conium maculatum* L. (MI – 1597)
Local Name:	Da spoo krachay
Habitat:	Waste places near water courses up to 1400 m
Part(s) used:	Whole plant

Ethnobotanical uses: The whole plant is extremely poisonous both for human and domestic animals.

Collection season: June – August

Botanical name: *28. Coriandrum sativum* L. (MI – 1044)

Local Name: Dhanyal

Habitat: Cultivated in kitchen gardens in Rabi season

Part(s) used: Leaves, fruit

Ethnobotanical uses: 5 grams of powdered coriander seeds are taken with water for the treatment of flatulence, indigestion, nausea, vomiting and diarrhea. Raw seeds are chewed for increasing appetite and eliminating bad mouth taste. Decoction of seeds is given during heartbeat disturbance, fear, anxiety, arthritis, chest congestion, diabetes and obesity.

Fresh leaves are used as salad and give flavor to many oriental dishes. The fresh leaves are considered not good for brain's functions especially memory. The fruits are used as condiment.

Collection season: June – July

Botanical name: *29. Foeniculum vulgare* Mill (MI – 1046)

Local Name: Kagaenalay

Habit: Evergreen perennial

Habitat: Cultivated and found naturally on drier lower hill elevations.

Part(s) used: Leaves, seeds

Ethnobotanical uses: 5 grams of raw seeds are chewed and swallowed with water for pain and spasm in stomach, nausea and dyspepsia. 10 grams of seeds are boiled in half litre cow milk and taken once a day for regulating menstrual flow and milk production in woman and as aphrodisiac in women. Decoction of seeds is used as anti-inflammatory, diuretic, laxative and analgesic. Infusion of fresh leaves is used as a gargle for sore throat and an eye wash of sore eyes. Chewing raw seeds eliminate nausea, bad mouth smell and dryness of mouth.

Young leaves are eaten raw as mouth freshener and carminative. Seeds are used as flavouring agents.

Collection season: June – September

Botanical name:	*30. Oenanthe javanica* (Blume) DC. (MI – 1600)
Local Name:	Surkhai
Habitat:	Marshy areas near rivers, streams and ponds up to 900 m.
Part(s) used:	Shoots
Ethnobotanical uses:	The young shoots are used as potherb.
Collection season:	March – May
Botanical name:	*31. Prangos pabularia* Lindl. (MI – 1048)
Local Name:	Zangali Kaga
Habitat:	Drier, sandy hill sides up to 2000 m
Part(s) used:	Leaves, fruits
Ethnobotanical uses:	10 grams fruits are boiled in two cups of milk and taken at bed time as aphrodisiac. Powdered fruits (one teaspoonful) are taken with water for the relief of heart burn, stomach pain, indigestion, vomiting and nausea. Few fruits (10 – 15) are boiled in the cow's milk for bottle feeding babies to make the milk more digestible and flavoured The leaves are chewed raw for refreshing mouth and alleviating bad mouth odor.
Collection season:	June – August
Botanical name:	*32. Scadix pectin-veneris* L. (MI – 1049)
Local Name:	Gangahay
Habitat:	Weed in Rabi crops and fallow lands
Part(s) used:	Shoots
Ethnobotanical uses:	Young shoos are eaten raw as a salad. Shoots are also cooked as potherb. The plant is also used as fodder.
Collection season:	March – May
Family:	**12. Apocyanaceae**
Botanical name:	*33. Nerium oleander* L. (MI – 1051)
Local Name:	Gandeeray
Habitat:	Sandy stream or river sides up to 1300 m
Part(s) used:	Leaves, flowers
Ethnobotanical uses:	A paste of fresh, crushed leaves is applied externally on skin for the treatment of swellings, scabies and ringworm. The whole plant is ornamental and mostly grown for this purpose

	because of evergreen leathery leaves and pink coloured flowers. The flowers and leaves are considered extremely poisonous.
Collection season:	Throughout the year
Family:	**13. Araceae**
Botanical name:	*34. Acorus calamus* L. (MI – 1052)
Local Name:	Skha Waja
Habitat:	Moist soils near stream sides, river banks and marshes up to 1800 m.
Part(s) used:	Stem, Rhizome
Ethnobotanical uses:	One tablespoonful of powdered rhizome is taken along water orally for a relief from flatulence, gastrointestinal pain, acidity and other digestive problems. Concentrated infusion of the root is emmenagogue but can cause abortion when used in first trimester of pregnancy. Chewing of root reduce toothache. The inner portion of young stems and young inflorescence is eaten by children. The stem and leaves are also used in thatching and strewing.
Collection season:	November – February
Botanical name:	*35. Arisaema flavum* (Forsk.) Schott (MI – 1053)
Local Name:	Marjarhai
Habitat:	Exposed hill sides and forest edges up to 2200 m.
Part(s) used:	Rhizome
Ethnobotanical uses:	The whole plant especially the rhizome is considered poisonous. It is believed that passing though areas with thick patch of this plant cause dizziness.
Collection season:	May – September
Botanical name:	*36. Arisaema jacquimontii* Blume (MI – 1054)
Local Name:	Marjarhai
Habitat:	Forest floors and high altitude pastures between 2200-3000m.
Part(s) used:	Rhizome
Ethnobotanical uses:	Rhizome of the plant is crushed into a paste and applied as a poultice on knee joints for rheumatism. The rhizome is poisonous and cause numbness of tongue when eaten raw.
Collection season:	August – November

Botanical name:	*37. Colocacia esculenta* (L.) Schott (MI – 1055)
Local Name:	Kachalo
Habitat:	Marshy areas near springs, streams and river
Part(s) used:	Corm
Ethnobotanical uses:	Corm is used as vegetable. After removing the skin it is cooked with beef to prepare "Kachalo Gosht". The juice expressed from the corm is used externally on scalp for preventing hair loss and treating alopecia.
Collection season:	September – November
Family:	**14. Araliaceae**
Botanical name:	*38. Hedera nepalensis* K.Koch. (MI – 1056)
Local Name:	Phalool Zeelai
Habitat:	Temperate forests from 1800 – 3000 m, often climbing on *Pinus wallichiana*, *Diospyros lotus* or other trees and on rocks, mountain ridges and slops.
Part(s) used:	Leaves
Ethnobotanical uses:	Five grams powdered drug is taken with water in the morning or 10 ml of a concentrated decoction of leaves is given to patient of diabetes for lowering blood/urine sugar level.
Collection season:	Throughout the year
Family:	**15. Asclepiadaceae**
Botanical name:	*39. Calotropis procera* subsp. *hamiltonii* (Wight) Ali (MI – 1057)
Local Name:	Spalmai
Habitat:	Drier sandy stream sides, sandy plains and lower hill altitudes.
Part(s) used:	Leaves, flowers, latex
Ethnobotanical uses:	A decoction of air dried leaves is kept in open place over night. Two to three tablespoonful of it is taken empty stomach in the morning for the treatment of jaundice. A poultice of crushed leaves is applied as poultice through bandage for rheumatism and burn injuries. An infusion of flowers is mixed with maize dough to make porridge. A golf ball size piece of the porridge is given to cattle thrice a day for the removal of liver fluke and intestinal worms. Fresh latex of aerial parts is applied directly on skin for the removal of spines and prickles

pierced through skin. The latex is also applied on warts on the skin. There is superstition that the plant hides a treasure below its roots.

Collection season: Throughout the year

Botanical name: *40. Periploca aphylla* Dcne. (MI – 1060)

Local Name: Bararha

Habitat: Drier, gravelly hills sides up to 1500m

Part(s) used: Whole plant, latex

Ethnobotanical uses: Young branches of the plant are incised with sickle to produce latex. The latex is dried to a gum within two days. 5 grams of the gum is mixed with egg yolk and fried. A little black pepper powder is sprinkled over it and eaten at bedtime for a relief in cough, cold and flu. Whole plant is crushed and made into a paste which is applied externally for the treatment of pain of swollen joints and other swellings of skin. Aqueous extract of the fresh plant is used to relieve pain. Ash obtained by burning the whole plant is mixed with mustard oil and applied on skin for the treatment of ringworm, boils and other skin swellings.

Collection season: Throughout the year

Botanical name: *41. Vincetoxicum hirudinaria* Medicus (MI – 1061)

Habitat: Sub-tropical lower hill elevations

Part(s) used: Roots

Ethnobotanical uses: The roots are crushed and mixed with milk to prevent milk splitting.

Collection season: Throughout the year.

Family: 16. Asparagaceae

Botanical name: *42. Asparagus adscendens* Roxb. (MI – 1062)

Local Name: Tindorhay

Habitat: Hedge rows, exposed hillside, up to 1300m

Part(s) used: Freshly sprouted shoots, root tubers

Ethnobotanical uses: Freshly sprouted, tender shoots are cut into small pieces. They are boiled in twice its volume of cow's milk till half of the milk is dried. The paste is fried in butter oil (Desi ghee) and sugar is added to taste. The dish is a delicacy and also considered general body tonic, demulcent and aphrodisiac in both sexes while galactagogue in

	women. 5 grams powdered root is taken with a glass of warm milk 3 – 4 hours before bed time for increasing male potency and as aphrodisiac. Milk decoction of roots is also used in postnatal problems of nursing women. 8 – 10 grams os powdered root is taken with water for gastrointestinal problems like diarrhea, dysentery and dyspepsia. Freshly sprouted shoots are used as a nutritious delicacy. Older shoots are used as brooms for cleaning ground where maize cobs are gathered for threshing.
Collection season:	March – April (Shoots), September – December (Roots)
Botanical name:	*43. Asparagus filicinus* Buch.-Ham. ex D.Don (MI – 1063)
Local Name:	Shal Gwatay
Habitat:	Humus rich coniferous and mixed forest floors between 2000 – 3000 m
Part(s) used:	Tuberous roots
Ethnobotanical uses:	3 – 5 grams of powdered root is given for the removal of intestinal worms. 5 grams of powdered root is taken with water twice a day for controlling diarrhea, cholera and dysentery. Freshly dug tuberous roots are boiled in four volumes of milk on gentle heat. When the milk is almost evaporated, the left over paste is mixed with equal volume of honey. One table spoon of the medicine is taken 2 – 3 hours before bedtime for increasing sexual desire.
Collection season:	September – December
Botanical name:	*44. Asparagus officinalis* L. (MI – 1064)
Local Name:	Ghat tindorhay
Habitat:	Often cultivated
Part(s) used:	Shoots, tuberous roots
Ethnobotanical uses:	Freshly expressed juice of the shoots is taken (one table spoon) thrice a day as demulcent, antispasmodic, cardiac stimulant and sedative. Infusion of roots is used as diuretic, hypotensive and liver tonic. It also helps in removing kidney stones. Ornamental plant. Young tender shoots are used as salad and as potherb.

Collection season: March – April (Shoots), May – June (Roots)

Family: **17. Asphodelaceae**

Botanical name: *45. Aloe vera* (L.) Burm. F. (MI – 1065)

Local Name: Kamal Panrha

Habitat: Sandy soils, often cultivated

Part(s) used: Succulent leaves

Ethnobotanical uses: The fleshy leaf blades are cut longitudinally and squeezed to obtain the jelly like exudates that is applied on skin for keeping the skin soft, healthy and fair. The same is applied for burns, cuts, wounds, pimples and acne on skin. The juice obatined after transverse cut of the leaf base is used as a purgative, stomachic, vermifuge and abortifacient.

Ornamental plant, often grown indoors. The leaves are used as cosmetic and help in quick wound healing

Collection season: Throughout the year

Family: **18. Aspleniaceae**

Botanical name: *46. Asplenium trichomanes* L. (MI – 1067)

Local Name: Tarpat

Habitat: Rock crevices, stone walls up to 1800 m

Part(s) used: Fronds

Ethnobotanical uses: Herbal tea made by boiling 5 gm of dried fronds is used for improving menstrual flow.

Collection season: Summer season

Botanical name: *47. Ceterach dalhousiae* (Hook.) C. Chir (MI – 1068)

Local Name: Boghma botay

Habitat: Moist, shady rock crevices and stone wall

Part(s) used: Fronds

Ethnobotanical uses: Two grams of dried leaves are boiled in half cup of water and then filtered through muslin cloth and fed to milk feeding children for ease of bowel movement.

Excessive use or grazing by animals causes loose motions in cattle.

Collection season: May – September

Family: **19. Asteraceae**

Botanical name: *48. Achillea millefolium* L. (MI – 1069)

Local Name: Jarai/Aqarqara

Habitat: Open pastures at high altitudes

Part(s) used: Whole plant

Ethnobotanical uses: Thirty grams of air dried plant is boiled in half liter of water to make a decoction. Half cup of this decoction is drunk warm for relief of cough, brochospasm and fever. A little sugar or honey is added for sweetening. A little black pepper powder is added with the decoction and used in the later stages of measles in children. The fresh leaves are applied directly to bruises and cuts as astringent. Fresh leaves are also chewed to relieve toothache. Decoction of the plant is applied half an hour before washing through a mild shampoo as hair tonic. This gives strength to the hair and prevents hair loss.

The plant is also used as fodder. Flowering plant is insect repellant and also used as hair tonic.

Collection season: July – September

Botanical name: *49. Anaphalis margaritacea* (L.) Benth. (MI – 1070)

Local Name: Pasham

Habitat: Steep forest slopes in coniferous forests between 1800 – 2500m

Part(s) used: Whole plant

Ethnobotanical uses: A poultice of the whole plant is directly applied on rheumatic joints, burns, swellings and bruises. Steam produced by heating the infusion of whole plant is inhaled for the release of congested sinuses and nose and relief from headache.

The whole plant is kept in baby cradles for insect repelling.

Collection season: July – September

Botanical name: *50. Artemisia capillaris* Thunb. (MI – 1611)

Local Name: Spin jawkay

Habitat: Drier sandy plains and lower hill slopes up to 1200 m

Part(s) used: Shoot

Ethnobotanical uses: The young whitish shoots which arise on previous year shoot base in early spring are collected and air dried under shade. 50 gm of dried shoots are boiled in half liter water to make a decoction. Half cup of

the decoction is taken once a day for a week for the treatment of malaria, jaundice, heat in the body and hepatitis. The decoction is kept overnight in open place under sky and two tablespoonful are taken as a prophylaxis against malaria and other infectious diseases.

Collection season: Early spring (February – March)

Botanical name: *51. Artemisia scoparia* Waldst. & Kit. (MI – 1072)

Local Name: Jawkay

Habitat: Open sandy places and lower hill elevations up to 1300 m

Part(s) used: Shoot

Ethnobotanical uses: Infusion of shoots is given during mild, recurrent fever and also during jaundice. Fresh shoots are crushed and applied directly as poultice for controlling itchy skin, eczema and ringworm.

Local name of the plant is used for naming. Shoots are used for broom making. The flowering shoot is insect repellant.

Collection season: May – August

Botanical name: *52. Artemisia vulgaris* L. (MI – 1073)

Local Name: Tarkha

Habitat: Hedge rows up to 1500m

Part(s) used: Leaves

Ethnobotanical uses: Thirty grams of dried leaves are boiled in 500 ml of water. Two teaspoonful of the infusion is taken half an hour after eating some raw sugar (gur) for the removal of intestinal worms. One cup (almost 100 ml) of the same is given to cattle for the removal of intestinal worms. Thirty grams of air dried leaves are boiled in one liter of water. Half teacup of the decoction is taken twice a day for dysmenorrhoea.

The whole plant is insect repellant.

Collection season: August

Botanical name: *53. Calendula arvensis* L. (MI – 1077)

Local Name: Ziargulay

Habitat: Common weed in Rabi crops and fallow lands

Part(s) used: Whole plant

Ethnobotanical uses: Crushed leaves are applied directly on skin warts for their easier

	removal. A poultice of crushed leaves is applied externally on insect stings, wounds, sprains and swellings. Leaves of the plant are collected in morning of a sunny day and dried under shade for few days. Ten grams of the leaves are boiled in 250 ml of water to make a herbal tea. The warm tea is taken once a day as astringent, blood purifier and immunity booster.
Collection season:	Spring (March – April)
Botanical name:	*54. Carthamus oxyacantha* Bieb. (MI – 1081)
Local Name:	Kareeza
Habitat:	Weed in rain fed Rabi crops, sandy drier areas
Part(s) used:	Leaves, seeds, flowers
Ethnobotanical uses:	Flowering shoots of the plant are dried under shade and finely ground to make a powder. One tablespoonful of the powdered drug is taken with luke warm water for treatment of male infertility, bronchitis, heart diseases and hepatitis. One teaspoonful of air dried, finely ground seeds are taken twice a day for 2 – 3 weeks for easing bowel movement and alleviating hepatitis. Young leaves form an important ingredient in a common local green rice delicacy called "Chukanrh" along with *Allium ampeloprasum*, *Trifolium resupinatum* and others.
Collection season:	(Leaves), May (Flowers), June – July (Seeds)
Botanical name:	*55. Cichorium intybus* L. (MI – 1083)
Local Name:	Han
Habitat:	Weed of Rabi crops, fallow lands and low hill elevations up to 1100m
Part(s) used:	Root, leaves, flowers
Ethnobotanical uses:	Leaves or roots boiled in water are given as an appetizer to improve bowel function because it is mild laxative. Hot water extract of leaves or roots is used to reduce blood sugar lever, blood cholesterol level and improving the function of liver by releasing and removing of bile and detoxifying impurities. An infusion of freshly collected roots is taken empty stomach, early in the morning for increasing urine flow and removal of kidney stones. Dried roots are soaked in water

overnight in open place and the extract obtained is taken early in the morning as a cooling agent and preventing thirst. Concentrated root extract is an excellent vermifuge. It is used for removing endoparasites both from humans and cattle.

Leaves are used as green vegetable and pot herb. Young roots are boiled and the water is removed. The boiled roots are cooked as a vegetable, often advised by local Hakeems for diabetics.

Collection season: April – May (Leaves and flowers), September – October (Roots)

Botanical name: *56. Conyza canadensis* (L.) Cronq. (MI – 1088)

Local Name: Maloch

Habitat: Waste places and sandy stream sides up to 1600m

Part(s) used: Whole plant

Ethnobotanical uses: Fifty grams of fresh plant material is kept overnight in 500ml of water. The infusion is filtered and 2 – 3 table spoonful are taken thrice a day for the treatment of diarrhea and dysentery especially the one with blood in stools.

Collection season: June – August

Botanical name: *57. Eclipta prostrata* (L.) L. (MI --1091)

Habitat: Wet marshy places and rice paddies

Part(s) used: Whole plant

Ethnobotanical uses: A paste of crushed fresh shoots of the plant is directly applied on hair for giving them strength. This prevents hair loss and premature graying of hair. Dried leaves are powdered and mixed with coconut oil then heated, cooled and bottled. It is applied on scalp daily for healthy hair, preventing hair loss and graying of the hair. Ten grams each of *Eclipta prostrata* and *Phyllanthus fraternus* are ground together along with 5grams of *Piper nigrum* seeds to make a paste. The paste is dissolved in half liter of cow's milk. Two spoonful of the mixture is taken twice a day for recovery from jaundice and giving strength to liver. Fresh leaves are crushed and applied directly on skin for the treatment of eczema and healing of wounds in humans and cattle. Fresh leaves are finely ground and a little water is added to it. The mixture is ground and stirred under shade till the time the

	whole water is evaporated and a dried, fine, black powder is left. This powder is applied in eye like antimony (Surma) for improving vision.
Collection season:	Summer season (May – September)
Botanical name:	*58. Helianthus annuus* L. (MI – 1094)
Local Name:	Nwar parast
Habitat:	Cultivated plant of summer season
Part(s) used:	Seed (fruit), leaves
Ethnobotanical uses:	Young leaves are air dried and crushed into fine powder. The powder is mixed with mustard oil and a little turmeric powder is added to it. The resultant ointment is applied with the help of bandage on skin sores, swellings, rheumatic joints and as antidote for scorpion bite. The seed (fruits) are roasted and eaten as dry fruits. Cooking oil is obtained by pressing the seeds in local mills. The leftover dried stems are used as fuel.
Collection season:	Summer season (June – September)
Botanical name:	*59. Helianthus tuberosus* L. (MI – 1095)
Local Name:	Alopech
Habitat:	Damp places with nutrient rich soils
Part(s) used:	Root tubers
Ethnobotanical uses:	The root tubers are eaten raw or cooked as a food. The tubers are fed to cattle for making them more fat and healthy.
Collection season:	September – March
Botanical name:	*60. Lactuca serriola* L. (MI – 1097)
Local Name:	Shawdapai
Habitat:	Way sides, waste places and sandy stream sides
Part(s) used:	Whole plant
Ethnobotanical uses:	Leaves are used raw as salad and cooked as potherb.
Collection season:	May – September
Botanical name:	*61. Matricaria matricarioides* (Less.) Porter ex Britton (MI – 1101)
Local Name:	Chandan botay
Habitat:	Roof tops of muddy roofs, waysides and waste places up to 2200 m
Part(s) used:	Whole plant
Ethnobotanical uses:	The dried whole plant with flowers is an insect repellant.

Collection season: Summer (May – July)

Botanical name: *62. Onopordum acanthium* L. (MI – 1102)

Local Name: Wreja kai

Habitat: Abundant weed of arable lands, waste places and hedge rows

Part(s) used: Seeds (fruit), flowers

Ethnobotanical uses: Thirty grams dried flowers are boiled in 500 ml of water for 30 minutes and then filtered through cloth. The decoction is taken before going to bed for improving heartbeat and prevention form cardiovascular diseases.

The young unripe seeds are eaten by children because of their rice like taste.

Collection season: Summer (May – September)

Botanical name: *63. Sigesbeckia orientalis* L. (MI – 1105)

Habitat: Moist sides of water courses often under shade of trees.

Part(s) used: Whole plant

Ethnobotanical uses: The juice extracted from the plant is applied on ringworm, athletefoot and sores between toes. A decoction of the plant is taken orally for relief in lower leg pain and sciatica.

Collection season: June – September

Botanical name: *64. Silybum marianum* (L.) Geartn (MI – 1106)

Local Name: Ghata Wrejakai

Habitat: Noxious weed of wheat, waste places and waysides in spring season

Part(s) used: Seeds

Ethnobotanical uses: Two tablespoons of the seeds are ground and boiled in 250ml if water. The extract is filtered and cooled for 30 minutes. The cooled extract is taken once or twice a day during jaundice and hepatitis. Ten grams of seeds are ground and sugar/ honey is added to it for taste. It is taken with water for stomach pain.

Seeds are eaten by children.

Collection season: May – June

Botanical name: *65. Sonchus oleraceus* L. (MI – 1109)

Local Name: Shawdapai

Habitat: Agricultural field borders, stream sides and fallow lands

Part(s) used: Leaves

Ethnobotanical uses: Infusion of fresh leaves is taken twice a day to ease the menstrual flow and normalize the delayed and irregular menstrual periods. Crushed, fresh leaves are applied as a paste on inflamed places of the body to give relief from the swelling and pain. Leaf and soot latex is used to remove warts from the skin.

The fresh leaves are used as potherb.

Collection season: April – August

Botanical name: *66. Tagetes minuta* L. (MI – 1633)

Local Name: Kach Hamesha

Habitat: Invasive weed of waste places, way sides and stream sides up to 1400m

Part(s) used: Shoots

Ethnobotanical uses: A flowering shoot is hung in houses for repelling mosquitoes and other insects. Flowering shoots are mixed with maize grains during storage to prevent from the damage incurred by grain eating pests like bugs and weevil. One tablespoonful of concentrated infusion of shoots is given before bedtime for the removal of intestinal worms. One medium size cup of the concentrated infusion is given to domestic animals like cows and buffaloes for the removal of endoparasites like liver flukes and intestinal worms. Crushed leaves are directly applied on bleeding haemorrhoids.

The whole plant is insect replant.

Collection season: July – September

Botanical name: *67. Taraxicum officinale* F.H.Wigg (MI – 1110)

Local Name: Toora daal

Habitat: Open waste places and pastures from plains up to 2800m

Part(s) used: Leaves, roots

Ethnobotanical uses: The roots of the plant are sliced and boiled in water for some time to make a broth. Chopped leaves of *Rumex hastatus* are added to it along with egg's yolk. 2 – 3 spoons of the broth is taken twice a day for the treatment of liver diseases and as liver tonic. Two cups of chopped roots are boiled in 15 times its volume of water to make a

	concentrated decoction. Honey or brown sugar is added for taste. 1 tablespoonful of the decoction is taken for improving the function of liver, helping in release of bile and preventing viral infections. The same is also used as blood purifier and dissolving kidney and gall bladder stones. A diluted infusion of fresh leaves is used as face wash for removing freckles from skin. The leaves are used as pot herb. The dried leaves are used to make herbal tea. Children play with the ripe fruits by blowing them.
Collection season:	March – May (Leaves), September – November (Roots)
Botanical name:	*68. Xanthium strumarium* L. (MI – 1112)
Local Name:	Ghat Jishkay
Habitat:	Sandy stream sides, waste places, lower hill elevations up to 1200 m
Part(s) used:	Leaves, fruits
Ethnobotanical uses:	A decoction of 10 grams air dried leaves is consumed two times a day for fever, malaria and anorexia. The dried ripened fruits are burnt and turned into ash. The ash is mixed with plenty of mustard oil. The oil is massaged on skin for the relief from itching. Dried leaves of the plant are mixed with wheat before storing as insect repellant. The excessive use is toxic for cattle.
Collection season:	May – July (Leaves), September – November
Family:	**20. Balsaminaceae**
Botanical name:	*69. Impatiens glandulifera* Royle (MI – 1116)
Local Name:	Prhatai
Habitat:	Cool, shady, moist places near forest margins between 1600 to 2200m
Part(s) used:	Shoots, fruit
Ethnobotanical uses:	Thirty grams of dried shoots are boiled in 500ml of water for 15 minutes and then filtered through a cloth. One table spoon of the decoction is taken thrice a day for cough relief as expectorant and for treating asthma. Children play with ripe fruit enjoying the bursting mechanism.
Collection season:	June – September
Botanical name:	*70. Impatiens pallida* Nutt. (MI – 1117)

Local Name: Ziarh Atrang

Habitat: Moist places under forest cover or open meadows between 2200 – 2800m

Part(s) used: Leaves

Ethnobotanical uses: The fresh leaves are squeezed through a cloth and a juice is obtained. This juice (Sap) is directly applied on skin for the treatment of ringworm, eczema and warts. A fresh leaf is crushed, squeezed and applied directly on the skin for relief from nettle (*Urtica dioica*) sting. An infusion of leaves is used as a skin wash to make the skin moist and fresh preventing dry, cracked skin.

Collection season: June – August

Family: **21. Berberidaceae**

Botanical name: *71. Berberis lycium* Royle (MI – 1118)

Local Name: Kwaray

Habitat: Drier hill sides with scrubby vegetation up to 2900m

Part(s) used: Roots, shoots, young leaves, fruits

Ethnobotanical uses: Root bark is dried under sun and powdered. One teaspoon of the powder is taken with water for dysentery, sore throat, internal wounds and diarrhea. Water extract of root bark is kept overnight in open place and one cup of it is taken empty stomach in morning as cooling agent, anti-jaundice, hepato-protective, anti-diabetic, blood purifier and mild laxative. Dried, powdered root bark is mixed with warm desi ghee (butter oil) and is tied through a bandage as poultice for broken and fractured bones. Fresh fruit is delicious and anthelmintic in effect. Cow's butter oil (desi ghee) is kept in leather bag and buried under soil beneath a *Berberis lycium* plant with one root of the plant inserted in the oil filed bag in autumn season of one year and dug out in the winter of the next year. One teaspoon of the oil is used daily as a general body tonic.

The woody shoots are used as fuel wood. Young, tender leaves are eaten raw. The ripe fruit is a sore tasting wild edible fruit. It has been noted that when birds especially Chakor partridge become wounded go towards *Berberis* and peel the bark of stem and tie it around the

	wound or broken legs.
Collection season:	June (Fruit), October – November (Rootbark)
Family:	**22. Betulaceae**
Botanical name:	*72. Alnus nitida* (Spach) Endl.Gen (MI – 1119)
Local Name:	Geeray
Habitat:	Moist sides of spring, stream or river
Part(s) used:	Wood, bark
Ethnobotanical uses:	Decoction of the bark is externally applied on the body for treating pain and swellings. It is applied on skin to subside the pain incurred due to insect bite. The wood is used as fuel and for construction and furniture making.
Collection season:	November – February
Family:	**23. Boraginaceae**
Botanical name:	*73. Trichodesma indicum* (L.) R.Br. (MI – 1129)
Local Name:	Gawzoban
Habitat:	Drier, sandy, low hill sides up to 1300m
Part(s) used:	Root
Ethnobotanical uses:	Fresh roots are ground finely and applied directly through a bandage on inflamed and swelled areas to cure.
Collection season:	July – October
Family:	**24. Brassicaceae**
Botanical name:	*74. Alliaria petiolata* (M. Bieb.) Cavara & Grande (MI – 1130)
Local Name:	Spingulay/Ooga botay
Habitat:	Hedge rows, graveyards, forest margins up to 1200m
Part(s) used:	Leaves, seeds
Ethnobotanical uses:	Aqueous extract of chopped leaves is applied directly on skin at night time for a relief in itching, eczema and scabies. A pinch of finely powdered seeds is kept in nostrils to cause sneezing and help in discharge of nasal and chest impurities. The young leaves are used as salad and potherb in winter and early spring season.
Collection season:	February – April (Leaves), May – June (Seeds)
Botanical name:	*75. Brassica juncea* (L.) Czern. et Coss. (MI – 1134)

Local Name: Awray

Habitat: Cultivated or as weed in wheat and other Rabi crops

Part(s) used: Leaves, Seeds

Ethnobotanical uses: Crushed leaves are tied to the forehead for relief in headache. Half teaspoonful of seeds is chewed and taken with tea as warming agent, stimulant and galactagogue. They also help in improving the health of hair. The oil expressed from seeds is a hair tonic.

The leaves are used as potherb.

Collection season: January – March (Leaves), May (Seeds)

Botanical name: *76. Brassica napus* L. (MI – 1135)

Local Name: Canola

Habitat: Cultivated plant of Rabi

Part(s) used: Leaves, seed oil

Ethnobotanical uses: The oil is used in massage of skin to make it soft, healthy and cool. It also strengthens hair. The oil is used in cooking and frying to strengthen heart muscles and reduces the risk of heart attack.

The young leaves are used as potherb. The young, unopened flowering shoot is a delicacy. The young shoots are used as fodder for cattle.

Collection season: January – March (Leaves and shoots), April – May (Seeds)

Botanical name: *77. Brassica rapa* subsp. *campestris* (L.) Clapham (MI – 1136)

Local Name: Sharsham

Habitat: Cultivated often as a mix crop with clover (*Trifolium*) or on field margins of wheat or other Rabi crops.

Part(s) used: Leaves, immature flowering shoots, seeds

Ethnobotanical uses: One teaspoon of mustard oil is taken with warm water half an hour before bedtime for the relief of chest congestion and constipation. The oil is dropped into ear canal to ease an earache. The body of babies and adults is massaged with the oil to make it soft and safe from infections.

Young leaves are used as potherb. Immature flowering shoots are cooked as a special dish called “Da ghandalo saag”. The young plants are also used as fodder. Seed oil is burnt for lighting in lamps. The

	seed oil is used in many household cuisines and in many medicinal recipes.
Collection season:	January – March (Leaves and shoots), April – May (Seeds)
Botanical name:	*78. Capsella bursa-pastoris* (L.) Medik (MI – 1137)
Local Name:	Bambaisa
Habitat:	Common weed of waste places, fallow lands and field margins of Rabi crops.
Part(s) used:	Shoots, seeds
Ethnobotanical uses:	An infusion of the whole plant is used as astringent and treats internal bleeding. It also regulates menstrual flow. The infusion is also used to help in speeding up the uterine contractions during childbirth. The quantity of infusion is increased by 5 – 10 times when using for the same purposes in cattle. Shoots are used as fodder for cattle, sheep and horses.
Collection season:	September
Botanical name:	*79. Descurainia sophia* (L.) Webb. ex Prantl. (MI-1644)
Local Name:	Spin awray
Habitat:	Waste places and field margins
Part(s) used:	Leaves, seeds
Ethnobotanical uses:	Crushed leaves are made into a paste and applied in mouth to treat toothache. A strong decoction of the plant is mixed with equal volumes of honey and vinegar and taken as gargle for controlling asthma, sore throat and cough. The seeds are ground and dusted on burns, scalds and sores to heal. The whole plant is used as fodder. The leaves are sometimes cooked as green vegetable with slightly pungent taste.
Collection season:	March – April (Leaves), June (Seeds)
Botanical name:	*80. Eruca sativa* Mill. (MI – 1645)
Local Name:	Jawawa
Habitat:	A weed in Rabi crops, sometimes cultivated.
Part(s) used:	Leaves, Seed oil
Ethnobotanical uses:	The oil is used as a massage on skin, cause irritation for sometime but is a stimulant and rubifacient. The oil is applied on scalp for

	improving the health of hair and as lice repellant. One tablespoon of the oil is mixed with honey and taken 2 – 3 hours before bedtime as an aphrodisiac. The young leaves are boiled and the water is removed to reduce the pungent taste. The boiled leaves are fried in mustard oil along with garlic and tomatoes to make a tasty green vegetable.
Collection season:	February – March (Leaves), May – June (Seeds)
Botanical name:	*81. Isatis costata* C.A. Mey (MI – 1646)
Local Name:	Nelawrho
Habitat:	Drier sandy hill sides, fallow lands and gentle slopes up to 1500m
Part(s) used:	Whole plant
Ethnobotanical uses:	Young whole plant is air dried under shade and ground into fine powder. The powder is mixed with mustard oil and applied externally on ringworms, eczema and athlete's foot.
Collection season:	April – June
Botanical name:	*82. Lepidium apetalum* Willd. (MI – 1141)
Local Name:	Zangali Halam
Habitat:	Weed of fallow land, field margins, waste places and sandy stream sides up to 1500m
Part(s) used:	Shoot
Ethnobotanical uses:	Half cup decoction of air dried leaves is taken twice a day for relief in asthma. Half teaspoon of powdered leaves is taken as stimulant and to keep the body warm. Fresh, crushed leaves are applied on skin for the treatment of itching, eczema and seborrhea. Young, tender shoots have pungent, mustard like taste and used as salad.
Collection season:	March-April.
Botanical name:	*83. Lepidium sativum* L. (MI – 1142)
Local Name:	Halam
Habitat:	Cultivated in kitchen gardens
Part(s) used:	Seeds
Ethnobotanical uses:	50 – 100 seeds are soaked in a spoonful of milk for an hour and given orally to infants for relieving colic and stomachache. The same recipe

	also eases bowel movements and work as mild laxative. Two teaspoonfuls of seeds are soaked overnight in warm water and sugar is added for taste and eaten in the morning as appetizer and glactagogue in nursing mothers. Powdered seeds are mixed with butter and applied as poultice for the treatment of burns, pain, boils and wounds. It also helps in removing the scars on skin after burn injuries.
Collection season:	May – June
Botanical name:	*84. Nasturtium officinale* R.Br. (MI – 1143)
Local Name:	Tarmeera
Habitat:	Slow running fresh water stream or spring margins up to 1300m
Part(s) used:	Leaves, Seeds
Ethnobotanical uses:	5 – 10 fresh shoots are eaten raw as an appetizer. Handful of fresh leaves are eaten once daily as stimulant, diuretic, blood purifier, hypoglycemic and tonic. Fresh juice of the leaves is applied on skin to cure irritation, itching and inflammation. Oil expressed from the seeds is applied on scalp as hair tonic, making hair thick and strong, prevent hair fall and remove lice, fleas and dandruff from hair. The fresh leaves are used as salad. The shoots are an excellent potherb with stimulating and warming effect on the body.
Collection season:	Throughout the year (Leaves), June – July (Seeds)
Botanical name:	*85. Raphanus sativus* L. (MI – 1145)
Local Name:	Moolai
Habitat:	Cultivated in loamy, well drained soils
Part(s) used:	Root, leaves, seedpod
Ethnobotanical uses:	5 – 10 pieces of freshly cut reddish root is eaten raw to increase appetite. Few slices of reddish are eaten within meal as a salad to help in digestion. 2 – 3 slices are eaten after meal to reduce flatulence and release the gas in stomach. It also works as stomachic and carminative. A fresh radish is cut lengthwise into four pieces and 5grams of ground Ammonium chloride is added to it and kept overnight. The radish pieces are eaten empty stomach in morning for 7 – 15 days to cure the inflammation of spleen. The same recipe is

	also applied in case of heamorrhoids. Half cup juice is extract from fresh leaves and raw sugar (Gur) is added to it. This mixture is taken after 3 – 4 hours interval for hepatitis and to improve the flow of bile. It treats jaundice. 30grams each, fresh leaf juice of *Raphanus sativus* and *Solanum rigrum* is mixed with raw sugar for taste and used in all types of hepatitis. A medium sized radish is eaten raw after sprinkling few drops of vinegar on it before bedtime and then the mouth and face is covered with blanket for relief in flue, cough and cold. Infusion of the leaves is anthelmentic both in humans and domestic animals. Two medium sized radishes are eaten raw as a diuretic, hepatoprotectant and anti-diarrheal. The root is used as salad. It is also cooked along with rice. It is also used as filling in a type of bread called "Mooli Paratha". The young leaves are used as salad or a potherb. The tender seedpods are eaten raw.
Collection season:	December – February
Botanical name:	*86. Sinapis alba* L. (MI – 1648)
Local Name:	Spin Sharhsham
Habitat:	Weed of Rabi crops and fallow lands
Part(s) used:	Leaves, seeds, whole plant
Ethnobotanical uses:	Seeds are boiled in water to make a herbal tea. A gargle of this tea is effective in sore throat and productive cough. 30grams of powdered seeds is taken as an emetic. The seeds are pressed to extract the oil which is applied directly as a massage for swollen joints, arthritis and chest congestion. The leaves are used as green vegetable. The seeds yield a fixed oil which is mustard oil substitute. Whole plant is a fodder for sheep.
Collection season:	February – June
Botanical name:	*87. Sisymbrium irio* L. (MI – 1149)
Local Name:	Zangali Awray
Habitat:	Waste places, disturbed areas and weed in fallow lands
Part(s) used:	Leaves, seeds
Ethnobotanical uses:	Fresh leaves are boiled in water to obtain an infusion. Half cup of the

	infusion is taken twice a day for throat and chest infection, asthma and bronchitis. Seeds are ground with equal amount of sugar and a teaspoon is taken twice a day for producing sweat, reducing fever and as stimulant. Few seeds are put into eyes for a while to induce tearing and cleansing of eyes.
Collection season:	March – May (Leaves), May – June (Seeds)
Family:	**25. Buddlejaceae**
Botanical name:	*88. Buddleja crispa* Benth. (MI – 1152)
Local Name:	Sperawane
Habitat:	Scrubs on lower hill slopes up to 1800m
Part(s) used:	Whole plant
Ethnobotanical uses:	The flowering shoots are air dried and then boiled in water to obtain a decoction. Two tablespoons are taken thrice a day before meal for reducing high blood pressure and obesity. One tablespoon of the decoction is taken an hour after meal to reduce heartburn and acidity. The shoots are used as fuel wood.
Collection season:	April – Tune
Family:	**26. Buxaceae**
Botanical name:	*89. Buxus wallichiana* Bail. (MI – 1153)
Local Name:	Shamshad
Habitat:	Steep, shady, forest edges between 1800 – 2500m
Part(s) used:	Leave, wood
Ethnobotanical uses:	Fresh leaves are chopped, slightly warmed and tied through a bandage around painful, inflamed joints. The wood is used to make wooden utensils. The shoots are also used as fuel wood. The local name of plant is used for naming as “Shamshad Gul”, “Shamshad Khan”. The leaves are purgative and poisonous for sheep and cattle.
Collection season:	Throughout the year
Botanical name:	*90. Sarcococca saligna* (D.Don.) Muell-Arg. (MI – 1154)
Local Name:	Ladanrh / Lathar
Habitat:	Moist, shady places under forest cover and ravines between 1300–2500m

Part(s) used: Shoot

Ethnobotanical uses: Young shoots are boiled in water to obtain an infusion. A cup of the infusion is taken daily for blood purification, rejuvenation, increasing red blood cells and boosting the immunity against infections. The local people have a superstition that only the first cut shoot has all these effects. A second cut from the same plant lacks all the mentioned effects. Ground fresh leaves paste is applied on swollen, painful joints and on infected skin for recovery.

The shoots are used as a packing and thatching material.

Collection season: April – September (April is the best time for collection.)

Family: **27. Cactaceae**

Botanical name: *91. Opuntia monacantha* Haw. (MI – 1155)

Local Name: Zoqam

Habitat: Introduced and naturalized in waste places, hedge rows

Part(s) used: Cladodes, fruit

Ethnobotanical uses: Equal amount of turmeric powder (*Curcuma longa*) and mucilage of *Opuntia monacantha* are mixed and applied externally for the treatment of rheumatism, haemorrhoids, scars on skin and bruises. Sap of cladode and honey are mixed in 1 : 3 proportion and a spoonful of the mixture is taken thrice a day for constipation, liver complaints and spleen enlargement. Sap of cladode is diluted with water in 1:10 proportion and few drops are put into eyes for ophthalmic diseases. Cladodes are crushed and boiled in water. Sugar is added to the infusion for taste and two spoons of the infusion are taken thrice a day for asthma, bronchitis and chest congestion.

The fruit is eaten by children when ripe. The plant is also planted in hedge rows.

Collection season: November – December (Fruit), Cladode (Throughout the year)

Family: **28. Caesalpinaceae**

Botanical name: *92. Caesalpinia decapetala* (Roth.) Alston (MI – 1156)

Local Name: Jarey

Habitat: Planted in hedge rows and grows naturally on gentle hill slopes up to 1300m

Part(s) used: Whole plant, seeds, leaves

Ethnobotanical uses: A decoction of air dried leave is prepared by boiling 50gm leaves in 500ml of water. The decoction is filtered and honey or raw sugar is added to it for taste. One tablespoon is taken thrice a day for the cure and prevention of malaria. One teaspoon of powdered leaves is taken with water half an hour before bedtime for the removal of intestinal worms. A paste of finely crushed fresh leaves is externally applied to burns, wounds and bruises on skin. The pulp of seeds is finely crushed and mixed with olive oil into a paste, which is applied on face and kept overnight to remove freckles and scars from the face.

The plant is grown as a hedge plant on field boundaries. It is also ornamental plant because of the beautiful yellow inflorescence.

Collection season: April – September

Family: **29. Cannabaceae**

Botanical name: *93. Cannabis sativa* L. (MI – 1158)

Local Name: Bhang

Habitat: Waste and disturbed places, sandy stream sides and graveyards

Part(s) used: Leaves, seeds, stems

Ethnobotanical uses: Equal amounts of *Cannabis sativa* leaves and *Papaver somniferum* fruit wall are kept overnight in water to make a drink locally called as "Tandai". This drink is used to relieve anxiety and depression, resulting in feelings of wellbeing. Half to one teaspoon of powdered leaves are taken to prevent vomiting and eliminate nausea. Alternate layers of *Cannabis sativa* leaves and beef are buried under soil for 3 – 4 weeks and then dugout as local variant of "Charas". Charas is smoked as narcotic, sedative, appetizer and anodyne. Leaves of the plant are tied around inflamed joints for relief in pain. 50grams of dried leaves are boiled in 250ml of water and filtered. The infusion is cooled and half cup is given to pregnant women during child birth to relieve labour pain. Fresh, crushed leaves are kept on the external genetalia of female cattle to prevent premature labour and abortion.

Stems of mature, blooming plants especially male plants are tied like ropes to make bundles of fodder and fuel wood. The stems are kept

	under water for two weeks for retting and the fiber of stem is separated to make durable ropes. The seeds on female plant are used as bird feed.
Collection season:	May – September
Family:	**30. Cannaceae**
Botanical name:	*94. Canna indica* L. (MI – 1159)
Local Name:	Taspabotay
Habitat:	Moist, rich soils, often cultivated
Part(s) used:	Seeds, whole plant, rhizome
Ethnobotanical uses:	Boiled rice is fermented for a day. Decoction of *Canna indica* rhizome is added to it and the mixture is applied on external genetalia for the treatment of gonorrhea and syphilis. The plant is ornamental because of its large, green foliage and beautiful red flowers. The leaves when burnt produce a smoke which kill and repel insects. The seeds are sewn as beads in a string to make rosary (Tasbeeh).
Collection season:	Throughout the year (Rhizome), October (Seeds)
Family:	**31. Caprifoliaceae**
Botanical name:	*95. Viburnum cotinifolium* D.Don (MI – 1162)
Local Name:	Shanglo
Habitat:	Open slopes of hills between 1200 – 2100m
Part(s) used:	Fruit, whole plant
Ethnobotanical uses:	The wood is used for fuel. The fruit when ripe is edible.
Collection season:	Throughout the year (Wood), June (Fruit)
Botanical name:	*96. Viburnum grandiflorum* Wall.ex DC (MI – 1163)
Local Name:	Khapyanga / Ghazmewa
Habitat:	High altitude scrubs between 1800 – 3000m
Part(s) used:	Whole plant, fruit
Ethnobotanical uses:	50 – 60 fruits are eaten for easing bowel movement and preventing constipation. Fruits are squeezed through cloth and the fruit juice is taken once a day for blood purification, as cooling agent and for improving menstrual flow. The whole plant is used as fuel wood. The branches are used for

	fencing. The ripe fruits are eaten.
Collection season:	June – July (Fruit)
Family:	**32. Caryophyllaceae**
Botanical name:	*97. Silence conoidea* L. (MI – 1169)
Local Name:	Bashka mashorhgai
Habitat:	Common, gregarious weed of wheat crop
Part(s) used:	Fruit
Ethnobotanical uses:	The tender, fresh fruit is having a mild sweet taste and eaten by children.
Collection season:	April
Botanical name:	*98. Stellaria media* (L.) Vill. (MI – 1172)
Local Name:	Olalai / Chichrha / Charg kulmay
Habitat:	Very common plant in spring season from plains to hills up to 2500m
Part(s) used:	Whole plant
Ethnobotanical uses:	The fresh plant is crushed into a fine paste which is applied on skin for the treatment of itching, eczema and insect bites. The whole plant is pound in a mortar and a little water is then added to it. The mixture is strained through cloth to obtain the juice, which is further filtered through fine pored muslin. Few drops of the juice are poured into eyes as eyewash and to cure the redness and other complaints of eyes. The expressed juice or the finely crushed shoots are applied on skin for tissue repair and filling the depressions on skin. Decoction of the plant is taken thrice a day as demulcent and galactagogue. Infusion of the plant is mixed with olive oil and rubbed on face as emollient and massaged on joints for rheumatism. The fresh plant is desirable pot herb.
Collection season:	December-February
Botanical name:	*99. Vaccaria hispanica* (Mill.) Rauschert. (MI – 1660)
Local Name:	Ghwarha Bashka
Habitat:	A rare weed of Rabi crops
Part(s) used:	Leaves, seeds
Ethnobotanical uses:	The sap of the plant is externally applied on skin for the cure of itching and other skin diseases. Decoction of the seeds is taken orally

	for stimulating parturition during labour.
	The leaves are used as condiment.
Collection season:	January – April (Leaves), May – June (Seeds)
Family:	**33. Celastraceae**
Botanical name:	*100. Euonymus hamiltonianus* Wall. (MI – 1173)
Local Name:	Shna lakhta / Sika
Habitat:	Scrub and woodlands between 1800 – 2500 m
Part(s) used:	Leaves, shoot
Ethnobotanical uses:	The leaves are browsed by goats. The shoots are used as fuel wood and to make weaving sticks.
Collection season:	March – September (Leaves), Throughout the years (Shoots)
Botanical name:	*101. Maytenus royleanus* (Wall. ex Lawson) Cufodontis (MI – 1174)
Local Name:	Sor azghay
Habitat:	Drier, gravely hill sides and hedgerows up to 1600m
Part(s) used:	Shoot
Ethnobotanical uses:	The shoots are browsed by goats. The shoots are also used as fuel wood.
Collection season:	Throughout the year
Botanical name:	*102. Maytenus wallichiana* (Spreng.) Raju & Babu (MI – 1662)
Local Name:	Bamporh
Habitat:	Mixed coniferous forests between 1600 – 2800m
Part(s) used:	Shoots
Ethnobotanical uses:	The shoots are used as fuel wood. There is a superstition that keeping the plant in house results in quarrels between the inmates especially wife and husband.
Collection season:	Throughout the year.
Family:	**34. Chenopodiaceae**
Botanical name:	*103. Chenopodium album* L. (MI – 1175)
Local Name:	Sarmay
Habitat:	Weed in fallow lands, sandy stream side and graveyards
Part(s) used:	Shoot, roots, seeds
Ethnobotanical uses:	Fresh shoot of the plant are ground and then squeezed through a muslin cloth to obtain the juice. 2 – 3 teaspoons of this is taken daily

for removal of kidney stone and preventing stone formation. Fresh leaves of the plant are heated on steam and then applied as poultice on swellings and inflamed areas of the body. Fresh juices of *Chenopodium ablum* and *Fumeria indica* are mixed in equal proportion and a little raw sugar (Gur) is added to it for taste. Half cup of the mixture is taken twice a day for blood purification and curing itching, extra body heat, skin pimples and bad mouth odour. Decoction of *Pistacia integerrima* stem bark and infusion of *Chenopodium album* leaves is mixed in 2:1 proportion and 2 – 3 spoon of the mixture is taken thrice a day for the treatment of jaundice. 20grams of dried ginger (*Zingiber officinale*) is powdered and 20 – 25grams of *Chenopodium album* seed powder is added to it. Both are boiled in half liter of water till 100 – 150ml of water is left. The mixture is passed through muslin cloth and 1 – 2 spoons are taken twice a day for regularizing menstrual cycles. Fresh leaves are chewed for a relief of toothache. Excessive intake of fresh leaves or concentrated infusion cause miscarriage and prevent pregnancy thus working as abortifacient and contraceptive.

The shoots are boiled and the water is removed after boiling. The boiled shoots are then roasted in oil with garlic (*Allium sativum*) and table salt to make an excellent green vegetable. The fresh crushed roots are used for cleaning utensils. Seeds are use as chicken and bird feed. Fresh stem juice is herbal cosmetic and applied on face for removal of freckles and prevention against sunburn.

Collection season: April – September (Leaves), October – November (Seeds)

Botanical name: *104. Chenopodium ambrosioides* L. (MI-1176)

Local Name: Binnakai

Habitat: Waste and disturbed places, sandy stream sides up to 1300m.

Part(s) used: Whole plant

Ethnobotanical uses: Infusion of leaves is taken to treat stomach pain and colic.

The juice of fresh plant is applied to remedy insect bites, haemorroids and wounds. A decoction made from air dried flowering shoots is given to children for removal of intestinal parasites. The seeds are

	ground into a powder and one teaspoon is given with water, 2-3 hours after meals to treat amoebic dysentery, where there is blood and mucus in the stools. Few twigs of the plant are added to various herbs to increase their digestibility and prevent flatulence. Half cup of a decoction of flowering tops of the plant is used during asthmatic cough attacks. The whole plant is insect repellant. Plant parts are mixed in soil to kill larvae of pests. The plant is vermifuge for cattle that also expel liver fluke from their bodies.
Collection season:	April - December (Shoots), December - January (Seeds)
Botanical name:	*105. Chenopodium botrys* L. (MI-1177)
Local Name:	Skha Kharawa
Habitat:	Sandy soils near streams and foot hills up to 1200 m.
Part(s) used:	Leaves.
Ethnobotanical uses:	Air dried leaves of the plant are boiled in water for plenty of time to obtain a strong decoction and stored in bottles. One table spoon of the syrup is diluted in half cup of warm water and sipped slowly to control catarrh, allergic cough and asthmatic attacks. The whole plant and its leaves especially are used as insect repellant and mixed with stored grains. The leaves are used as green tea.
Collection season:	April – September.
Botanical name:	*106. Chenopodium murale* L. (MI-1178)
Local Name:	Sor sarmay
Habitat:	Weed in fallow lands and in low attitude hill slopes often on poor soil.
Part(s) used:	Leaves.
Ethnobotanical uses:	The leaves are used as pot herb. The leaves are boiled and water is removed. The boiled leaves are marinated in vinegar or yogurt and then roasted in oil along with garlic and ginger.
Collection season:	February – June.
Botanical name:	*107. Kochia scoparia* (L.) Schrad. (MI-1179)
Local Name:	Mosami Sarwa
Habitat:	Often cultivated but sometimes become invasive weed of fallow

lands. Recently introduced.

Part(s) used: Whole plant

Ethnobotanical uses: The plant is mainly used as a summer ornamental plant. The old dead plants are used as brooms

Collection season: July – August.

Botanical name: *108. Spinacia oleracea* L. (MI-1180)

Local Name: Palak

Habitat: Cultivated as a green vegetable.

Part(s) used: Leaves, seeds.

Ethnobotanical uses: The infusion of leaves is utilizes thrice a day as mild laxative and hypoglycemic. Half cup infusion of leaves is taken half an hour before meals to increase appetite. One table spoon of finely powdered dried seeds is taken thrice a day with water for four weeks to control hepatitis.

The green leaves are a common, excellent pot herb, cooked and roasted in a variety of ways.

Collection season: February – April (leaves). May – June (seeds)

Family: **35. Colchicaceae**

Botanical name: *109. Colchicum luteum* Baker (MI-1181)

Local Name: Qaimatgullay

Habitat: Stony hillsides, graveyards and high altitude meadows, distributed between 1000 – 3000 m.

Part(s) used: Corm.

Ethnobotanical uses: The scales from the corm are removed and then it is crushed by mortar and pestle and mixed with egg yolk. The mixture is fried in animal fat (Desi ghee) and taken at night time for joint pain, gout and low back pain. 30 grams of dried corms are boiled for 30 minutes in 500 ml of water. The decoction which is obtained is sweetened with honey or raw sugar. One table spoon of the syrup is diluted in half cup of water and taken in morning before breakfast as a blood purifier and alterative.

Collection season: Throughout the year but especially at time it sprouts and blooms for correct identification between Februarys – May.

Family:	**36. Commelinacece.**
Botanical name:	*110. Commelina benghalensis* L. (MI-1182)
Local Name:	Narha
Habitat:	Common, often gregarious weed of khareef crops especially corn field.
Part(s) used:	Whole plant.
Ethnobotanical uses:	The whole plant including the root tubers are crushed and slightly heated on steam and applied externally through a bandage for the treatment of swellings and to heal burns injuries. The shoots are used as an excellent, palatable fodder for cattle.
Collection season:	July – September
Botanical name:	*111. Tradescantia pallida* (Rose) D.Hunt (MI-1184)
Local Name:	Oodeypanrha
Habitat:	Cultivated as ornamental, sometimes escape and become invasive.
Part(s) used:	Whole plant.
Ethnobotanical uses:	The fresh juice obtained by cutting the stem, which bleed out is collected and used to wash the skin injuries due to cuts and burns. The sap is also applied on face for removing freckles. The whole plant is ornamental because of its evergreen nature, purple foliage and pink flowers.
Collection season:	Throughout the year especially summer season.
Family:	**37. Convallariacere.**
Botanical name:	*112. Polygonatum multiflorum* (L.) All. (MI-1185)
Local Name:	Baramol
Habitat:	Under forest shade on steep slopes above 2500 m.
Part(s) used:	Shoots, Rhizome, roots
Ethnobotanical uses:	The dried rhizome is ground into a powder and heated for a while in mustard oil. A little turmeric powder is added to it and tied through a bandage as poultice on bruises and wounds for quick healing and regeneration of tissue. A cup full of rhizome infusion is taken daily as general body tonic, restorative of lost energy, cure for stomach inflammation and chronic dysentery. A pinch of powdered root is kept in nostrils like a snuff to induce sneezing. This results in

	clearing of nose, expelling phlegm from air passage ways and easing normal breathing. Young, tender shoot sprouted in spring season are collected and boiled in milk, with a little sugar added. It is a delicacy in the local cuisine.
Collection season:	April – May (Young sprouts) October – December Rhizone)
Botanical name:	*113. Polygonatum verticillatum* (L.) All. (MI-1186)
Local Name:	Noor-e-Alam
Habitat:	Grassy hill tops and forest floors between 2600- 3000 m.
Part(s) used:	Leaves, Rhizome.
Ethnobotanical uses:	50 grams of fresh rhizome is boiled in 500 ml of milk till only 100 ml of the milk is left. About two cups full of honey is added to it and stored. 2-3 table spoons of the mixture are taken twice a day. In morning it is taken half an hour before breakfast and in evening 2-3 hours before bed time. This medication is considered powerful revitalizing agent, aphrodisiac and tonic for men and a galactagogue for lactating women. An infusion of rhizome is diluted in 1:5 proportions with water and taken thrice a day as anti-rheumatic agent, for the treatment of back pain and as diuretic. The young, tender leaves are either directly fried or cooked in milk and then fried in desi ghee (butter) and sweetened with a little sugar. It is taken as a salep tonic and revitalizing food. The rhizome is slightly sweet in taste and eaten raw as a salad.The rhizome is boiled in cow's milk and a little sugar is added to it. When the mixture turns into a semi solid consistency, it is taken as a food for strength giving and revitalization.
Collection season:	April – May (leaves) and October – December (Rhizome)
Family:	**38. Convolvulaceac**
Botanical name:	*114. Convolvulus arvensis* L. (MI-1187)
Local Name:	Prewatkai.
Habitat:	A common weed of arable lands, fallow lands, hedge rows, gardens and bushes up to 2200 m.
Part(s) used:	Whole plant.

Ethnobotanical uses: A concentrated decoction of the whole plant is a strong purgative both for humans and cattles. Infusion of leaves is used as a wash on insect bites and taken internally to reduce profuse menstruation.

The stem being flexible is used for tying up fuel wood and grass bundles. The plant is used as a fodder.

Collection season: Throughout the year.

Botanical name: *115. Ipomoea purpurea* (L.) Roth (MI-1189)

Local Name: Prewata

Habitat: Cultivated and naturalized in waste places, stream sides and disturbed areas up to 2000 m.

Part(s) used: Whole plant, seed.

Ethnobotanical uses: The seeds are ground finely and a teaspoon full is taken with water for killing and expulsion of intestinal worms. 10 grams of seeds are boiled in two cups of water for half an hour. The decoction is passed through cloth and 1-2 table spoons are taken one hour after meal as a laxative and to eliminate constipation.

The plant is used as an ornamental plant grown on walls and hedges.

Collection season: July-October

Family: **39. Cornaccae**

Botanical name: *116. Cornus macrophylla* Wall. ex Roxb. (MI-1190)

Local Name: Khadang.

Habitat: Forest slopes, stream sides between 1000 – 1800 m.

Part(s) used: Stem bark, wood, fruit.

Ethnobotanical uses: The stem bark is boiled in water to obtain an infusion. Wheat flour is fried in cow's butter and the decoction of stem bark of *Cornus macrophylla* is added to it and cooked on gentle heat for some time to make a paste (Halwa). This paste is taken at night time as analgesic to relieve body pains especially low back pain (lumbago) and uterine pain during pregnancy or after birth. The paste is also considered general body tonic and astringent.

The shoots and wood of the tree is used as fuel and for making charcoal. The fruits are edible as wild fruits.

Collection season: July – August (fruit) and Throughout the year (stem bark).

Family:	**40. Crassuilaceae**
Botanical name:	*117. Hylotelephium ewersii* (Ledeb.) H.Ohba (MI-1191)
Local Name:	Da Ghra Warkharhay
Habitat:	Rock crevices between 2000 – 3000m
Part(s) used:	Whole plant
Ethnobotanical uses:	The whole plant is crushed into a paste and applied o forehead and temples to provide soothing and cooling effect and to relieve tension and headache. The whole plant is used as ornamental plant. It is used as a fodder with lactogenic qualities for cattle.
Collection season:	April-October
Family:	**41. Cucurbetaceae**
Botanical name:	*118. Citrulus lanatus* (Thunb.) Mats. (MI-1193)
Local Name:	Hindwane.
Habitat:	Cultivated in rainfed areas
Part(s) used:	Fruit, Seed
Ethnobotanical uses:	Almost half of a full size water melon is eaten raw to increase the volume of urine and to help expel kidney stones. It also help in prevention of heart attack. The fruit rind is dried and then crushed into a powder. One table spoon of the powder is taken with water twice a day to reduce blood sugar level. 2 table spoons of powdered seeds are added to a cup of cow's curd and thoroughly mixed. It is given to children for the treatment of nocturia (bed wetting). One table spoon of freshly ground seeds is taken empty stomach to kill and expel intestinal worms. The fleshy pulp of the fruit is eaten. The fruit pulp is applied on face to make the skin soft and spotless.
Collection season:	June – August.
Botanical name:	*119. Cucumis melo* subsp. *agrestis* (Naud.) Grebensc. (MI-1194)
Local Name:	Karkunday
Habitat:	Weed in arable lands.
Part(s) used:	Fruit, seeds
Ethnobotanical uses:	The whole seeds are ground into a powder and one table spoon is

	given to children with water for killing intestinal worms. 5-10 spoons of powdered seeds are mixed in water and given to cattle or sheep for the expulsion of endoparasites including tape worm and liver fluke. The cut fruit is rubbed on skin as a cooling moisturizer and cleanser. The seeds are wermifuge for cattles and sheep. Children play with its fruit.
Collection season:	July – October
Botanical name:	*120. Cucumis sativus* L. (MI-1195)
Local Name:	Badrang
Habitat:	Cultivated as a khareef crop.
Part(s) used:	Fruit, seeds.
Ethnobotanical uses:	The fresh fruits are eaten in larger quantities as substitute of lunch and dinner to reduce fats in the body and obesity. Fresh fruits are eaten raw to increase the volume of urea and as cooling agent. 20-30 grams of finely ground seeds are taken with water for the expulsion of intestinal worms. The fruit sap is applied on skin of face to make it soft and fare. The fresh, tender fruit is a common salad ingredient. It is also used in Raita. The fruit skin repel cockroaches and other insects.
Collection season:	June – September
Botanical name:	*121. Cucurbeta maxima* Duch. ex Lam. (MI-1196)
Local Name:	Khog Kado
Habitat:	Cultivated as a mix crop in khareef crops especially maize
Part(s) used:	Tender shoots, fruit, seeds
Ethnobotanical uses:	The pulp of fruit is used in a variety of ways but considered general body tonic, immunity booster, emollient, demulcent, detoxifier, brain tonic and refrigerant. The seeds are ground into powder along with seed coat and mixed with water to make an emulsion which is taken as a vermifuge. The tender shoots are a common summer pot herb. The young, tender fruits are eaten raw by children. The fruit is a common vegetable cooked in a variety of ways. Slices of pumpkin are boiled in water and then stored in thick sugar syrup as a jam. Fully ripe pumpkin

pieces are boiled and then fried in oil and sugar to make a delicious paste called “Kado Halva”. The seed with coat removed is eaten as dry fruit and added to confectionaries.

Collection season: June - October

Botanical name: *122. Lagenaria siceraria* (Molina) Standley (MI-1197)

Local Name: Gharhangey Kado

Habitat: Cultivated on field margins along hedge rows and along hay stacks.

Part(s) used: Leaves, Fruit, Seeds.

Ethnobotanical uses: Fresh leaves and flowers are crushed and gently heated on steam. They are applied as poultice on snake bites and insect stings as antidote. The above recipe without heating is applied on forehead for headache. A juice squeezed from the pulp of the fruit is taken to increase volume of urine, expel kidney stones, reduces stomach acidity and indigestion. Equal amounts of bottle guard seeds and *Achyranthes aspera* seeds are boiled and then ground into a paste which is applied on boils for the removal of pus and on tooth and gum for relief in pain.

The fruit is used as a common vegetable cooked in a variety of ways. The shell of fully ripe fruit is emptied from the pulp and used as a bottle for various purposes especially fish collecting during fishing.

Collection season: June – September

Botanical name: *123. Luffa acutangula* (L.) Roxb. (MI-1198)

Local Name: Toorai

Habitat: Cultivated along hedge rows, haystacks, walls and trees as a kitchen garden item

Part(s) used: Fruit, seeds, leaves

Ethnobotanical uses: Decoction of leaves is taken twice a day for amenorrhea. Poultice of leaves is applied on hemorrhoids. Juice of fresh leaves is dropped into eyes for clearing the eye balls and eye lids. Juice of leaves is also applied on skin sores and animal bites. 30-50 grams of fresh pulp of the fruit induce vomiting and loose motions, which is applied for clearing of the gut after food poisoning. Finely powdered seed is mixed with mustard oil or butter and applied on skin for the treatment

of dermatitis. Fine powdered seeds are inhaled through nose for the treatment of jaundice.

The tender, young fruit is used as a vegetable and cooked in variety of ways. The fully ripe fruit possess a hard skeleton of vascular bundles and fibers which is left after the decay of soft tissue and removal of pulp. This fibrous mish is used as bath sponge, utensil cleaner, skin scrubber and back scratcher. The flowers are frequently visited by insects like beetles and honey bees.

Collection season: May – October.

Botanical name: *124. Momordica charantia* L. (MI-1199)

Local Name: Kareela

Habitat: Cultivated along hedge rows or artificial support for climbing.

Part(s) used: Leaves, fruit, seeds.

Ethnobotanical uses: One cup of leaf decoction is taken twice a day for the treatment of rheumatism, gout, hepatitis, enlarged spleen and internal sores. One young tender fruit is eaten raw daily as immunity booster and prevention against viral infection and malaria. A fresh juice extracted from two normal size fruits is taken twice a day for reducing blood sugar level. Fresh fruit juice is directly applied on skin for the treatment of scabies, eczema, itching, vaginitis and hemorrhoids. An infusion obtained by boiling 2-3 normal size fruits with pulp removed is sweetened with honey or raw sugar and 1-2 spoonful are taken thrice a day for regulating menstrual flow in women and as aphrodisiac in men. 2 spoonful of concentrated fruit decoction is utilized to expel intestinal worms. Seed powder cause uterine bleeding and abortion.

The young or slightly ripened fruit is a bitter tasting vegetable cooked or roasted in a variety of ways either singly or in combination with meat or potatoes. Its use as vegetable is considered anti diabetic, tonic, anthelmintic, carminative, appetizer and hepatoprotective.

Collection season: May – September

Botanical name: *125. Solena amplexicaulis* (Lam.) Chandi (MI-1200)

Local Name: Kakorha

Habitat: Hedge rows

Part(s) used: Roots, leaves, fruit, seeds.

Ethnobotanical uses: 100 grams of air dried root tubers are ground in 100 ml of water to make an infusion. Two tea spoon of the infusion is given to pregnant women with empty stomach for two days to induce labour. Two table spoons of this infusion are taken as purgative. The leaves are crushed into a paste using mortar and pestle and applied on skin as anti-inflammatory agent especially for lesions and bruises on skin. Applying the paste on normal skin make it more healthy, soft and fresh. 50-100 grams of air dried leaves are ground into a fine powder and boiled in 100 ml of water to make a concentrated decoction. It is filtered through cloth and 1-2 tea spoons of the decoction is taken twice a day for the treatment of spermatorrhoea. The seeds are ground into fine powder. One table spoon is taken daily with milk or water as heart tonic.

The ripe fruit pulp is eaten.

Collection season: May – September.

Botanical name: *126. Trichosanthes cucumerina* L. (MI-1201).

Local Name: Baindool

Habitat: Cultivated along hay stacks and trees.

Part(s) used: Roots, leaves, fruits and seeds.

Ethnobotanical uses: 20-30 grams of root juice is given as a strong purgative and abortifacient. 2-3 table spoon of the juice is given as anthelmintic for killing and expelling intestinal worms. Half cup of expressed juice of leaves is given as an emetic to induce vomiting. Decotion of air dried fruit is sweetened with sugar and 1-2 table spoon are taken as digestive, antiflatulent and mild laxative. The dried seeds are ground into fine powder or chewed and swallowed directly as anthelemtic, abortifacient and aphrodisiac.

The long, tender fruits are cooked as a tasty vegetable in summer.

Collection season: June – October

Family: 42. Cupressaceae

Botanical name: *127. Cupressus sempervirens* L. (M1-1202)

Local Name: Sarwa

Habitat: Introduced and naturalized in plain areas often cultivated as ornamental plant and in graveyards.

Part(s) used: Twigs, cones, wood.

Ethnobotanical uses: Young shoots and female cones after shade drying are ground into fine powder. Two teaspoon of the powder are taken with water for expelling intestinal worms. A decoction made by boiling 30-50 grams of powdered shoots and cones in 250 ml of water is taken thrice a day in a dose of 1-2 tablespoons for the treatment of asthma, spasmodic cough, whooping cough, cough with blood in sputum, sore throat and common colds. An infusion of shoots and cones is used externally on bleeding piles. The infusion of young shoots is used as a foot wash for combating bad odour and excessive perspiration. A resin obtained by making incisions on the tree trunk is mixed with mustard oil and turmeric powder and applied on slow healing lesions of skin for quick healing and elimination. The smoke of young twigs and cones is inhaled as an expectorant, sneeze inducer and clearing of air passage ways for easier breathing. The smoke is also considered evil repellant by the local people, and releases stress, tension, anxiety and depression.

The tree is planted in houses and garden as ornamental. Twigs and branches of dead trees are used as a fuel. The wood of mature trees is used for making almirahs, wardrobes and cabinet shelves. Because of its fragrance its wood is insect replant and durable because it is impervious to wood worms and other pests. The tree is considered sacred and thus planted in grave yards. Children play with the first year closed cones as alternative to marbles. The smoke of young twigs repels mosquitoes and other insects and is fragrant. The tree is famous abode and shelter for many birds especially maynas for their stay.

Collection season: Throughout the year.

Botanical name: *128. Juniperus communis* L. var. s*axatilis* Pallas (M1-1203)

Local Name: Gugarh

Habitat: Found on alpine meadows on gravelly and rocky substratum on the upper limit of tree line above 3000m.

Part(s) used: Shoots, berries (cones)

Ethnobotanical uses: An infusion is made from crushing 30 grams of young shoots or ripe berries in half liter of water. Half cup of the decoction is taken and hour after meals as carminative and antiflatulent. A cup full of the infusion is used as stomachic and strong diuretic. The infusion is diluted in 1:3 proportion with luke warm water and used as antiseptic for washing the wounds and cleansing the skin. The scalp and head is washed with an infusion of fresh twigs for removing the dandruff. The smoke of fresh twigs is inhaled for mode relaxation and eliminating depression, tension and worries. The fully ripe female cones are eaten on the spot and considered stomachic, diaphoretic, carminative, tonic and diuretic. The fruit is given to sheep for the cure of respiratory diseases. The crushed young shoots mixed with butter and slightly warmed are applied on the exposed wounds of animals for healing and tissue regeneration.

The shoots are grazed by sheep. The dried shoots are used as a fuel wood and as tinder to start fire. The young shoots are spread on the floors of mosques and rooms for fragrance. The smoke of the plant is excellent evil repellant. The smoke is also insect repellant and fragrant.

Collection season: Throughout the year (shoot) and May – June (ripe berries)

Family: **43. Cuscutaceae**

Botanical name: *129. Cuscuta reflexa* Roxb. (M1-1205)

Local Name: Maichey botoay

Habitat: Grow as parasite on a variety of host trees and shrubs up to 1800m.

Part(s) used: Whole plant

Ethnobotanical uses: The whole plant is crushed and made into a paste. The paste is applied externally as a poultice for the treatment of joint pains and shoulders pains. 40-50 grams of fresh stem is finelly crushed into a viscous paste, to which one glass of water is added and taken as a strong purgative. A decoction is prepared by boiling 50 grams of

	dried shoots in half liter water. 3-5 table spoons of sugar is added to it. Half cup of the decoction is taken twice a day for a month as remedy for jaundice and hepatitis.
Collection season:	April – October
Family:	**44. Cyperaceae**
Botanical name:	*130. Carex canescens* L. (M1-1670)
Local Name:	Narai Deela
Habitat:	Along side of mountains ravines between 2200-3000m
Part(s) used:	Shoots
Ethnobotanical uses:	The shoots are grazed by animals and used as a fresh fodder.
Collection season:	May – September
Botanical name:	*131. Cyperus rotundus* L. (M1-1213)
Local Name:	Deela
Habitat:	A common weed of waste places, sandy stream sites, mud roof tops and fallow lands up to 1300m.
Part(s) used:	Rhizome, shoot
Ethnobotanical uses:	Equal amounts of air dried rhizome of the plant and black pepper are ground together. One teaspoon of the mixture is taken orally for the treatment of stomach pain. Freshly dug out rhizome is crushed and water is added to it in 1:5 proportion. Half cup of the infusion is taken daily to prevent conception. The shoots are used as a fodder of low quality.
Collection season:	April – October (shoots) and June – December (rhizome)
Family:	**45. Dennstaedtiaceae**
Botanical name:	*132. Pteridium aquilinum* (L) Kutin (M1-1225)
Local Name:	Baboozee
Habitat:	On hill sides under coniferous forests on dark colour soils.
Part(s) used:	Rhizome, shoots (fronds)
Ethnobotanical uses:	The young tender shoots while still unfurling are used as green vegetable and pot herb. The mature shoots are used as an excellent thatching material and as tinder. The rhizome is squeezed and rubbed on scalp for promoting strong hair growth.
Collection season:	April – May (young shoots) and June – October (mature shoots)

Family: **46. Dryopteridceae**

Botanical name: *133. Dryopteris filix-mas* (L.) Schott (M1-1227)

Habitat: Moist shady places along water courses

Part(s) used: Rhizome

Ethnobotanical uses: The rhizome is cleared of the scales and dried in shade. It is then grounds into a fine powder. 1-3 teaspoons of the drug is taken after almost 6-8 hours of fasting for killing and eliminating intestinal worms especially tape worm. 5 tablespoons of the powdered drug is either added to one cup of water or to corn flour dough and give to cattle for the expulsion of tape worms and other endoparasites.

Collection season: Through the year

Botanical name: *134. Dryopteris juxtaposita* H.Christ (M1-1228)

Local Name: Kwanjay

Habitat: Moist, shady hill sides between 1800-3000m.

Part(s) used: Young fronds

Ethnobotanical uses: The young fronds when still unfolding are collected and rubbed together for the removal or brown scales. They are then chopped and cooked in whey. Finally the cooked vegetable is fried with oil and garlic paste to make a delicious green vegetable.

Collection season: March – May

Family: **47. Ebenaceae**

Botanical name: *135. Diospyros kaki* L.f. (M1-1229)

Local Name: Ghat Amlok

Habitat: Cultivated from plains to 1800m.

Part(s) used: Fruit, stem bark, wood.

Ethnobotanical uses: The stem bark is ground into a powder and applied directly on wounds for stopping bleeding and healing the wound. The fresh fully ripe fruit is eaten raw for the treatment of constipation and bleeding piles and healing the wound. The cooked fruit is eaten for treating diarrheas. A juice extracted from green, unripe fruit is taken to control hypertension. The fruit when peeled and dried in sunlight are used as antitussive, expectorant, demulcent anti diarrheal.

The ripe fruit is eaten raw as a delicious sweet fresh fruit. The outer

	fruit cover is peeled and the pulp of fruit is then dried in sun to turn into a dry fruit. The ripe fruit is stored with intact shoot till winter season and then used like honey or jam as a sweet dish. The wood of stem is used for fuel.
Collection season:	Throughout the year (wood and bark) and September – November (Fruit)
Botanical name:	*136. Diospyros lotus* L. (MI-1230)
Local Name:	Toor amlok
Habitat:	Hill gorges and mixed forests between 1500-2200 m.
Part(s) used:	Fruit, wood.
Ethnobotanical uses:	The ripe fruits are stored under shade in a cool place to turn dark brown and then air / sun dried to become date-like dry fruit which is eaten in winter season. The young plants are used as a rootstock for grafting a scion from *Diospyros kaki*. The wood is used for fuel purposes and furniture making.
Collection season:	September – November.
Family:	**48. Elaeagnaceae**
Botanical name:	*137. Elaeagnus umbellata* Thunb. (MI-1231)
Local Name:	Ghanam Ranga
Habitat:	Drier exposed hill sides in scrub vegetation between 1200-2300 m.
Part(s) used:	Fruit, Flowers, whole plant.
Ethnobotanical uses:	The ripe fruits are air dried under shade. The seeds are removed and fruit is ground into fine flour like powder. 1-2 teaspoons of the powder is mixed with cow's milk and taken as cardiac stimulant and tonic. The ripe fruits are edible and eaten on the spot as wild fruits. The shoots are used as a fuel wood. The plant is grown as a hedge plant. The flowers are fragrant and therefore the plants are grown near houses as ornamental for this purpose.
Collection season:	July – August (Fruit)
Family:	**49. Equisetaceae.**
Botanical name:	*138. Equisetum arvense* L. (MI-1234)
Local Name:	Bandbandakay

Habitat: Moist, shady places between 1500-2300 m.

Part(s) used: Shoots.

Ethnobotanical uses: The young air dried shoots are boiled in water to make a concentrated decoction. The decoction is externally applied on wounds with the help of cotton and bandage for speedier healing, stopping bleeding and regenerating the damaged tissue. A slightly diluted decoction is applied through a dropper into nostrils for stopping nose bleeding. A diluted decoction is used as a wash for irritated, itching skin and eczema.

Collection season: May – October

Family: **50. Euphorbiaceae**

Botanical name: *139. Andrachne cordifolia* (wall. ex Decne.) Mnell. Arg. (MI-1236)

Local Name: Mahe Panrha/chaghjey botay

Habitat: Rock cliffs, exposed hill sides on stony soils near streams sides between 1000-2100 m.

Part(s) used: Leaves

Ethnobotanical uses: About 30 grams of fresh leaves are crushed and mixed with corn flour dough and fed to cattle for expelling intestinal worms.

The shoots when eaten in excess are purgative and even fatal for cattle and sheep.

Collection season: April – October.

Botanical name: *140. Euphorbia helioscopia* L. (MI-1239)

Local Name: Mandanrho / Prewatkai

Habitat: Gregarious weed of Rabi crops, waste places and fallow lands.

Part(s) used: Shoot.

Ethnobotanical uses: Dried shoots are boiled in water to make a decoction. Half liter of the decoction is given to buffalos and cattles while one cup to sheep or goat for the removal of intestinal worms.

The shoots and latex is poisonous for humans and cattle. The latex causes skin inflammation.

Collection season: February – May.

Botanical name: *141. Euphorbia hirta* L. (MI-1240)

Local Name: Jaghje

Habitat: Drier, sunny roadsides, fallow lands and foot hills up to 1200m.

Part(s) used: Whole plant

Ethnobotanical uses: 20-30 grams of fresh plant is soaked in water and then thoroughly rinsed to clear the soil and dirt from it. One liter of boiling water is added to it and left for 30 minutes. The infusion is then filtered through a maeh. 2-3 tablespoons of the infusion is taken 3-4 times a day for 2-3 weeks to cure asthma, bronchitis and respiratory inflammations. 15-20 grams of the plant is boiled in half liter water for 30 minutes or is crushed and mixed with corn flour dough and given twice a day to cattles for controlling diarrhea.

Collection season: April – December.

Botanical name: *142. Euphorbia prostrata* Ait. (M1-1242)

Local Name: Warmaga

Habitat: Weed of arable land and follow lands up to 1600m.

Part(s) used: Whole plant.

Ethnobotanical uses: The fresh plant is crushed into a paste and mixed in 2:1 proportion with mercury. The mixture is applied on face pimples at night time. Infusion of the plant is used as wash for the treatment of eczema.

Collection season: Throughout the year.

Botanical name: *143. Euphorbia wallichii* Hook.f. (M1-1243)

Local Name: Arghamala/Shangla

Habitat: Open meadows between 2400 – 3000m

Part(s) used: Shoot

Ethnobotanical uses: The latex bleeding out of cut stem is applied on ringworm for a week to subside. The whole plant when eaten in excess cause puging and even death of domestic animals. 20-30 grams of dried shoots are boiled in 500m of water for 20 minutes to obtain a decoction. This decoction is given in two equal dozes within 24 hours for the elimination of endoparasites in cattle and sheep.

Collection season: April – September

Botanical name: *144. Phyllanthus fraternus* Webster (M1-1244)

Local Name: Amalabotay/Nasoor

Habitat: Common weed of Khareef crops and fallow lands.

Part(s) used: Whole plant.

Ethnobotanical uses: Fresh whole plant is crushed into a paste and applied externally on burns and chronic wounds for 2-3 weeks. The whole plant is air dried and then ground into a fine powder. 2-3 grams of the powder is mixed in a tablespoon of honey and licked slowly twice a day for productive coughs and to expel phlegm from the lungs and air passage ways. Fresh plants are crushed and then strained trough cloth to obtain extract of the plant. 5-10 ml of the extract is given twice a day for 3-4 weeks as a cure of inflamed, painful joints. 10grams each of *Phyllanthus fraternus* and *Eclipta prostrata* are ground together to make a paste. Five grams of black pepper (*Piper nigrum*) powder is mixed with the paste and the boiled in half litre milk for 10 minutes. Two tablespoonful of the mixture are taken twice a day for the treatment of jaundice, viral hepatitis and other liver complaints.

Collection season: July – October

Botanical name: *145. Ricinus communis* L. (M1-1245)

Local Name: Harhanda

Habitat: Often cultivated near houses but has naturalized around settlements in waste and disturbed places up to 1300m.

Part(s) used: Seeds, leaves

Ethnobotanical uses: The fresh leaves of the plant are tied around the forhead for relief of headache. Crushed fresh leaves are applied as poultice on boils and pustules to release pus from them and heal them. The seed oil is rubbed on scalp for elimination and control of dandruff. Defending upon the age, 1-4 tablespoon of seed oil is given as laxative. Eating more than five seeds are poisonous and even kill an adult. The seeds are burnt into an ash. 1-2 grams of the ash is mixed with tobacco in cigarette and smoked as a narcotic. 5-10 seeds are ground and boiled in half liter of milk to decrease their toxicity. 1-2 tablespoons of the concoction is used for killing and removing intestinal worms. 2-3 spoonful of the concoction is used as purgative and emetic.

The plant is grown as an ornamental plant and insect repellant.

Collection season: Throughout the year.

Family:	**51. Fabaceae**
Botanical name:	*146. Astragalus candolleanus* Royle ex Benth. (MI-1725)
Local Name:	Ghwarhakay
Habitat:	Drier hill slope up to 2300 m.
Part(s) used:	Whole plant, seed.
Ethnobotanical uses:	Infusion of the whole plant is considered blood purifier and control skin diseases like itching, boils and pimples. 1-2 teaspoons of powdered seeds are taken with warm milk as a body tonic, give strength to bones and increase the fertility of women. The plant is grazed by goats and sheep.
Collection season:	March – October (whole plant) and October (Seeds)
Botanical name:	*147. Astragalus graveolens* Buch. Ham ex Benth. (MI-1728)
Local Name:	Pichpach.
Habitat:	Drier hill ridges often hanging, found between 1500-2300 m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The young shoots are used as a pot herb. The plants are used as fodder in fresh and dried form.
Collection season:	March – May
Botanical name:	*148. Astragalus pyrrhotrichus* Boiss. (MI-1730)
Local Name:	Mamol
Habitat:	Drier, gravelly foothills up to 1500m.
Part(s) used:	Young leaves, flower.
Ethnobotanical uses:	The plant is visited by variety of insects especially honey bees for nectar collection.
Collection season:	March – May.
Botanical name:	*149. Dalbergia sissoo* Roxb. (MI-1346)
Local Name:	Shawa
Habitat:	Introduced in the area, planted along road sides and in water shed areas up to 1400m.
Part(s) used:	Wood, leaves, Bark.
Ethnobotanical uses:	10-15 fresh leaves of the plant are crushed into a paste and 20 grams of raw sugar (gur) is added to it. The medication is taken empty stomach in morning for normalizing the profuse menstruation. 40 to

50 grams of dried leave s are boiled in water and strained through a cloth. Half cup of the decoction is taken three times a day to cure painful, burning micturition. One table spoon of fresh juice extracted from leaves is taken thrice a day for the treatment of jaundice. Few leaves are warmed and tied around beast and a decoction of leaves is taken orally for reducing the inflammation and swelling in breast. 15 gm bark of *Dalbergia sissoo* is boiled in half litre of water till half the water is evaporated. 15 gm leaf juice is mixed with the decoction. 2 table spoon of this mixture is taken daily in morning for 30-40 days as a remedy for leprosy. Decoction of bark is taken twice a day for reducing fever.

The wood is used for fuel and making furniture.

Collection season: Throughout the year (wood, bark) and March – October (leaves)

Botanical name: *150. Desmodium elegans* DC. (MI-1347)

Local Name: Talbahay.

Habitat: Shrubs and forest margins on drier slopes between 1300-2500m

Part(s) used: Shoots, roots.

Ethnobotanical uses: 1-2 teaspoons of powdered roots are taken with water for the treatment of gastric ulcer, burning sensation in stomach and esophagus and flatulence. Infusion of roots is taken in a doze of 20-30 ml daily for treating jaundice and removing of kidney stones. Infusion of roots is smelled to the patients of epilepsy during seisures for recovery. The leaves are browsed by goats. The shoots are used as fuel.

Collection season: October – January (Roots)

Botanical name: *151. Indigofers heterentha* var. *gerardiana* (Wall. ex Baker) Ali (MI-1348)

Local Name: Ghwareja

Habitat: Drier, sunny slopes, forming scrubs and a thick shrub layer under forests between 1400-2700 m.

Part(s) used: Whole plant, leaves, flowers.

Ethnobotanical uses: An infusion of fresh leaves or decoction of dried leaves is used for the treatment of diarrhea, dysentery and cough. One teaspoon of the

	powdered bark of the plant is taken with water for relieving abdominal pain. One end of the fresh stem is burnt and the sap oozing out of the other end is collected and directly applied on skin for controlling ringworm, eczema and itchy, inflamed skin. The shoots are used for making baskets, brooms and grain storing houses. The dried shoots are used as fuel. The shoots make a good thatching material. The flowers are visited by honey bees for nectar collection.
Collection season:	Throughout the year (shoot, bark) and March – September (leaves)
Botanical name:	*152. Lablab purpureus* (L.) Sweet (M1-1350)
Local Name:	Sem
Habitat:	Cultivated
Part(s) used:	Pods, seeds.
Ethnobotanical uses:	The fully ripe seeds are ground into a fine powder. One tablespoon of powder is added to 100ml of water and shaken to make homogenous syrup. This syrup is taken after 6-8 hours fasting for killing intestinal worms. 50 grams of seeds are roasted on a hot plate and then ground into a fine powder. The powder is thoroughly mixed in honey. 1-2 teaspoons of the medication is taken two times a day for increasing sexual desire, stamina and recovery from erectile dysfunction. The young tinder pods are cooked as favourite vegetable.
Collection season:	June – September
Botanical name:	*153. Lathyrus aphaca* L. (M1-1351
Local Name:	Kurkamanay
Habitat:	Weed in Rabi crops, hedgerows and follow lands up to 1800m.
Part(s) used:	Shoots
Ethnobotanical uses:	The young shoots are eaten raw and cooked as a pot herb. The plant is used as fodder for cattle.
Collection season:	March – May
Botanical name:	*154. Lathyrus sphaericus* Retz. (M1-1734)
Local Name:	Chilo
Habitat:	Found in rain fed arable lands, foothills, bushes etc up to 1800m.
Part(s) used:	Pods.

Ethnobotanical uses: The young pots are fried and eaten. This seed are eaten raw when young.

Collection season: March – April

Botanical name: *155. Lens culinaris* Medi (M1-1354)

Local Name: Nask

Habitat: Cultivated in rain fed areas.

Part(s) used: Seeds.

Ethnobotanical uses: The seeds are ground into a fine powder and then mixed with a little cow's butter to make a paste. The paste is applied on pus producing wounds, boils and pustules for the discharge and drying of pus and quick healing.

The seeds when fully ripe are used as a pulse, cooked in a variety of ways either singly or with rice and other pulses. The dish prepared with pure lentils is considered good for people suffering from heart diseases, hypertension and diabetes.

Collection season: June.

Botanical name: *156. Lespedeza juncea* (L.F.) Pers. (M1-1355)

Local Name: Oormaray

Habitat: Open chill slopes between 1000 – 2000m.

Part(s) used: Shoots.

Ethnobotanical uses: Fresh shoots are crushed and strained through a cloth to obtain a juice which is directly applied on skin affect with ringworm. A decoction of dried shoots is taken for controlling diarrhea and dysentery.The shoots are used for broom making. Young shoots are used as fodder.

Collection season: March – September.

Botanical name: *157. Lotus corniculatus* L. (M1-1356)

Local Name: Kasnee

Habitat: Open pastures on hill slopes between 1300 – 2500m.

Part(s) used: Shoots, flowers.

Ethnobotanical uses: 30 – 40 grams of fresh flowers are crushed into a paste and half liter water is added to it and stirred. The infusion is filtered through cloth. 2 – 3 tablespoon if the infusion is taken daily as cardiotonic and selative. Fresh shoots are crushed into a paste and applied externally

	on skin to reduce inflammation. The plant is used as fodder and forage for sheep, goat and cattle. The flowers are cardiotonic and sedative. The whole plant is anti-inflamatory.
Collection season:	March – October (shoots) and April – August (flowers)
Botanical name:	*158. Medicago lupulina* L. (M1-1357)
Local Name:	Mardekakh
Habitat:	High altitude open pastures often on hilltops between 2200 – 2900m.
Part(s) used:	Shoots.
Ethnobotanical uses:	An infusion of shoots is considered a mild laxative and prevents constipation. The shoots are used as a pot herb. The plant is forage and fodder species.
Collection season:	March – June.
Botanical name:	*159. Medicage minima* (L.) L. (M1-1358)
Local Name:	Kach Shpeshtaray
Habitat:	Drier, sandy stream sides, fort hills and open exposed slopes between 1000 – 2300m.
Part(s) used:	Shoot.
Ethnobotanical uses:	Used as a pot herb. The plant is also grown as a sand binder and increase soil fertility.
Collection season:	March – August
Botanical name:	*160. Medicago polymorpha* L. (M1-1360)
Local Name:	Shpeshtaray
Habitat:	Common weed of Rabi crops, fellow lands, lawns and crop field margins up to 2000m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The young shoots are used as a common pot herb. It is cooked fresh as well as dried and used later on in off season. The shoots are also forage and fodder species. The plant increase soil fertility and this grown in crop rotation and mixed cropping systems.
Collection season:	March – May
Botanical name:	*161. Melilotus indica* (L.) all (M1-1361)
Local Name:	Lewanai
Habitat:	Weed of rabi crops, waste places, fruit orchards and lawns up to

2500m.

Part(s) used: Shoots, seeds

Ethnobotanical uses: Fresh shoots are chopped, slightly warmed and applied as poultice to cure swelling on the skin. A decoction of shoots is used to treat bronchitis and abdominal pain. Half teaspoon of seeds are chewed and swallowed with water to cure diarrhea especially in children.

Collection season: March – September.

Botanical name: *162. Phaseolus lunatus* L. (MI-1362)

Local Name: Dadarmal

Habitat: Rain fed areas, cultivated but escaped as a weed.

Part(s) used: Shoot, seeds

Ethnobotanical uses: Young shoots are cooked as pot herb and also used as an ingredient in green rice dish locally called "Chukanrh". Young, tender seeds cooked like pea.

Collection season: April – May.

Botanical name: *163. Phaseolus vulgaris* L.(MI-1363)

Local Name: Shoparh

Habitat: Cultivated in rain fed areas.

Part(s) used: Pods, seeds.

Ethnobotanical uses: Young tender pods with seeds are cooked as a vegetable. Young seeds are also used as vegetable like pea. The nature seeds are as a common pulse and used for making curry especially in winter season. The dried pods are used as tinder and dried shoots as fodder. The plant increase soil fertility and thus grown in crop rotation and mixed cropping.

Collection season: September – October.

Botanical name: *164. Pisum sativum* L. (MI-1364)

Local Name: Matar

Habit: Annual climbing herb

Habitat: Cultivated as Rabi crop.

Part(s) used: Shoots, Pods, Seeds.

Ethnobotanical uses: About 250 grams of mature seeds are soaked in water and roasted and eaten once a month by women to prevent conception. Young

tender shoots are used as a pot herb. Young pods are used as vegetable. Young seeds are used as vegetable cooked in a variety of ways either singly or in rice or meat. The tender seeds are also eaten raw.

Collection season: April – June.

Botanical name: *165. Robinia psendo-ocacia* L. (MI-1365)

Local Name: Farami Keekar

Habitat: Recently introduced in the area, grown along road sides, hedge rows, water shed areas and afforested areas up to 2500m.

Part(s) used: Wood, flowers, leaves

Ethnobotanical uses: The wood is used for fuel. Branches are used for fencing. Leaves are used as fodder. Flowers are used for fragrance. The plant is grown for soil stabilization.

Collection season: Throughout the year (Wood), March - September (Leaves) and April (Flowers)

Botanical name: *166. Trifolium alexandrianum* L. (MI-1366)

Local Name: Losan Shawtal.

Habitat: Cultivated for fodder

Part(s) used: Shoots

Ethnobotanical uses: Young shoots are used as a pet herb. Shoots are a common fresh fodder and dried hay for cattle. The plants are grown in crop rotation system for increasing soil fertility

Collection season: February – June

Botanical name: *167. Triflium repens* L. (MI-1367)

Local Name: Zangali Shawtal.

Habitat: Moist, rich soils near water courses, water places and high altitude meadows.

Part(s) used: Flower, shoots.

Ethnobotanical uses: A poultice of shoots is applied on swollen inflamed joints for relief. Infusion of shoots is taken internally for controlling coughs and reducing fever. Infusion of flower heals is used as an eye wash for different eye diseases.

The plant is a fodder and forage species. The flowers are visited by

honey bees for nectar collection.

Collection season: Throughout the year (Shoots) and May – August (Flowers)

Botanical name: *168. Trifolium resupinatum* L. (MI-1368)

Local Name: Watani Shawtal

Habitat: Cultivated for fodder.

Part(s) used: Shoots. Flowers.

Ethnobotanical uses: The shoots are used as a fresh fodder and dried hay for all types of live stock. Young leaves are used as a pot herb. The flowers are visited by honey bees for honey collection. The flowers have a refreshing, cooling fragrance.

Collection season: February – June (Shoots) and May – July (Flowers)

Botanical name: *169. Trigonella foenum-graecum* L.(MI-1369)

Local Name: Malkhwazey

Habitat: Cultivated as kitchen garden plant.

Part(s) used: Shoots, seeds.

Ethnobotanical uses: Finely ground seeds are mixed with mustered oil and massaged into the scalp for strong, healthy and shiny hair. Infusion of seeds is used as a face wash for healthy, fair skin. The seeds are chewed and swallowed to enhance appetite and restore good taste in the mouth. Powered seeds mixed with sugar and milk are taken as a remedy for stomach and intestine ulcers and a galectogogue for lactating women. Decoction of seeds is taken regularly twice a day for 30-40 days to lower blood cholesterol level and blood sugar level. Seed powdered mixed with raw sugar (gur) is taken after meal to reduce flatulence, enhance digestive and cure stomach cramps. Seed powder is missed with equal amount of honey. 1-2 table spoons are taken twice a day as expectorant. A paste of ground seeds mixed in water or butter is applied as a poultice on abscesses, ulcers, boils and burns for quick healing and tissue regeneration. 50 grams of powdered seeds are boiled in 500 ml of water and taken as a whole for inducing uterine contractions during labour. Seeds are soaked overnight in water and 2 table spoons of it are chewed and swallowed in the morning for restoration of health, going weight and enhancing sexual desire.

	Young tender shoots are cooked as a pot herb. Dried leaves are used as condiment. Dried, powdered seeds are used as condiments. Seeds are used as hair tonic and cosmetic. Dried leaves are used for making green tea.
Collection season:	February – March (Shoot) and May – June (Seeds)
Botanical name:	*170. Vicia bithynica* (L.) L. (MI-1740)
Local Name:	Marghaikhpa
Habitat:	Common weed of Rabi crops.
Part(s) used:	Shoot
Ethnobotanical uses:	The young shoots are eaten raw as a salad. The shoots are used as fodder.
Collection season:	February-April.
Botanical name:	*171. Vicia sativa* L.(MI-1370)
Local Name:	Da Spo Marghaikhpa
Habitat:	Weed of Rabi crops, hedge rows, graveyards and waste places up to 1600 m.
Part(s) used:	Seeds
Ethnobotanical uses:	The seeds are considered poisonous for human beings and livestock.
Collection season:	May – July.
Botanical name:	*172. Vigna mungo* (L.) Hepper.(MI-1371)
Local Name:	Mahey
Habitat:	Cultivated as a Khareef crop often mixed with maize crop.
Part(s) used:	Seeds, Seed pods, Seed coat.
Ethnobotanical uses:	The seed either with intact coat or coat removed is a commonly used pulse prepared as a dish in variety of methods. The seed pods after removed of seeds are used as fodder. The seeds coats when detached from seed after boiling and then dried are used to wash utensils.
Collection season:	September – October.
Botanical name:	*173. Vigna radiata* (L.) Wilezek. (Mi-1372)
Local Name:	May
Habitat:	Cultivated mixed with maize crop.
Part(s) used:	Seeds.
Ethnobotanical uses:	A simple diet of green gram is often fed to people suffering from

	fever. A thick soup of green gram with the coat removed is given to people with convulsions and vertigo. The seeds are cooked either with intact seed coat or without coat as pulse.
Collection season:	September – October.
Botanical name:	*174. Vigna unguiculata* (L.) Walp. (MI-1373)
Local Name:	Lobia
Habitat:	Grow mixed with maize crop, climbing and twining around maize stem.
Part(s) used:	Seeds.
Ethnobotanical uses:	30-50 grams of roasted seeds are eaten daily for improving the memory, restoring the health and weight of body and treating insomnia. The seeds are used as a pulse and cooked in a variety of ways.
Collection season:	September – October.
Family:	**52. Fagaceae**
Botanical name:	*175. Quercus baloot* Griff (M1-1246)
Local Name:	Serhai/Breh
Habitat:	Common on drier, south facing slops of hills between 1200 – 1800m.
Part(s) used:	Wood, bark, fruit.
Ethnobotanical uses:	50 gms of stem bark is boiled in half liter water to make a decoction. Half cup of the decoction is taken twice a day for controlling asthma. The seeds are roasted and the hard pericarps are removal. The seed cotyledons are ground into fine powder and raw sugar is added to it. 1-2 teaspoon of the mixture is taken with water twice a day by children to cure bed wetting. The wood is used for fuel purposes. The wood is also amplied in agriculture tool making especially ploughs and handles of axes, diggers and hoes. Young, straight branches are used as walking sticks. The seed inside acorn is eaten as a dry fruit when roasted
Collection season:	Throughout the year (wood), September – November (fruit)
Botanical name:	*176. Quercus dilatata* Royle (M1-1247)
Local Name:	Toor Banj

Habitat: Common, often mixed with blue pine between 1600 – 2500m.

Part(s) used: Wood, leaves, fruit.

Ethnobotanical uses: The wood is used for fuel. The wood is amplied in construction and agricultural tool making. The leaves are used as folder for goats and sheep. Children play with the nut and acron of the plant.

Collection season: Throughout the year (wood and leaves)
September – November (fruit)

Botanical name: *177. Quercus incana* Roxb. (M1-1248)

Local Name: Spin Banj

Habitat: Drier, gravelly southern slopes of hills between 1200 – 2200m

Part(s) used: Wood, leaves

Ethnobotanical uses: The wood in used for fuel purposes and making charcoal. The wood is utilized in construction agricultural tool making and walking sticks. The leaves are used as fodder for goats and sheep.

Collection season: Throughout the year

Botanical name: *178. Quercus semicarpifolia* Smith (M1-1249)

Local Name: Meer/Kanarh

Habitat: Higher altitude tree line often gregarious or mixed with *Abies* and *Picea* above 2800m.

Part(s) used: Wood, bark.

Ethnobotanical uses: The bark is air dried, ground into fine powder, mixed with mustard oil or butter and applied as poultice to heal wounds, bruises and chilblains. The juice extracted from the bark is applied externally for relieving muscular pain.
The hard work is used as durable fuel and burnt to make charcoal.

Collection season: Throughout the year.

Family: 53. Fumariaceae

Botanical name: *179. Fumaria indica* (Husskn) Pugsley (M1-1251)

Local Name: Paprah

Habitat: Common weed of wheat and other Rabi crops and fallow lands.

Part(s) used: Whole plant.

Ethnobotanical uses: Fresh juice of the plant is diluted in 1:5 proportion with water and one cup of the infusion is taken twice a day to clean the blood and

	control skin diseases and body heat. 20 gms of air dried plant is boiled in 500ml of water for 30 minutes. One cup of the decoction is used to relax muscular cramps and muscular pain. Fresh plant is crushed and applied through a bandage around eczema and painful joints for cure.
Collection season:	February – April
Family:	**54. Gentianaceae**
Botanical name:	*180. Swertia cordata* (D.Don) Clarke (M1-1253)
Local Name:	Loon Saloon / Cherat Botay
Habitat:	High altitude meadows, open ridges and pastures often on rich, moist soils above 2500m.
Part(s) used:	Whole plant
Ethnobotanical uses:	20-30 gms of the whole plant is rinsed in water and then crushed. Half liter of boiling water is added to it and left for an hour. The infuse is passed through a cloth. One cup of the infusion is taken after 5-6 hours fasting for the expulsion of intestinal worms and bowel cleaning. One teaspoon of sun dried powered drug is used with water as a biter tonic and a hepatoprotectant. The whole plant is used as fodder.
Collection season:	June – August
Family:	**55. Geraniaceae**
Botanical name:	*181. Geranium ocellatum* Camb (M1-1694)
Local Name:	Chinjan Wala
Habitat:	Hedge rows, grave yards and along water courses.
Part(s) used:	Whole plant
Ethnobotanical uses:	The whole plant is chopped and crushed with 5-10 volumes of water in a mortar and pistle or juicer and then passed through a muslin cloth. One glass of the infusion is taken empty stomach as a diuretic. One complete, fresh plant is chewed and swallowed directly or one table spoon of powdered plant is taken with water to cure amoebic dysentery. A decoction of 10 gms powered drug in a glass of hot water is taken for curing internal bleeding and haemorrhages.
Collection season:	February – April

Botanical name:	*182. Geranium Swatense* Schonb.-Tem. (M1-1258)
Local Name:	Srazela/Sra kasa
Habitat:	Common on forest floors and open meadows between 1800 – 3000m.
Part(s) used:	Creeping rhizome
Ethnobotanical uses:	Equal amounts of dried rhizome of the plant and leaf galls of *Pistacia integerrima* are boiled in plenty of water to make a concoction. Half cup of the concoction is taken thrice a day for the treatment of fever, cough and burring urination. The fresh rhizome is crushed and applied as a poultice for healing of wounds. Fresh rhizome is chewed and left for a while in mouth to cure toothache, sore tongue and mouth.
Collection season:	May – September
Botanical name:	*183. Pelargonium zonale* (L.) L'Her. ex Aiton (M1-1259)
Local Name:	Pannerak
Habitat:	Often cultivated in home gardens and graveyards.
Part(s) used:	Whole plant, leaves.
Ethnobotanical uses:	The plant is grown for the aromatic leaves and beautiful flowers as an ornamental plant in homes and graveyards. The leaves are applied on wounds to stop bleeding.
Collection season:	February – November
Family:	**56. Haemodoraceae**
Botanical name:	*184. Ophiopogan intermedius* D.Don (M1-1260)
Local Name:	Da Gamlo Wakha
Habitat:	Shaded places near water courses on the forest floor between 1600 – 2000m.
Part(s) used:	Whole plant
Ethnobotanical uses:	The plant is grown in pots as an evergreen ornamental plant.
Collection season:	May – September
Family:	**57. Hamamelidaceae**
Botanical name:	*185. Parrotiopsis jacquemontiana* (Dcne.) Rehder (M1-1261)
Local Name:	Beeranj
Habitat:	Cooler, north facing slopes of hills under forest cover between 1400-2500 m.

Part(s) used: Branches, wood.

Ethnobotanical uses: The stem is used as fuel wood. The straight braches when dried are used as walking sticks. The stem is used in agricultural tool making including ploughs, axes, diggers and bed steads. Young twigs are strong and flexible therefore they are used for making baskets and twisted to make ropes for making bundles of fuel wood and fodder.

Collection season: Throughout the year.

Family: **58. Hippocastanaceae**

Botanical name: *186. Aesculus indica* (Wall Ex Lamb) (MI-1262)

Local Name: Jawaz

Habitat: Moist temperate forest mixed with *Pinus wallichiana* or along ravines in the hilly areas between 1600 – 3000m.

Part(s) used: Bark, seed, wood, leaves.

Ethnobotanical uses: The hard seed of the plant is rubbed with a stone to form a fine powder. Powder from half seed is mixed with corn flour and made into a dough ball. It is given to horses for colic and expulsion of endoparasites. The seed oil is rubbed on forehead for relieving headache and on painful inflamed joint for soothing effect. Bark is crushed into a paste and 5 volumes of water are added to it. The mixture is strained through a sieve or cloth to obtain an infusion. One cup of the infusion is taken daily for 2-3 weeks for the treatment of internal bleeding, haemorrhoids, body pains and rheumatism.

Leaves are used as a fodder. The tree is often grown for shade purpose. The wood is used as fuel wood and for making furniture and wooden utensils.

Collection season: Throughout the year (wood), April – September (leaves)
And November (fruit and seed)

Family: **59. Hypericaceae**

Botanical name: *187. Hypericum perforatum* L. (M1-1265)

Local Name: Shin Chai

Habitat: Drier places, hedge rows and gentle slopes between 1100-2200m.

Part(s) used: Whole plant

Ethnobotanical uses: To two teaspoons dried shoots of the plant, one cup of boiling water

	is added and let to steep for 5-10 minutes. Sugar or honey is added to it for taste. The decoction is taken to boost up the mood and relieve anxiety and depression. The whole plant is poisonous for cattle when eaten in excess. The dried plant is used as a green tea. The smoke of plant is evil repellant.
Collection season:	May – October
Family:	**60. Iridaceae**
Botanical name:	*188. Iris germanica* L. (1267)
Local Name:	Turai
Habitat:	Often cultivated as ornamental in houses and graveyards between 800-1300m.
Part(s) used:	Whole plant, rhizome.
Ethnobotanical uses:	The rhizome are dried under shade for several days. The scales are removed and ground into a rough powdered drug. One cup of boiling water is added to two teaspoons of the powdered drug and left to cool for 15-20 minutes. The decoction is used as an emetic to induce vomiting after food poisoning. Fresh juice of the rhizome extracted by squeezing the chopped rhizomes through cloth is applied directly on skin for removal of scars and freckles. The plant is ornamental because of the light green foliage and large beautiful flowers and thus grown in homes and muslim graveyards.
Collection season:	Throughout the year (rhizome)
Botanical name:	*189. Moraea sisyrinchium* (L.) Ker Gawal. (MI-1269)
Local Name:	Gandeechar
Habitat:	Common weed of Rabi crops in rain fed areas.
Part(s) used:	Shoots
Ethnobotanical uses:	The leaves are poisonous and cathartic for cattle and other livestock. The leaves are elastic and thus twisted and tied into ropes used to make bundles of fodders.
Collection season:	February – May
Family:	**61. Juglandaceae**
Botanical name:	*190. Juglans regia* L. (M1-1270)
Local Name:	Ghuz

Habitat: Cultivated and wild in the hilly areas from 1000-2200m.

Part(s) used: Seed, fruit, epicarp, leaves, bark wood.

Ethnobotanical uses: The fresh leaves of the plant are picked in the afternoon of sunny day and dried under sun or half shade. 50 gms of dried leaves are boiled in a liter of water for 30 minutes and then passed through a sieve. The decoction is kept out door under open sky overnight. Half cup of the decoction is taken daily in the morning for blood purification, as alterative, astringent and antiasthmatic. 2 teaspoons of powdered leaves are taken with water thrice a day for controlling diarrhea. Cotyledons of 4-5 walnuts are eaten along with honey in the morning for prevention of cardiac problems, as brain tonic, memory booster, relieving low back pain, controlling frequent urination and dissolving kidney stones. One to teaspoon of the freshly extracted oil of seed is taken for killing and expelling intestinal parasites. The oil is rubbed on skin suffering from eczema to recover. Eating walnut seed kill appetite and help in preventing over eating and managing body weight. Eating walnut seeds regularly prevent from allergies especially pollen and dust allergy. Pregnant women are given walnut paste made from 200-250 gms crushed walnut seeds soaked in cow's milk and then fried in butter with sugar for normal health of both mother and the foetus. 3-5 walnut seeds eaten with brown sugar at night is considered sexual tonic and aphrodisiac.

The seed is a valuable dry fruit eaten singly or in confectionaries. The leaves are used as a green tea. The leaves are used for dying the gums. The leaves are also used as fodder. Children play with the shelled seeds as marbles. The bark of stem and root is used for teeth cleansing and gum dying as 'Dandasa'. The epicarp of fruit is crushed into a paste and boiled in water to make a dye. This infusion is used as a hair tonic and hair dye. The wood is valued for making cupboards, furniture and study stands. It is impervious to insects and wood pests. The leaves are mixed with soil for killing insects. The leaves are also insect repellant.

Collection season: Throughout the year (wood, bark), April – September (leaves) and

	September – November (fruit)
Family:	**62. Lamiaceae**
Botanical name:	*191. Ajuga bracteosa* Wall ex.Benth. (M1-1274)
Local Name:	Booti
Habitat:	Drier, southern foothills between 900 – 1600m.
Part(s) used:	Whole plant.
Ethnobotanical uses:	The plants are collected on a sunny day, rubbed together and shaken to clear the dust and dried under sun. The plants are stored and when needed ground into a powder. Two cups of boiling water is added to 2-3 tablespoons of powdered drug and kept over night under open sky. The decoction is passed through cloth. One cup in morning and one at night is taken as blood purifier, cooling agent, antimalarial, antipyretic and bitter astringent. 3-4 fresh leaves of the plant are chewed and the bitter juice extracted is swallowed for the treatment of sore mouth and sore tongue.
Collection season:	March – November
Botanical name:	*192. Ajuga parviflora* Benth (M1-1275)
Local Name:	Tarkha Booti
Habitat:	Rock crevices, steep slopes and along walking tracks between 1300 – 2500m.
Part(s) used:	Whole plant.
Ethnobotanical uses:	Fresh plants are chopped after being washed thoroughly and one liter of boiling water is added to half cup of the chopped leaves and left for an hour. The infusion is filtered through fine cloth. Quarter to half tea cup of the infusion is taken thrice a day for the treatment of jaundice, gastric ulcers and internal bleeding. The infusion is diluted in 1:1 proportion with water and used as gargle for curing sore throat.
Collection season:	March – July
Botanical name:	*193. Clinopodium vulgare* L. (M1-1279)
Local Name:	Kamasla Pudina
Habitat:	Dry grassy places, sandy sides of streams between 1000 – 1800m.
Part(s) used:	Shoots.
Ethnobotanical uses:	Thoroughly rinsed fresh plants are crushed and water is added to it.

	The infusion is strained through cloth to obtain an infusion. 2-3 teaspoons of the infusion are taken after meals as carminative and to enhance digestion. The shoots of the plant are used as fresh or dried fodder for livestock.
Collection season:	March – August.
Botanical name:	*194. Isodon rugosus* (Wall Ex Benth) Codd (MI-1281)
Local Name:	Speerkay
Habitat:	Common, often dominant shrub of the drier scrub vegetation in mid-hill elevations between 1200-2000m.
Part(s) used:	Shoots, flower
Ethnobotanical uses:	Fresh leaves are pressed and chewed for the relief of toothache. The shoots are used as tinder and fuel wood. The flowers are visited for honey collection by honey bees. The honey of the plant is valued for may medical properties. The plant is mosquito repellant. The dried shoots are used for broom making. The shoots are used as thatching material especially for roof sides of mud stone houses.
Collection season:	March – November (shoots) and August – October (flowers)
Botanical name:	*195. Lamium album* L. (M1-1282)
Local Name:	Spin Ghutyalay
Habitat:	Damp, shady places under forest cover between 2200-3000m.
Part(s) used:	Shoots/flower.
Ethnobotanical uses:	The shoots are grazed by sheep. The plant is honey bee species.
Collection season:	May – September
Botanical name:	*196. Lamium amplexicaule* L. (M1-1283)
Local Name:	Ghutyalay
Habitat:	Common weed of Rabi crops especially wheat and clover up to 1800m.
Part(s) used:	Shoot.
Ethnobotanical uses:	A decoction of shoot is taken for stopping internal bleeding and diarrhea. A poultice of fresh leaves reduces swellings, heals wound and burns and neutralize the effect of insect stings. The shoots are cooked as a potherb. The shoots are used as fresh fodder.

Collection season: December – April

Botanical name: *197. Leucas cephalotes* (Roth.) Spreng (M1-1284

Habitat: Forest floor between 1800 – 2500m.

Part(s) used: Shoots

Ethnobotanical uses: A paste of fresh shoots is mixed with warm mustard oil and applied as poultice for removal of pus and healing of boils on the body.

Tender leaves are cooked as a potherb. The plant is grazed by sheep and goats and is also used as dry or fresh fodder.

Collection season: May-September

Botanical name: *198. Lycopus europaeus* L. (M1-1286)

Local Name: Da Jabey Seezonkay

Habitat: River and stream sides, marshy places between 800 – 1300m.

Part(s) used: Shoots

Ethnobotanical uses: 20gms of dried shoots are boiled in 500ml of water for 30 minutes. The decoction is settled and cooled. Half cup of the decoction is taken twice a day to regulate heart beat and stop bleeding of respiratory tract and help in recovery from tuberculosis. Crushed fresh shoots are applied on infected and pus forming wounds to clean them.

Collection season: June – November

Botanical name: *199. Marrubium vulgare* L. (M1-1287)

Local Name: Kharat

Habitat: Drier mid hill slopes between 1500 – 2000m.

Part(s) used: Shoots

Ethnobotanical uses: The dried young shoots are boiled in water to make a herbal tea which suppress cough and expel phlegm and sputum from respiratory tract. Honey or sugar is added or taste to the recipe. Equal amount of *Marrubium vulgare* shoots and *Plantago major* roots are crushed together to make a paste. The paste is applied on snake bite as antidote. Fresh shoots are crushed and mixed with water and strained through a cloth to obtain an extract. Half cup of the extract is taken one hour before meals as in appetizer and digestive system stimulant.

Collection season: April – September.

Botanical name: *200. Mentha longifolia* (L.)L. (M1-1288)

Local Name: Enalay

Habitat: Moist places, sandy stream sides, field boundaries and along water courses between 800 – 1500m.

Part(s) used: Shoots.

Ethnobotanical uses: Fresh shoots cursed or dried powder mixed with a little table salt is swallowed with water as carminative digestive and anti-flatulent, after meals. 2-3 teaspoons of the powered drug is taken half an hour before meal to increase appetite. A herbal tea made from dried leaves is taken for coughs, colds, asthma, indigestion, flatulence, headache and fever. Fresh leaves are crushed and cooked with rice to make a dish like rice greens. This dish is fed to patients with chronic diarrhea and amoebic dysentery. Few twigs of the plant are boiled in water and the vapours arising are inhaled through nostrils for clearing of air passage ways and easing the breathing.

Fresh, tender shoot are eaten raw as a salad and crushed into chutneys. Tender shoots are added as a condiment in various leafy green vegetables. The shoots are mixed with stored grains like corn and wheat to repel mice and rates. Rubbed on the body and bedding repel mosquitoes. Dried grass and wild mint shoots are lit into fire to produce smoke which stupefies honey bees during honey collection.

Collection season: April – November

Botanical name: *201. Mentha spicata* L. (M1-1289)

Local Name: Poodina

Habitat: Moist places, filed boundaries often cultivated.

Part(s) used: Shoots

Ethnobotanical uses: One cup hot water is added to 2 table spoons of powered drug to make a herbal tea. This teas is used as anti-emetic, carminative, digestive and strong appetizer.

The fresh twigs are eaten as mouth fresheners, salad and crushed into chutneys. Dried powdered shoots is used as a condiment.

Collection season: April-July

Botanical name: *202. Micromeria biflora* (Buch.- Ham ex D.Don) Benth. (M1-1290)

Local Name: Narary Shamkay

Habitat: Open hill slopes, ridges, along tracks and undisturbed places between 1000 – 2200m.

Part(s) used: Root, whole plant.

Ethnobotanical uses: The roots of the plant are chewed and pressed between the jaws for a while to relive toothache.

The whole plant is burnt in homes as incense and mosquito repellant.

Collection season: Throughout the year.

Botanical name: *203. Nepeta cataria* L. (M1-1700)

Local Name: Peshoo Botay

Habitat: Mid hill elevations, open hill slopes between 1500-2200m.

Part(s) used: Shoots.

Ethnobotanical uses: One liter hot water is added to a cup of crushed shoots of the plant to make an infusion. The infusion is filtered and a cup of it is taken to induce perspiration and lower the body temperature. A strong decoction of the shoots is applied on the skin and fir of live stock to repel and kill fleas and ticks.

The plant is used as insect and rodent repellant.

Collection season: June – August.

Botanical name: *204. Nepeta erecta* (Royle ex Benth.) Benth. (M1-1291)

Local Name: Peshoo Botay

Habitat: Forest under growth and open meadows, often attaining dominant status, found between 1800 – 3000m.

Part(s) used: Whole plant, flowers.

Ethnobotanical uses: The young shoots are used as a potherb. The plant is a good fodder species. The flowers are visited by honey bees for honey collection.

Collection season: May – September

Botanical name: *205. Ocimum basilicum* L.(M1-1293)

Local Name: Kashmalay

Habitat: Often cultivated

Part(s) used: Leaves, inflorescence, seeds.

Ethnobotanical uses: Fresh leaves are chewed and swallowed for enhancing appetite and stimulating digestive system. Infusion of fresh leaves or decoction of

air-dried leaves is used orally for the treatment of flatulence, colic, indigestion and stomachache. The decoction also ease the symptoms of cold, influenza, migraine, exhaustion and depression. Fresh leaves are externally applied as a poultice for the treatment of acne, snake bites, insect stings and infections of the skin. The seeds are made into an infusion and given in the treatment of chronic diarrhea, amoebic and bacillary dysentery and gonorrhea. Infusion of seeds cleans the eye from dust and other impurities. The oil extracted from seeds is used as drops for earache and as massage for itchy skin and painful joints.

The whole plant is ornamental and aromatic often grown in home gardens and lawns. The leaves are used as salad and condiment. The leaves and inflorescence are kept in pockets, clothes and bed for pleasant fragrance and as repellant of insects and pests. Few leaves are chewed and swallowed for mouth freshening. A tea made from leaves refreshes the body and brain.

Collection season: April – December

Botanical name: *206. Origanum vulgare* L. (M1-1294)

Local Name: Shamakay

Habitat: Common on drier open grassy areas mostly on southern slopes, in scrub vegetation and gravelly soils between 1000 – 2500m.

Part(s) used: Shoots

Ethnobotanical uses: The extract of fresh shoots is used as an antiseptic on skin. Few drops of shoot extract is applied through a cotton swab on aching tooth for quick relief. Crushed, fresh shoot paste is applied as poultice for treating arthritis and muscular pain and massage or rub on chest and upper lip for inhalation through nose to ease asthmatic attach and bronchitis. Decoction of dried shoots is taken for the treatment of flatulence, dyspepsia, vomiting, influenza, colds, fever, painful menstruation and insomnia. Few shoots are put into boiling water and the fumes arising are inhaled for the relief of cold, flue, bronchitis, asthma and chest congestion.

The shoots when dried are used as a condiment. The young shoots are

	used as a scrubber to clean utensils especially the pot in which whey and yogurt is stirred for butter separation. Cleansing the pot in this way helps in easier separation of butter from the whey. The shoots are rubbed in the earthen pot kept for honey bees to attract them for hive formation. The dried leaves are used for making herbal tea which is refreshing. The extract of fresh shoots kills lice in hair. The dried shoots are kept in kitchen to repel ants, cockroaches and fruit flies. The plant is also a good sand binder. The plant is a honey bee species.
Collection season:	May – October.
Botanical name:	*207. Otostegia limbata* (Benth.) Boiss. (MI-1295)
Local Name:	Spin Azghay
Habitat:	Drier, south facing, gravelly hill slopes between 1000 – 1600m.
Part(s) used:	Leaves, whole plant.
Ethnobotanical uses:	Fresh leaves are ground into a paste. Little water is also added to the paste and then strained through a cloth to obtain a concentrated extract. A teaspoon of the extract is left in mouth for 2-3 minutes and then spitted out. This treatment is for mouth sores and gum diseases. Honey or raw sugar is added for taste when the same recipe is used for children sore mouth. 50grams of dried leaves are boiled in two cups of water for 15-20 minutes to obtain a decoction. The decoction is taken orally in two equal dozes. The treatment is continued for 4-5 weeks for recovery from jaundice. Dried leaves are ground into powder and mixed with equal amount of butter and applied on wounds for healing. The plant when dried is used as fuel. Goats browse the leaves.
Collection season:	April – August
Botanical name:	*208. Phlomis bracteosa* Royle ex Benth. (M1-1702)
Local Name:	Da Ghra Kharghwag/Sharhai
Habitat:	Rare plant under forest cover between 2600 – 3000m.
Part(s) used:	Leaves
Ethnobotanical uses:	The leaves are tied through bandage around inflamed and painful areas of the body for soothing and pain relieving action. Infusion of

fresh leaves is taken thrice a day for the cure of malaria. 2 tablespoons of dried powder of leaves is taken with water thrice a day for controlling diarrhea.

Collection season: June – September

Botanical name: *209. Prunella vulgaris* L. (MI-1296)

Local Name: Guljarhai

Habitat: Forest edges, open grasslands and moist places between 1500 – 2600m.

Part(s) used: Shoot.

Ethnobotanical uses: A paste prepared by crushing fresh shoots is applied on skin to treat and heal wounds, stop bleeding, cure sores and inflammations. An infusion of fresh shoots or decoction of shade dried shoots is taken twice a day for controlling diarrhea, stopping internal bleeding, reliving stomach cramps, reducing fever, lowering high blood pressure and revitalizing body.

Collection season: May – August

Botanical name: *210. Salvia lanata* Roxb. (M1-1279)

Local Name: Kianrh

Habitat: Open drier slopes between 1500 – 2200m.

Part(s) used: Young shoots.

Ethnobotanical uses: Young shoots are used as dressing on wounds. Juice extracted from shoot is rubbed on skin to subside itching. The young stem of shoot is peeled and eaten raw as salad. The young shoots are boiled in whey and then cooked with garlic, oil and condiments into a slightly sore tasting delicious dish.

Collection season: April – July

Botanical name: *211. Salvia moorcroftiana* Wall. ex Benth. (M1-1298)

Local Name: Karghwag

Habitat: Open drier, sandy slopes between 800 – 1800m.

Part(s) used: Roots, leaves.

Ethnobotanical uses: 10 gm of dried powdered roots are boiled in 2 cups of water till only one cup water is left. This decoction is taken thrice a day for the treatment of cough and colds. The leaves are tied as dressing for

controlling muscular pain, skin inflammation, rheumatism and bleeding wounds.

Collection season: April – July

Botanical name: *212. Salvia plebeia* R.Br (M1-1703)

Local Name: Kach Speerkay

Habitat: Hedge rows, hill sides along water courses and rice paddies up to 1300m.

Part(s) used: Leaves

Ethnobotanical uses: 20-30 grams of dried drug is boiled for 15-20 minutes to obtain a decoction. When cooled the decoction is taken as cooling agent, diuretic and menstrual flow regulator. A fresh juice extracted from fresh leaves is applied directly on skin for stopping bleeding and healing of wounds. Leaf extract is applied on skin with itchy eczema and on snake or insect bites. A fresh leef is squeezed and applied to the sores and cracks produced between the toes due to moisture or prolonged walking.

Collection season: April – August

Botanical name: *213. Scutellaria chamaedrifolia* Hedge and Paton (MI-1300)

Habitat: Drier, exposed slopes of hills between 1600-2100 m.

Part(s) used: Shoot

Ethnobotanical uses: 20-30 grams of dried shoots are added to four cups of boiled water and left to settle for one hour. Half cup of the decoction is taken twice a day as anti-spasmodic, muscle relaxant, sedative, anti-depressant and anxiolytic.

The shoots are used a fodder for cattle and sheep.

Collection season: April – July.

Botanical name: *214. Stachys praviflora* Benth. (M1-1301)

Local Name: Speerbotay

Habitat: Drier, sandy places and foot hills up to 1400m.

Part(s) used: Shoot

Ethnobotanical uses: The shoots are poisonous for cattle, sheep and goat. The shoots are externally tied to rheumatic joints for relief in pain and inflammation.

Collection season: April – July

Botanical name: *215. Teurium stocksianum* Boiss. (M1-1302)

Local Name: Kwandi Botay

Habitat: Common on drier, exposed, gravelly hill sides between 1100-2200m.

Part(s) used: Shoots

Ethnobotanical uses: 20 grams of the flowering shouts of the plant are soaked in two cups of water over night and filtered in the morning. One cup of the extract is taken twice a day as hepatoprotective, cooling agent appetizer, blood purifier, tonic and anti-diabetic. 2-3 teaspoons of shade dried powered shoot is taken thrice a day as febrifuge, anti-diarrhoeal and stomachic. Two table spoons each of the powered drug and honey re mixed in one glass of warm milk and taken at night time by women to increase fertility and chances of conception. 3-5 fresh twigs of the plant or 1-2 tablespoons of powdered drug is boiled in water and the vapours which arise are inhaled for the treatment of cold, flue and fever.

Collection season: May – October

Botanical name: *216. Thymus linearis* Benth. (M1-1303)

Local Name: Da Ghra Speerkai

Habitat: Common on drier, exposed slopes between 1700 – 2600m.

Part(s) used: Shoots

Ethnobotanical uses: In one glass of water 20-25 grams of air dried shoots are soaked for the whole night. The shoots are removed and the aqueous extract is taken empty stomach daily as alterative, restorative of the health and immunity booster. One cup of boiled hot water is added to 10-15 grams of dried, powered drug to make decoction. The decoction is taken for refreshing, mood relaxation, releasing tension and depression and as carminative, anti-flatulent and expectorant. Fresh shoots are applied externally for healing minor injuries, mastitis, sore throat and gum diseases.

Fresh shoots are eaten as salad. Green tea is prepared from the shade dried shoots. Fresh shoot juice is used as deodorant and insect repellant.

Collection season: May – July

Family:	**63. Liliaceae**
Botanical name:	*217. Lilium polyphyllum* D.Don (M1-1710)
Local Name:	Da ghar Kamergul
Habitat:	Forest floor with rich soils between 2500 – 3000m.
Part(s) used:	Bulbs
Ethnobotanical uses:	The bulbs are longitudinally cut into four pieces and dried in sun. 1-2 teaspoonful of the dried powder of bulbs are boiled in one glass full of milk till the mild is evaporated and to the remaining soaked drug equal amount of honey is added and taken once a day for increasing the quantity of milk in women and increase sexual stamina and desire in men. The sap from fresh bulbs is rubbed on skin and face as a cosmetic and moisturizer.
Collection season:	August – November.
Botanical name:	*218. Notholirion thomsonianum* (D.Don) Stapf. (M1-1305)
Local Name:	Kamargul
Habitat:	Hedge rows, field borders, along water courses and moist places.
Part(s) used:	Whole plant, bulb.
Ethnobotanical uses:	Bulb is cut into pieces, sun dried and then ground into a powder. 10-15 grams of powder is soaked in warm milk and kept overnight. The infusion is passed through cloth and taken empty stomach in morning for the sure of muscular pain and painful excessive discharge of menses. The whole plant is planted as an ornamental plant.
Collection season:	June – November
Botanical name:	*219. Tulipa clausiana* D.C (M1-1306)
Local Name:	Ghantool
Habitat:	Common weed of wheat especially in rainfed areas between 900 – 1600m.
Part(s) used:	Flowers / bulb
Ethnobotanical uses:	The flower are plucked and kept in water in a vase as ornamental. Children play with the tepals by pumping the petals to buble out and making siren sounds. The bulbs are sometimes cooked as vegetable.
Collection season:	March – April (flowers) and Throughout the year (bulbs)

Family:	**64. Linaceae**
Botanical name:	*220. Reinwardtia indica* Dumort (M1-1712)
Local Name:	Basan Butay
Habitat:	Rock crevices between 1200 – 1800m.
Part(s) used:	Whole plant.
Ethnobotanical uses:	The plant is used as ornamental because of beautiful yellow flowers. The shoot paste is applied on wounds in cattle.
Collection season:	February – June
Family:	**65. Loranthaceae**
Botanical name:	*221. Viscum album* L. (M1-1307)
Local Name:	Melma
Habitat:	Grow as parasite on walnut, oak, olive and apricot trees between 1200 – 1800m.
Part(s) used:	Leaves, seeds, bark.
Ethnobotanical uses:	Fresh leaves are crushed finely into a paste. The paste is applied on the bite of mad dog as antidote. This paste is also applied in case of removing warts from skin. The paste is slightly warmed and a little turmeric powder is sprinkled over it and tied through bandage for recovery from gout, arthritis and muscular pain. The fresh leaves are crushed and a little water is added to it. The infusion is strained through cloth and applied on scalp. It is left as such for half an hour and then washed by using a normal soap to remove dandruff from hair. Fresh seeds or leaves are chewed and then pressed for few minutes against aching teeth for recovery. Bark of the stem if a plant grown as parasites on oak is powdered and mixed in warm milk and given to children for expelling intestinal worms. The leaves are poisonous for human and cattle when taken fresh and in large quantities.
Collection season:	Throughout the year (leave, bark) and May – August (seeds)
Family:	**66. Malvaceae**
Botanical name:	*222. Abelmoschus eseculentus* (L.) Moench. (MI-1308)
Local Name:	Bhendai
Habitat:	Cultivated

Part(s) used:	Fruit, leaves
Ethnobotanical uses:	The young leaves are ground into a mucilaginous fine paste that is applied on skin as emollient. The young fruits are crushed in a juicer with water to make an infusion. Half cup of the infusion is taken after six hour interval as a demulcent, diuretic and mild laxative. The tender, immature fruit is a common vegetable and cooked in a variety of ways. A paste of young, fresh leaves is applied on skin for softening the skin. The dried, dead stems are used as fuel and tinder.
Collection season:	May – October.
Botanical name:	*223. Alcea rosea* L. (MI-1309)
Local Name:	Gule Khaira
Habitat:	Cultivated but naturalized in some areas like graveyards.
Part(s) used:	Flowers
Ethnobotanical uses:	2-3 grams of dried petals of the flower are boiled in a cup of water to make a decoction. The decoction is taken three times a day as demulcent, easing breathing, improving blood circulation, preventing constipation and treating dysmenorrhea. A paste of fresh petals is applied on skin as emollient, moisturizer and cosmetic.The plant is grown as an ornamental plant for its beautiful flowers.
Collection season:	May – September.
Botanical name:	*224. Hibiscus cannabinus* L. (MI-13100)
Local Name:	Sanrh
Habitat:	Cultivated on the margins of maize crop.
Part(s) used:	Leaves, stem, stem back fiber, seeds, flowers.
Ethnobotanical uses:	The juice of flower petals is mixed with brown sugar (*Saccharm officinale*) and powder of black pepper (*Piper nigrum*). One tablespoon is taken twice a day for a week to reduce the acidity and excessive bile in the gut. An infusion of leaves is given for the treatment of cough, sore throat and controlling bloody dysentery. The seeds of the plant are mixed with equal amount of black sesame (*Sesamum indicum*) seeds and sugar. 3-5 tablespoons of the mixture is thoroughly masticated and swallowed. The recipe is effective for fattening, enhancement of libido and increasing the viability and

activity of sperms.

Young leaves have a slightly sore taste and cooked as a pot herb. The stems are kept under stagnant water for two weeks for retting of the fibers. The fibers obtained are used for ropes, cattle halter, cordage and nets. The mature green stems are used to tie bundles of maize stalks during harvesting and for hay stock making. The stem pulp stalks left after separation of fiber is used as tinder and fuel. The stems with intact bark is dried and used as walking stick.

Collection season: June – July (leaves), August (flowers) and October (stem, seeds)

Botanical name: *225. Hibiscus syriacus* L. (M1-1311)

Local Name: Gilasgulay

Habitat: Cultivated but naturalized up to 1800m.

Part(s) used: Flowers

Ethnobotanical uses: An infusion made from fresh petals sweetened with honey and mixed with *Morus alba* extract is stored as a syrup. 1-2 tablespoons are taken three four times a day as expectorant and remedy for chest complaints. A mucilaginous paste made from fresh petals is applied as poultice on wounds, itchy skin, dry and cracked skin, inflammations and burns.

The plant is grown as an ornament plant because of its large, pink coloured, beautiful flower. The plant is also grown as a hedge plant. The dried flower petals are used for making a pleasant tasting herbal tea. The dried shoots are used as fuel wood.

Collection season: May – October

Botanical name: *226. Malva neglecta* Wallr (M1-1312)

Local Name: Paneerak

Habitat: Weed of waste and disturbed places, field margins and soil rich in humus up to 2500m.

Part(s) used: Shoots

Ethnobotanical uses: The fresh leaves are crushed to make a poultice. The poultice is tied around the skin with a bandage for healing of bruises inflammations and regeneration of damaged tissue after wound healing. A decoction of leaves is used after four hours intervals in a doze of 1-2

	spoons for ease in cough, flue, nose/chest congestion and cold. Young shoots are used as pot herb. The shoots are utilized as fresh fodder.
Collection season:	April – May
Botanical name:	*227. Malva parviflora* L. (M1-1313)
Local Name:	Sanchal
Habitat:	Cultivated but escaped and naturalized in the area around cultivations up to 2200m.
Part(s) used:	Leaves
Ethnobotanical uses:	A paste of leaves is applied as poultice on inflamed skin, boils and sores. A decoction of leaves is taken for chest complaints and cough. An infusion of leaves is used as a wash for removing dandruff. The young leaves are used as an excellent pot herb cooked fried in a variety of ways.
Collection season:	March – June
Botanical name:	*228. Malvastrum coromandelianum* (L.) Garoke (M1-1314)
Local Name:	Tarrpanrha
Habitat:	Waste undisturbed places, graveyards and field sides up to 1600m.
Part(s) used:	Shoots.
Ethnobotanical uses:	A decoction of shoots is used for controlling dysentery. A paste of shoots is applied on wounds for quicker healing.
Collection season:	March – October
Family:	**67. Marsileaceae**
Botanical name:	*229. Marsilea polycarpa* Hook & Grev. (M1-1315)
Local Name:	Prhaqay
Habitat:	Pond margins, rice paddies and marshy areas near rivers and streams up to 1300m.
Part(s) used:	Leaves.
Ethnobotanical uses:	The fresh leaves are crushed and strained through a cloth to obtain juice. The juice is applied directly on the site of snake bite, inflamed skin and abscesses on the body. The leaves are poisonous for cattle.
Collection season:	March – October

Family:	**68. Meliaceae**
Botanical name:	*230. Melia azedarach* L. (M1-1316)
Local Name:	Bekanrha
Habitat:	Agriculture field sides, hedge rows, graveyards and drier mid hill elevations up to 2000m.
Part(s) used:	Leaves, wood, fruit, root bark.
Ethnobotanical uses:	Pulp from 3-4 fruit is mixed with raw sugar and fed to children for killing and removal of endoparasites. The juice extracted from leaves is diluted in 1:10 proportion and one glass is taken daily for breaking and dissolving kidney stones and their removal. The recipe is also considered diuretic. Pure concentrated leaf infusion is used as purgative to clean gut and as emmenagogue to regulate menstrual flow. Rood bark juice is applied as ointment for eliminating ringworm and eczema. The mature fruits are fed in dough of corn flour to goats for inducing oestraus. The leaves are used as fodder for goats, sheep and cattle. The leaves are mixed in the soil prepared as a bed for raising rise seedling. The practice is done for killing insect and molluse larvae and enhances germination of rice seeds. The wood is used for construction, furniture making and interior decoction. The wood is also used for fuel purpose. The hard fruit endocarp is used as beads for making rosaries. Young fruits are eaten by goats. The leaves are mosquitos and insect repellant
Collection season:	March – September (leaves), September - December (fruit) and Throughout the year (wood, root bark)
Family:	**69. Mimosaceae**
Botanical name:	*231. Acacia modesta* Wall. (M1-1317)
Local Name:	Paloosa
Habitat:	Muslim graveyards, drier foot hills and scrubs up to 1200m.
Part(s) used:	Wood, flowers, twigs.
Ethnobotanical uses:	The wood is used for fuel purpose. Young twigs are used as a tooth brush (miswak). The leaves are browsed by goats. The tree is planted as hedge plant. The branches are used for fencing because of their

spiny nature. The flowers are visited frequently by honey bees for honey collection.

Collection season: Throughout the year (wood) and May – July (flowers)

Botanical name: *232. Acacia nilotica* (L.) Delile

Local Name: Keekar

Habitat: Drier plains and foot hills up to 1100m.

Part(s) used: Wood, stem bark, twigs, seeds, gum.

Ethnobotanical uses: The seeds are powered and brushed on teeth with help of miswak (tooth brush) made from fresh twig of the plant for subsiding toothache and strengthening the teeth and gums. The leaves of the plan are powered and mixed with equal amount of ground raw sugar (gur). One teaspoon of the mixture is kept in mouth for a while and slowly swallowed for controlling cough and curing bronchitis. Equal amounts of leaves and black pepper are ground and mixed with a little animal fat and applied on cracked skin and heel. The gum obtained from the tree is mixed with equal amount of coconut seed powder and 1-2 teaspoons of turmeric powder. The mixture is fried in desighee. One cup of the medication is eaten for a week to recover the body and uterus after child birth, relieve backache stop internal bleeding and to give vigour to the general body. A fresh twig is burnt on fire and the sap. Oozing out on the other side of the twig is applied on skin abscesses and ringworm as remedy. A decoction made from stem bark mixed with a little sugar for sweeting is used as a gargle for mouth and throat sores.

The wood is used as fuel. The tree is a common hedge plant. The leaves are browned by goat. The tree is sometimes planted as ornamental plant.

Collection season: Throughout the year (wood, bark) and August – December (seeds)

Family: **70. Moraceae**

Botanical name: *233. Brousonetia papyrifera* (L.) L Herit ex Vent (M1-1320)

Local Name: Kaghazi Toot

Habitat: Recently introduced, planted on road sides but has escaped and naturalized up to 1200m.

Part(s) used: Wood, fruits

Ethnobotanical uses: The Recently introduced, planted on road sides but has escaped and naturalized od is used as fuel. The fruits when ripe are eaten by children.

Collection season: May – August (fruit) and Throughout the year (wood)

Botanical name: *234. Ficus carica* L. (M1-1521)

Local Name: Ghat Inzar

Habitat: Cultivated

Part(s) used: Fruit, stem latex, leaves.

Ethnobotanical uses: The dried fruits are eaten separately or with honey and green tea as tonic and demulcent for soothing the respiratory tract. 1-2 fresh fruits are eaten as digestive and stomachic. The fruit is roasted and applied on teeth and gums for their health. 2-3 dried fruits are eaten daily as aphrodisiac and galactagogue. A decoction of leaves is stomachic. Latex from the stem is applied on skin for the removal of corns, piles and warts and as antidote for insect bite. Dried fruits are boiled in water for half to one hour and the decoction obtained is taken as laxative.

The fruits are delicious and eaten fresh as well as dried. The whole plant is considered sacred by Muslims as its name has been used in the Holy Quran. People are named after its local name as "Inzar Gul".

Collection season: June-December (Fruit) Throughout the year (Latex)

Botanical name: *235. Ficus palmata* Forssk. (MI-1322)

Local Name: Kach Inzar

Habitat: Plains to mid hill elevations up to 2200m.

Part(s) used: Whole plant, fruit, stem latex

Ethnobotanical uses: 10-15 fully ripe fruits are eaten daily as a tonic and expectorant. 10-15 dried fruits are soaked in water for 4-5 hours to make a viscous infusion. 2-3 table spoons of the infusion are taken as expectorant, demulcent of respiratory system and laxative that eliminate constipation. The bark latex is applied on skin warts to remove them. The latex oozing out of stem bark and plucked leaf is applied on skin

to remove the spines and prickles pierced deep in the flesh.

The whole plant is considered sacred and therefore its use as a fuel wood is often avoided or if used its ash is disposed in water or clean place. People are named as “Inzar Gul” after its local name. The fruit is eaten fresh, with a little salt sprinkled and followed by taking yogurt to prevent tongue sore and diarrhoea.

Collection season: June – August (Fruit) Throughout the year (Latex).

Botanical name: *236. Ficus sarmentosa* Bush. Ham. ex J.E.Smith (MI-1323)

Habitat: Grows on moist rock, rock crevices and other trees up to 2100m.

Part(s) used: Whole plant, fruit.

Ethnobotanical uses: The plant is grown near house walls as an ornamental because it covers the wall with its green foliage. The fruit are eaten by children.

Collection season: June – September (fruit)

Botanical name: *237. Morus alba* L. (MI-1324)

Local Name: Spin toot.

Habitat: Plains to fort hills up to 1500m, often grown on field margins and hedge rows.

Part(s) used: Wood, shoots, fruit.

Ethnobotanical uses: A decoction prepared by adding 1 litre of hot boiled water to 50 grams of powdered mulberry leaves is taken twice a day for reducing the high blood sugar level. The doze is 2-3 table spoons, continued for about four weeks. Fresh leaves are chewed for the relief of toothache.An aqueous extract of leaves is used as drops for eye diseases. Fresh leaf, paste is applied externally on wounds, bruises and chilblains for healing. An infusion of fresh leaves is taken three times a day in the dose of half cup for the treatment of tetanus. Fresh leaf juice is mixed with equal amount of honey and a pinch of black pepper powder. One table spoon of the mixture is taken after 5-6hours interval for controlling cold, cough, flue and asthmatic attacks. Fresh fruits are eaten as body tonic, giving strength to kidney,. Preventing hair loss and graying of hair and as mild laxative. Dried fruits are soaked in warm water to make a viscous syrup. The syrup is taken to treat constipation and respiratory complaints.

The wood is used for making legs of charpai (village cot) and other furniture items.Young flexible branches are used in basketry and also twisted to tie fuel wood bundles and fodder bundles. The leaves and branches are lopped for feeding cattle, goat and sheep. Freshly sprouted twigs are used as a pot herb. The wood is used for fuel. The ripe fruits are very sweet in taste and eaten fresh and dried.

Collection season: April – June (fruit) and March – September (leaves)

Botanical name: *238. Morus macroura* Miq. (MI-1325)

Local Name: Shahtoot

Habitat: Often grafted on other species of *Morus*. Grown on field margins, up to 1500 m.

Part(s) used: Wood, shoots, fruit, stem bark.

Ethnobotanical uses: The juice squeezed out of the bark is applied on wounds, bruises, cuts and scrates on skin for healing.

The wood is used for fuel, agricultural tool making, walking sticks and weaving sticks making. The whole plant is grown as a shade plant. The tinder young shoots are cooked as pot herb. The fruit is sweet and eaten fresh.

Collection season: March – September (leaves), April – May (fruit) and Throughout the year (wood, bark).

Botanical name: *239. Morus nigra* L. (MI-1326)

Local Name: Toor toot

Habitat: Graveyards, field margins, hedge rows and open, sunny forest edges up to 1800 m.

Part(s) used: Wood, stem bark, fruit, root bark.

Ethnobotanical uses: The sap of shoots is mixed with sugar to make viscous syrup. One teaspoon is taken thrice per day for tetanus, fever, body pains and insomnia. A fresh leaves infusion or cried leaves decoction is taken for controlling sugar level and treating flue, cold and nose bleeding. The stem bark is chewed between the painful teeth for subsiding the pain. Fresh fruits are crushed and mixed with sugar or honey to make a concentrated sweet syrup. 1-2 teaspoon are taken after four hour interval for the relief of flue, cold, cough, asthma, bronchitis and

wheezing in chest. A powder of the root bark is taken with water after six hours of fasting for killing and elimination of intestinal worms.

The wood is used for fuel and charcoal making. The wood is heavy and durable, thus used for furniture making, construction and agricultural tool making. The fruits when half ripe with red colour are sore in taste and eaten raw. Fully ripe fruits are seldom eaten but cause diarrhea when eaten excess.

Collection season: April – June (Fruit) and Throughout the year (wood, bark).

Family: **71. Myrsineceae**.

Botanical name: *240. Myrsine africana* L. (MI-1327)

Local Name: Manrhgwaya

Habitat: Under coniferous forest and shady, northern slopes of hills between 1200-2500 m.

Part(s) used: Shoots, fruits.

Ethnobotanical uses: The dried shoots and leaves are boiled for 15-20 minutes in water to obtain a decoction. Half cup of the decoction is taken daily as blood purifier. 2 tablespoons of fresh fruits are eaten for killing different types of endo parasites

The shoots are used for broom making. The dried shoots are used as tinder and fuel.

Collection season: May – July (Fruit) and Throughout the year (Leaves)

Family: **72. Myrtaceae.**

Botanical name: *241. Eucalyptus camaldulensis* Dehnh. (MI-1328)

Local Name: Kamasal lachi

Habitat: Recently introduced, grown along road sides, foot hills and marshy places.

Part(s) used: Wood, leaves.

Ethnobotanical uses: The fresh leaves are crushed and squeezed to extract the aromatic juice. The juice is rubbed on skin as antiseptic and on utensils etc. as disinfectant. The leaf paste is applied on skin with minor cuts, scratches and bruises. A decoction of leaves is taken twice daily for cough, cold, flue, bronchospasm and stomachache. The leaves are

	burnt in fire and the smoke arising is inhaled to open the congested, blocked nose and air passage ways. The smoke also helps in expelling the phlegm from respiratory system. The wood is used as fire wood. The wood is used in building construction. The plants are grown in watershed areas for soil binding and reclamation of forest.
Collection season:	Throughout the year.
Botanical name:	*242. Myrtus communis* L. (MI-1329)
Local Name:	Manrho
Habitat:	Moist, shady, foot hill habitats between 1000-1800 m.
Part(s) used:	Leaves, fruits.
Ethnobotanical uses:	10-15 grams of leaves are mixed in one glass of hot water and left to settle and cool for a while. The whole decoction is taken for controlling diarrhea and dysentery. Dried leaves are boiled in water and a little honey is added for taste. The decoction is taken two times a day for controlling dry coughs, chest congestion and sore throat. A concentrated fresh leaf aqueous extract is used as a gargle for controlling sore throat sinusitis and gum infections. A paste of fresh, crush ed leaves is applied on facial acne and bleeding piles as a remedy. An infusion of fresh fruit is carminative, anti-flatulent, control diarrhea and stops internal bleeding and dysentery. The leaves are added to tea for flavouring. The fruits are eaten fresh and dried. The plant is grown as ornamental because of its green foliage, beautiful white flower and pleasant aroma. Twigs are kept indoors as mosquito repellant.
Collection season:	Throughout the year (leaves) and June – September (Fruit).
Family:	**73. Nyctaginaceae.**
Botanical name:	*243. Boerhavia procumbens* Banks ex Roxb (MI-1330)
Local Name:	Itsut
Habitat:	Drier, sandy places around streams, foot hills and rain fed areas utpo 1800 m.
Part(s) used:	Shoot, roots.
Ethnobotanical uses:	A paste of shoots is applied as a poultice on painful joints and

	muscles. The root is crushed into a paste and applied on the site of insect sting and snake bite. One teaspoon of dried, powdered root is mixed with equal amount of brown sugar (gur) and given to children for removal of intestinal parasites. Shoot are grazed by sheep and goat.
Collection season:	May – September.
Botanical name:	*244. Mirabilis jalapa* L. (MI-1331)
Local Name:	Gule Bade
Habitat:	Often cultivated but escaped and naturalized in graveyards and village vicinities up to 1800m.
Part(s) used:	Leaves, Roots, Seeds.
Ethnobotanical uses:	Fresh leaves are slightly warmed and tied around boils and abscesses to become warm, mature and relax pus for quicker healing. A leaf paste is used as poultice for inflamed and painful muscles. Decoction of leaves is diuretic. Powdered root is mixed with wheat flour and backed on gentle heat with desi ghee (animal fat) and eaten as aphrodisiac for men and emmenagogue for women. A paste of root is applied on skin for the treatment of eczema, itching, swelling and scabies. Dried roots are boiled in water and the decoction is used as gargle for tonsillitis. The seeds are poisonous, purgative and emetic. The plant is grown as an ornamental for its beautiful flowers. Children play with the seeds of the plant.
Collection season:	March – October (leaves), Throughout the year (Roots) and October – November (Seeds)
Family:	**74. Oleaceae**.
Botanical name:	*245. Jasminum humile* L. (MI-1332)
Local Name:	Ziash Rambeel
Habitat:	Scrubs and edges of coniferous forests between 1000-2500 m.
Part(s) used:	Shoots, flowers.
Ethnobotanical uses:	One litre of hot water is added to 30 grams of dried flower to make a decoction. The decoction is filtered and half cup of it is taken daily as a heart tonic. The dried shoots are used as tender. The leaves are browsed by goats.

The plant is sometimes grown as an ornamental.

Collection season: April – June (flowers)

Botanical name: *246. Jasminum officinale L.* (MI- 1333)

Local Name: Rambul Chambeel / Yasmeen

Habitat: Scrubs and forest edges between 1200-2200 m.

Part(s) used: Leaves, flowers, shoots.

Ethnobotanical uses: Decoction of dried flowers is analgesic and relieves body pains. Flowers are put into a hot or boiling water to produce an aroma. The aromatic vapors are inhaled for soothing and calming the body and as aphrodisiac. The juice of leaves is antiseptic and applied as drops for controlling pus discharge from ears. 2-3 spoons of dried, powdered leaves are taken with water for expulsion of intestinal worms. Shade dried flower buds of the plant are taken in a doze of 1-2 table spoons thrice a day for four to six weeks as a remedy of hepatitis.

The plant is grown as an ornamental plant. The leaves are grazed by domestic animals. The flowers when dried are used for making green tea. Girls are named "Yasmeen" after the name of the plant. Flowers are woven into fragrant garlands.

Collection season: March – November (Leaves) and May – July (Flowers)

Botanical name: *247. Olea ferruginea* Royle (MI-1334)

Local Name: Khona.

Habitat: Dominant in Muslim graveyards and on drier foothills up to 2000 m.

Part(s) used: Leaves, Branches, wood, fruit.

Ethnobotanical uses: The bitter tasting leaves are chewed and the juice is swallowed for relief in toothache and healing of sore throat and mouth and healing of cracked tongue. An infusion of leaves is taken daily for stopping internal bleeding, reducing sugar and cholesterol level in blood, expelling intestinal worms and as a remedy and prevention of jaundice, hepatitis and other liver complaints. One or two cups of fresh or dried fruits are eaten daily for giving strength to bones and general body.

The whole plant is considered sacred by Muslims as it is mentioned in the Holy Quran. People are named after its local name as "Khona",

	"Khona Gul". Often planted as ornamental because of evergreen nature and dark green foliage. The fruit are eaten fresh and dried. Leaves are eaten as fodder by goats. Young twigs are planted as a symbol of sanctity and virtue on a newly build Muslim grave. The wood is durable and utilized in making handles of agricultural tools, candles/lamp stands and decoration pieces. The wood is seldom used for burning and fuel purposes. The ash produced after burning is disposed in water or clean soil. Branches are used as walking sticks. Y. shaped branches are used for catapult making. Young branches are used as tooth brush (Miswak).
Collection season:	Throughout the year(Leaves) and September- November (Fruit)
Family:	**75. Onagraceae**
Botanical name:	*248. Epilobium hirsutum* L. (MI-1335
Local Name:	Soordingay
Habitat:	Moist and marshy areas near stream banks and sides of rice paddies.
Part(s) used:	Whole plant.
Ethnobotanical uses:	The plant is poisonous both for human and domestic animals. The shoots are sometimes used for healing of minor cutes.
Recipe:	Young shoots are applied as such without crushing them on the minor cuts and bruises on skin.
Collection season:	Throughout the year.
Botanical name:	*249. Oenothera rosea* L'Her. ex Ait. (MI-1336)
Habit:	Perennial herb.
Habitat:	Field margins, sand stream sides, fellow lands, exposed hill ridges up to 2000 m.
Part(s) used:	Whole plant.
Ethnobotanical uses:	An infusion of fresh shoots is taken twice a day in a doze of half to full tea cup for relieving headache and pains in kidney, stomach and liver. A paste of the plant is applied externally as poultice to reduce skin inflammation, itching and hypersensitivity. The whole plant is used as a fodder.
Collection season:	March – October.
Family:	**76. Orchidaceae**

Botanical name: *250. Dactylorhiza hatagirea* (D.Con) Soo (MI-1715)

Local Name: Jabbagai / Panja.

Habitat: Moist forest floors on higher altitudes between 2500-3000 m on dark coloured, humus rich soils.

Part(s) used: Roots

Ethnobotanical uses: The tuberous roots are thoroughly rinsed with water to remove the dust. They are chopped into small pieces and boiled in goat's milk till the milk is dried. Equal amount of honey is added to it. 3-4 tablespoons of the medicine is taken twice a day during the postpartum period for earlier recovery and rejuvenation of the body. About2-5 teaspoons of the mixture are taken three hours before the intercourse as a powerful sexual stimulant and aphrodisiac.

Collection season: August – November.

Family: 77. Orobanchaceae.

Botanical name: *251. Orobanche alba* Steph. (MI-1338)

Local Name: Ziarh botay

Habitat: Grow as parasite on Thymus linearis and other herbs between 2000-2800 m.

Part(s) used: Whole plant

Ethnobotanical uses: A paste of the plant is applied as poultice to heal the wounds quickly. A decoction of the plant is given in a doze of half cup, twice a day for stopping noise bleeding and other internal bleedings. One cup of the decoction is taken for boosting libido.

Collection season: March – May.

Family: 78. Oxalidaceae

Botanical name: *252. Oxalis corniculata* L. (MI-1339)

Local Name: Manzakay Tarookay

Habitat: Waste places, fallow lands, hedge rows and graveyards found up to 2500m.

Part(s) used: Whole plant, Fruits.

Ethnobotanical uses: Chewing the plant for a while in teeth and then swallowing it regularly for fifteen to twenty days strengthen gums, stops gum bleeding and cures sensitive teeth. Infusion of whole plant is given to

children for removal of hook worms. Equal amounts of onion bulbs and shoots of *Oxalis corniculata* are crushed together and then strained through a cloth to obtain a mixed juice. The juice is applied on skin warts to weather them off and on skin eruptions to subside. The juice of leaves is rubbed on the places of insect bites to neutralize and eliminate the pain especially scorpion stings.

The shoots are eaten raw as a salad with sore taste and stimulating saliva secretion. The shoots are chewed to neutralize the effect of eating sore foods by people with sensitive teeth. Children play with the fruit enjoying the bursting mechanism.

Collection season: March – December.

Family: **79.Paeoniaceae**

Botanical name: *253. Paeonia emodi* Wall. ex Royle (MI-1340)

Local Name: Ward

Habitat: Forest margins and shrubs between 1800 – 2800 m.

Part(s) used: Rhizome, Seed, Flower petals.

Ethnobotanical uses: One hundred grams each of *Paeonia emodi* rhizome powder and wheat flour are soaked togeather in water to make a mixture like a dough. The dough is fried in animal fat (Butter oil) and a little brown sugar (gur) is added to it. One cup of the warm paste (Halva) is taken daily for curing lumbago (low back pain) and post partum gynecological complaints. One to two tablespoons of the powered rhizome is taken two times a day for controlling hysteria, epilepsy and other nervous disorders. A decoction of dried flower petals is taken in a dose of one tablespoonful thrice daily for controlling cough, treating bleeding piles and as blood purifier. A powder of seeds is emetic and purgative.

Collection season: Throughout the year (Rhizome), May – June (Flower) and August – September (Seed)

Family: **80. Papaveraceae**

Botanical name: *254. Papaver dubium* L.(MI-1721

Local Name: Reday

Habitat: Weed in wheat and other Rabi crops from plains to 1800m.

Part(s) used:	Shoots, seeds.
Ethnobotanical uses:	The young shoots are used as an ingredient in a local green rice dish called "Chukanrh". It has a warming effect on the body. The seeds are eaten by children. The flowers have been mentioned in the local poetry as a symbolism for blood colour and a flirting love affair.
Collection season:	March – June
Botanical name:	*255. Papaver somniferum* L. (MI-1723)
Local Name:	Qashqash
Habitat:	Commonly cultivated till 1980s as a cash crop but is now totally banned in the area for commercial cultivation. Now it is grown as an ornamental and on small scale for seed production.
Part(s) used:	Latex from capsule (opium), capsules, stem, seeds.
Ethnobotanical uses:	One grain (almost 2 grams) of opium is thoroughly mixed in 250 ml of water and taken orally for the relief in pain and reducing fatigue. This recipe also stimulates the body and increase stamina and efficiency but become addictive if used regularly for more than a week. A small piece of opium equal to the size of a grain is taken with water before bedtime to increase sexual stamina and prevent premature ejaculation. The dried empty capsules are powdered and half tea spoon is boiled for 10 minutes in water to make a tea. The tea is taken thrice a day to control catarrh, flue, cold and expel phlegm from lungs and air passage ways. The seeds are soaked overnight in water and crushed in mortar and pistle. Sugar is added for taste and a syrup is prepared by adding cold water. Taking one glass (250 ml) of the syrup daily is considered a powerful brain tonic and memory booster. Equal amount of capsule wall and leaves of *Cannabis Sative* are kept over night in water to make "Tandai", which is taken for relaxation and feeling of wellbeing. The plant is grown as ornamental for its varying coloured large flowers. The dried stems after removal of the capsules are used as tinder and fuel. The seed are considered nutritious and eaten as such when still on the plant and have a little moisture. The seeds are used in making confectionaries, tea and pastes.

Collection season: May – June.

Family: **81. Parnassiaceae**

Botanical name: *256. Parnassia nubicola* ssp. *occidentalis* E.S. ⁻Temesy (MI-1742)

Local Name: Kamasla Mamera

Habitat: Moist forest floors between 2000 – 3000m.

Part(s) used: Whole plant, roots.

Ethnobotanical uses: A powder of dried roots of the plant is sprinkled on the site of snake bite as antidote and on boils, wounds and cuts for quick healing. An infusion of leaves is used as eye wash to sure inflammation of eye lids and redness of eye balls.

The whole plant is used as a pot herb.

Collection season: April – September

Family: **82. Phytolaccaceae**

Botanical name: *257. Phytolacca latbenia* (Moq.) Walter (M1-1374)

Local Name: Gararha/tambakopanrha

Habitat: Forest margins and floors between 1800 – 2700m.

Part(s) used: Leaves, roots.

Ethnobotanical uses: A decoction of dried roots is prepared by adding two cups (500ml) of water to 30 grams of root powder. Half cup of the decoction is taken two times a day for controlling asthmatic attacks and as expectorant. One or two spoons of powdered root is taken for the removal of intestinal worms. Root powder is sprinkled on boiled, sores, carbuncles and pus producing wounds to kill the bacteria and heal them.

The young leaves are boiled and the water is removed after boiling. The boiled leaves are fried with garlic and condiments in mustard oil to prepare a delicious green dish. The matured leaves are poisonous for both humans and live stock

Collection season: April – September

Family: **83. Pinaceae**

Botanical name: *258. Abies pindrow* Royle (M1-1375)

Local Name: Hachar/Kachal

Habitat: Thick forest on high altitudes forming pure patches or mixed with

Picea smithiana between 2200 – 3000m, mostly on northern slopes.

Part(s) used: Wood, leaves, cones.

Ethnobotanical uses: A decoction of leaves is used for the treatment of asthma, bronchitis and diabetes. One tablespoon of a leaf juice is given to women in the post parturition period for earlier recovery of uterus and reducing blood flow.

The wood is used for interior decoration of homes and making ornamental objects. Branches and cones are used as fuel and as decorating objects.

Collection season: Throughout the year.

Botanical name: *259. Cedrus deodara* (Roxb. ex D.Don) G.Don (M1-1376)

Local Name: Ranzrha / Deyar

Habitat: Drier, southern slopes of hills between 1800 – 2600m, ofthen forming pure patches or mixed with *Pinus wallichiana.*

Part(s) used: Wood, branches oil from heartwood leaves, cones, resin.

Ethnobotanical uses: A decoction of the dark coloured oily heartwood is used for lowering fever, congested respiratory tract, diabetes, enhancing perspiration, eliminating flatulence and curing piles. Oil extract from heart wood is given as a mixture of 20ml oil with 250ml water for eliminating flatulence in cattle. 2-3ml of the oil is swallowed using on an empty capsule to avoid the better taste for a constant relief from urticaria and protection from blood sucking insects like pleas, lice, bedbugs and mosquitos. People say that the insects are killed after sucking the blood, after using this oil. Taking one milliliter of the oil cause profuse perspiration and lowering of temperature and blood pressure. Rubbing the oil on skin cures urticaria and act as insect repellant. A resin oozing out of the incised bark, is applied externally on cuts, bruises, eczematic and itchy skin.

The wood is most valuable among all because of its light weight, durability and resistance to moisture and pest attack. It is used for bridges, pillars, building construction, furniture and ornamental piece making. The branches are used as fire wood. The wood being oily, catch fire easily and is used as tinder. The braches with leaves and

cones are used for decoration indoor.

Collection season: Throughout the year

Botanical name: *260. Picea smithiana* (Wall.) Boiss. (M1-1377)

Local Name: Kandal / Mangazai

Habitat: In thick forest mostly on northern slopes mixed with *Abies pindrow* between 2200 – 3000m.

Part(s) used: Wood, shoots, cones.

Ethnobotanical uses: The wood is used for construction and furniture making. Used as firewood and burnt for obtaining good quality charcoal. The young shoots are used for making a green tea.

Collection season: Throughout the year.

Botanical name: *261. Pinus roxburghii* Sargent (M1-1378)

Local Name: Nakhtar

Habitat: Lower and mid hill elevation, often forming pure patches and mixes with *Pinus wallichiana* in its upper reach. Found between 1200 – 2500m.

Part(s) used: Wood, spurs, resin, cones, seeds

Ethnobotanical uses: The resin collected from incisions on the stem is boiled along with milk till whole of the milk is dried. 3-5 grams of this resin mixture is taken daily with water as blood purifier and astringent. It dries up all the boils, pimples and pustules on skin. Young leaves are finely crushed and stirred with fresh water and then strained through a cloth. The infusion is taken daily as blood purifier, stimulant, immunostimulant and rejuvenator. It reduces the burning sensation in body. Tuberculosis and asthma patient are advised by local hakeems (herbalists) to stay in chir pine forests for 3-4 months to get rid of the disease.

The wood is used as timber for building construction. The wood is used as fire wood and also burnt for charcoal making. The spurs and leaves are used as bedding for live stock, as thatching material and as packing material in fruit packing. The spurs are also used to made brooms used for flour clearing in water mills and kitchens. The resin obtained from cuts on the stem is used to strengthen the threat used

	for stitching shoes. Resin is used by women for removal of hair for personal hygiene. The cones are used for fuel and decoration purpose. The seeds are eaten like chilghoza. The resinous wood obtained from the point of origin of a branch on main stem is used for lighting like candles and also used as tinder.
Collection season:	Throughout the year.
Botanical name:	*262. Pinus wallichiana* A.B. Jackson (M1-1379)
Local Name:	Peewoch / Sraf
Habitat:	Dominant tree in drier hill forests between 2000 – 3000m.
Part(s) used:	Wood, spurs, cones, resin.
Ethnobotanical uses:	The resin oozing of a cut in stem is boiled in milk till whole of the milk is dried and only the resin is left. 3-5 grams of the resin is swallowed independently or with water for the treatment of skin diseases and respiratory tract diseases including cold, asthma and tuberculosis. The resin is mixed with butter or mustard oil to make a liniment plaster which is applied externally on wounds, burns, boils and sores on skin. The wood is valuable and extensively used as timber for construction, doors and cupboard making and furniture. Branches and cones used as fuel. Resinous wood is used for lighting and as tinder. The spurs are used for livestock bedding thatching and fruit packing.
Collection season:	Throughout the year
Family:	**84. Plantaginaceae**
Botanical name:	*263. Plantago lanceolata* L. (M1-1380)
Local Name:	Ghwaye Jabai
Habitat:	Common weed of Arabic lands, stream sides, field verges and graveyards up to 2300m.
Part(s) used:	Leaves, seeds, roots.
Ethnobotanical uses:	A paste of crushed, fresh leaves is directly applied on wounds and cuts for healing and regeneration of lost tissue. The juice of fresh leaves is applied between the toes for healing of the cracks produced due to moisture and prolonged walking in wet places. A decoction of leaves is taken to heal peptic ulbers, stop bleeding from harmorrhoids

	and intestine. Equal amounts of *Plantago lanceolala* roots and *Marrubium vulgare* shoots are crushed together and applied on the site of snake bite as antidote. The seeds are soaked in water overnight and eaten in the morning as laxative and to eliminate constipation.
Collection season:	March – September (leaves), Throughout the year (roots) and July – September (seeds)
Botanical name:	*364. Plantago major* L. (M1-1381)
Local Name:	Jabai
Habitat:	Open, moist, grassy places and forest margins from 100 – 3000m.
Part(s) used:	Leaves, roots.
Ethnobotanical uses:	Equal amounts of fresh *Plantago major* root and *Marrubium vulgare* shoots are ground together into a past and applied in skin as antidote for snake bite. Crushed leaves are applied directly on wounds skin sores and cracks on feet and heel to heal. An infusion of leaves is taken as a diuretic and body cooling agent.
Collection season:	March – September
Family:	**85. Plumbaginaceae**
Botanical name:	*265. Limonium macrorhabdon* Kuntze (MI-1383)
Local Name:	Ghwakhakay
Habitat:	Drier, stony and gravely steep slopes and cliffs between 1200-2100 m.
Part(s) used:	Roots, Flowers.
Ethnobotanical uses:	The roots are dried and made into a powder which is sprinkled on wounds, bruises and cuts for healing. Flowers are crushed into a paste and mixed with mustered oil and massaged on face to keep it fresh wrinkle free and moist.
Collection season:	Throughout the year (Roots) and July – September (Flowers)
Family:	**86. Poaceae.**
Botanical name:	*266. Acrachne racemosa* (Heyne ex Roem. & Schult.) Ohwi. (MI-1384)
Habitat:	Common weed of summer season in maize crop, rice paddy verges, waste places etc.
Part(s) used:	Shoots.

Ethnobotanical uses: The shoots are used as forage and fodder species for cattle.

Collection season: June – September.

Botanical name: *267. Alopecurus myosuroides* Huds. (MI-1386)

Local Name: Zozay

Habitat: Wet meadows, marshy areas, rice paddies and pond margins up to 1500m.

Part(s) used: Anthers, shoots.

Ethnobotanical uses: An infusion of fresh shoots is taken as diuretic, blood purifier and anti-inflammatory agent. The juice of fresh plant is applied on the scars left after chickenpox.

The hanging anthers are collected by children and eaten. The shoots are used as a fodder.

Collection season: March – April (Anthers) and March – September (Shoots)

Botanical name: *268. Apluda mutica* L.(MI-1387)

Local Name: Pashkalay Wakha

Habitat: Very common summer grass of field verges, graveyards and mid hills elevations up to 2000 m, where it becomes a dominant grass in the herb layer.

Part(s) used: Shoots, Roots.

Ethnobotanical uses: Roots are crushed into a paste and mixed with mustered oil is given to calf for mouth sore healing. The same recipe is applied as poultice for the treatment of gonorrhea. Shoots are crushed and applied on boils with pus for quicker discharge of pus and earlier healing. A decoction of dried shoots is used as diuretic.

The shoots are a common forage and fodder species, used both fresh and as hay.

Collection season: July – November

Botanical name: *269. Aristida cyanantha* Nees ex Steud. (MI-1389)

Local Name: Mashkanrhay

Habitat: Drier, south facing hill slopes between 1100-1900 m.

Part(s) used: Shoots.

Ethnobotanical uses: The shoots are used for making brooms. Young plants before blooming are used as fodder. The main stem with leaves removed is

	employed in making grain cleaning and winnowing utensil locally called “Chaj”. The plant is a good sand binder and prevents erosion.
Collection season:	April – November.
Botanical name:	*270. Arthraxon prionodes* (Steard). Dandy (MI-1390)
Local Name:	Bandakay
Habitat:	Weed of rain fed arable lands, foot hills, field verges and hedge rows up to 2000 m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The shoots are used as a fodder.
Collection season:	June – November.
Botanical name:	*271. Arundo donax* L. (MI-1391)
Local Name:	Nal.
Habitat:	River sides and moist places up to 1200 m.
Part(s) used:	Stem, roots, leaves.
Ethnobotanical uses:	A paste of roots is applied directly on forehead for the treatment of headache. Young leaves are browsed by goats and cattle. The stem is used for making calligraphy pens (Qalams). The stems are woven by threads into mats used as door cover or roof thatching material. The stems are used for making music instruments like pipe (flute). The stems are used to make fences. The stems are also employed in making grain cleaner and shaker called “Chaj”. Children make water shooters from the stem and also make the frame work of a kite. Locally the stems are used as splints for broken bones.
Collection season:	November – December.
Botanical name:	*272. Avena fatua* L. (MI-1392)
Local Name:	Jamdaray.
Habitat:	Common weed of Rabi crops.
Part(s) used:	Shoots, grains.
Ethnobotanical uses:	The shoots are used as a fodder. The grains are ground into a porridge used as a cattle feed.
Collection season:	April – June
Botanical name:	*273. Avena sativa*. (MI-1747)

Local Name: Asli Jamdaray

Habitat: Weed in wheat crop and also cultivated as mixed crop with clover for fodder.

Part(s) used: Shoots, grains.

Ethnobotanical uses: Milk like juice is strained from partially ripe grains is collected and one teaspoon is added in a glass of warm milk. This concoction is taken daily as a restorative food after debilitating illness and as a sexual stimulant and stamina enhancer. Ground grains are boiled in milk to make a gruel. This is considered a cardiac stimulant, nerve tonic, anti-cholesteromic agent and a uterine tonic given to women after parturition. A concentrated decoction of grains is applied on skin as a remedy of eczema, itching, drying of skin and seborrhoeic dermatitis. The grains are crushed into a coarse flour which is used as a cattle feed with tonic and galactogague properties.

The shoots are valued for its fodder producing quality. It is preferred fodder for all types of livestock in fresh, dried and straw form.

Collection season: March –June

Botanical name: *274. Bothriochloa bladhii* (Retz.) S.T.Blake (MI-1393)

Local Name: Palwan

Habitat: Drier food hills up to 1600 m.

Part(s) used: Shoots, Stem.

Ethnobotanical uses: The shoots are used as forage and fodder species. The plant is considered a preferred species for revegetation of barren, eroded areas. The stems are used as tooth picks.

Collection season: June – Octrober.

Botanical name: *275. Brachiaria remosa* (L.) Stapf. (MI-1394)

Local Name: Thala

Habitat: Common, often a gregarious weed of Khareef crops.

Part(s) used: Shoots, grain.

Ethnobotanical uses: The shoots are used as a fodder. The grains are used as a bird feed.

Collection season: July – October.

Botanical name: *276. Bromus pectinatus* Thunb. (MI-1396)

Local Name: Jaikay

Habitat: Waste places, hedge rows, rock crevices and graveyards.

Part(s) used: Shoots.

Ethnobotanical uses: The plant is used as a fodder of winter and early spring season.

Collection season: February – April.

Botanical name: *277. Chrysopogon gryllus* (L.) Trin. (MI-1398)

Local Name: Beeranrh.

Habitat: Meadows and forest margins above 1800 m.

Part(s) used: Shoots.

Ethnobotanical uses: The shoots are used as a valuable fodder. It is considered to increase meat and milk in livestock.

Collection season: June – October

Botanical name: *278. Chrysopogon serrulatus* Trin. (MI-1753)

Local Name: Spin wakhay.

Habitat: Drier foot hills and ridges between 1000-2000 m

Part(s) used: Shoots.

Ethnobotanical uses: The shoots are used as fodder both in fresh form and as hay

Collection season: June October.

Botanical name: *279. Cymbopogon jwarancusa* (Jones) Schutt. (MI-1754)

Local Name: Sargarhay

Habitat: Drier waste places. Foot hills and growly soils.

Part(s) used: Shoots.

Ethnobotanical uses: A decoction of dried leaves is used for cough, cold and flue.

The shoots are a forage species in young condition. Mature shoots are stored as hay for feeding in time of fodder scarcity. The mature shoots are also spread in in mosques as mats.

Collection season: June-September

Botanical name: *280. Cynodon dactylon* (L.) Pers. (MI-1400)

Local Name: Kabal

Habitat: Waste places, fallow lands, sandy stream sides, river banks, field verges, open exposed foot hills and mountain tops up to 3000 m.

Part(s) used: Whole plant.

Ethnobotanical uses: Fresh shoots are crushed and made into a paste which is applied in fresh cuts and wounds for stopping bleeding and healing. A decoction

	of the whole plant is considered a heart tonic and alterative. An infusion of fresh shoots is used as a gargle to eliminate bad mouth odour and refresh breathing. It is a common opinion of the people in the area that walking bare footed on the lawn of *Cyndon dactylon,* daily in morning gives strength to the heart and improves eye sight. The plant is a common lawn grass and grown for ornamental purposes in home lawns. It is a good sand binder and grown to check water and wind erosion. The plant is a best forage grass and also used as fodder in fresh form.
Collection season:	March – October.
Botanical name:	*281. Dactylis glomerata* L. (MI-1401)
Local Name:	Zangali Warbashey.
Habitat:	Exposed ridges, forest floors, fruit orchards and field verges between 1100-2800 m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The shoots are an excellent fodder for all types of livestocks.
Collection season:	June – August.
Botanical name:	*282. Dactyloctenium aegypticum* (L.) Willd. (MI-1402)
Local Name:	Ghakhakay.
Habitat:	Waste places, paddies, sandy stream sides and crop lands up to 1500 m.
Part(s) used:	Shoots. Seeds.
Ethnobotanical uses:	Fresh plant aqueous extract is taken for fevers and applied externally on wounds. Decoction of seeds relieve kidney pain and control cough. Young shoots are used as fodder.
Collection season:	June – October.
Botanical name:	*283. Desmostachya bipinnata* (L.) Stapf. (MI-1403)
Local Name:	Drab.
Habitat:	Found in drier places, hedge rows, sandy stream sides and gravely places up to 1300 m.
Part(s) used:	Shoots, roots.
Ethnobotanical uses:	30-50 grams of roots are boiled in 500 ml water for 15-20 minutes to

	make a decoction. The decoction in given to cattle for controlling diarrhea and dysentery. Equal amounts of dried roots and black pepper are ground together and one table spoon of the mixed powder is taken to control cholera and diarrhea. The medication is continued for at least three days, thrice daily. The shoots are used as a fodder of low quality eaten mostly by buffaloes. The plant is a sand binder and grown to prevent water and wind erosion.
Collection season:	June – November.
Botanical name:	*284. Dichanthium annulatum* (Forssk.) Stapf. (MI-1404)
Local Name:	Palwan.
Habitat:	Common, often dominant grass on open gentle slopes and foot hills, drier plains and field verges.
Part(s) used:	Shoots, whole plant.
Ethnobotanical uses:	The plant is highly palatable and a preferred forage grass for all types of livestock, used fresh and in hay form. The plant is a good and binder. The stems are used as tooth pick.
Collection season:	March – November.
Botanical name:	*285. Digitaria sanguinalis* (L.) Scop. (MI-1755)
Local Name:	Wakha.
Habitat:	Common in fruit orchards, maize crop, sandy stream sides and waste places as a summer weed.
Part(s) used:	Shoot.
Ethnobotanical uses:	A decoction of the plant is taken for the treatment of gonorrhea. A diluted shoot infusion is used to wash the eyes and eliminate redness of eyelids and impurities in eyes. The plant is used as a fodder.
Collection season:	June – October.
Botanical name:	*286. Echinochloa colona* (L.) Link (MI-1407)
Local Name:	Sra Shamokha.
Habitat:	Weed of waste places, Khareef crops, damp places and irrigated crop lands up to 1300 m.
Part(s) used:	Shoots, grains.

Ethnobotanical uses: The shoots are used as a fresh fodder. The grains are an excellent birds feed.

Collection season: May – September.

Botanical name: *287. Echinochola crus-galli* (L.) P. Beauv. (MI-1408)

Local Name: Babara Shamokha

Habitat: Weed in rice paddies and marshy places up to 1100m.

Part(s) used: Shoots, grains, roots.

Ethnobotanical uses: Dried roots of the plant are powdered and sprinkled on carbuncles, wounds and scares for quicker healing. A decoction of roots is taken daily as tonic and to control internal hemorrhages.

The shoots are used as fodder but their excessive uses can cause flatulence and even death. The grains are given to birds.

Collection season: June – October.

Botanical name: *288. Eleusine indica* (L.) Gaertn (M1-1409)

Local Name: Patra

Habitat: Waste, disturbed places and lawns up to 1100m.

Part(s) used: Shoots, roots.

Ethnobotanical uses: An infusion of roots is taken daily for blood purifier, as diuretic and diaphoretic agent. 2 tablespoons of powdered roots are mixed in a cup of cured and taken daily for treating jaundice and as hepatoprotectant.

The shoots are used as a fodder for cattle and horses.

Collection season: June – August.

Botanical name: *289. Eragrostis pilosa* (L.) P.Beauv. (MI-1411)

Habitat: Waste places, muddy rooftops, along water courses and field verges up to 1300 m.

Part(s) used: Shoots.

Ethnobotanical uses: The shoots are used as fodder in fresh form especially for bufalloes.

Collection season: July – November.

Botanical name: *290. Eulaliopsis binata* (Retz.) C.E. Hubbard (MI-1412)

Local Name: Barwaza.

Habitat: Drier, steep hill sides between 800- 1300 m.

Part(s) used: Shoots.

Ethnobotanical uses: The shoots are spread as floor bedding and mat in mosques. Bundle of shoots is used as a pillow kept under the head of corps before burial in Muslim grave. The shoots are used to make ropes, mats and even slippers.

Collection season: September – November.

Botanical name: *291. Hemarthria compressa* (L.f.) R.Br. (MI-1413)

Local Name: Ghat Kabal.

Habitat: Moist places along water courses, field verges and undisturbed areas up to 1200 m.

Part(s) used: Whole plant.

Ethnobotanical uses: The plant is used as a fodder for cattle and a forage species.

Collection season: July – September.

Botanical name: *292. Heteropogon contortus* (L.) P.Beauv. ex Roem. & Schulte (MI-1414)

Local Name: Surmal

Habitat: Dominant grass on sub-tropical hill slopes.

Part(s) used: Shoots.

Ethnobotanical uses: The shoots are used as a fodder before flowering. After blooming it is avoided by cattle and other livestock because the sharp pointed seeds and tangled awns cause injuries to the skin and mouth of the livestock. The plant is also used for mating in mosques and thatching of roofs.

Collection season: April – June.

Botanical name: *293. Hordeum murinum* L. (MI-1415)

Local Name: Lalmay Warbasha.

Habitat: Disturbed areas and hedge rows up to 1300 m.

Part(s) used: Whole plant.

Ethnobotanical uses: A decoction of the dried plant is used as diuretic and treatment of urine retention in the bladder.

Collection season: March – May.

Botanical name: *294. Hordeum vulgare* L. (MI-1758)

Local Name: Warbashey

Habitat: Cultivated as crop and also mixed crop with clover for fodder.

Part(s) used: Shoots, grains.

Ethnobotanical uses: A decoction of shoots is diuretic. The grains are finely ground and the husk is removed. The powder is boiled in water to make a viscous soup. About half cup of the soup is taken in warm condition for soothing of digestive system and respiratory tract. A paste of ground seed mixed with butter is applied on skin as emollient and a poultice for burns and wounds.

The shoots are used a fodder before flowering. After flowering, the awns cause trouble and thus the whole spikes are removed before feeding to cattle. The grains are crushed in local water mills as a coarse grained flour called "Dal" and used as a cattle feed. The flour of grains is used for making breads in the time of food scarcity in hilly areas. The grains with husk removed is boiled in water and then mixed with yogurt is taken as a food called "Butey

Collection season: February –April (Shoots) and June (Grains)

Botanical name: *295. Hyparrhenia hirta* (L.) Stapf. (MI-1416)

Local Name: Sor Wakhay

Habitat: Drier hill sides between 1100-1400 m.

Part(s) used: Shoots.

Ethnobotanical uses: The plant is a good forage species and used as fodder both in fresh and hay conditions. The shoots are used for making bread keeping pots, baskets, roof thatching and mats in mosques. The plant is also a good sand binder.

Collection season: March – August.

Botanical name: *296. Imperata cylendrica* (L.) Raeuschel. (MI-1417)

Local Name: Banrha.

Habitat: Weed on field verges, rice paddies, waste places, lawns and fallow lands between 1000-1300 m.

Part(s) used: Shoots, Rhizome.

Ethnobotanical uses: A decoction of rhizome is taken daily as a diuretic, cooling agent and cure for jaundice. A concentrated infusion of the rhizome is given as anthelmintic for removal of intestinal worms. This recipe is also effective for treating hemorrhages like nose bleeding, hematuria

	and vomiting of blood.
	The shoots are used as fodder of low quality in time of starvation. The shoots are used as thatching material. The plant is a good sand binder and soil stabilizer.
Collection season:	Though out the year (Rhizome).
Botanical name:	*297. Isachne himalaica* Hook. F. (MI-1418)
Local Name:	Da Jabo wakha.
Habitat:	Wet and marshy places especially near water channels, springs and rice paddies, found up to 1100 m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The shoots are used as a fodder for horses, donkeys and cattles.
Collection season:	May – November.
Botanical name:	*298. Lolium temulentum* L. (MI-1422)
Local Name:	Mastakay.
Habitat:	A common weed of wheat crop up to 1800 m
Part(s) used:	Shoots, grains.
Ethnobotanical uses:	The shoots are used as fodder in young condition. Excessive use of the plant by cattles and livestock after flowering may cause diarrhea, flatulence and even death. The seeds are ground into a coarse flour called “Dul” used as a feed for female livestock as a galactagogue and male livestock as aphrodisiac. Regular use of the plant by female livestock prevents conception.
Collection season:	March – July.
Botanical name:	*299. Oryza sativa* L. (MI-1820)
Local Name:	Wrejay/Shooley.
Habitat:	Cultivated in irrigated areas with plenty of water up to 1800 m.
Part(s) used:	Grains, Shoots, husk.
Ethnobotanical uses:	The grains after removal of husk are the second most important staple food in the area. The shoots after removal of grains are dried as hay and stored as a fodder. The hay is used as bedding for cattle and twisted into ropes which are woven into slippers and manure carrying buckets locally called “Deeranai”. The husk produced after milling the grains is used for utensil cleaning.

Collection season: October.

Botanical name: *300. Paspalum dilatatum* Poir. (MI-1426)

Local Name: Ghata Shamokha.

Habitat: Recently introduced and naturalized on field verges, rice paddy ridges are disturbed areas up to 1300 m.

Part(s) used: Whole plant.

Ethnobotanical uses: The plant is a good sand binder. The plant is fed to livestock as a fodder.

Collection season: June – October.

Botanical name: *301. Paspalum paspalodes* (Michx.) Scribner (MI-1427)

Local Name: Bandakay

Habitat: Moist places, along water courses, ditches and as a weed in rice fields up to 1200 m.

Part(s) used: Shoots.

Ethnobotanical uses: The shoots are used as a fresh fodder for cattle and a forage for horses and donkeys.

Collection season: March – October.

Botanical name: *302. Pennisetum flaccidum* Griseb. (MI-1761)

Local Name: Toor Anjanrh

Habitat: Pastures of higher altitudes on forest margins between 2300 – 3000 m.

Part(s) used: Shoots.

Ethnobotanical uses: Forage species for sheep and goats and a fodder for all types of livestock.

Collection season: April – October.

Botanical name: *303. Pennisetum glaucum* (L.) R.Br (MI-1428)

Local Name: Bajra.

Habitat: Cultivated for fodder.

Part(s) used: Shoots, Stem, grains.

Ethnobotanical uses: The grains are squeezed and rubbed on face for eradication of facial pimples.

The shoots are used as a fresh fodder for livestock and a favourable feed for horses. The stem is chewed by children for its sweet taste.

	The grains are used as a common bird feed especially for pigeons, bater bird and teetar.
Collection season:	July – October.
Botanical name:	*304. Pennisetum orientale* L.C.Rich, (MI-1429)
Local Name:	Spin Anjanrh
Habitat:	Drier, exposed sunny slopes of hills, sometimes forming pure patches between 1000-2500 m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The plant is an excellent forage species before blooming. In mature state it is collected as a fodder and dried as hay for use during winter season.
Collection season:	April – October.
Botanical name:	*305. Pennisetum purpureum* Schumach. (MI-1762)
Local Name:	Welayati Wakha
Habitat:	Recently introduced and grown on field verges for fodder purposes.
Part(s) used:	Shoots
Ethnobotanical uses:	The shoots are used as a fresh fodder often made into silage for all types of livestock especially in a season when no other fresh fodder is available.
Collection season:	Almost throughout the year.
Botanical name:	*306. Phalaris minor* Retz. (MI-1430)
Local Name:	Ghat Zoozay
Habitat:	Weed of Rabi crops, road sides, hedge rows and fallow lands.
Part(s) used:	Shoots.
Ethnobotanical uses:	Used as a forage species for goats and sheep. Excessive intake can cause flatulence.
Collection season:	March – May.
Botanical name:	*307. Poa alpina* L.(MI-1433)
Local Name:	Gaya.
Habitat:	Mountain tops and high altitude meadows and pastures between 2700-3000 m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The shoots are grazed by goats, sheep and other livestock.

Collection season:	May - September.
Botanical name:	*308. Poa annua* L. (MI-1434)
Local Name:	Shinkay
Habitat:	Weed in lawns, crops, rich soils and disturbed places between 1000-1600 m.
Part(s) used:	Shoots
Ethnobotanical uses:	The shoots are an early spring forage for cattles and sheep.
Collection season:	February – May.
Botanical name:	*309. Poa bulbosa* L. (MI-1435)
Local Name:	Ghat Shinkay.
Habitat:	Moist field verges, gentle slopes of hills and pastures between 1000-2700 m
Part(s) used:	Shoots
Ethnobotanical uses:	The plant is used as early spring forage for livestock and a fodder for domestic livestock.
Collection season:	February – July
Botanical name:	*310. Rottboellia exaltata* (L.) L.f. (MI-1770)
Local Name:	Bazkata
Habitat:	Grown on field verges for fodder purposes
Part(s) used:	Shoots.
Ethnobotanical uses:	The shoots are used as a fodder in fresh form often cut three times during growing season.
Collection season:	June – October.
Botanical name:	*311. Saccharum spontaneum* L. (MI-1439)
Local Name:	Kahay.
Habitat:	Common along river beds, sides of water bodies, flood plains and sandy stream sides.
Part(s) used:	Whole plant, roots.
Ethnobotanical uses:	20-30 grams of powdered roots are added to hot, boiled water to make one cup decoction. The decoction is taken in morning for increasing the amount of urine and helping in removal of kidney stones.This decoction also help in cooling the body and help in quenching thirst.

	The stems are used for making winnowing trays locally called as "Chaj". The shoots are also used for boom making. The plant is a good sand binder and a soil stabilizer. The shoots are used for thatching of roofs. The strait culms are used for making door screens, mates and handles of cotton candies.
Collection season:	July – October.
Botanical name:	*312. Setaria pumila* (Poir.) Roem. & Schulte. (MI-1414).
Local Name:	Peshoogai.
Habitat:	Weed in Khareef crops, field verges, sandy stream sides and fallow lands between 800 – 1500 m.
Part(s) used:	Shoots, grains.
Ethnobotanical uses:	The shoots are used as fodder in young condition. The grains are eaten by wild birds, rodents and rats etc.
Collection season:	April – October.
Botanical name:	*313. Setaria viridis* (L.) P.Beauv. (MI-1443)
Local Name:	Babara Peshogai
Habitat:	Weed of waste places, graveyards, sandy stream sides and fallow lands.
Part(s) used:	Shoots.
Ethnobotanical uses:	The plant is used as a fodder for cattles and horses.
Collection season:	June – September.
Botanical name:	*314. Sorghum bicolor* (L.) Moench. (MI-1444)
Local Name:	Khanjaray
Habitat:	Cultivated as a fodder for horses.
Part(s) used:	Shoots, seeds.
Ethnobotanical uses:	10-15 grams of seeds are boiled for 20 minutes in 500 ml of water and then filtered through cloth. The decoction is taken twice a day for kidney pain, burning sensation during urination and urinary retention. The mature shoots are used as a fodder often made into a silage for horses. The panicles are used as brooms. The reclaimed stalks are used for making mats, weaving fences and wattle houses. The seeds are used as a cattle and bird feed.

Collection season:	June – November.
Botanical name:	*315. Sargham halepense* (L.) Pers. (MI-1445)
Local Name:	Dadam.
Habitat:	Weed of arable lands and fallow lands up to 2500 m.
Part(s) used:	Shoots, seeds.
Ethnobotanical uses:	10-15 grams of seeds are boiled in 250 ml of water for 10 minutes. The decoction is administered for the treatment of urinary retention. The mature shoots are used as a fodder both in fresh and hay form. Young shoots are extremely poisonous, causing flatulence and death in livestock.
Collection season:	July – November.
Botanical name:	*316. Themeda anathera* (Nees ex Stand.) Hack (MI-1446)
Local Name:	Loong.
Habitat:	Drier foot hills, exposed ridges, often assuming dominant status between 1200- 1800 m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The shoots are used as forage and fodder both in fresh and hay form. The shoots are used for washing utensils. The shoots are used for making baskets, brooms, bread keeping pots and tops of wheat straw stacks. The shoots are also used as thatching material.
Collection season:	June – October
Botanical name:	*317. Triticum aestivum* L. (MI-1818)
Local Name:	Ghanam
Habitat:	Cultivated in all parts of the valley as the main staple food.
Part(s) used:	Grains, stems, shoots.
Ethnobotanical uses:	A paste is prepared by boiling wheat flour in water added with a few seeds of dill *(Anethum graveslens)* and a little table salt. The paste is fed mixed with desi ghee (cow's butter) to women after delivery for quicker restoration of uterine walls and general body health. The whole grains are boiled in water and then made into curry with meat is given for increasing sexual stamina in men. Partially ground coarse flour is a cattle feed especially given to cattle after delivery. Wheat flour is sprinkled on moist straw to make silage that is considered

tonic and galactagogue for cattles.

The young shoots are used as fodder for cattles. The grains are the main staple food in the area, turned into flour and baked into breads. The whole grains are also boiled and cooked in a variety of ways. Partially ripe grains while still on the spike are roasted in the spike on fire, mixed with raw sugar and eaten. This is called "Dada" locally. The straw left after threshing is stored as straw stacks (Busarha) and used as silage or cattle feed in winter season. The straw is used as a bed for brooding hens. The stems after removal of leaves and grains are used as thatching material especially used as water cover on floor margin and mud-stone wall covering. A slightly decayed straw is used as mulch. The straw is mixed with mud used for plastering the interior of mud-stone walls to prevent cracking. Wheat straw is mixed with cattle's dung for making dung cakes.

Collection season: May – June.

Botanical name: *318. Urochloa panicoides* P. Beauv (MI-1773)

Local Name: Wakha

Habitat: Weed of arable lands, sandy stream sides and disturbed places up to 1300 m.

Part(s) used: Shoots

Ethnobotanical uses: The shoots are used as fodder for cattle and horses

Collection season: June – September

Botanical name: *319. Zea mays* L. (MI-1819)

Local Name: Jowar.

Habitat: Cultivated as a Khareef crop

Part(s) used: Shoots, stem stalks, cobs, grains, silk.

Ethnobotanical uses: An infusion of fresh silk of the cob is used as a lithotripic for kidney stones, diuretic, vasodilator and hypotensive. A paste of fresh silk is applied on skin for draining pus from pus-forming wounds, pustules and boils land for the removal of warts and inflammations of skin. A decoction of dried silk is taken daily to lower blood sugar level and as a demulcent and expectorant for controlling cough, chest congestion and bronchitis. The corn flour is sprinkled on hot charcoal

to produce a smoke. Fumigation with this smoke reduces skin allergies and urticaria. The maize flour dough is the main medium through which different herbal remedies are administered to livestock. The grains are boiled and given to goats and cattle to prevent frequent estrous cycles so that the livestock continue lactation.

The grains are an important staple food for the people of the area, especially those living in the hilly areas. The grains are ground into corn flour for making bread and other local cuisines. The boiled grains are an ingredient of a mixed pulses dish called "Gungrhee", often cooked on some occasions of religious importance. The tinder grains while still on cob are roasted on charcoal or boiled with leaves of *Montha longifolia* and eaten as a delicacy. Tinder grains or fully ripe grains are fried or roasted as popcorn. The oil expressed from sweet corn is used as cooking oil having health benefits. The dried cobs and stem stalks are used as fuel and tinder. The cobs are also used as back scratchers. The young shoots and leaves of mature plants are used as fodder. The shoots after removal of cobs are dried and stored as hay stack for use as a fodder in winter season. The tassel stalks and pith of mature stems are used for making toys by children. The stems are chewed by children as a sugar cane substitute.

Collection season: August- October.

Family: **87. Podophyllaceae**

Botanical name: *320. Podophyllum emodi* Wall. ex Royle (MI-1449)

Local Name: Kakorha / Gangorha.

Habitat: Forest floor with rich dark coloured soil between 2100 – 3000 m.

Part(s) used: Fruits, Root, Rhizome.

Ethnobotanical uses: 1-2 grams of the resin obtained from roots is diluted with half cup water and given orally for killing intestinal worms and expelling them because the recipe cause bowed evacuation. The roots and rhizome are boiled in milk in a proportion of 1:20 for such a time that only one tenth of the milk is left. Half teaspoon of the concoction is

taken with warm water twice a day for increasing the flow of bile and its removal from body thus reducing jaundice. The same recipe is also implied in the treatment of viral hepatitis. Root powder is mixed with mustard oil and massaged on rheumatic joints for reducing inflammation. A juice of the roots and rhizome is directly applied on warts, tumorous growths on skin and allergic inflammations as a remedy. An infusion of fresh roots and rhizome is used as a wash for snake bite and some dermatological disorders including ringworm, eczema and hypersensitivity.

The fruit is edible when fully ripe but cause purging when eaten in excess. Excessive use of roots is poisonous.

Collection season: June – July (Fruit) and November (Rhizome and roots).

Family: **88. Polygalaceae**

Botanical name: *321. Polygala abyssinica* R.Br. ex Fresen (MI-1450)

Habitat: Drier, Steep cliffs and ridges up to 2200 m.

Part(s) used: Roots.

Ethnobotanical uses: Infusion of fresh roots is taken to calm the nerves and body, reducing tension and worry and inducing a sleep. A decoction of roots, with a little honey and a pinch of black pepper is taken for stimulating mucus membrane thus helping in normal flow of salive and expectoration of phlegm from chest. A table spoon full of powdered root is taken with water or milk to enhance sexual energy both in men and in women.

Collection season: Throughout the year.

Family: **89. Polygonaceae**

Botanical name: *322. Bistorta amplexicaulis* (D.Don) Green (MI-1451)

Local Name: Tarva Panrha / Maslonrh

Habitat: Moist rock cliffs, ridges and forest under cover between 2400 – 3000 m.

Part(s) used: Rhizome, leaves.

Ethnobotanical uses: An infusion of fresh rhizome is diuretic and anti-diabetic. One table spoon of powdered rhizome is taken with water three times a day for controlling diarrhea and curing peptic ulcers. An infusion of fresh

	rhizome is used as a wash for burns, small wounds and hemorrhoids to stop bleeding. Infusion of rhizome is also used as gargle for treating mouth, ulcers, sore throat and bleeding gums. Decoction of dried rhizome is used to control catarrh and fever. The leaves are chopped, slightly warmed and used as a poultice for rheumatic joints. The leaves are used as fodder for sheep and goats.
Collection season:	Throughout the year.
Botanical name:	*323. Persicaria capitata* (Buch. Ham. ex D.Don) H.Gross (MI-1453)
Local Name:	Trewakay
Habitat:	Moist rocky sites near water channels in the hilly areas between 1500 – 2300 m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The dried shoots are boiled in water to make a decoction. One cup of the decoction is taken thrice a day for the removal of kidney stones, and kidney pain due to infection.
Collection season:	May – August.
Botanical name:	*324. Persicaria glabra* (Willd.) M. Gomes (MI-1454)
Local Name:	Da jabo Palpolak
Habitat:	Hydrophyte found near stagnant water, ditches, marshy areas, stream sides often partially submerged in water up to 1000 m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The shoots are crushed and strained through cloth to obtain a juice. One teaspoon of the juice is given for reducing fever. Fresh leaves are crushed and boiled water is added to it and left to settle for one hour. The infusion is filtered and one cup is taken twice a day for the relief of colic pain.
Collection season:	May – November.
Botanical name:	*325. Persicaria hydropiper* (L.) Delarbre (MI-1455)
Local Name:	Palpolak
Habitat:	Muddy and marshy places near water bodies especially stream sides up to 1300 m.
Part(s) used:	Whole plant.
Ethnobotanical uses:	Leaf juice taken from fresh plants is diluted with five times its

volume of water and taken daily for regularizing menstrual flow. Dried powder of shoots (2 table spoons) is taken daily to prevent pregnancy. A decoction of shoots is given for controlling diarrhea, dyspepsia and bleeding piles. A mixture is produced by crushing equal amounts of leaves of the plant and black pepper. One teaspoon is taken for headache, toothache and loss of appetite. A paste of the plant or a juice extracted from it is applied externally on wounds, painful carbuncles, itching skin and other skin diseases as a remedy.

The shoots are sometimes used as a potherb. The shoots are crushed along with sand and is thrown in slow running water as a fish poison for capturing them. The shoots are also used as insect repellant and insecticide for stored grains.

Collection season: May – October.

Botanical name: *326. Persicaria lapathifolic* (L.) Delabre (MI-1456)

Local Name: Spin Palpolak

Habitat: Moist places near water courses and field margins up to 1300 m.

Part(s) used: Whole plant.

Ethnobotanical uses: Infusion of the whole plant is taken to cure stomachache and fever. A paste made by crushing the shoots of the plant is applied externally on skin to heal burns and eliminate itching of the skin.

The plant is used to wash clothes in the hilly areas.

Collection season: June – October

Botanical name: *327. Persicaria maculosa* S.F. Gray (MI-1457)

Local Name: Soor Palpolak

Habitat: Moist, shady places between 1000-2100 m.

Part(s) used: Whole plant.

Ethnobotanical uses: Infusion of the plant is used for breaking and removing kidney stones and reducing fever. A decoction of the whole plant is mixed with wheat flour to make a paste which is applied on skin and painful, inflamed joints as a remedy.

Collection season: June – October

Botanical name: *328. Polygonum aviculare* L. (MI-1460)

Local Name: Bandakai

Habitat: Waste places, arable lands, lawns, moist and shady places up to 2800 m.

Part(s) used: Whole plant.

Ethnobotanical uses: 2 table spoons of powdered shoot are taken with water for the treatment of diarrhea. The doze is repeated three times a day. Infusion of the shoots is given to control bronchial catarrh and cough. Fresh juice of the shoots is used as a mouth wash for controlling sore throat, mouth sores and nose bleeding. A paste made from shoots is applied as a poultice to heal skin sores.

The shoots are used as a pot herb. The leaves are used to make green tea.

Collection season: April – September.

Botanical name: *329. Polygonum plebeium* R.Br. (MI-1461)

Habitat: Sandy sides of river and streams, rainfed arable lands and fallow lands up to 1500 m.

Part(s) used: Shoots.

Ethnobotanical uses: Decoction of shoots is given for relieving colic pain. Ash of burnt plant is mixed with mustard oil and applied as an ointment on eczema.

The young shoots are used as a pot herb.

Collection season: September – March.

Botanical name: *330. Rumex dentatus* L. (MI-1462)

Local Name: Shal Khay

Habitat: Weed of Rabi crops and waste places with rich soil from 1000 – 2500 m.

Part(s) used: Leaves, Stems.

Ethnobotanical uses: A poultice of fresh leaves is applied on itchy skin, eczema and ringworm.

The leaves are used as a pot herb and salad. Excessive use is harmful to kidneys because it causes kidney stones. The dried shoots are used as a fuel.

Collection season: November – March.

Botanical name: *331. Rumex hastatus* D.Don. (MI-1463)

Local Name: Tarookay

Habitat: Drier, rocky hill slopes, often assuming dominant herb status between 1000-2300 m.

Part(s) used: Leaves, roots.

Ethnobotanical uses: Fresh leaves are chewed to neutralize the sensitivity of teeth after eating sour food. Fresh juice of leaves is given thrice a day (2 table spoons) for controlling bloody dysentery. 2-3 table spoons of dried, powdered roots or a decoction of roots is given two times a day as a tonic for liver, protecting liver from the bad effects of toxins and virus and a cure for hepatitis.

The leaves are used as an ingredient in various pot herbs to give a sour and salty taste. The young leaves are used as a salad.

Collection season: Throughout the year

Botanical name: *332. Rumex nepalensis* Spreng. (MI-1464)

Local Name: Da ghra Shalkhay.

Habitat: Grows commonly on hill slopes, moist and shady forest under cover on rich dark coloured soils between 1500 – 3000 m.

Part(s) used: Leaves, roots.

Ethnobotanical uses: An infusion of roots is used as a purgative for cleaning the bowel. A concentrated decoction of roots is applied on dislocated bones in joins before tying a support for bone alignment. A root paste is applied on swollen gums. Infusion of fresh leaves is given to treat colic pain. Juice of fresh leaves is applied on forehead for the relief of headache. Fresh leaves are squeezed and applied on the skin touched with *Urtica dioica* to neutralize and eliminate urticarial and burning sensation. A decoction of roots is used as a wash to relieve body pain.

The leaves are used as a pot herb. Dried stems are used as tinder.

Collection season: May – August (leaves) and Throughout the year (Roots)

Family: **90. Pontederiaceae**.

Botanical name: *333. Monochoria vaginalis* (Burm. f) Presl. (MI-1465)

Local Name: Kacha Panrha.

Habitat: Marshy areas, rice fields, near stagnant water up to 1200 m

Part(s) used: Leaves, roots

Ethnobotanical uses: Roots are chewed for toothache. Roots bark is mixed with brown sugar (Gur) and one tablespoon is taken three times a day for asthma. A decoction of the roots is given to patients with liver complaints, jaundice and hepatitis. Equal amounts of leaves and ginger *(Zingiber officinale)* are boiled together. Honey is added for taste. The concoction is used twice a day (half cup) for the treatment of cough and cold.

The stalks of young leaves are eaten raw as salad and cooked as a pot herb. The plants are kept in vases filled with water as ornamental for sometime.

Collection season: June – November

Family: **91. Portulacaceae**

Botanical name: *334. Portulaca oleracea* L. (MI-1466)

Local Name: Warkharhay

Habitat: Weed in Khareef crops, kitchen gardens, sandy stream sides and waste places.

Part(s) used: Shoots, seeds

Ethnobotanical uses: An infusion of the shoots is taken daily to cure scurvy, boost immune system and prevent heart attacks. Fresh juice of the plant is utilized to treat frequent, painful urination with burning sensation. The juice squeezed out of the fresh stems is applied on skin directly to treat burns and reduce burning sensation and prickly heat. The juice of leaves is also asked as a rub on forehead for headache, dropped in ear for earache, taken orally for stomachache and applied on skin to neutralize the effect of insect and caterpillar stings. One or two teaspoons of the seeds are eaten with raw sugar (gur) for dyspepsia and flatulence and a wormifuge for intestinal parasites.

The shoots are used as a popular and preferred pot herb cooked in a variety of ways often mixed with whey and lentils (*Lens caulinaris*).

Collection season: April – Octrober

Family: **92. Primulaceae**

Botanical name: *335. Anagallis arvensis* L. (MI-1470)

Local Name: Chichrha/Mangooti

Habitat: Weed in Rabi crops, fallow lands, sandy soils and waste places

Part(s) used: Whole plant.

Ethnobotanical uses: An infusion of the fresh plant is taken for the treatment of dropsy, retention of bile in the gall bladder and liver enlargement. Decoction of dried plant is taken orally for eliminating depression and anxiety. This treatment also reduce the attack of seizures in epileptic patients. Decoction of the shoots sweetened with honey is taken thrice a day for catarrh and cough. Juice of fresh shoots is applied on skin to withdraw deeply pierced thorns and splinters in the skin. Leaf juice mixed with equal amount of a clear honey collected from *Isodon rugosus* is applied as drops to increase sight and remove opaqueness of the cornea. Leaf juice or a paste is applied on skin for the removal of freckles from the face.

Collection season: February – April

Botanical name: *336. Androsace rotundifolia* Hardw. (MI-1472)

Local Name: Gulpeensa

Habitat: Found on exposed ridges, cliffs and gravelly soils from 1000-2600 m

Part(s) used: Whole plant

Ethnobotanical uses: Fresh, chopped leaves are heated on a gentle heat and then fried with raw sugar (Gur) in cow's butter oil. This recipe is eaten daily (half cup) for regulating menstrual flow and preventing conception.

Because of its colourful flowers and leaves which turn red on maturity the plant is grown as ornamental.

Collection season: May – August

Botanical name: *337. Primula denticulata* Smith (M1-1473)

Local Name: Mameera

Habitat: Forest clearing and open meadows at higher altitudes between 2600-3000m

Part(s) used: Whole plant, stem base, leaves

Ethnobotanical uses: The yellow colouring powder present at the axib of leaves on lower surface before the unfolding of leaves is collected and applied in eyes with a wooden applicator to improve eye sight and clean the eyes. An

	infusion of young stem base is applied in eyes for ophthalmic diseases and improving eye sight. Leaf juice is applied on face for reducing its oiliness and controlling The plant is grown as an ornamental.
Collection season:	April – May
Family:	**93. Pteridaceae**
Botanical name:	*338. Pteris cretica* L. (M1-1474)
Local Name:	Sapeerha
Habitat:	Moist, shady places along water courses up to 1500m
Part(s) used:	Whole plant
Ethnobotanical uses:	A decoction of the rhizome is taken to lower the body temperature during fever. Dried powder of rhizome is applied on the site of snake bite to absorb venom and detoxify it. A paste of rhizome and young fronds is applied on burns and wounds
Collection season:	March – November
Botanical name:	*339. Pteris vittata* L. (M1-1475)
Habitat:	Moist rock crevices, steep cliffs and stream sides.
Part(s) used:	Whole plant.
Ethnobotanical uses:	The whole plant is ground into a paste and applied of skin for wound healing. Paste of the plant and black pepper (*Piper nigrum*) are mixed in 10:01 proportion and taken orally for the treatment of cold, cough and fever. The plant is grown as an ornamental plant.
Collection season:	March – November
Family:	**94. Punciaceae**
Botanical name:	*340. Punica protopunica* Balf.f (MI-1476)
Local Name:	Anangorhay
Habitat:	Scrubs and lower hill elevations up to 2000m.
Part(s) used:	Wood, roots, fruit, fruit skin, leaves.
Ethnobotanical uses:	The pericarp of fruit is cooked and ground into a paste which is applied on skin sores and wounds for healing. The dried pericarp of fruit emptied from the internal contents is ground into a powder. Two teaspoons of the powder is mixed in a cup of curd and given to

children for the treatment of bed wetting and nocturia. The dried seeds of the fruit are eaten for relief of stomachache. The bitter tasting powder of the pericarp is concealed in a morsel of bread and swallowed without chewing for the expulsion of intestinal worms. 5-10 grams of root bark powder is mixed in a maize flower dough and given to cattle for expulsion of liver fluke, tapeworms and other endoparasites.

The wood is used as fire wood and also utilized for making charcoal. The leaves are browsed by goats. The shoots and branches are used as fences around kitchen gardens. A decoction of pericarp is mixed with milk to make it sour and help in easier collection of butter.

Collection season: September – December (fruit)

Family: **95. Ranunculaceae**

Botanical name: *341. Aconitum laeve* Royle (M1-1477)

Local Name: Sarbawale

Habitat: Dark coloured, rich soils under forest cover above 2800m

Part(s) used: Root

Ethnobotanical uses: The root is tightly wrapped in the stomach or intestine of sheep and boiled in milk for an hour. The milk is discarded and the roots are dried and pulverized into a pine powder. One or two grams of the powder are taken with milk as general body tonic, aphrodisiac and remedy for arthritis. One or more tablespoons of the detoxified root is powdered and mixed in corn flour with milk to form dough. The dough is given to cattle daily for faster growth, improved appetite and gain of meat and weight.

Taking the root directly is considered very toxic and may even cause death. Eating the leaves cause numbness of the tongue.

Collection season: October – December.

Botanical name: *342. Aquilegia pubiflora* Wall ex Royle (M1-1478)

Local Name: Bajardanthe

Habitat: Forest under cover above 2500m.

Part(s) used: Rhizome, shoot.

Ethnobotanical uses: The dried rhizome is powdered and mixed with mustard oil and

	applied on skin to reduce irritation and itching. A paste of rhizome is applied on the site of snake bite to absorb the venom and heal the wound.
	The shoots are grazed by goats and sheep. Excessive eating may cause diarrhea and even death of animals.
Collection season:	September – November.
Botanical name:	*343. Caltha alba* Camb (M1-1479)
Local Name:	Da obo Warkharhay/Makanpat
Habitat:	Streams and water channels in the hilly areas above 2500m.
Part(s) used:	Leaves, root.
Ethnobotanical uses:	The rhizome is boiled and then mashed into a paste and applied on skin sores for healing. One teaspoon of powdered roots is taken with water or milk for a relief in stomach cramps.
	The young green leaves are used as pot herb.
Collection season:	April – August
Botanical name:	*344. Clematis grata* Wall (M1-1480)
Local Name:	Chinjan Zeela
Habitat:	Hedge rows, foot hills up to 2000m
Part(s) used:	Shoot
Ethnobotanical uses:	The shoots are crushed in a pistle and mostar and then strained through a cloth to obtain juice. The juice is applied on ringworm twice daily for a week or two to completely eradicate it. The shoots are poisonous for cattles. The shoots cause skin blisters.
Collection season:	May – September.
Botanical name:	*345. Clematis montana* Buch Han ex DC (M1-1782)
Local Name:	Gharzeelai/Parharbootay
Habitat:	Found as climber on trees at higher altitudes above 2200m.
Part(s) used:	Flowers, shoot.
Ethnobotanical uses:	A decoction of flowers is given two times a day for controlling cough and cold. A paste made from the crushed shoots is applied as a poultice on rheumatic joints and gouty arthritis for relief in pain and inflammation.
Collection season:	May – September

Botanical name: *346. Delphinium denudatum* Wall ex Hook & Thoms (M1-1481)

Local Name: Da konozeela/Lajward

Habitat: Grassy hill slopes and scrubs between 1800 – 2500m

Part(s) used: Rhizome, leaves, seeds.

Ethnobotanical uses: A powder of rhizome is taken with water for the treatment of fever and cold. Rhizome is chewed for reliving toothache. A paste of leaves is applied on haemorrhoids and rheumatic joints as a remedy. An infusion of rhizome is applied as a wash of fir and hair on the skin of livestock for removal of mites and ticks.

Collection season: Throughout the year (rhizome), May – September (leaves) and September (seeds)

Botanical name: *347. Ranunculus arvensis* L. (M1-1482)

Local Name: Kach Ziarhgulay

Habitat: Weed of wheat and other rabi crops, waste places, sandy stream sides and disturbed places.

Part(s) used: Shoots.

Ethnobotanical uses: The shoots are poisonous and are avoided as a feed for cattle. Excessive intake causes purging and death of cattle. Sitting on the plants for longer period causes skin blisters and mastitis in cattle.

Collection season: February – June.

Botanical name: *348. Ranunculus muricatus* L. (M1-1484)

Local Name: Ghat Ziarhgulay

Habitat: Weed of rabi crops, rich soild, waste places and disturbed sites between 800 – 1600m.

Part(s) used: Shoot

Ethnobotanical uses: A decoction of dried shoots is given orally, two times a day for the control of malaria and asthma. The shoots are poisonous for cattle.

Collection season: February – June.

Botanical name: *349. Ranunculus sceleratus* L. (M1-1485)

Local Name: Qaziband

Habitat: Wet, marshy places, sides of water courses from 800 – 2500m

Part(s) used: Shoots, seeds

Ethnobotanical uses: The juice expressed from stem cause blisters but are used as a

	remedy for scabies when applied on skin as a wash. Applying the juice on rheumatic joints cause blisters and reduce inflammation. The blisters are then treated with some astringent remedies like the bark of *Berberis lyceum* or *Bergenia ciliata.* The crushed seeds are boiled in milk and sweetened with sugar. One teaspoon is taken daily for the treatment of spermatorrhoea. The shoots are extremely poisonous for cattle and other livestock.
Collection season:	February – May
Botanical name:	*350. Thalictrum cultratum* Wall (M1-1486)
Local Name:	Kamasla Mamera
Habitat:	Under forest covers above 2200m.
Part(s) used:	Leaves, roots.
Ethnobotanical uses:	The leaf juice is applied directly on boils and pimples to expel the pus and heal the scars. The roots are cleared from the mud and scales and then chopped into small pieces. 30 grams of the roots are boiled in one liter of water till only 100 ml of water is left. The decoction is passed through fine muslin cloth. The decoction is applied as eye drops for eye diseases.
Collection season:	May – August (leaves) and September – November (roots)
Family:	**96. Rhamnaceae**
Botanical name:	*351. Rhamnus triquetra* (Wall.) Brandis (M1-1784)
Local Name:	Battal
Habitat:	Thick forest between 2000 – 2700m.
Part(s) used:	Leaves, wood, bark.
Ethnobotanical uses:	Fresh bark of the tree is crushed and equal amount of water is added to it. The mixture is stirred thoroughly and then strained through a cloth to obtain a viscous infusion. 1-2 tablespoons are taken 2 or 3 times a day for controlling dysentery and diarrhea. The leaves are used as fodder. The wood is used as fire wood and for charcoal making.
Collection season:	Throughout the year.
Botanical name:	*352. Sageretia thea* (Osbeck) M.C Johnston (M1-1487)
Local Name:	Mamanraha

Habitat: Drier foothill and mid-hill elevations, in scrub vegetation mostly on southern slopes between 1100 – 2500m.

Part(s) used: Shoots, fruits, leaves, roots.

Ethnobotanical uses: One cups of a decoction of dried roots of the plant is given twice a day to patients suffering from icteric jaundice and hepatitis for 10-15 days. The same remedy is also administered as cooling agent to reduce extra body heat. One teaspoonful of powered leaves is given with water for controlling diarrhea and dysentery.

Dried shoots are used as firewood. The leaves are young shoots are browsed by goat. The dried shoots are also used as fence for agriculture fields. The tender young and fully ripe fruits are edible and eaten by children mostly

Collection season: March – August (leaves)

Botanical name: *353. Ziziphus jujuba* Mill (M1-1488)

Local Name: Makhranrhai

Habitat: Drier gravelly and stony slopes of hills between 100 – 2100m and also cultivated in homes and field margins for fruit or as hedge plant.

Part(s) used: Wood, fruit, leaves, flowers.

Ethnobotanical uses: Almost 20 – 30 ripe fruits are eaten fresh during the fruit season by weak people to gain body weight, muscle strength, stamina and vigour. The fruits also improve appetite and reduce anxiety and tension. The fruits also improve the function of liver and kidney and boost up immune system resistance against infections. The fruit also purify blood and help combating itching, pimples and acne on skin. Dried fruits on plant, roots of *Glycyrrhiza glabra,* flowers of *Viola canescens* and fruits of *Foeniculum vulgare* are taken in a proportion of 4:4:2:1 and boiled in water for 30 to 45 minutes and then filtered to obtain a concoction. Half cup of the concoction od taken three times a day for cough, cold, flue, chest congestion, asthma and bronchitis. The treatment is continued for 7-10 days. Dried leaves are pulverized into a fine powder. One or two tablespoons of the powder is taken with water for controlling high blood sugar level and diabetes. Honey of the plant is highly valued for its unique taste in

	sweetness and recommend for diabetic and hypertension patients. A paste of fresh leaves is applied on skin to combat inflammation, itching, pimples, burns and wounds. A concentrated leaf aqueous extract is applied on scalp and left for half an hour and then washed with mild soap or shampoo. This gives strength to hair making then thick, lustrous and prevent hair loss. The ripe fruit are delicious and sweet. They are eaten fresh and dried. The tree is grown as a hedge plant. The shoots are used for fencing and also as firewood. The leaves are crushed into a paste and used like soap for washing clothes and bathing. Flwers are visited by honey bees.
Collection season:	April – August (leaves) and August – September (fruits)
Botanical name:	*354. Ziziphus nummularia* (Burm.f) Wight & Arn (M1-1489)
Local Name:	Karkanda
Habitat:	Drier foot hill on sandy and gravelly soils from 800 – 1300m.
Part(s) used:	Shoots, leaves, fruits.
Ethnobotanical uses:	The dried fruits after removal of seed are mixed with brown sugar (*Saccharum officinarum*) and eaten as a cooling agent reducing head sensation in gut and body. The recipe is also used to enhance appetite and remedy stomach. A paste of leaves is applied on skin for the cure of itching, scabies, boils and other skin diseases. The leaves are browsed by goats. Fully ripe fruits are eaten having flour like starchy taste.
Collection season:	March – September (leaves) and July – August (fruits)
Botanical name:	*355. Ziziphus oxyphylla* Edgew. (M1-1490)
Local Name:	Elanai
Habitat:	Drier foothills or mid-hills in a scrub vegetation up to 1800m
Part(s) used:	Shoots, leaves, fruits
Ethnobotanical uses:	2-3 tablespoons of powdered leaves is taken two times a day for two to four weeks as a remedy for diabetes and jaundice. The shoots are used as firewood and implied in fencing. The leaves are browsed by goats and are threshed for fodder purpose. Fruits are slightly sour and are eaten.

Collection season:	April – September (leaves) and October - November (fruit)
Botanical name:	*356. Ziziphus spina-christi* (L.) Willd. (M1-1491)
Local Name:	Ninaybadre
Habitat:	Drier sandy plains and foot hills scrubs up to 1500m
Part(s) used:	Shoots, leaves, fruits.
Ethnobotanical uses:	Half cup of decoction made from dried fruits is taken three times a day for controlling bronchitis. Aqueous extract of leaves or a paste of fresh leaves is applied on skin for the treatment of atopic dermatitis, ringworm, itching and inflammation. A viscous aqueous extract of leaves is applied on the scalp and left for half an hour and then washed. This gives strength and vigour to hair. The dried shoots are used for fencing around agriculture fields. The shoots are used as firewood. The leaves are browsed by goats and used as fodder for livestock. The fruits are saltish sweet in taste and eaten on the spot. The leaves are crushed and made into a paste. The paste is used as bath soap.
Collection season:	April – August (leaves) and July – August (fruit)
Family:	**97. Rosaceae**
Botanical name:	*357. Agrimoria eupatoria* L. (M1-1492)
Local Name:	Kamasla Qarqaranga
Habitat:	Sunny places on high altitudes between 2500-3000m.
Part(s) used:	Whole plant.
Ethnobotanical uses:	One teaspoon of dried plant is added to a cup of hot boiled water to make a decoction. The decoction is taken three times a day for blood purification, bed-wetting, heavy menstrual bleeding and healing peptic ulcers. 30-50 grams of dried plant is boiled in 500ml of water till a time when only 100ml of water is left. The decoction is filtered and left to slightly cool down. The decoction is used as a wash for minor injuries and an harmerrhoids and a gargle for sore throat and clearing of voice. The dried plant is used as a herbal tea with refreshing effects on the body.
Collection season:	April – July

Botanical name: *358. Cotoneaster microphyllus* Wall ex Lindl. (M1-1495)

Local Name: Khonawrhay

Habitat: Open forest margins between 2000 – 3000m

Part(s) used: Shoots, leaves, fruits

Ethnobotanical uses: The fruits are eaten as wild fruits leaves are browsed by goats and sheep. The dried shoots are used as firewood. The plant is a soil stabilizer. The smoke of the plant is an insect repellant.

Collection season: Throughout the year (shoots) and August – September (fruits)

Botanical name: *359. Cotoneaster nummularius* Fisch. & C.A May (M1-1494)

Local Name: Ghata Kharawa

Habitat: Forest areas between 2200 – 2700m.

Part(s) used: Shoots, leaves, manna.

Ethnobotanical uses: The leave are kept overnight in water. One cups of the water extract is taken daily to cure mild chronic fever due to unknown reason. The whitish manna on the stem is scrapped and dried. Half teaspoon of the manna is dissolved on one cup of cold water and taken two times a day for the cure of jaundice and as a cooling agent.

The dried shoots are used as fuel. The straight stem is used as walking sticks.

Collection season: April – September (leaves) and Throughout the year (manna)

Botanical name: *360. Cotoneaster racemiflorus* (Desf.) K.Koch (M1-1785)

Local Name: Kharawa

Habitat: Scrubs on stony and drier slopes between 1100 – 2200m

Part(s) used: Shoots, leaves, fruits

Ethnobotanical uses: The juice expressed from the fresh ripe fruits is taken as a body tonic and relieve stomach pain. 2 teaspoons of dried fruits are boiled in 250ml of water for 15 minutes to make a decoction which is taken three times a day as cough expectorant.

The dried shoots are used as fire wood. The shoots are implied in brooms making. The shoots after defoliation are used for making baskets. The stems as small braches are flexible and thus used for making toothpicks. The leaves are browsed by goats.

Collection season: Throughout the year (shoots) and May – June (fruits)

Botanical name:	*361. Cydonia oblonga* Mill (M1-1496)
Local Name:	Behe
Habitat:	Lower hill elevations up to 1500m often cultivated.
Part(s) used:	Fruit
Ethnobotanical uses:	Unripe fruit is crushed into a paste. One tablespoon for children and two for adults is given with water three times a day for controlling diarrhea. At least one ripe fruit is eaten daily to give strength to heart and brain. One glass of fresh fruit juice is taken daily for stopping internal bleeding as a cooling agent and a nerve stimulant. Fresh fruit juice is diluted with water and used as a gargle for washing mouth cavity. This gives strength to the gums and heals mouth and throat sores. The fruit is eaten when fully ripe.
Collection season:	August – September (unripe fruit) and October – November (ripe fruit)
Botanical name:	*362. Duchesnea indica* (Andrews) Focke (M1-1497)
Local Name:	Da Zmakey Toot.
Habitat:	Grassy, moist areas near water courses up to 1900m
Part(s) used:	Fruits, whole plant.
Ethnobotanical uses:	One quarter of a cup of the fruit is crushed in pestle and mortar and one glass of water is added to it. Two teaspoons of honey is added to the infusion and taken daily for stomach cramps, fever, laryngitis, tonsillitis and blood purification. The whole plant is crushed into a paste and applied through a bandage on skin burns, abscesses, boils, atopic dermatitis, snake or insect bites, ringworms and injuries for quick recovery and healing. Aqueous extract of flowers is taken (one or two table spoons) twice a day for blood purification and activation blood circulation in the body. The ripe fruits are eaten on the spot.
Collection season:	March- April (Flowers) and May – September (Fruits)
Botanical name:	*363. Eriobotrya japonica* (Thumb.) Lindl. (MI-1498)
Local Name:	Lokat.
Habitat:	Cultivated up to 1200 m.

Part(s) used: Leaves, fruits.

Ethnobotanical uses: Half glass (almost 100 ml) of a juice expressed from ripe fruits is taken for stopping vomiting diarrhea thirst and alleviating insomnia. The leaves are dried and then the hairs on lower surface are removed by rubbing and tapping. The leaves are crushed into a coarse powder and stored in bottles. Two heaping tablespoons of leaf powder is boiled for sometime in four cups of water and then simmered for 10 minutes. The decoction is cooled down and taken in four equal doses daily (cold or warm) for the treatment of feverish colds, coughs, bronchitis and bloody dysentery. The decoction is also used as a gargle for oral or vaginal thrush. The recipe alleviates depression, insomnia and swellings.

The fruits area eaten raw when fully ripe. The seeds are poisonous. Honey bees visit the flowers. Because of evergreen nature the plant is grown as ornamental.

Collection season: Throughout the year especially March – October (Leaves) and February – April (Fruits)

Botanical name: *364. Fragaria nubicola* (Hook. f.) Lindl. ex Lacaita(MI-1499)

Local Name: Shadkaray

Habitat: Forest floors, forest margins, open grassy meadows between 1600-3000 m.

Part(s) used: Fruits.

Ethnobotanical uses: Quarter to half cup of fresh fruits is crushed in mortar and pestle and a glass of milk is added to it. The syrup is taken for prevention of constipation. Paste of fresh fruits is applied on skin to heal bruises, abrasions and inflammation of skin and on tongue to heal cracks and blemishes.

The fruits when ripe are eaten on the spot. Excessive use or drinking water after it causes diarrhoea.

Collection season: June – August.

Botanical name: *365. Geum urbanum* L. (MI-1500)

Local Name: Qarqaranga

Habitat: Forest floors, scrubs and along water courses often on damp soils

between 2100 – 3000 m

Part(s) used: Roots, leaves.

Ethnobotanical uses: 15-20 grams of air dried powdered roots is boiled in half litre of water and then filtered to obtain a decoction. The decoction is taken in four equal doses daily for five to seven days to cure intermittent fevers, agues and malaria. Fresh roots dugout in spring are crushed finely and water is added to it to make in infusion. 2-3 tablespoons of the infusion is taken for controlling dysentery, catarrh and liver obstruction. Aqueous extract of the root is used as a wash for skin diseases, hemorrhoids and wounds while a gargle of the extract is effective for pharyngitis, laryngitis, sore throat, cracked tongue and bleeding gums.

The roots are kept with clothes to repel moths and other insects. The leaves are used as flavouring agent in other green vegetables. The roots are used to make herbal tea.

Collection season: March

Botanical name: *366. Malus domestica* Borkh (MI-1501)

Local Name: Manrha

Habitat: Cultivated in well-drained soil

Part(s) used: Fruits, leaves, bark, shoot

Ethnobotanical uses: 2-3 tablespoons of dried root powder is taken with water for expelling intestinal worms. One cup each of lemon (*Citrus limon*) ginger (*Zingiber officinale*) and garlic (*Allium sativum*) are crushed together and cooked on gentle heat so that the water is dired. After cooling one cup of apple vinegar and one cup of honey is added and thoroughly mixed and stored. One or two teaspoons are taken with water twice a day on empty stomach for reducing obesity, weight of the body hypertension and risk of heart attack. A vinegar made by fermenting apple juice is taken daily in a doze of one to two tablespoons for hair loss and liver obstruction. One to two tablespoons of apple vinegar mixed with honey is effective for joints pain. Fresh apple juice is a heart tonic, antidiabetic and reduces the acidity of stomach. Eating fresh apple improve appetite, induce sleep

	and prevent constipation. An infusion of leaves is used as a wash for skin infection and haemorrhoids. The fruit is very delicious and eaten raw or stored as a jam in sugar syrup. The seeds are poisonous. The shoots obtain during pruning are used as fuel. Eating the whole apple (without cutting it into pieces) with bouts through teeth has a reputation of cleaning and strengthening teeth and gums.
Collection season:	September – October (fruit), March – September (leaves) and Throughout the year (bark)
Botanical name:	*367. Potentilla nepalensis* Hook f. (M1-1503)
Local Name:	Sra Kunachi
Habitat:	Forest floors and open meadows at higher altitudes between 2500 – 3000m.
Part(s) used:	Roots, whole plant
Ethnobotanical uses:	One tablespoon of powdered root is taken for stomach cramps and dyspepsia. Decoction of the root is taken twice a day (2 tablespoons) for heart arrhythmia and hypertension. Infusion of fresh roots is administered once a day as a blood purifier. Ash of root is mixed with mustard (*Brassica campestris*) oil and applied on burns. The whole plant is green as an ornamental plant.
Collection season:	Throughout the year
Botanical name:	*368. Potentilla reptans* L. (M1-1786)
Local Name:	Kunachi
Habitat:	Found in grassy meadows between 1500 – 3000m
Part(s) used:	Whole plant.
Ethnobotanical uses:	30 grams of dried powder plant is thoroughly shaken and mixed with two cups of cold water and left over night. The infusion is filtered in the morning and taken one up each in the morning and evening for controlling diarrhea, bloody dysentery, excessive menstrual bleeding and stomach ache. A concentrated decoction of the plant is used as a gargle for toothache. A paste of fresh plant or juice of the plant is applied on skin for healing skin rashes and sores. It is also used as face wash for removing wrinkles from the face acting as cosmetic.

Collection season: April – October

Botanical name: *369. Potentilla supina* L. (1504)

Habitat: Found near water courses, damp waste grounds, edges of crop fields and sandy stream sides between 1000 – 2100m.

Part(s) used: Whole plant, roots.

Ethnobotanical uses: Pieces of fresh root are chewed and then held in mouth for half an hour to relieve toothache and to stop bleeding from the gums.

The plant is used as a fodder.

Collection season: March – September (M1-1505)

Botanical name: *370. Prums armeniaca* L. (M1-1505)

Local Name: Khobanai

Habitat: Cultivated but naturalized in some hilly areas up to 1900m.

Part(s) used: Wood, bark, gum, flowers, leaves, fruits, seeds.

Ethnobotanical uses: An infusion of flowers petal is given to adult women for increasing their fecundity. A poultice of the bark is applied on skin to counteract irritated and inflamed skin conditions and minor injuries. Dried fruit pulp is kept in warm water for 5-6 hours and then thoroughly mixed and shaken to prepare a syrup. 2 tablespoon of the syrup is taken 3-4 times a day as cough expectorant and anti-tussive. Equal amounts of the gum on bark of the plant and coconut (*Cocos nucifera*) are fried together in butter oil and alittle turmeric (*Curcuma longa*) powder is added to it. Half cup of the medication is taken two times a day by women in the post parturition period and by both sexes to control internal bleeding.

The dried shoots collected during pruning are used as fuel. The plant is a honey bee species. The leaves are used as fodder. The fruits are delicious and sweet eaten fresh and dried. The seeds are dried and eaten as dry fruit. The gum collected from stem is used as adhesive. Over ripe fruits are made into a paste called “shut” eaten as a sweet dish or jam in break fasts like honey.

Collection season: Throughout the year (bark, gum), March (flowers) and June (fruits, seeds)

Botanical name: *371. Prunus cerasoides* D.Don (M1-1506)

Local Name: Annang

Habitat: Blue pine forest zone between 1600 – 2500m.

Part(s) used: Branches, fruits, bark, seeds.

Ethnobotanical uses: The bark of the plant is heated gently in water to make a concentrated decoction. The decoction is soaked in cotton and applied through a bandage on the low back for the treatment of lumbago.

The straight dried branches are used as walking sticks. The fruit is eaten on the spot. The seeds are employed in rosary making.

Collection season: May – June (fruit, seed) and Throughout the year (bark)

Botanical name: *372. Prunus cornuta* (Wall. ex Royle) Stud (M1-1507)

Local Name: Changa/Barit/Badara

Habitat: Mixed coniferous forest in shady slopes mostly northern aspects between 2000 – 3000m.

Part(s) used: Leaves, wood, fruit, bark.

Ethnobotanical uses: Fresh fruit juice (half cup) is taken as cardiac stimulant. A decoction of dried fruits with few seeds of *Foeniculum vulgare* give a relief is asthma.

The leaves are used as fodder. The wood is used for untencil making. The fruit is edible and eaten on the spot. The stem bark is used for milk curding.

Collection season: March – September (leaves), July - August (fruit) and Throughout the year (bark)

Botanical name: *373. Prunus domestica* L. (M1-1508)

Local Name: Aleecha/Alu Bukhara

Habitat: Cultivated from plains up to 1900m.

Part(s) used: Wood, gum, leaves, fruits.

Ethnobotanical uses: One or two sore, unripe fruits are eaten to stimulate saliva secretion and perspiration. 5-7 dried fruits are eaten followed by few sips or green tea for stomach cramps and colic. The recipe also works as a mild laxative. About 10-15 dried fruits are soaked in one glass of water overnight and the viscous juice thus obtained is taken in the morning with empty stomach as a cure for jaundice and hepatitis. A juice of fresh fruits is a cooling agent and help in eliminating thirst.

The dried shoots obtained during pruning are used as fire wood. Leaves are used as fodder especially for goats. Gum on stem bark is edible. The fruits when fully ripe are very juicy and delicious.

Collection season: May – June (fruits)

Botanical name: *374. Prunus persica* (L.) Batsch (M1-1509)

Local Name: Shaltalo

Habitat: Cultivates as a cash crop up to 1300m.

Part(s) used: Leaves, flowers, bark, fruit, seed, gum.

Ethnobotanical uses: A decoction of dried leaves is effective for whooping cough in children. The decoction is taken by women to prevent vomiting and morning sickness during pregnancy. One teaspoon of flower petals are added to hot, boiled water and stirred. The decoction thus obtained is used as a diuretic and hypotensive. The gum is soaked in water to make a jelly which is eaten in the morning as a demulcent and mild laxative.

The fruits of the plant are very delicious and eaten as such or made in to squashes and juice. It is most valuable cash crop of the area. The branches cut during pruning are used as fire wood and for wearing sticks making. The hard seed shells are converted into spinning tops by children for their playing. The flowers are used for making a refreshing herbal tea. The gum on the bark is chewed like a chewing gum. Leaves are used to wash utencils.

Collection season: March (leaves, bark), April (flowers) and July – August (fruits)

Botanical name: *375. Pyrus communis* L. (M1-1510)

Local Name: Nashpatai/Tango

Habitat: Cultivated in hilly areas in field margins up to 2000m.

Part(s) used: Fruits, bark, leaves.

Ethnobotanical uses: One full size fruit is eaten directly or a juice expresses from it is taken empty stomach two times a day for increasing urine flow, lowering blood pressure, helping in removal of kidney stones as an alternative to reduce the effects of age on body. 2 tablespoons of dried leaves are soaked for half an hour in half liter of water. Two cups of the infusion is taken daily before meals for reducing body

	weight, lessening the fats in body and reducing obesity and dropsy. 2-3 tablespoons of dried powdered bark is boiled for 20-30 minutes in water to obtain a decoction. The decoction is applied on the skin affected with strains, bruises and twists to relieve inflammation and pain. The fruits are delicious and eaten fresh and also dried in slices form for future use. The dried slices are called "kakhta" locally.
Collection season:	March – April (leaves), September – October (fruits) and November – February (bark)
Botanical name:	*376. Pyrus pashia* Buch. Ham. ex D.Don (M1-1511)
Local Name:	Gidarhtanga
Habitat:	Scrubs on foot hills and mid-hill slopes between 1200 – 2000m.
Part(s) used:	Wood, fruits, shoot.
Ethnobotanical uses:	The shoot of the plant is used as a root stock for grafting other varieties of pears. The wood is used for fuel purposes. The branches are used for fencing and walking sticks making. The fruit are edible only when fully ripe and start decaying and eaten by human beings only on the spot. It is used as a common food for hawling foxes and jackals.
Collection season:	November – December (fruit)
Botanical name:	*377. Rosa brunonii* Lindl (MI-1512)
Local Name:	Khorhach
Habitat:	Mixed coniferous forests, often on northern sides of hills between 1600 – 2500m.
Part(s) used:	Leaves, flowers, fruits.
Ethnobotanical uses:	The leaves are used as fodder. The flowers of the plant are visited by honey bees for honey collection. The ripe thalamus cup is eaten by children but causes stinging sensation on the tongue if the seeds inside are not removed carefully.
Collection season:	March – August (leaves) and September – November (fruits)
Botanical name:	*378. Rosa chinensis* Jacq. (MI-1513)
Local Name:	Gulab/Gulesadbar
Habitat:	Often cultivated as ornamental.

Part(s) used: Young shoots tops, petals, leaves, fruit.

Ethnobotanical uses: A decoction of the fruits is used internally as a remedy for cough and haematuria. A paste of fruits is applied directly on wounds and sprains for relieving pain and quick healing. Flower petals are crushed along with sugar in a pistle with mortar to make "Gul Qand". One or two tablespoons of Gul Qand is eaten after meals as stomach tonic, digestive and alleviating stomach distention. Gulqand also regulate menstrual flow in women and treat dysmenorrhoea. Rose water obtained by distillation of flower buds is used for eye cleansing, face and skin softening (as herbal cosmetic) and stomach distention.

Young shoot tops are eaten raw like a salad often sprinkled with a little salt. The plant is a very common ornamental plant of the area. The flowers are kept indoors for the fragrance. Flower buds are utilized by local herbalists for rose water (arq-e-gulab) collection. Rose water is sprayed for fragrance in religious congregations. Symbolizing the beauty of the flower people are named as "Gulab Gul" "Gulab Khan" "Amir Gulab" or "Gulab Mama". The leaves are used as fodder.

Collection season: April – June (flowers)

Botanical name: *379. Rosa moschata* Herrm (M1-1514)

Local Name: Palwarhi

Habitat: Mostly grown as a hedge plant between 1000 – 2200m.

Part(s) used: Young shoot, whole plant, petals.

Ethnobotanical uses: The plant is the most common hedge plant in the area. The flowers are frequently visited by honey bees. The leaves are preferentially browsed by goats. The petals and the young tender shoots are eaten raw as a salad.

Collection season: February – March (young shoots) and May – June (flowers)

Botanical name: *380. Rosa webbiana* Wall. ex Royle (M1-1515)

Local Name: Zangali Gulab

Habitat: On rocky slopes under forests between 2000 – 3000m.

Part(s) used: Whole plant, roots, flowers.

Ethnobotanical uses: About one tablespoon of dried roots of the plant are kept in a glass of water overnight and the infusion of filtered and taken in the morning for hypertension

The plant is grown as ornamental plant. The flowers are visited by honey bees for nectar collection.

Collection season: November – February (roots)

Botanical name: *381. Rubus ellipticus* Sm. (M1-1516)

Local Name: Goraja

Habitat: Drier, scrub, vegetation and open grassy slopes between 1100 – 2200m

Part(s) used: Fruits, roots

Ethnobotanical uses: An aqueous extract obtained by crushing the roots inside water and straining through cloth is stored in bottles. 1-2 tablespoon are taken two times a day for gastric trouble, stomach and colic pain. Fruit juice obtained by compressing the ripe fruits is taken in a doze of one tablespoon three times a day for cough and sore throat.

The ripe fruits are eaten.

Collection season: November – February (bark) and June – August (fruit)

Botanical name: *382. Rubus fruticosus* L. (M1-1519)

Local Name: Karwarha

Habitat: Hedge rows and foot hills up to 1600m.

Part(s) used: Young shoots, leaves, fruits.

Ethnobotanical uses: The juice obtained by compressing the fruits is a coolant and general body tonic. A decoction of the leaves is used for diarrhea, dysentery and blood piles. A concentrated decoction of the leaves is used as a gargle for mouth and throat sores, swollen gums and thrush. A paste of leaves is applied on scratches, wounds, sores and bruises

Young shoots when they emerge from soil in the early spring are peeled of and eaten raw as a salad. The fruit are sore in unripe condition but become very delicious when fully ripe. The plant is also grown as a hedge plant and dried shoots are used for fencing. The leaves are also used for mouth washing.

Collection season: March (young shoots), March – June (leaves) and August –

	September (fruits)
Botanical name:	*383. Rubus niveus* Thunb. (M1-1517)
Local Name:	Baganrha
Habitat:	Drier scrubs, mixed coniferous forests and hedgerows between 1100 – 2300m.
Part(s) used:	Whole plant, young tinder shoots, fruits.
Ethnobotanical uses:	The plant is grown as a hedge plant and its branches are used for fencing. Young tinder shoots when they emerge from ground in early spring are eaten as a salad. The ripe fruits are very delicious and eaten raw.
Collection season:	February – March (young shoots) and July – August (fruits)
Botanical name:	*384. Rubus ulmifolius* subsp. s*anctus* (Schreb) Sundre (M1-1518)
Local Name:	Da ghra Baganrhe
Habitat:	Thick mixed forests.
Part(s) used:	Fruits.
Ethnobotanical uses:	The ripe fruits are juicy, delicious and eaten on the spot
Collection season:	July – August
Botanical name:	*385. Sanguisorba minor* Scop (M1-1520)
Local Name:	Zangali salad
Habitat:	Open grassy areas, ridges, exposed cliffs between 1400 – 2200m.
Part(s) used:	Leaves.
Ethnobotanical uses:	An infusion of leaves is taken internally for the treatment of joint pains. When applied externally the infusion of leaves works as a soothing remedy for sun burns and wounds. Young leaves are used as a salad.
Collection season:	June – July.
Botanical name:	*386. Sorbaria tomentosa* (Lindl.) Rehder (MI-1522)
Local Name:	Jijrhai
Habitat:	Flat mountain tops or deep valleys with moist soils between 1400 – 2200m.
Part(s) used:	Flowers, leaves.
Ethnobotanical uses:	Flowers are ground and mixed with butter or mustard oil and applied on skin burn, bruisers and wounds.

	Leaves are fodder for goats.
Collection season:	March – September (leaves) and June – July (flowers)
Botanical name:	*387. Sorbus aria* Crantz. (M1-1523)
Local Name:	Doda
Habitat:	Mixed forest on eastern or northern slopes between 1800 – 2500m.
Part(s) used:	Wood, fruit.
Ethnobotanical uses:	An infusion of fruits is used in the treatment of constipation. The fruit is edible after being bletted. The wood is used for fuel.
Collection season:	September – October.
Botanical name:	*388. Spiraea canescens* D.Don (M1-1524)
Local Name:	Krachay
Habitat:	Scrubs on open hill sides, ridges and field verges between 1400 – 2500m.
Part(s) used:	Leaves, shoots.
Ethnobotanical uses:	The leaves are browsed by cattle and goats. Excessive intake by cattle can cause diarrhea. The shoots are used as fuel wood.
Collection season:	March – September.
Family:	**98. Rubiaceae**
Botanical name:	*389. Galium aparine* L. (M1-1525)
Local Name:	Konay
Habitat:	Hedge rows, waste places, foothills and muslim graveyards up to 2500m.
Part(s) used:	Whole plant.
Ethnobotanical uses:	The shoots of the plant are ground finely and stirred with water and strained through a cloth to get an infusion. Half cup of the infusion is taken as a diuretic and blood purifier with a soothing effect on the body and mind and curing insomnia. A paste produced by crushing the plant is applied on wounds for quicker healing. The whole plant is used as a herbal tea with a sliming effect on the body. A decoction of the plant is used as wash for hair to remove dandruff. The whole plant is used as fodder.
Collection season:	May-June.
Botanical name:	*390. Galium rotundifolium* L. (MI-1788)

Local Name: Warha Karghan Meva

Habitat: Rock crevices, forest floors, near rotting logs between 2100-2600m.

Part(s) used: Shoots.

Ethnobotanical uses: An infusion of the shoots is taken internally for the treatment of colic pain and bronchitis. A paste is applied on skin to heal bruises and wounds. Juice expressed from shoots is applied on eczema.

The shoots are used as fodder.

Collection season: May – August.

Botanical name: *391. Rubia cordifolia* L. (M1-1529)

Local Name: Karghan Mewa

Habitat: Hedge rows, grave yards, scrub or northern hill slopes up to 2100m.

Part(s) used: Roots, fruits, stem.

Ethnobotanical uses: A decoction made from 50-60 grams of dried roots heated gently for 30-50 minutes in one liter of water is filtered and stored in clean bottles. Half cup of the decoction is taken two times a day for cough and as a diuretic for removal of kidney, gall bladder and urinary bladder stones. Half teaspoon of dried, powdered root is taken with water for regularizing the menstrual cycle. Decoction of the plant is considered blood purifier and help in alleviating acne, eczema, allergy and pimples from skin. Chronic wound with pus and oozing of secretion are washed with root decoction followed by dressing with roof powder quickly heals the wound. The root powder mixed in honey is applied as herbal cosmetic on skin to cure acne and give skin a smooth look.

The ripe fruit are eaten by children on the spot. The roots and stem of the plant is used for dying.

Collection season: October (fruits) and November – February (roots)

Family: 99. Rutaceae

Botanical name: *392. Citrus sinensis* (L.) Osbeck (M1-1530)

Local Name: Malta

Habitat: Cultivated in hilly areas

Part(s) used: Fruits, flowers.

Ethnobotanical uses: Fresh fruit rind is squeezed near eyes to spray the aromatic oils into

	the eyes which irritate eyes and secrete a plenty of tears that wash the eye balls and remove all the impurities. Fresh rind is rubbed on acne to dry off and on skin to make its soft, moist and smooth. Dried fruit rind is mixed with raw sugar and give to cure dyspepsia, nausea and anorexia. 2 tablespoons of dried pieces of fruit rind are added to one cup of hot, boiled water to make a decoction. The decoction is taken three times a day to treat colds, coughs and catarrh. The plant is sometimes grown in homes for ornamental purposes. The fruit is very juicy, delicious and refreshing. The juice is refreshing, cooling and appetizer. The fruit rind is dried, cut into pieces and used as flavouring agent in sweet rice dish called "zarda". Flowers are kept indoors for the pleasant fragrance. Flowers are used to make herbal tea. Fruit rind is also used for cleansing of utensils.
Collection season:	April – (flowers) and December – February (fruits)
Botanical name:	*393. Skimmia laureola* (D.C) Sieb. & Zucc. ex Walp (MI-1791)
Local Name:	Nazar Panrha
Habitat:	Thick forest under growth on moist northern slops between 2500 – 3000m.
Part(s) used:	Leaves.
Ethnobotanical uses:	Few shade dried leaves are spread over hot charcoal to produce smoke. The patient is bathed in the smoke and is advised to inhale it. This gives a relief in cough, cold, flu, sneezing, headache and fever. Powdered leaves are mixed with maize flour dough and given to cattle for expelling intestinal worms. The smoke of the plant is considered evil repellant. In ceremonial congregations and gathering the leaves are fumigated as a fragrance and to allay evil sight.
Collection season:	April – October.
Botanical name:	*394. Zanthoxylum armatum* D.C (M1-1531)
Local Name:	Dambara
Habitat:	Drier, gravelly hills sides in scrubs and in hedge rows up to 1800m.
Part(s) used:	Branches, fruits.
Ethnobotanical uses:	Half teaspoon of powdered fruit is mixed with a little salt and taken

with a cup of water for relieving stomachache, flatulence and nausea and enchaning appetite. The recipe is also considered a general body stimulant. Young stem branches are used to make tooth brush (miswak) that cleans teeth and relieve toothache.

Prickly branches are made into sticks for walking and snake killing. It is a superstition that a stick of *Zanthoxylum armatum* in home repels snakes from the home. The fruits are used as a condiment to make chutneys and especially fish condiment. The dried branches are used as fuel and fence. The plant is grown as hedge plant.

Collection season: June – August.

Family: **100. Salicaceae**

Botanical name: *395. Populus ciliata* Wall. ex Royle (M1-1532)

Local Name: Naray Speerdar

Habitat: Mixed forest in hilly areas. Grown and cultivated along stream sides in moist habitats between 1000 – 2400m.

Part(s) used: Wood, bark, young buds.

Ethnobotanical uses: The bark of the stem is ground into a paste and mixed with equal amount of cows dung ash and applied externally on muscular swelling and cramps produced by trauma.

The logs are soaked in running water for a month to kill all the insects inside and make the wood durable. The wood is then used for making beams, planks and construction material. The wood is also used for fuel. The young unsprouted buds with thick, viscous, brown jelly are soaked in water for a day. The infusion thus obtained is used to moisture the stem cuttings of different plants for their successful planting.

Collection season: February – March (buds) and September – February (bark)

Botanical name: *396. Populus nigra* L. (M1-1533)

Local Name: Ghat Speerdar/Toor Speerdar

Habitat: Introduced but naturalized as a dominant tree along streams, road sides and field boundaries up to 1300m.

Part(s) used: Wood, bark, young buds.

Ethnobotanical uses: Two tablespoons of dried buds are added to one liter of hot water and

left for 15 minutes. One cup of the decoction is taken three times an day for lowering fever, relieving pain and inflammations in the body. One tablespoon of dried leaf buds are boiled in water and the vapours arising are inhaled as expectorant and reliving nasal and chest congestion. Half teaspoon of dried bark of the plant is added to hot water and left for 15 minutes. The decoction is filtered and taken twice a day for arthritis. The decoction of bark is added to wheat flour and cooked, then fried in butler oil with a little brown sugar (gur) to make a paste. The paste is eaten or low back pain, menstrual cramps and post parturition pain. A decoction of 2-3 tablespoons of dried nark in one liter of hot water for 30 minutes is used as a wash for chilblains, burns and sprains and as a sitz bath for 15 minutes to treat haemorrhoids and anal fissures.

The plant is grown as a shelter belt to reduce wind speed and a sand binder for checking water erosion. The logs are soaked in running water for a month to make the wood durable and are then used for construction and furniture making, though it is prone to insect and wood pest attack. The wood is also used for fuel.

Collection season: February – March (leaf buds) and October – January (bark)

Botanical name: *397. Salix babylonica* L. (M1-1534)

Local Name: Tita Wala

Habitat: Moist, marshy places on the sides of river up to1000m.

Part(s) used: Young branches, wood, bark.

Ethnobotanical uses: A decoction of the stem bark is taken for reliving pain and fever. A powder of sun dried bark of the plant is mixed with butter oil or mustard oil and applied as poultice for abscesses and skin inflammation.

Young branches are employed in basketry. The wood in used in making light weight beds as “charpaye”. The plant is grown as send binder and soil stabilizer.

Collection season: October – February

Botanical name: *398. Salix flabellaris* Andersson (M1-1792)

Local Name: Chita Wala

Habitat: Moist, shady slopes under thick forest cover above 2500m.

Part(s) used: Shoots.

Ethnobotanical uses: The young shoots are used as bedding in the seasonal huts used by nomadic herders during summer season.

Collection season: May – September

Botanical name: *399. Salix tetrasperma* Roxb. (M1-1535)

Local Name: Wala

Habitat: River banks, stream sides along water courses up to 1600m.

Part(s) used: Wood, young branches, bark.

Ethnobotanical uses: The stem bark is sun dried and made into powder. Two teaspoons are added to boiled, hot water and stirred for ten minutes. The decoction is taken for a relief from fever and body pains. The dose is repeated two or three times a day.

The wood is light weight and used for making cricket bats and light furniture. Straight branches are turned into walking sticks. Young branches when dried as used as wearing sticks. The wood is used for fuel purposes. The plant is a sand binder and soil stabilizer.

Collection season: October - January

Family: **101. Sapindaceae**

Botanical name: *400. Cardiospermum halicacabum* L.(MI-1536)

Habitat: Weed in drier areas, sandy stream sides and gravelly foot hills up to 1300m.

Part(s) used: Leaves.

Ethnobotanical uses: Two table spoons of dried leaves are stirred in a cup of hot boiled water for ten minutes. The decoction thus prepared is taken two times a day for the treatment of rheumatism, itchy skin and neurosis. Juice of leaves is droped in ears for relieving earache. Leaves are crushed into a paste along with a little salt and applied on swellings, stiffened body parts and painful joints as a poultice.

Collection season: June-September (Leaves)

Botanical name: *401. Dodonaea viscosa* (L.) Jacq. (MI-1537)

Local Name: Ghwarhaskay.

Habitat: Dominant species of south facing drier, gravelly areas with scrub

vegetation between 1200-1800m.

Part(s) used: Shoots, Leaves.

Ethnobotanical uses: Fresh leaves of the plant are slightly moistened and wrapped around inflamed, painful joins to relive the swelling and pain. Care should be taken not to prolong the bandage because it can cause skin sore and irritation. An infusion of leaves of leaves is used as a wash for wounds and swellings on skin for quicker recovery. The leaves are masticated in the mouth for toothache and then spitted out. One end of young shoot is burnt and the liquid oozing out of the other end is applied on skin affected with eczema and ringworm.

The shoots are used as firewood. The shoots are used as thatching material for mud-houses. The plant is ornamental and grown as hedge around lawns. The leaves are crushed along with sand and put in streams to stupefy and hunt fish. The shoots are used for brooms.

Collection season: Throughout the year.

Family: **102. Sapotaceae**

Botanical name: *402. Monotheca buxifolia* (Falc.) A.DC. (MI-1538)

Local Name: Gurgura.

Habitat: Drier, south facing stony slopes of hills up to1200m.

Part(s) used: Shoots, leaves, fruits.

Ethnobotanical uses: About half kilogram of the fresh fruit is eaten for a cooling effect on the body, preventing and eliminating constipation and expelling the intestinal worms.

The dried branches are used as fuel wood. The leaves are browsed by goats. The ripe fruits are delicious and eaten. Children play with the seeds as marbles.

Collection season: June.

Family: **103. Saxifragaceae**

Botanical name: *403. Bergenia ciliata* (Haw.) Sternb.

Local Name: Gatpanrha.

Habitat: Moist, steep rocks and cliffs under forest cover between 2000-2600m.

Part(s) used: Leaves, rhizome.

Ethnobotanical uses: Crushed fresh leaves or their juice is applied externally on bruises, boils, wounds and inflammations for quick healing, and tissue regeneration. The treatment is also effective for broken bones. Fresh juice of leaves is dropped in eyes for ophthalmia. Infusion of fresh leaves and/or rhizome is taken two times a day on empty stomach as a strong diuretic that dissolve and remove kidney stone. The rhizome is boiled in milk to make porridge. A cup of the porridge is taken daily as general body tonic and a remedy for back pain. Juice expressed from rhizome is applied directly on boils and hemorrhoids for healing. Decoction made by putting two teaspoons of dried rhizome in one cup of hot water is sipped slowly, three times a day for colds, coughs, catarrh and asthma.

The plant is grown as ornamental.

Collection season: August- February.

Family: **104. Scrophulariaceae**

Botanical name: *404. Mazus japonicas* (Thunb.) O.Kuntze (MI-1542)

Local Name: Spinmakhay

Habitat: Wet meadows on forest edges and along stream sides in hilly areas between 1200-3000m.

Part(s) used: Leaves.

Ethnobotanical uses: One table spoon of the juice expressed from fresh leaves is taken three times a day for two-four weeks for the elimination of long, chronic, mild fever, characterized by weakness of the body.

Young leaves cooked as pot herbs.

Collection season: April-October.

Botanical name: *405. Scrophularia nodosa* L. (MI-1799)

Local Name: Zagzagai.

Habitat: Damp areas near water courses in hedge rows and stream sides up to 1600m.

Part(s) used: Flowering shoots.

Ethnobotanical uses: A paste of fresh shoot is applied as poultice for burns and swellings. A decoction of dried shoots is applied as wash or ointment for sprains, gangrene and chronic skin diseases. One tablespoon of dried

shoots is added to half liter of water and boiled slowly so that only one cup of water is left. This decoction is taken once a day for detoxification, blood purification and elimination of eczema, mastitis and swollen lymph nodes. The treatment is continued for at least three weeks

Collection season: May-September.

Botanical name: *406. Scrophularia umbrosa* Dum. (MI-1543)

Local Name: Da jabo Zagzagai.

Habitat: Damp places near water course, rice fields and marshy areas up to 1300m.

Part(s) used: Flowering shoots.

Ethnobotanical uses: The flowering shoots are crushed into a paste and applied on pus forming wounds and sites of burns to drain and dry the puss and secretions to quickly heal them.

Collection season: April-September.

Botanical name: *407. Verbascum thapsus* L. (MI-1544)

Local Name: Khardag

Habitat: Drier, sunny places, waste grounds, sandy stream sides and fallow lands up to1900m.

Part(s) used: Leaves, stem, flower.

Ethnobotanical uses: An infusion of fresh leaves strained and filtered through a very thick cloth with small pores is mixed with equal amount of *Thymus linearis* shoot juice. One table spoon of the mixture is taken three times a day as cough expectorant. Juice of leaves mixed with olive oil is massaged on inflamed skin and piles and dropped in ear for earache. Fresh leaves with hair removed are crushed into a paste. The paste is wrapped in a cloth and tied around wound for quick healing.

The flowers crushed in water are used as a hair dye. The dried stem is used as tinder.

Collection season: April-October

Botanical name: *408. Veronica anagallis-aquatica* L. (MI-1545)

Local Name: Dadatarkha

Habitat: Wet meadows, marshy areas, partially submerged near streams below

	1500m
Part(s) used:	Shoots
Ethnobotanical uses:	An infusion of young shoots is used as blood purifier. The fresh plant is ground into a paste and applied directly on whitlows of fingers and skin burns for healing. The young shoots are used as pot herb.
Collection season:	March-September
Botanical name:	*409. Veronica polita* Fries. (MI-1547)
Local Name:	Mekhakay
Habitat:	Weed of Rabi crops, waste places, disturbed sites, graveyards and fallow lands up to 1800m.
Part(s) used:	Shoot
Ethnobotanical uses:	1-2 tablespoons of sun dried leaves are boiled in one glass of water for 10 minutes to make a decoction. The decoction is taken to regularize menstrual cycle in women. The shoots are cooked as potherb.
Collection season:	February-March
Botanical name:	*410. Wulfenia amherstiana* Benth. (MI-1548)
Local Name:	Chit makanpat
Habitat:	Moist cliffs and hilly slopes between 2100-2700m.
Part(s) used:	Leaves.
Ethnobotanical uses:	One table spoon of dried leaves is added to one cup of hot water to make a decoction. The decoction is taken two times a day for fever and muscular body pains.
Collection season:	May-September.
Family:	**105. Simaroubaceae**
Botanical name:	*411. Ailanthus altissima* (Mill.) Swingle (MI-1549)
Local Name:	Kamasla Bekanrha
Habitat:	Introduced and naturalized on the foot hills, hedge rows and often cultivated on field margins.
Part(s) used:	Wood, Leaves.
Ethnobotanical uses:	The plant is grown in hedge rows. The wood is used as fire wood. The crushed leaves act as insect repellant while leaves steeped in

water act as insecticide. The leaves are spread in the seed bed prepared for rice as insecticide that kills insects' larva and mulluscs.

Collection season: March-September

Family: **106. Solanaceae**

Botanical name: *412. Capsicum annuum* L. (MI-1551)

Local Name: Shimla marchakay.

Habitat: Cultivated

Part(s) used: Fruits

Ethnobotanical uses: The fruits are cooked as vegetable. It is also eaten raw as a salad.

Collection season: May-August

Botanical name: *413. Capsicum frutescens* L. (MI-1552)

Local Name: Sur marchakay

Habitat: Cultivated in kitchen gardens

Part(s) used: Fruits

Ethnobotanical uses: A chutney made from tomatoes (*Lycopersicon esculentum*), mint (*Mentha spicata*) and *Capsicum frutescence* is taken along with meals to stimulate digestive system, increasing saliva secretion, gastric juice secretion, improving appetite, helping digestion and reducing flatulence. Chili powder sprinkled on pulses or mixed in condiments cause profuse perspiration and help in refreshing the body. They work as stimulants and increase the rate of blood flow in blood vessels. A very small amount of chili powder is inhaled through nose or its smoke is inhaled to induce sneezing that helps in opening the air passage ways and also relieve migraine.

iv. The inner side of the fruit is rubbed on the site of snake bite as an antidote.

The green tender fruits are used as salad. The red ripened fruits are used to give hot pungent taste to curries. The dried, powdered fruit is a common condiment.

Collection season: May-October.

Botanical name: *414. Cestrum nocturnum* L. (MI-1553)

Local Name: Rat ki rani

Habitat: Grown in home garden, lawns and backyards as ornamental plant.

Part(s) used: Flowers

Ethnobotanical uses: The plant is a common ornamental plant which blooms at night in summer season and has a very pleasant fragrance. Indigenous people have a superstition that snakes are attracted by the smell of the flowers. The plant parts including leaves and flowers are poisonous to both human and livestock.

Collection season: May-October.

Botanical name: *415. Datura stramonium* L. (MI-1554)

Local Name: Datura.

Habitat: Dried waste places, sandy stream sides, flood pans and disturbed places up to 1500m.

Part(s) used: Leaves, seeds.

Ethnobotanical uses: A pinch of powdered leaf is taken with water for relieving body pains. Higher doze cause hallucinations and giddiness. Half tablespoon of seeds are decocted in one liter of water. Half cup of the decoction is used for cough, bronchospasm and asthma. The decoction also has a purgative action. Powdered leaves mixed with mustard oil are used as ointment for fistulas, abscesses and infected wounds. Infusion of fresh leaves is used to wash hair for removal of dandruff.

The whole plant especially the seeds are poisonous and can cause death if ingested excessively by humans or livestock.

Collection season: May-July

Botanical name: *416. Lycopersicon esculentum* Miller. (MI-1555)

Local Name: Tamatar

Habitat: Cultivated in kitchen gardens up to 2600m

Part(s) used: Fruits

Ethnobotanical uses: The ripe fruit is cut into pieces and rubbed on skin affected with scalds and sunburns. The fleshy fruit is rubbed over skin to eliminate the excessive oil and works as herbal cosmetic.

The ripe fruit is used for flavoring majority of the local cuisines. It is also used as a salad and crushed into chutneys. The dried, powdered fruit is used as condiment.

Collection season: June-October

Botanical name: *417. Nicotiana tabacum* L. (MI-1556)

Local Name: Tamako.

Habitat: Cultivated in plane areas of the valley up to 1100m.

Part(s) used: Leaves, Stems.

Ethnobotanical uses: The leaves are moistened and slightly warmed and applied through a bandage around swollen, painful joints, site of scorpion or other insect sting and boils as a poultice and remedy. Inhaling the smell of dried powdered leaves irritate mucus membranes, inducing sneezing thus helping in clearing of air passage ways. The dried leaves crushed along with ash are used as a snuff that stimulates body and brain.

The stems after all the leaves are removed are dried and used as fuel and tinder. The leaves are kept with clothes for repelling insects. The leaves are marketed as cash crop to cigarette making tobacco industry.

Collection season: May-September

Botanical name: *418. Physalis divaricata* D. Don. (MI-1557)

Local Name: Mangotey

Habitat: Weed of Khareef crops, sandy stream and river sides and fallow lands up to 1800m.

Part(s) used: Fruits, leaves.

Ethnobotanical uses: 5-10 ripe fruits of the plant are eaten raw as appetizer and digestive system stimulant that also prevents constipation. Juice of leaves is diluted with water and mixed with equal amount of mustard (*Brassica campestris*) oil to be used as drops for earache.

The fruits when ripe are bitter in taste but edible. Unripe fruit is cooked like vegetable

Collection season: July-September (Leaves) and September-October (Fruits).

Botanical name: *419. Physalis peruviana* L. (MI-1558)

Local Name: Khog Batinganrh

Habitat: Cultivated but escaped into arable lands up to 1800m, best grown on sandy soils.

Part(s) used: Fruits.

Ethnobotanical uses: The juice or squash of fruit is given in a doze of one cup daily for three days to kill and expel intestinal worms.

The fruit is eaten raw and in dried form.

Collection season: July-October.

Botanical name: *420. Solanum melongina* L. (MI-1559)

Local Name: Toor Batinganrh

Habitat: Cultivated

Part(s) used: Leaves, fruits

Ethnobotanical uses: The crushed fruit is mixed with vinegar and applied on cracked and discharging sores. The leaves are ground into a fine paste and applied as a soothing poultice for burns and abscesses. Eating the dish containing egg plant fruit has a good effect on blood circulation reducing hypertension. Eating the cooked fruit is also beneficial to hemorrhoids and food poisoning due to toxic substances.

The fruits are used as a vegetable often cooked with curd or fried in oil.

Collection season: May-September (Leaves) and July-October (Fruit).

Botanical name: *421. Solanum nigrum* L. (MI-1560)

Local Name: Kachmachu

Habitat: Weed of arable lands, fallow lands, sandy stream and river sides, grave yards and forest margins up to 2300m.

Part(s) used: Whole plant.

Ethnobotanical uses: Indigenous people give much more importance to the plant for its medicinal properties. Aqueous extract of the plant is taken three times a day in a doze of half cup for the treatment of jaundice and malaria. Roots of the plant are smashed into pieces and kept in water over night. One cup of the infusion is taken daily for the treatment of hepatitis. An infusion obtained by boiling the plant in water for one hour is used as the only sauce to be taken with breed as a heeling diet during liver enlargement, hepatitis, malaria and jaundice. A decoction of the dried plant parts is considered diuretic and blood purifier. A paste of crushed shoots is applied as a poultice for the treatment of leucoderma, boils, psoriasis, haemorrhoids and abscesses. One

	teaspoon of dried, powdered shoots is given for stomachache. The shoots are used as pot herb. The fruits when ripe and turned black are edible and eaten on the spot.
Collection season:	March-December (Leaves) and August-November (Fruit).
Botanical name:	*422. Solanum pseudocapsicum* L. (MI-1561)
Local Name:	Kamasal Marchakay
Habitat:	An escape to wild places and muslim graveyards up to 1300m.
Part(s) used:	Whole plant.
Ethnobotanical uses:	The plant is grown in homes and lawns as ornamental herb. The fruits are considered poisonous to domestic animals.
Collection season:	June-October
Botanical name:	*423. Solanum surattense* Burm. f. (MI-1562)
Local Name:	Marhagonay.
Habitat:	Drier, sandy foot hills, sandy stream and river sides and cultivated lands up to 1200m.
Part(s) used:	Whole plant.
Ethnobotanical uses:	Various parts of the plant are used locally for different ailments. One tea spoon of dried pulverized fruit is added to one cup of hot water and left for 10 minutes. The decoction is taken three times a day for bronchial asthma, urine retention in the kidney or urinary bladder and for rejuvenation of the body. Shade dried roots of the plant are boiled in water for 15-20 minutes. The decoction is passed through a cloth. Half cup of the decoction is taken two times a day for fever, phlegmatic cough, urine retention and chest pain. A decoction of the whole plant is given internally in a dose of one cup two times a day for jaundice and hepatitis while it is used as a wash for gonorrhea. The leaves with spines removed are ground into a paste and applied externally on swollen joints and muscle bumps for pain relief.
Collection season:	March-October (Leaves) and June-November (Fruit).
Botanical name:	*424. Solanum tuberosum* L. (MI-1563)
Local Name:	Alo.
Habitat:	Cultivated in sandy soils up to 3000m.
Part(s) used:	Tubers.

Ethnobotanical uses: One medium sized potato is crushed in a juicer with one glass of water. The juice is taken in two equal doses a day. This treatment is continued for a week to reduce the acidity of stomach, cure gastric and peptic ulcers and eliminates heart burn. The skin pealed from raw potato is thoroughly washed and then boiled for 5-10 minutes in water. The mixture is strained through a cloth and one cup is taken three times a day for arthritis. A half cut raw potato is rubbed on forehead and temples for 1-3 minutes to get relief from headache. A piece of potato is crushed along with water into a paste and is applied as a poultice for skin burns and cracks. A thin slice of potato is placed over a skin wart and tied through a bandage to keep it in place overnight. The bandage is removed in morning. The process is repeated for 5-7 days to subside the wart. Raw potato slices are rubbed on skin and face as moisturizer and removal of freckles and wrinkles.

Potato tubers are cooked and fried in a variety of ways and act as a vegetable. A slice of raw potato is rubbed on shoes like a shoe polish.

Collection season: September-October.

Botanical name: *425. Solanum villosum* (L.) Moench (MI-1564)

Local Name: Sur Kachmachu.

Habitat: Sandy stream and river sides, graveyards and foot hills up to 1600m.

Part(s) used: Whole plant.

Ethnobotanical uses: An infusion of fresh plant is taken in a doze of half cup twice a day for 3-4 weeks to cure liver enlargement, jaundice and hepatitis.

The shoots are used as potherbs the berries are eaten on the spot when fully ripe and turned orange red.

Collection season: March-November.

Botanical name: *426. Withania somnifera* (L.) Dunal (MI-1565)

Local Name: Kutelal

Habitat: Driver, waste, stony places up to 2100m

Part(s) used: Leaves, fruits roots.

Ethnobotanical uses: One or two grams of dried roots of the plant are boiled in two cups of water for 15 minutes and then leaved for 10-15 minutes to prepare a

decoction. The decoction is taken in two equal doses per day for rejuvenating the body, increasing muscle strength and restoring vitality. Two grams of powdered leaves are boiled in one glass of milk for 10 minutes. One tablespoon of honey is added to the decoction. The decoction is taken two hours before bedtime as aphrodisiac. The same recipe is given to women as a uterine tonic after miscarriage and post-parturition complaints. Quarter to half teaspoon of powdered leaves is added to one cup of hot water to make herbal tea that treats nervous exhaustion and insomnia. The root bark powder is mixed with mustard oil and applied as a poultice on haemorrhoids, boils, swellings and sprains. One teaspoon of dried berries of the plant are boiled for 15 minutes in half liter of water and left over night. The decoction is taken in two equal doses in the morning and evening as a diuretic agent.

The leaves act as insect repellant and thus kept in stored grains and clothes.

Collection season: October-December (Roots), Throughout the year (Leaves) and September-November (Fruits).

Family: **107. Taxaceae**

Botanical name: *427. Taxus wallichiana* Zucc. (MI-1566)

Local Name: Banrhya

Habitat: Thick forests of *Abies* and *Picea* with steep, rocky slopes between 2200-3000m.

Part(s) used: Wood, leaves, stem bark, fruit.

Ethnobotanical uses: 10 grams fresh leaves are ground into a fine paste. Half liter of water is added to the paste and stirred. The infusion is passed through a cloth and used as gargle two times a day for diphtheria, sore throat and swollen tonsils. 2 grams of dried stem bark is boiled for 30 minutes in two cups of water. 20-30ml of the decoction is taken daily for at least five days to induce menstruation and end pregnancy.

The wood is red brown in color and used for making decorative furniture. The flanks made from the wood are used in Muslim graves. The fruits when fully ripe are eaten. The smoke of the leaves is used

	as incense that repels insects and clears closed areas. The twigs are used as thatching material.
Collection season:	Throughout the year (Bark, Leaves) and September-October (Fruits).
Family:	**108. Thymelaeaceae**
Botanical name:	*428. Daphne mucronata* Royle. (MI-1567)
Local Name:	Leoghonay.
Habitat:	Dry, open, gravelly slopes of hills between 1100-2300m.
Part(s) used:	Shoots, fruits, leaves.
Ethnobotanical uses:	The leaves are chopped, slightly warmed and applied through a bandage on rheumatic joints for relieving swelling and pain. The bark of shoot is tied in the neck of cattle to repel mites and ticks acting like an insect repellant. The shoots when dried are used as fire wood. The fruits when ripe are eaten but care should be taken to remove the small hair on fruit which cause irritation of mouth and tongue. The shoots are used as thatching material.
Collection season:	Through the year (Leaves) and September-October (Fruits).
Botanical name:	*429. Wikstroemia canescens* Meisn. (MI-1568)
Local Name:	Katanrh
Habitat:	Scrubs and grassy slopes under forest cover between 1300-2600m.
Part(s) used:	Shoots.
Ethnobotanical uses:	The branches are very flexible and elastic and thus used as ropes after being twisted for making bundles of firewood.
Collection season:	Through the year.
Family:	**109. Tiliaceae**
Botanical name:	*430. Corchorus olitorius* L. (MI-1569)
Local Name:	Malakheya
Habitat:	Weed in Khareef crops especially maize.
Part(s) used:	Leaves.
Ethnobotanical uses:	A fresh leaves aqueous extract is taken in a dose of one cup twice a day as a demulcent agent and soothes the nasal passages, air passage ways, digestive system and urinary system. The recipe is also diuretic and utilized in gonorrhea, cystitis, dysuria and kidney stones.

The leaves are used as a pot herb. A herbal tea is made from the leaves.

Collection season: June-August.

Botanical name: *431. Grewia optiva* Drummond ex Burret (MI-1570)

Local Name: Pastawoonay

Habitat: Foothills and field verges in hilly areas up to1800m

Part(s) used: Leaves, fruits.

Ethnobotanical uses: The leaves are given to all types of livestock as a fodder. It is considered to increase milk production. The fruits are sweet and eaten on the spot. It is considered a cooling agent.

Collection season: April-September (Leaves) and September (Fruits).

Family: 110. Trilliaceae

Botanical name: *432. Trillium govanianum* Wall. ex Royle. (MI-1571)

Local Name: Matarzeela

Habitat: Under forest cover, in rich moist soil between 2400-3000m.

Part(s) used: Leaves, Roots.

Ethnobotanical uses: One teaspoon of dried powdered root is boiled in milk and a little sugar is added to it. The decoction is taken two times a day by women as a uterine tonic that prevent uterine haemorrhages., excessive menstruation and bleeding after parturitition. One table spoon of dried powdered drug is boiled in one cup of milk for five minutes. The concoction is taken two or three hours before bed time as an aphrodisiac. The leaves are ground into a paste and applied as a poultice on tumors, inflamed areas and ulcerated skin. Afresh root juice or a dried root decoction is rubbed on nipples for healing their soreness and breast feeding after this treatment by infants has a sedative effect on them. A raw root is slightly squeezed in fingers and rubbed on swellings of eyelids to cure and on rheumatic joints for relieving the pain. A concentrated root bark decoction is used as drops for curing earache.

The leaves are used as potherb.

Collection season: October-January

Family: 111. Typhaceae

Botanical name:	*433. Typha latifolia* L. (MI-1572)
Local Name:	Lokha
Habitat:	Partially submerged in slow running water and marshy areas up to 1300m.
Part(s) used:	Root, young shoot, leaves.
Ethnobotanical uses:	An aqueous extract of the roots is taken once daily as a diuretic and cooling agent by men and as a galactagogue by women. The roots and the young shoots are used as vegetable. The leaves of mature plants are used as thatching material, tinder, bedding on floors and woven into soft mats spread in mosques.
Collection season:	September-January (Roots) and April-August (Leaves).
Family:	**112. Ulmaceae**
Botanical name:	*434. Celtis caucasica* Willd. (MI-1573)
Local Name:	Tagha
Habitat:	Drier foothills ad graveyards
Part(s) used:	Leaves, fruit, wood
Ethnobotanical uses:	The leaves are used as fodder for livestock. The fruits when ripe are eaten by children. The wood is as firewood.
Collection season:	September-November (Fruits).
Botanical name:	*435. Celtis eriocarpa* Decne. (MI-1574)
Local Name:	NineyTagha
Habitat:	Muslim graveyards, hedge rows and gentle hill slopes up to 1800m.
Part(s) used:	Leaves, fruits, wood.
Ethnobotanical uses:	The leaves are used as fodder for livestock. The fruits are sweet and eaten on the spot. It is advised that the seeds should be spitted out because they can cause colic and intestinal irritation. The wood is used as a fuel. The plant is considered sacred. A small piece of stem bark is wrapped in cloth and tied around neck or arm as a blessing tie and evil repellant.
Collection season:	October-November (Fruits).
Botanical name:	*436. Celtis tetrandra* Roxb. (MI-1575)
Local Name:	Ghat tagha.
Habitat:	Hedge rows, roadsides, along the edge of the terraced fields in hilly

areas up to 2200m.

Part(s) used: Leaves, fruits, wood.

Ethnobotanical uses: Leaves are used as fodder. The fruits when ripe are eaten. The wood is used for fuel and making legs of village cots.

Collection season: August-September (Fruits).

Botanical name: *437. Ulmus wallichiana* Planch. (MI-1576)

Local Name: Kahai.

Habitat: Moist ravines ad mixed forests at higher altitudes between 1900-2600m.

Part(s) used: Leaves, young branches, wood.

Ethnobotanical uses: A paste of fresh leaves is applied on skin suffering from eczema, inflammation, dermatitis and itching. One teaspoon of powdered stem bark is taken with water for stomachache.

Leaves are used as fodder. The young branches are twisted and used as ropes for tying bundles of fuel wood and fodder. The wood is used for fuel and furniture making.

Collection season: March-September (Leaves) and October-January (Bark).

Family: **113. Urticaceae**

Botanical name: *438. Debregeasia saeneb* (Forssk.) Hopper & J.R.I.Wood (MI-1577)

Local Name: Ajlai.

Habitat: Hedgerows along water courses up to 2000m

Part(s) used: Stem bark, fruits, wood.

Ethnobotanical uses: The sundried bark is pulverized and mixed with mustard oil and applied as a poultice for curing dermatitis, skin rashes, ringworm and eczema.

The stem bark is used like rope for tying fuel wood and fodder bundles. The fruits are eaten on the spot. The wood is used for fuel. The plant is grown as a hedge plant.

Collection season: June-July (Fruits) and Throughout the year (Bark).

Botanical name: *439. Urtica dioica* L. (MI-1580)

Local Name: Seezonkai/Jalbang.

Habitat: Hedgerows, waste places, sandy stream sides and open meadows up to 2500m.

Part(s) used: Leaves.

Ethnobotanical uses: Young fresh leaves are rubbed on joint to cause irritation and give a relief from rheumatic pain at joints. Rubbing the leaves on low back gives a relief in pain and sciatica. A decoction is produced by adding one teaspoon of dried leaves to one cup of hot water and left as such for some time to cool down. The decoction is taken daily in the morning for blood purification. A diluted infusion of fresh leaves is used as a wash for haemorrhoids. A green tea made from leaves warms the body. An infusion of the fresh leaves is used as a hair wash making the hair strong and removing dandruff.

The leaves are used as potherb in young condition. The leaves are boiled and the water is removed. The boiled leaves are fried in mustard oil with garlic and tomatoes to make a delicious green vegetable. Children use the leaves during their fights because of its irritating nature. Decoction of leaves is used for milk curding.

Collection season: May-June.

Family: **114. Valerianaceae**

Botanical name: *440. Valeriana hardwickii* Wall. (MI-1804)

Local Name: Mushke Bala

Habitat: Forest floors with dark colored rich soil between 1800-3000m.

Part(s) used: Roots.

Ethnobotanical uses: An infusion of 10g fresh roots in one glass (250ml) of water is taken as a nerve and brain tonic. Two teaspoon of dried, powdered roots are taken with water or milk two times a day for prevention of epileptic seizures, hysteria and to cure insomnia.

Collection season: October-November.

Botanical name: *441. Valeriana jatamansi* Jones. (MI-1581)

Local Name: Mushke Bala.

Habitat: A common herb layer plant under forest cover on rich soils between 1500-3000m.

Part(s) used: Roots, Leaves.

Ethnobotanical uses: One table spoon of dried, powdered root is taken with water or milk for the treatment of flatulence, stomachache, constipation and colic

	pain. Juice extracted from roots is applied as a massage on forehead and temples for headache. The juice of root is dropped in eyes for cleansing and curing eye diseases. 2 table spoons of dried, powdered roots is added to hot milk and left for sometime to slightly cool down for oral use. The concoction is taken as an antispasmodic, nervine and sedative that eliminate hysteria, insomnia, nervous overstrain and neurosis. Infusion of fresh roots is taken once daily for controlling and reducing high blood pressure (Hypertension). Two teaspoons of powdered root and one teaspoon of honey are mixed in warm cow's milk and taken three hours before bedtime as an aphrodisiac. A paste of leaves is applied externally on skin for the treatment of boils, ulcers, eczema, dermatitis and minor injuries. Infusion of roots is hair tonic. The dried roots are used as incense and insect repellant.
Collection season:	October-November (Roots) and April-September (Leaves)
Botanical name:	*442. Valeriana pyrolifolia* Decne. (MI-1582)
Local Name:	Shingatai
Habitat:	Forest floors and open meadows at higher altitude above 2500m.
Part(s) used:	Roots, leaves.
Ethnobotanical uses:	One table spoon of the root powder is mixed with one cup of warm milk and taken before bedtime for insomnia, hysteria, and neurosis. One tea spoon of powdered root is taken with water two times a day for relieving abdominal pain. Fresh leaves of the plant are ground into a paste and rubbed on the forehead and temples for a relief from headache and migraine.
Collection season:	September-November (Root) and March-September (Leaves).
Family:	**115. Verbenaceae**
Botanical name:	*443. Duranta repens* L. (MI-1807)
Local Name:	Duranta.
Habitat:	Cultivated and escaped into graveyards and hedgerows up to 1300m.
Part(s) used:	Whole plant.
Ethnobotanical uses:	An infusion of 10g fresh leaves or 5g of ripe fruits in one glass of water is given twice a day as remedy for malaria. The medication is continued for 5-7 days.

The plant is grown as an ornamental hedge plant often cut and pruned into different sizes and styles.

Collection season: Through the year (Leaves) and July-September (Fruits).

Botanical name: *444. Lantana camara* L. (MI-1583)

Local Name: Gul Ghuncha

Habitat: Cultivated and introduced as ornamental but escaped and naturalized.

Part(s) used: Leaves, fruits.

Ethnobotanical uses: A decoction made from leaves and flowering tops of the plant is given two times a day to the patients for recovery from tetanus and rheumatism. A teaspoon of dried leaves are powdered and taken with a cup of water for stopping diarrhea. A paste of leaves is applied on skin for controlling itching and burning sensation.

The plant is grown for ornamental purposes. The fully ripe fruits are edible.

Collection season: March-October (Leaves) and October (Fruits).

Botanical name: *445. Verbena officinalis* L. (MI-1585)

Local Name: Skha Botay

Habitat: Waste places, sandy stream and river sides and field verges up to 2500m.

Part(s) used: Shoots.

Ethnobotanical uses: 50-60 grams of dried shoots are boiled in a litre of water for 15-20 minutes and then settled. The decoction is separated and half cup is consumed two times a day for toning nervous system and eliminating headache, depression, nervous exhaustion and fever. A paste of shoots is rubbed on swollen gums to stop bleeding and eliminating the swelling.

The dried shoots are used to make herbal tea.

Collection season: May-November.

Botanical name: *446. Vitex negundo* L. (MI-1587)

Local Name: Marwandai.

Habitat: Graveyards, hedgerows, stream sides and scrubs up to 1600m.

Part(s) used: Leaves, branches, fruits.

Ethnobotanical uses: Aqueous extract of fresh leaves is sweetened with the addition of raw

sugar (Gur) and half cup is swallowed quickly without leaving in mouth to avoid the extremely bitter taste. The single dose is sufficient for removing intestinal worms, skin allergies and urticaria. A decoction of dried leaves is used daily for a week to disperse the swelling of joints during acute rheumatism. A paste of crushed leaves is applied as a poultice on pus forming ulcer to discharge and drain the pus and on tumors to heal and give relief in pain. The juice extracted from fruits or its paste is massaged on paralyzed parts of the body for recovery.

Young branches are used as tooth brush (Miswak). The leaves are mixed with stored grains as insect repellant. Aqueous extract of the leaves is insecticidal and sprayed on stagnant water for killing mosquito larvae. The plant is grown as a hedge plant. Baskets and wattles are made from the young shoots.

Collection season: April-September (Leaves) and September-October (Fruits).

Family: **116. Violaceae**

Botanical name: *447. Viola betonicifolia* Sm. (MI-1588)

Local Name: Banafsha.

Habitat: Moist field verges, mountain slopes, ridges and water courses up to 2300m.

Part(s) used: Whole plant.

Ethnobotanical uses: 50 grams of dried plant is boiled in water for half an hour and left to cool down and stored in bottles. 2-3 tablespoons of the decoction is taken three times a day for curing fever caused by unknown reasons. An infusion of fresh leaves is taken in the morning in a dose of one cup as a laxative. A decoction of the plant is used to wash wounds for quick healing. One teaspoon of dried plant is added to one cup of hot water and left for five minutes. The decoction is sipped daily, especially at night for insomnia, epilepsy and other neurological disorders. A decoction of flowers is taken orally in a dose of half cup three times a day for treating cough, sinusitis, pharyngitis and chest congestion due to bronchospasm. It works as a demulcent and expectorant. Decoction of root is taken three times a day for curing

repiratory pneumonia.Paste of leaves is applied externally on boils for healing.

Collection season: March-August.

Botanical name: *448. Viola canescens* Wall. ex Roxb. (MI-1589)

Local Name: Banafsha.

Habitat: Forest floors, hedgerows, rock crevices and along walking tracks in hilly areas between 1500-2600m.

Part(s) used: Whole plant.

Ethnobotanical uses: Flowers of *Viola canescens*, fruits of *Zizyphus jujuba*, roots of *Glycerrhiza glabra* and fruits od *Foeniculum vulgare* are taken in a proportion of 2:4:4:1 and boiled together in water for 30-45 minutes to make a concoction. 3-5 tablespoons (half cup) of the concoction is taken three times a day as a demulcent to treat cough, bronchospasm, catarrh and phlegmatic cough. A decoction of the whole plant is taken two times a day for treating fever of unknown reason or from malaria. The dose is half cup for 2-3 weeks.

Collection season: March-July.

Family: **117. Vitaceae**

Botanical name: *449. Parthenocissus quinquefolia* (L.) Planch. (MI-1809)

Local Name: Kwar Zeelai.

Habitat: Grown in homes along walls as ornamental climber.

Part(s) used: Whole plant, leaves.

Ethnobotanical uses: Dried leaves are boiled in water for 10 minutes to make a decoction. Half cup of the decoction is taken two times a day for eliminating jaundice.

The plant is grown in homes along walls as an ornamental plant.

Collection season: April-August.

Botanical name: *450. Vitis jacquimontii* Parker (MI-1590)

Local Name: Gedarh Kwar.

Habitat: Grows as climber on other trees or rocks in mid hill elevations especially in the Chir pine and blue pine zones between 1300-2200m.

Part(s) used: Fruits.

Ethnobotanical uses: Half kilogram of fresh fruits are eaten as body tonic and cooling

agent, causing sweating and perspiration. 20 grams of dried fruits are taken orally with water as laxative to eliminate constipation.

The ripe fruits are sore and edible.

Collection season: August-September

Botanical name: *451. Vitis vinefera* L. (MI-1591)

Local Name: Kwar.

Habitat: Cultivated in homes and along hedgerows up to 2500m.

Part(s) used: Fruits.

Ethnobotanical uses: The dried fruits are eaten to clear the throat and sound. About 20-30 grams of dried fruits (Raisins) are soaked in water and eaten as laxative to prevent and eliminate constipation. Fresh leaves of the plant are ground into a paste and rubbed on the forehead and temples for a relief from headache and migraine.

The fruits are very delicious and sweet. The fresh fruits are considered cooling agents. The dried fruits are a preferred dry fruits especially for winter season and also used in different dishes.

Collection season: July-September.

Family: 118. Xanthorrhoeaceae

Botanical name: *452. Hemerocallis fulva* (L.) L. (MI-1592)

Local Name: Gwalghutai.

Habitat: Cultivated as ornamental and an escape in wild found in forest meadows near water and moist places between 1300-2600m.

Part(s) used: Flowers, tubers

Ethnobotanical uses: An aqueous extract of the floral leaves is used as a blood purifier

The tubers are used as a vegetable. The flowers are used as a salad and garnish. The plant is grown as ornamental.

Collection season: May-July

Family: 119. Zygophyllaceae

Botanical name: *453. Tribulus terrestris* L. (MI-1593)

Local Name: Markundai

Habitat: Weed of drier, open arable lands and uncultivated places up to 2400m.

Part(s) used: Fruits

Ethnobotanical uses: One table spoon of dried pulverized powder of the fruit is mixed with a cup of curd and given to children to stop bed wetting. Two tablespoons of powdered fruit is taken with a glass of water by adults to treat painful, burning micturition and urine retention. Two tablespoons of powdered fruits mixed in half cup of honey is taken daily for male impotence, resulting in enhancement of libido and male fertility. Fifty grams of dried fruits are boiled in a litre of water till half of the water is evaporated. The decoction is cooled and filtered. Half cup of the decoction is taken after meals for treating gas trouble, flatulence, headache and stomachache.

Collection season: July-October.

3.5 DISCUSSION

Different societies have different biodiversity around them; there is diversity in their food habits, occupations, daily routine, social customs, needs and notions about natural phenomena. The circumstances have given rise to very diverse experiences among indigenous societies about plant wealth around them. Over generations, this has made very rich addition to the interrelationships between man and plant wealth around him (Jain, 2000). The present study indicated that the indigenous people of Kabal valley are very knowledgeable about the plant resources around them. Out of the total 820 species, 553 were locally used for different purposes. Based on the methodology of applied Ethnobotany (Martin, 2001), the plants were classified into eight main local use classes, which include medicinal plants, fodder and forage species, fuel wood, food, tools making, ethnoveterinary, construction and miscellaneous plants.

3.5.1 QAUNTITATIVE ETHNOBOTANY

From the ethnobotanical inventory, the secondary data was extracted by using excel spreadsheet to draw tables and graphs along with standard formulae to understand the extant of information lying with the indigenous communities. The detail is as follows:

3.5.1.1 Family importance index (FII)

The present enumeration indicated that the native ethnobotanically used 453 plants which were belonged to 119 families. Amongst them, Poaceae was the leading family with 54 species that shared 11.92% of the ethnobotanical flora (Table 3.1). Since the area is low hilly to high mountainous terrain, nature gifted grasses to bind soil as well as to provide fodder/forage to animals. Almost, the same proportionte of grasses is reported from the deserts of Pakistan (Qureshi, 2012). Rosaceae was the second largest family of the study area that represented by 32 species (7.06%). It was followed by Fabaceae (29 spp., 6.40%), Lamiaceae (26 spp., 5.74%), Asteraceae 21 spp., 4.64%), Solanaceae 15 spp., 3.31%), Brassicaceae (14 spp., 3.09%), Polygonaceae (11 spp., 2.43%), Ranunculaceae (10 spp., 2.21%) and Cucurbitaceae (9 spp., 1.99%). The remaining 109 families shared 1-7 species (Table 3.1).

3.5.1.2 Habit of the ethnobotanical flora

The habit/growth forms revealed that there were eight forms of the ethnoflora (Fig. 3.1). Perennial herbs were the most commonly used growth form by the natives with 161 species (35.54%). It was followed annual herbs (145 spp., 32.01%), deciduous trees (85 spp., 18.76%), evergreen shrubs (22 spp., 4.86%), evergreen trees (17 spp., 3.75%), climbers (11 spp., 2.43%), biennial herbs (9 spp., 1.99%), while parasites represented by three species (0.66%).

3.5.1.3 Use value categories (UVC) of valuable species

In all, eight use value categories (UVC) viz., construction, ethno-veterinary, fodder, food, fuel, medicinal, miscellaneous and tools were recognized from 453 ethbotanical taxa. The UVC for all plants is compiled in Table 3.2. The data revealed that *Juglans regia, Morus alba, M. macroura, M. nigra* and *Olea ferruginea* were the most important species which were utilized by the natives to fulfill their all eight major use categories. The other important species were *Cotoneaster racemiflorus, Melia azedarach, Pinus roxburghii,* and *Prunus cornuta* that fulfilled seven human need categories and accordingly ranked second in nature. It was followed by *Aesculus indica, Cedrus deodara*, *Ficus palmata, Hibiscus cannabinus, Indigofera heterantha, Juniperus communis, Prunus persica, Punica protopunica, Quercus baloot, Taxus wallichiana, Zanthoxylum armatum* and *Ziziphus jujuba* which were used in six use categories (Table 3.2).

The summary of the UVC is provided in Fig. 3.2 that revealed an inversely proportional relationship to the use categories number (i.e. the most useful plants are less in number). It is indicated that six species were used in 8 major use categories, 7 UVC (7 spp.), 6 UVC (13 spp.), 5 UVC (26 spp.), 4 UVC (54 spp.), 3UVC (93 spp.), 2 UVC (162 spp.), while 92 species were used in fulfilling single use categories. This kind of census depicts the anthropogenic pressure on the valuable plant species in the study area (Khan et al., 2012; Khan et al., 2013b).

The census of ethnobotanical information is provided in Fig. 3.3. Most of the species were used as folk medicine (344 spp., 75.94%), since the area has rich diversity of flora due to different habitat types and geomorphic features. Generally, the people living in the area are solely dependant on medicinal plants to overcome their health problems due to unavialability of modern health facilities and far flung from the cities. The same kind of work is reported by

Qureshi and Bhatti (2008) from Nara Desert, Pakistan and Ilyas *et al.* (2013) from Qalagai hills, Swat, who reported that the inhabitants living in rural areas possess empirical knowledge of plants to be used as medicaments. Another reason could be relience on natural drugs because of popular theme as no or less side effects and long lasting effects. Such kinds of data is reported from Africa reporting great majority of plants for medicinal purpose (Lykke *et al.,* 2004; Belem *et al.,* 2007; Cheikhyoussef *et al.,* 2011; Nadembega *et al.,* 2011), showing dependency of plant wealth for their health needs. It is contradicted from Western world, who rely on modern lifestyle and allopathic medicines (Sop *et al.,* 2012).

Another group of plants were miscellaneously used (216 spp., 47.68%), followed by food (205 spp., 45.25%). People who are engaged in livestock rearing were more experienced in fodder/forage species and Gujjar community of the study area possessed a very good account on such plants. This group by nature is semi-nomadic which are familiar with plants and without doubt using plant resources for their subsistence. The said indigenous community by profession is herd keeping in nature and hence it is not surprising that a good number of species (153 spp., 33.77%) would be consumed as fodder (Fig. 3.3). Elsewhere nomads are more knowledgeable about the use of fodder species (Ayantunde *et al.,* 2008).

The area possessed plentyful number of species which are used as fuel, since there is no alternate source of energy (Shaheen *et al.,* 2011). People are very much selective for such species and 94 taxa (20.75%) were used for this purpose (Fig. 3.3). It was followed by ethno-veterinary (90 spp., 19.87), tools (63 spp., 13.91%) and construction (41 spp., 9.05%).

3.5.1.4 Use value indexation

Use value indexation (Phillips *et al.,* 1994) is a quantitative ethnobotanical technique that compares the importance of plant species within indigenous communities with respect to their uses that reflects the cultural value system and help in identifying conservation prioritoization (Albuquerque *et al.,* 2006). In Kabal valley, Swat, Pakistan, plant species with

highest use values (Table 3.1) were *Morus alba* (3.46), *Juglans regia* (3.28), *Morus macroura* (3.19), *Olea ferruginea* (3.18), *Cedrus deodara* (3.14) *Berberis lyceum* (3.09) and *Isodon rugosus* (3.08). All these are multipurpose plants utilized for subsistence by the local people and are under severe exploitation pressure. *Juglans regia* and *Cedrus deodara* has also highest use values from other Himalayan valleys (Khan *et al.*, 2013b). For effective conservation of such plant resources a convergence of indigenous knowledge with scientific information could bring a positive result (Hu Huabin, 2002; Bisong and Essien, 2010).

Highest extent of ethnobotanical knowledge was recorded for old age group (more than 50 years) and among each age group females were more knowledgeable than males as shown in table 3.2 and Fig. 3.4. These findings are in line with Qureshi *et al.* (2009).

3.5.2 Some novel ethnobotanical uses

Compared with studies from neighboring areas (Ali and Qaiser, 2009; Sher and Hussain, 2009; Ahmad *et al.*, 2011; Akhtar *et al.*, 2013; Ilyas *et al.*, 2013; Khan *et al.*, 2013a) Kabal valley is significantly richer in ethnobotanically important flora and indigenous knowledge. Uses of many plants are similar as reported by other workers from diverse regions of the world (Ayantunde *et al.*, 2008; Lulekal *et al.*, 2008; Agbogidi, 2010; Cheikhyoussef *et al.*, 2011; Nadembega *et al.*, 2011) but a large number of species and their particular uses have been reported for the first time. Some unique and new claimed uses, especially the medicinal uses are of great significance such as *Sarcococca saligna* used for rejuvenation and eliminating the effect of aging, *Solanum nigrum* used for malaria and hepatitis, *Artemisis capillaris* used for treatment and prophylaxis of malaria, *Vitex negundo* used for tumors, urticaria and allergies etc. need to be validated by ethnopharmacological and phytochemical screening (Bisong and Essien, 2010; Qureshi, 2012).

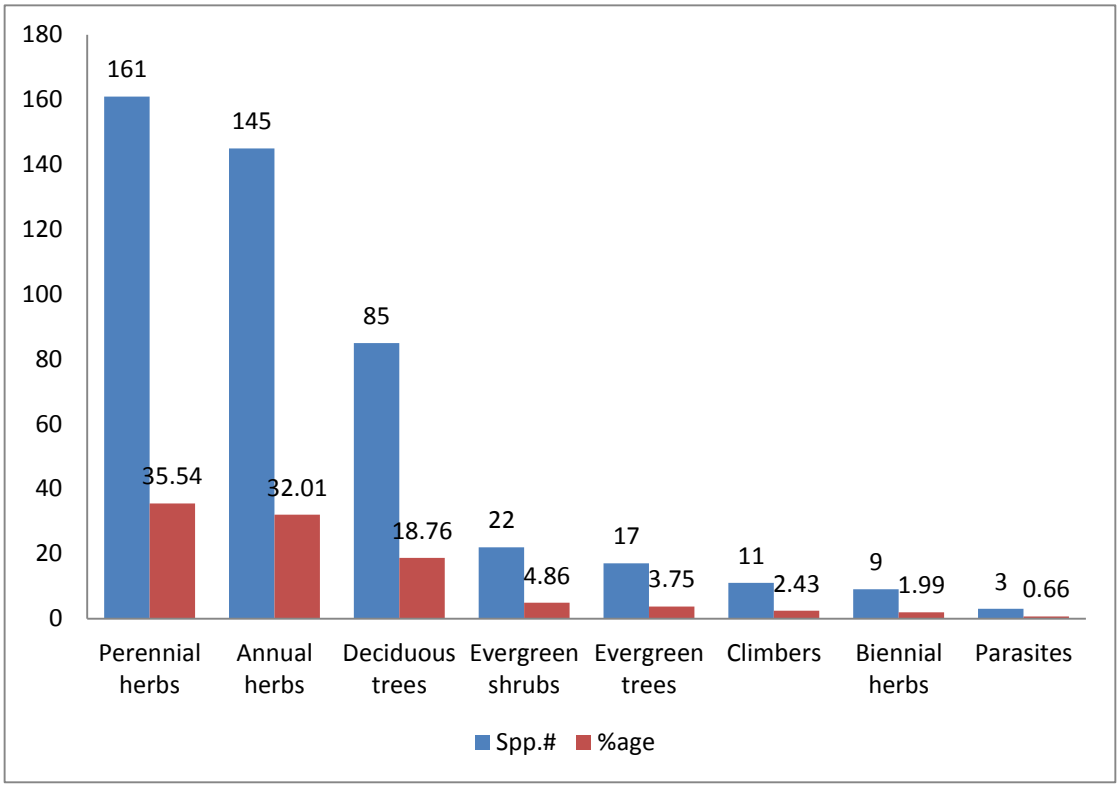

Fig. 3.1: Habit/growth form of the ethnobotanical flora.

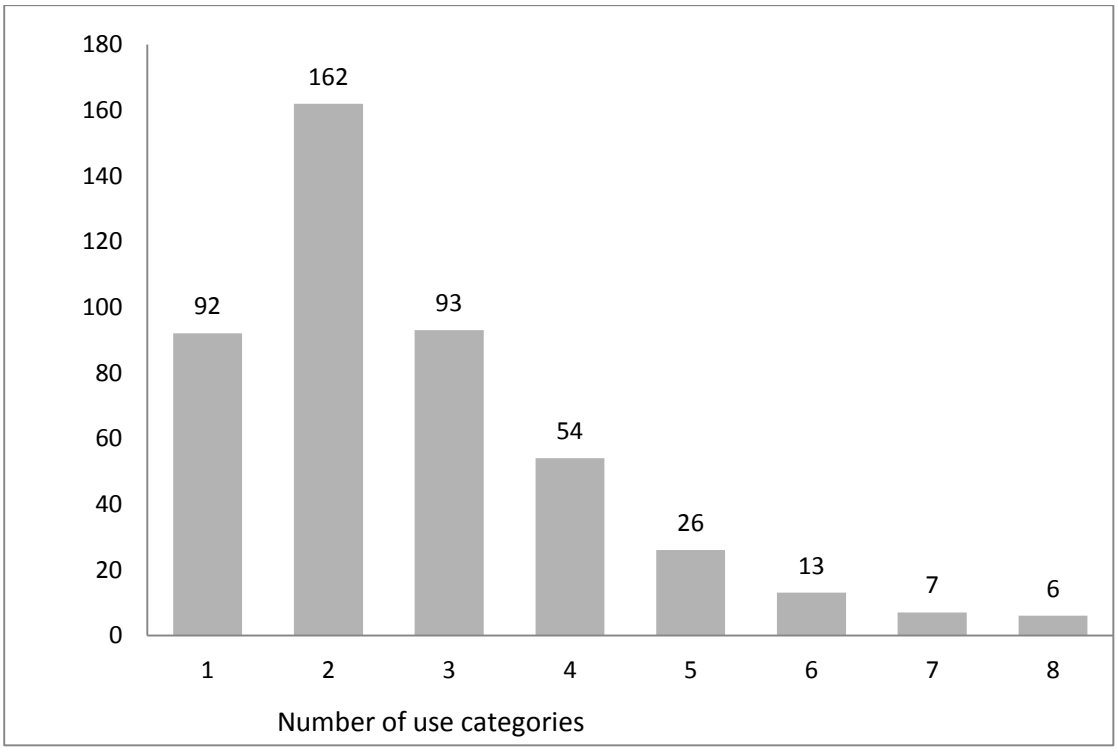

Fig. 3.2: Number of taxa used in eight major use categories.

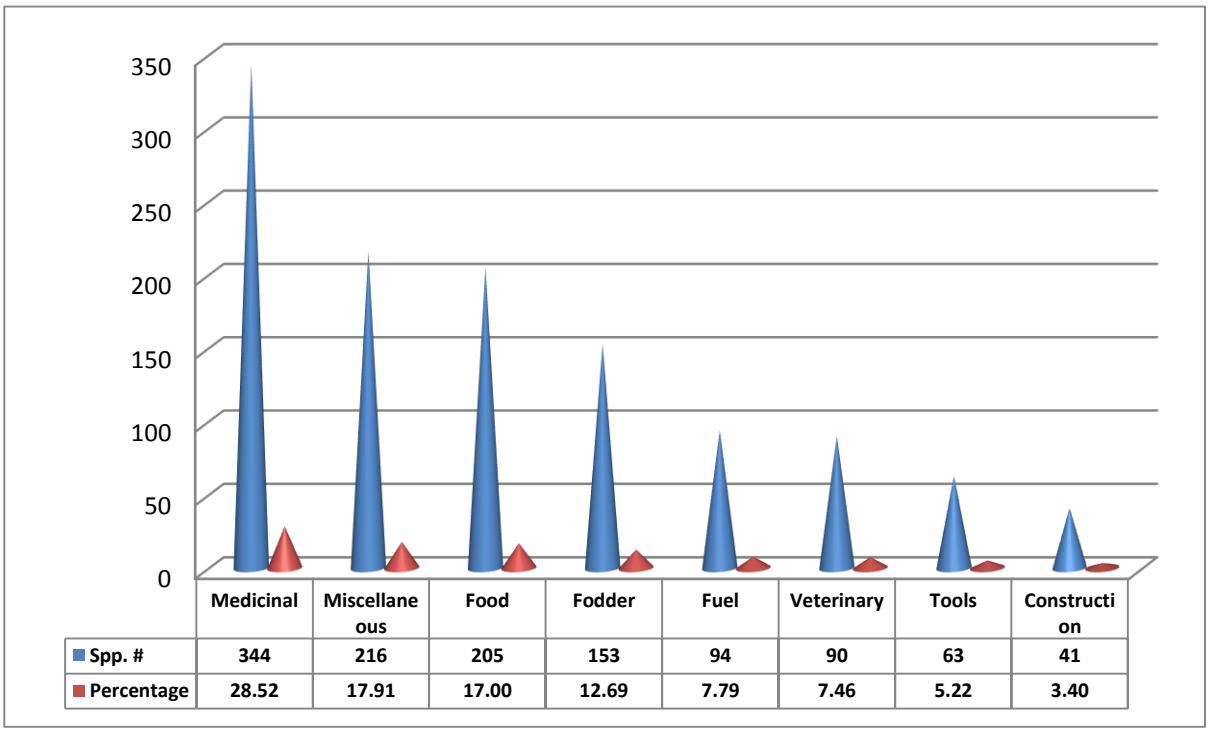

Fig. 3.3: Ethnobotanical use of the native flora.

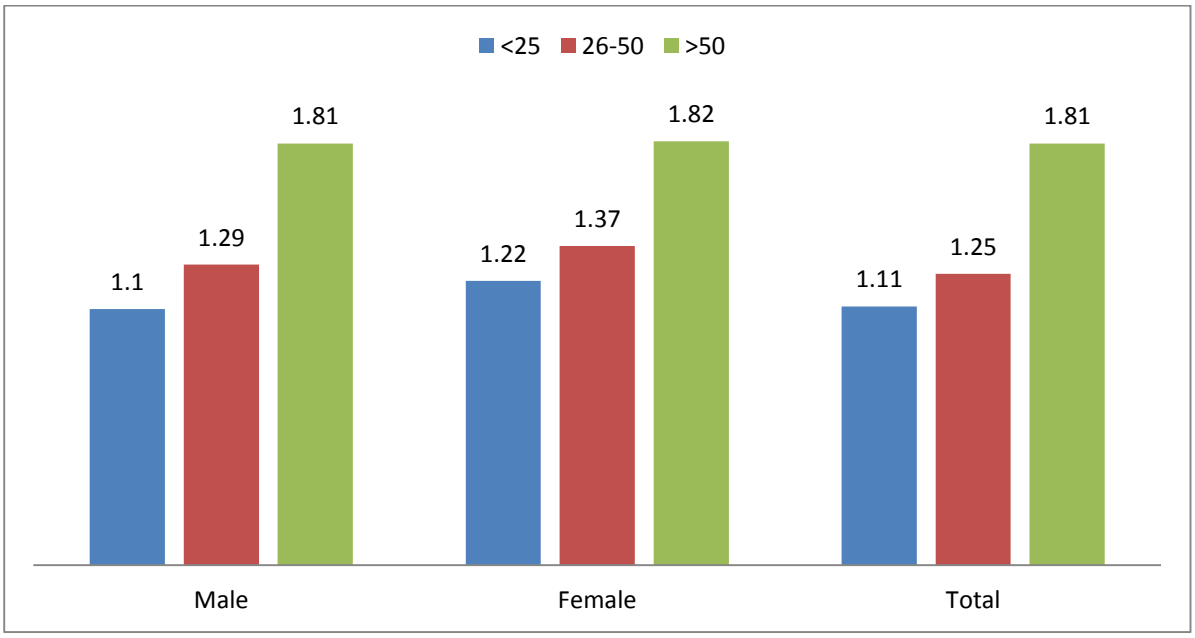

Fig. 3.4: Age wise and gender wise extent of Ethnobotanical knowledge.

Table 3.1: Use value Index of the ethnobotanical flora of Kabal valley, Swat.

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
1	*Abelmoschus esculentus* (L.) Moench	87	16	0	12	0	0	0	9	124	87	1.43
2	*Abies pindrow* Royle	0	8	0	0	45	0	45	9	107	45	2.38
3	*Acacia modesta* Wall.	0	0	16	40	0	0	0	37	93	43	2.16
4	*Acacia nilotica* (L.) Delile	0	3	2	7	0	0	0	2	14	7	2.00
5	*Acer cappadocicum* Gleditsch	0	0	0	13	0	0	11	0	24	14	1.71
6	*Achillea millefolium* L.	0	6	3	0	0	0	0	4	13	12	1.08
7	*Achyranthes aspera* L.	0	40	0	0	0	0	0	12	52	47	1.11
8	*Aconitum laeve* Royle	0	19	0	0	0	0	0	8	27	20	1.35
9	*Acorus calamus* L.	5	40	0	0	4	0	0	2	51	43	1.19
10	*Acrachne racemosa* (Heyne ex Roem. & Schult.) Ohwi	0	0	18	0	0	0	0	0	18	18	1.00
11	*Adiantum capillus-veneris* L.	0	41	0	0	0	0	0	34	75	45	1.67
12	*Adiantum caudatum* L.	0	15	0	0	0	0	0	0	15	15	1.00
13	*Adiantum venustum* D. Don	0	32	0	0	0	0	0	0	32	32	1.00
14	*Aesculus indica* (Wall.ex Camb.) Hook.f.	0	43	5	4	23	34	5	0	114	68	1.68
15	*Agave americana* L	2	5	0	0	0	0	0	7	14	8	1.75
16	*Agrimonia eupatoria* L.	8	12	0	0	0	0	0	0	20	15	1.33
17	*Ailanthus altissima* (Mill.) Swingle	0	0	41	53	0	23	0	7	124	53	2.34
18	*Ajuga bracteosa* Wall. ex Benth.	0	55	0	0	0	0	0	0	55	55	1.00
19	*Ajuga parviflora* Benth.	0	50	0	0	0	0	0	0	50	50	1.00

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
20	*Alcea rosea* L.	0	8	0	0	0	0	0	16	24	18	1.33
21	*Alisma plantago-aquatica* L.	13	15	0	0	0	0	0	0	28	23	1.22
22	*Alliaria petiolata* (M. Bieb.) Cavara & Grande	7	5	0	0	0	0	0	0	12	11	1.09
23	*Allium ampeloprasum* var. *porrum* (L). Regel	59	25	0	0	0	0	0	0	84	59	1.42
24	*Allium cepa* L	87	78	0	0	0	0	0	34	199	87	2.29
25	*Allium sativum* L.	78	66	0	0	0	0	0	0	144	78	1.85
26	*Alnus nitida* (Spach) Endl.Gen.	0	6	0	21	2	0	9	0	38	21	1.81
27	*Aloe vera* (L.) Burm. F.	0	22	0	0	0	0	0	25	47	31	1.52
28	*Alopecurus myosuroides* Huds.	2	7	18	0	0	0	0	0	27	21	1.29
29	*Amaranthus graecizans* L.	60	25	56	0	0	0	0	0	141	60	2.35
30	*Amaranthus spinosus* L.	0	9	35	0	0	10	0	0	54	53	1.02
31	*Amaranthus viridis* L.	62	24	0	0	0	0	0	0	86	65	1.32
32	*Anagallis arvensis* L.	8	0	0	0	0	0	0	5	13	11	1.18
33	*Anaphalis margaritacea* (L.) Benth.	0	9	0	0	0	0	0	6	15	12	1.25
34	*Andrachne cordifolia* (Wall. ex Decne.) Muell. Avg.	0	0	12	0	0	18	0	0	30	29	1.03
35	*Androsace rotundifolia* Hardwicke	0	17	0	0	0	0	0	14	31	21	1.48
36	*Apluda mutica* L.	0	6	47	0	0	9	0	0	62	47	1.32
37	*Aquilegia pubiflora* Wall. ex Royle	0	30	4	0	0	7	0	0	41	32	1.28
38	*Arisaema flavum* (Forsk.) Schott	0	0	0	0	0	0	0	21	21	21	1.00
39	*Arisaema jacquemontii* Blume	0	23	0	0	0	0	0	24	47	46	1.02
40	*Aristida cyanantha* Nees ex Steud.	0	0	4	0	0	0	38	10	52	41	1.27

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
41	*Artemisia capillaris* Thunb.	0	20	0	0	0	0	0	0	20	20	1.00
42	*Artemisia scoparia* Waldst. & Kit.	0	60	0	56	0	0	45	8	169	67	2.52
43	*Artemisia vulgaris* L.	0	13	0	0	0	9	0	7	29	27	1.07
44	*Arthraxon prionodes* (Steud.) Dandy	0	0	15	0	0	0	0	0	15	15	1.00
45	*Arundo donax* L.	0	5	2	0	23	0	26	12	68	34	2.00
46	*Asparagus adscendens* Roxb.	55	35	0	0	0	0	16	8	114	56	2.04
47	*Asparagus filicinus* Buch.-Ham. ex D. Don	0	26	0	0	0	0	0	0	26	26	1.00
48	*Asparagus officinalis* L	2	4	0	0	0	0	0	4	10	10	1.00
49	*Asplenium trichomanes* L.	0	15	0	0	0	0	0	0	15	15	1.00
50	*Astragalus candolleanus* Royle ex Benth.	0	12	8	0	0	0	0	0	20	18	1.11
51	*Astragalus graveolens* Buch.-Ham.ex Benth.	12	0	8	0	0	0	0	0	20	15	1.33
52	*Astragalus pyrrhotrichus* Boiss.	5	0	0	0	0	0	0	10	15	12	1.25
53	*Avena fatua* L.	0	0	38	0	0	12	0	0	50	38	1.32
54	*Avena sativa* L.	12	23	34	0	0	25	0	0	94	34	2.76
55	*Barleria cristata* L.	0	11	0	0	0	0	0	5	16	13	1.23
56	*Berberis lycium* Royle	54	67	19	44	0	23	0	0	207	67	3.09
57	*Bergenia ciliata* (Haw.)Sternb.	0	63	0	0	0	0	0	12	75	65	1.15
58	*Bistorta amplexicaulis* (D. Don) Green	0	67	23	0	0	0	0	0	90	67	1.34
59	*Boerhavia procumbens* Banks ex Roxb.	0	10	7	0	0	0	0	0	17	16	1.06
60	*Bosea amherstiana* (Moq.) Hook. f.	0	6	0	0	0	0	0	12	18	13	1.38
61	*Bothriochloa bladhii* (Retz.) S.T. Blake	0	0	9	0	0	0	6	7	22	12	1.83

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
62	Brachiaria ramosa (L.) Stapf	0	0	55	0	0	0	0	18	73	55	1.33
63	Brassica juncea (L.) Czern. et Coss.	23	13	0	0	0	0	0	0	36	34	1.06
64	*Brassica napus* L.	15	7	14	0	0	0	0	4	40	15	2.67
65	Brassica rapa subsp. campestris (L.) Clapham	53	23	48	0	0	17	0	4	145	54	2.69
66	*Bromus pectinatus* Thunb.	0	0	12	0	0	0	0	0	12	12	1.00
67	*Broussonetia papyrifera* (L.) L'Herit. ex Vent.	4	0	0	12	0	0	0	0	16	12	1.33
68	*Buddleja crispa* Benth.	0	6	0	24	0	0	0	0	30	25	1.20
69	*Bunium persicum* (Boiss.) Fedtsch.	25	0	0	0	0	0	0	0	25	25	1.00
70	*Buxus wallichiana* Baill.	0	10	0	12	0	5	13	3	43	19	2.26
71	*Caesalpinia decapetala* (Roth) Alston	0	8	0	0	0	0	0	8	16	12	1.33
72	*Calendula arvensis* L.	0	15	0	0	0	0	0	0	15	15	1.00
73	*Calotropis procera* subsp. *hamiltonii* (Wight) Ali	0	4	0	0	0	6	0	4	14	14	1.00
74	*Caltha alba* Camb.	20	12	0	0	0	0	0	0	32	21	1.52
75	*Canna indica* L.	0	5	0	0	0	0	11	15	31	16	1.94
76	*Cannabis sativa* L.	0	12	0	0	0	23	0	12	47	34	1.38
77	*Capsella bursa-pastoris* (L.) Medik.	0	8	6	0	0	5	0	0	19	18	1.06
78	*Capsicum annuum* L.	25	0	0	0	0	0	0	0	25	25	1.00
79	*Capsicum frutescens* L.	65	45	0	0	0	0	0	0	110	65	1.69
80	*Cardiospermum halicacabum* L.	4	5	0	0	0	0	0	0	9	8	1.13
81	*Carex canescens* L.	0	0	12	0	0	0	0	0	12	12	1.00
82	*Carthamus oxyacantha* Bieb.	52	24	0	0	0	0	0	0	76	53	1.43

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
83	*Cedrus deodara* (Roxb. ex D. Don) G. Don	0	24	0	56	74	43	23	12	232	74	3.14
84	*Celosia argentea* L.	5	3	6	0	0	0	0	5	19	13	1.46
85	*Celtis caucasica* Willd.	12	0	12	13	0	0	0	0	37	13	2.85
86	*Celtis eriocarpa* Decne.	34	0	45	54	0	0	0	23	156	55	2.84
87	*Celtis tetrandra* Roxb.	13	0	16	11	0	0	7	0	47	32	1.47
88	*Cestrum nocturnum* L.	0	0	0	0	0	5	0	15	20	15	1.33
89	*Ceterach dalhousiae* (Hook.) C. Chr.	0	11	0	0	0	0	0	13	24	21	1.14
90	*Chenopodium album* L.	78	34	34	0	0	23	0	6	175	87	2.01
91	*Chenopodium ambrosioides* L.	0	18	0	0	0	9	0	12	39	36	1.08
92	*Chenopodium botrys* L.	0	12	0	0	0	0	0	16	28	23	1.22
93	*Chenopodium murale* L.	22	0	0	0	0	0	0	0	22	22	1.00
94	*Chrysopogon gryllus* (L.) Trin.	0	0	32	0	0	12	0	0	44	32	1.38
95	*Chrysopogon serrulatus* Trin.	0	0	11	0	0	0	0	0	11	11	1.00
96	*Cichorium intybus* L.	51	45	0	0	0	16	0	0	112	55	2.04
97	*Citrullus lanatus* (Thunb.) Mats. & Nakai	45	13	0	0	0	0	0	6	64	45	1.42
98	Citrus sinensis (L.) Osbeck	34	16	0	0	0	0	0	13	63	34	1.85
99	*Clematis grata* Wall.	0	15	0	0	0	11	0	0	26	23	1.13
100	*Clematis montana* Buch. -Ham. ex DC	0	12	0	0	0	0	0	0	12	12	1.00
101	*Clinopodium vulgare* L.	0	5	6	0	0	0	0	0	11	10	1.10
102	*Colchicum luteum* Baker	0	28	0	0	0	0	0	0	28	28	1.00
103	Colocasia esculenta (L.) Schott	67	0	0	0	0	0	0	23	90	67	1.34

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
104	*Commelina benghalensis* L.	0	6	44	0	0	0	0	0	50	45	1.11
105	*Conium maculatum* L.	0	0	0	0	0	0	0	10	10	10	1.00
106	*Convolvulus arvensis* L.	0	6	8	0	0	5	0	5	24	14	1.71
107	*Conyza canadensis* (L.) Cronq.	0	11	0	0	0	0	0	0	11	11	1.00
108	*Corchorus olitorius* L.	18	8	0	0	0	0	0	0	26	21	1.24
109	*Coriandrum sativum* L.	67	65	0	0	0	0	0	0	132	67	1.97
110	*Cornus macrophylla* Wall. ex Roxb.	43	51	0	17	0	0	0	0	111	53	2.09
111	*Cotinus coggyria* Scop.	0	5	0	33	0	0	5	0	43	33	1.30
112	*Cotoneaster microphyllus* Wall. ex Lindl.	3	0	6	5	0	0	0	4	18	12	1.50
113	*Cotoneaster nummularius* Fisch. & C.A. Mey.	0	4	0	11	0	0	8	0	23	11	2.09
114	*Cotoneaster racemiflorus* (Desf.) K. Koch	9	12	11	23	12	0	6	5	78	41	1.90
115	*Cucumis melo subsp. agrestis* (Naud.) Grebensc.	0	0	0	0	0	5	0	13	18	15	1.20
116	*Cucumis sativus* L.	59	13	0	0	0	0	0	13	85	59	1.44
117	*Cucurbita maxima* Duch. ex Lam.	37	14	0	0	0	0	0	0	51	37	1.38
118	*Cupressus sempervirens* L.	0	3	0	5	1	4	3	1	17	12	1.42
119	*Cuscuta reflexa* Roxb.	0	35	0	0	0	0	0	0	35	35	1.00
120	*Cydonia oblonga* Mill.	26	18	0	0	0	0	0	0	44	26	1.69
121	*Cymbopogon jwarancusa* (Jones) Schult.	0	7	6	0	0	0	0	9	22	13	1.69
122	Cynodon dactylon (L.) Pers.	0	6	54	0	0	23	0	34	117	54	2.17
123	*Cyperus rotundus* L.	0	4	8	0	0	0	0	0	12	10	1.20
124	*Dactylis glomerata* L.	0	0	20	0	0	0	0	0	20	20	1.00

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
125	Dactyloctenium aegyptium (L.) Willd.	0	12	27	0	0	0	0	0	39	34	1.15
126	*Dactylorhiza hatagirea* (D.Don) Soo	0	15	0	0	0	0	0	0	15	15	1.00
127	*Dalbergia sissoo* Roxb.	0	3	0	7	7	0	7	0	24	9	2.67
128	*Daphne mucronata* Royle	4	8	0	17	0	8	0	6	43	18	2.39
129	*Datura stramonium* L.	0	38	0	0	0	14	0	9	61	45	1.36
130	*Debregeasia saeneb* (Forssk.) Hepper & J.R.I.Wood	12	8	0	8	0	0	0	4	32	25	1.28
131	*Delphinium denudatum* Wall. ex Hook. & Thoms.	0	18	0	0	0	18	0	5	41	21	1.95
132	*Descurainia sophia* (L.) Webb ex Prantl	3	5	5	0	0	0	0	0	13	12	1.08
133	*Desmodium elegans* DC.	0	15	8	13	0	0	0	0	36	22	1.64
134	Desmostachya bipinnata (L.) Stapf	0	4	8	0	0	4	0	5	21	21	1.00
135	*Dichanthium annulatum* (Forssk.) Stapf	0	0	33	0	0	0	13	17	63	39	1.62
136	*Digera muricata* (L.) Mart.	5	5	43	0	0	0	0	0	53	45	1.18
137	*Digitaria sanguinalis* (L.) Scop.	0	6	20	0	0	0	0	0	26	22	1.18
138	*Diospyros kaki* L. f	50	12	0	0	0	0	0	0	62	50	1.24
139	*Diospyros lotus* L.	54	0	0	45	6	0	13	0	118	54	2.19
140	Dodonaea viscosa (L.) Jacq.	0	34	0	87	34	27	0	14	196	87	2.25
141	Dryopteris filix-mas (L.) Schott	0	5	0	0	0	8	0	0	13	12	1.08
142	*Dryopteris juxtaposita* H. Christ	45	0	0	0	0	0	0	0	45	45	1.00
143	*Duchesnea indica* (Andrews) Focke	37	10	0	0	0	0	0	0	47	41	1.15
144	*Duranta repens* L.	0	5	0	0	0	0	0	11	16	11	1.45
145	Echinochloa colona (L.) Link	0	0	42	0	0	0	0	5	47	45	1.04

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
146	Echinochloa crus-galli (L.) P. Beauv.	0	4	6	0	0	2	0	5	17	12	1.42
147	*Eclipta prostrata* (L.) L.	0	6	0	0	0	5	0	0	11	11	1.00
148	*Elaeagnus umbellata* Thunb.	23	19	0	16	0	0	0	8	66	33	2.00
149	Eleusine indica (L.) Gaertn.	0	7	8	0	0	0	0	0	15	13	1.15
150	*Epilobium hirsutum* L.	0	8	0	0	0	6	0	0	14	13	1.08
151	*Equisetum arvense* L.	0	12	0	0	0	0	0	0	12	12	1.00
152	Eragrostis pilosa (L.) P. Beauv.	0	0	11	0	0	0	0	0	11	11	1.00
153	*Eriobotrya japonica* (Thunb.) Lindl.	45	14	0	0	0	0	0	12	71	45	1.58
154	*Eruca sativa* Mill.	4	7	0	0	0	0	0	4	15	11	1.36
155	*Eucalyptus camaldulensis* Dehnh.	0	5	0	9	9	0	0	3	26	12	2.17
156	*Eulaliopsis binata* (Retz.) C.E. Hubbard	0	0	0	0	0	0	13	15	28	15	1.87
157	*Euonymus hamiltonianus* Wall. in Roxb.	0	0	9	8	0	0	7	0	24	23	1.04
158	*Euphorbia helioscopia* L.	0	0	0	0	0	23	0	26	49	40	1.23
159	*Euphorbia hirta* L.	0	10	0	0	0	5	0	0	15	12	1.25
160	*Euphorbia prostrata* Ait.	0	30	0	0	0	0	0	0	30	30	1.00
161	*Euphorbia wallichii* Hook. f.	0	12	0	0	0	15	0	0	27	20	1.35
162	*Ficus carica* L.	34	30	0	0	0	0	0	8	72	34	2.12
163	*Ficus palmata* Forssk.	56	34	12	34	0	12	0	6	154	69	2.23
164	*Ficus sarmentosa* Bush: Ham. ex J.E. Smith	5	0	0	0	0	0	0	13	18	15	1.20
165	*Foeniculum vulgare* Mill.	83	83	0	0	0	0	0	0	166	83	2.00
166	*Fragaria nubicola* (Hook.f.) Lindl. ex Lacaita	52	29	0	0	0	0	0	0	81	52	1.56

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
167	*Fumaria indica* (Hausskn.) Pugsley	0	40	0	0	0	0	0	0	40	40	1.00
168	*Galium aparine* L.	3	5	4	0	0	0	0	0	12	9	1.33
169	*Galium rotundifolium* L.	0	6	6	0	0	0	0	0	12	11	1.09
170	*Geranium ocellatum* Camb.	0	15	0	0	0	0	0	0	15	15	1.00
171	*Geranium Swatense* Schönb.-Tem.	0	35	0	0	0	0	0	0	35	35	1.00
172	*Geum urbanum* L.	5	20	0	0	0	0	0	6	31	23	1.35
173	*Grewia optiva* Drummond ex Burret	12	0	15	0	0	12	0	0	39	15	2.60
174	*Hedera nepalensis* K. Koch	0	40	0	0	0	0	0	0	40	40	1.00
175	*Helianthus annuus* L.	30	7	0	17	0	0	0	9	63	31	2.03
176	*Helianthus tuberosus* L.	20	0	0	0	0	5	0	0	25	23	1.09
177	Hemarthria compressa (L.f) R. Br.	0	0	11	0	0	0	0	0	11	11	1.00
178	*Hemerocallis fulva* (L.) L.	2	5	0	0	0	0	0	8	15	9	1.67
179	Heteropogon contortus (L.) P. Beauv. ex Roem. & Schult.	0	0	32	0	13	5	0	6	56	43	1.30
180	*Hibiscus cannabinus* L.	5	5	0	23	0	6	6	9	54	29	1.86
181	*Hibiscus syriacus* L.	4	6	0	6	0	0	0	12	28	15	1.87
182	*Hordeum murinum* L.	0	9	0	0	0	0	0	0	9	9	1.00
183	*Hordeum vulgare* L.	37	25	56	0	0	0	0	0	118	56	2.11
184	*Hylotelephium ewersii* (Ledeb.) H. Ohba	0	5	4	0	0	3	0	1	13	5	2.60
185	Hyparrhenia hirta (L.) Stapf	0	0	31	0	5	0	4	5	45	31	1.45
186	*Hypericum perforatum* L.	23	27	0	0	0	15	0	11	76	37	2.05
187	*Impatiens glandulifera* Royle	0	8	0	0	0	0	0	6	14	12	1.17

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
188	*Impatiens pallida* Nutt.	0	8	0	0	0	0	0	0	8	8	1.00
189	Imperata cylindrica (L.) Raeuschel.	0	3	3	0	2	0	0	5	13	13	1.00
190	*Indigofera heterantha var. gerardiana* (Wall. ex Baker) Ali	0	34	12	45	24	0	23	6	144	87	1.66
191	Ipomoea purpurea (L.) Roth	0	5	0	0	0	0	0	10	15	10	1.50
192	*Iris germanica* L.	0	4	0	0	0	0	0	14	18	15	1.20
193	*Isachne himalaica* Hook.f.	0	0	8	0	0	0	0	0	8	8	1.00
194	*Isatis costata* C.A.Mey.	0	12	0	0	0	0	0	0	12	12	1.00
195	*Isodon rugosus* (Wall. ex Benth.) Codd	0	38	0	75	42	0	21	67	243	79	3.08
196	*Jasminum humile* L.	0	5	3	4	0	0	0	9	21	15	1.40
197	*Jasminum officinale* L.	3	12	3	0	0	0	0	23	41	25	1.64
198	*Juglans regia* L.	89	87	10	18	5	6	34	43	292	89	3.28
199	*Juniperus communis* L. var. *saxatilis* Pallas	3	1	1	4	0	1	0	5	15	13	1.15
200	*Justicia adhatoda* L.	0	52	0	0	0	23	0	0	75	58	1.29
201	*Kochia scoparia* (L.) Schrad.	0	0	0	0	0	0	5	12	17	12	1.42
202	*Lablab purpureus* (L.) Sweet	11	5	0	0	0	0	0	0	16	11	1.45
203	*Lactuca serriola* L.	15	0	0	0	0	0	0	0	15	15	1.00
204	*Lagenaria siceraria* (Molina) Standley	29	13	0	0	0	0	15	10	67	29	2.31
205	*Lamium album* L.	0	0	8	0	0	0	0	4	12	11	1.09
206	*Lamium amplexicaule* L.	23	10	33	0	0	0	0	0	66	34	1.94
207	*Lantana camara* L.	4	5	0	0	0	0	0	8	17	8	2.13
208	*Lathyrus aphaca* L.	18	0	14	0	0	0	0	0	32	23	1.39

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
209	*Lathyrus sphaericus* Retz	13	0	0	0	0	0	0	0	13	13	1.00
210	*Lens culinaris* Medic.	45	9	0	0	0	0	0	0	54	45	1.20
211	*Lepidium apetalum* Willd.	20	9	0	0	0	0	0	0	29	23	1.26
212	*Lepidium sativum* L.	31	60	0	0	0	0	0	0	91	65	1.40
213	*Lespedeza juncea* (L.f.) Pers.	0	8	6	0	0	0	5	0	19	14	1.36
214	*Leucas cephalotes* (Roth) Spreng	0	6	8	0	0	0	0	0	14	13	1.08
215	*Lilium polyphyllum* D.Don	0	9	0	0	0	6	0	1	16	12	1.33
216	*Limonium macrorhabdon* Kuntze	0	8	0	0	0	0	0	8	16	14	1.14
217	*Lolium temulentum* L.	0	0	18	0	0	15	0	0	33	23	1.43
218	*Lotus corniculatus* L.	0	8	7	0	0	0	0	0	15	13	1.15
219	*Luffa acutangula* (L.) Roxb.	27	21	0	0	0	0	8	13	69	27	2.56
220	*Lycopersicon esculentum* Miller	87	18	0	0	0	0	0	8	113	87	1.30
221	*Lycopus europaeus* L.	0	12	0	0	0	0	0	0	12	12	1.00
222	*Malus domestica* Borkh.	59	17	0	34	0	0	0	0	110	59	1.86
223	*Malva neglecta* Wallr.	33	12	19	0	0	0	0	0	64	34	1.88
224	*Malva parviflora* L.	23	11	0	0	0	0	0	6	40	23	1.74
225	Malvastrum coromendelianum (L.) Garcke	0	12	0	0	0	0	0	0	12	12	1.00
226	*Marrubium vulgare* L.	0	15	0	0	0	0	0	0	15	15	1.00
227	*Marsilea polycarpa* Hook. & Grev.	0	6	0	0	0	7	0	0	13	12	1.08
228	*Matricaria matricarioides* (Less.) Porter ex Britton	0	0	0	0	0	0	0	8	8	8	1.00
229	*Maytenus royleanus* (Wall. ex Lawson) Cufodontis	0	0	6	21	0	0	0	0	27	23	1.17

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
230	*Maytenus wallichiana* (Spreng.) Raju & Babu	0	0	0	10	0	0	0	7	17	15	1.13
231	*Mazus japonicus* (Thunb.) O. Kuntze	5	7	0	0	0	0	0	0	12	11	1.09
232	*Medicago lupulina* L.	5	2	6	0	0	0	0	0	13	13	1.00
233	*Medicago minima* (L.) L.	3	0	10	0	0	0	0	2	15	10	1.50
234	*Medicago polymorpha* L.	61	0	65	0	0	0	0	6	132	65	2.03
235	*Melia azedarach* L.	0	33	43	53	31	43	23	12	238	80	2.98
236	Melilotus indica (L.) All.	0	11	0	0	0	0	0	0	11	11	1.00
237	*Mentha longifolia* (L.) L.	98	80	0	0	0	16	0	17	211	98	2.15
238	*Mentha spicata* L.	65	58	0	0	0	0	0	0	123	65	1.89
239	*Micromeria biflora* (Buch.-Ham. ex D. Don) Benth.	0	15	0	0	0	0	0	16	31	30	1.03
240	*Mirabilis jalapa* L.	0	23	0	0	0	0	0	21	44	32	1.38
241	*Momordica charantia* L.	20	18	0	0	0	0	0	0	38	20	1.90
242	*Monochoria vaginalis* (Burm. f.) Presl	2	6	0	0	0	0	0	3	11	9	1.22
243	*Monotheca buxifolia* (Falc.) A. DC.	14	5	4	9	0	0	0	4	36	14	2.57
244	*Moraea sisyrinchium* (L.) Ker Gawl.	0	0	0	0	0	9	0	8	17	15	1.13
245	*Morus alba* L.	67	40	34	67	10	12	32	15	277	80	3.46
246	*Morus macroura* Miq.	50	12	23	30	3	10	33	11	172	54	3.19
247	*Morus nigra* L.	19	60	35	56	12	12	34	14	242	92	2.63
248	*Myrsine africana* L.	8	14	0	12	0	0	4	6	44	15	2.93
249	*Myrtus communis* L.	20	18	0	0	0	0	0	11	49	23	2.13
250	*Narcissus tazetta* L.	0	4	0	0	0	3	0	41	48	41	1.17

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251	*Nasturtium officinale* R. Br.	53	23	0	0	0	0	0	42	118	56	2.11
252	*Nepeta cataria* L.	0	14	0	0	0	10	0	6	30	25	1.20
253	*Nepeta erecta* (Boyle ex Benth.) Benth.	18	0	16	0	0	0	0	15	49	45	1.09
254	*Nerium oleander* L.	0	5	0	0	0	0	0	15	20	16	1.25
255	*Nicotiana tabacum* L.	0	5	0	7	0	6	0	35	53	40	1.33
256	*Notholirion thomsonianum* (D. Don) Stapf	0	6	0	0	0	0	0	12	18	15	1.20
257	*Ocimum basilicum* L.	5	10	0	0	0	5	0	7	27	25	1.08
258	*Oenanthe javanica* (Blume) DC.	20	0	0	0	0	0	0	0	20	20	1.00
259	*Oenothera rosea* L' Her. ex Ait.	0	7	5	0	0	0	0	0	12	11	1.09
260	*Olea ferruginea* Royle	59	68	44	49	19	45	45	37	366	115	3.18
261	*Onopordum acanthium* L.	21	17	0	0	0	0	0	0	38	23	1.65
262	*Ophiopogon intermedius* D. Don	0	0	0	0	0	0	0	11	11	11	1.00
263	*Opuntia monacantha* Haw.	8	9	0	0	0	0	0	4	21	13	1.62
264	*Origanum vulgare* L.	7	21	0	0	0	17	0	24	69	37	1.86
265	*Orobanche alba* Steph.	0	13	0	0	0	0	0	0	13	13	1.00
266	*Oryza sativa* L.	73	0	70	0	0	0	18	42	203	73	2.78
267	*Otostegia limbata* (Benth.) Boiss.	0	20	5	13	0	0	0	0	38	23	1.65
268	*Oxalis corniculata* L.	16	8	4	0	0	0	0	8	36	23	1.57
269	*Paeonia emodi* Wall. ex Royle	0	55	0	0	0	0	0	0	55	55	1.00
270	*Papaver dubium* L.	11	0	0	0	0	0	0	5	16	15	1.07
271	*Papaver somniferum* L.	25	40	0	23	0	12	0	13	113	45	2.51

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272	*Parnassia nubicola* ssp. *occidentalis* E.S-Temesy	5	8	0	0	0	0	0	0	13	12	1.08
273	*Parrotiopsis jacquemontiana* (Dcne.) Rehder	0	0	0	51	0	0	58	25	134	59	2.27
274	*Parthenocissus quinquefolia* (L.) Planch	0	4	0	0	0	0	0	10	14	10	1.40
275	*Paspalum dilatatum* Poir.	0	0	9	0	0	0	0	4	13	11	1.18
276	*Paspalum paspalodes* (Michx.) Scribner	0	0	15	0	0	0	0	0	15	15	1.00
277	*Pelargonium zonale* L'Herit ex Soland.	0	5	0	0	0	0	0	10	15	10	1.50
278	*Pennisetum flaccidum* Griseb.	0	0	11	0	0	0	0	0	11	11	1.00
279	Pennisetum glaucum (L.) R. Br.	9	7	34	0	0	0	0	8	58	34	1.71
280	*Pennisetum orientale* L.C. Rich.	0	0	40	0	0	0	0	0	40	40	1.00
281	*Pennisetum purpureum* Schumach.	0	0	31	0	0	0	0	0	31	31	1.00
282	*Periploca aphylla* Dcne	0	45	0	0	0	0	0	0	45	45	1.00
283	*Persicaria capitata* (Buch.-Ham. ex D. Don) H. Gross	0	10	0	0	0	0	0	0	10	10	1.00
284	*Persicaria glabra* (Willd.) M. Gómes	0	40	0	0	0	0	0	0	40	40	1.00
285	*Persicaria hydropiper* (L.) Delarbre	5	8	0	0	0	0	0	42	55	45	1.22
286	*Persicaria lapathifolia* (L.) Delarbre	0	6	0	0	0	0	0	25	31	30	1.03
287	*Persicaria maculosa* S. F. Gray	0	21	0	0	0	0	0	0	21	21	1.00
288	*Phalaris minor* Retz.	0	0	14	0	0	10	0	0	24	23	1.04
289	*Phaseolus lunatus* L.	51	0	0	0	0	0	0	0	51	51	1.00
290	*Phaseolus vulgaris* L.	56	0	34	28	0	0	0	6	124	56	2.21
291	*Phlomis bracteosa* Royle ex Benth.	0	15	0	0	0	0	0	0	15	15	1.00
292	*Phyllanthus fraternus* Webster	0	11	0	0	0	0	0	0	11	11	1.00

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293	*Physalis divaricata* D. Don	3	9	0	0	0	0	0	0	12	11	1.09
294	*Physalis peruviana* L.	8	3	0	0	0	0	0	0	11	8	1.38
295	*Phytolacca latbenia* (Moq.) Walter	5	12	0	0	0	4	0	7	28	15	1.87
296	*Picea smithiana* (Wall.) Boiss	5	0	0	20	30	0	10	4	69	30	2.30
297	*Pinus roxburghii* Sargent	5	45	0	34	24	23	8	4	143	91	1.57
298	*Pinus wallichiana* A. B. Jackson	0	23	0	76	98	0	35	29	261	98	2.66
299	*Pistacia integerrima* J. L. Stewart ex Brandis	0	60	43	0	0	0	5	0	108	67	1.61
300	*Pisum sativum* L.	49	12	0	0	0	0	0	0	61	49	1.24
301	*Plantago lanceolata* L.	0	63	0	0	0	0	0	0	63	63	1.00
302	*Plantago major* L.	0	59	0	0	0	0	0	0	59	59	1.00
303	*Poa alpina* L.	0	0	11	0	0	0	0	0	11	11	1.00
304	*Poa annua* L.	0	0	15	0	0	0	0	0	15	15	1.00
305	*Poa bulbosa* L.	0	0	8	0	0	0	0	0	8	8	1.00
306	*Podophyllum emodi* Wall. ex Royle	9	58	0	0	0	0	0	0	67	58	1.16
307	*Polygala abyssinica* R.Br. ex Fresen	0	8	0	0	0	0	0	0	8	8	1.00
308	*Polygonatum multiflorum* (L.) All.	30	45	0	0	0	0	0	0	75	50	1.50
309	*Polygonatum verticillatum* (L.) All.	53	50	0	0	0	47	0	0	150	58	2.59
310	*Polygonum aviculare* L.	36	23	0	0	0	0	0	0	59	43	1.37
311	*Polygonum plebeium* R. Br.	11	14	0	0	0	0	0	0	25	23	1.09
312	*Populus ciliata* Wall. ex Royle	0	4	0	45	40	0	8	0	97	45	2.16
313	*Populus nigra* L.	0	6	0	34	34	0	18	19	111	40	2.78

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314	*Portulaca oleracea* L.	67	56	0	0	0	0	0	0	123	67	1.84
315	*Potentilla nepalensis* Hook. f.	0	23	0	0	0	0	0	14	37	32	1.16
316	*Potentilla reptans* L.	0	8	0	0	0	0	0	6	14	11	1.27
317	*Potentilla supina* L.	0	6	11	0	0	0	0	0	17	12	1.42
318	*Prangos pabularia* Lindl.	18	16	0	0	0	0	0	0	34	23	1.48
319	*Primula denticulata* Smith	0	35	0	0	0	0	0	13	48	37	1.30
320	*Prunella vulgaris* L.	0	30	0	0	0	0	0	0	30	30	1.00
321	*Prunus armeniaca* L.	67	34	21	26	0	0	0	9	157	67	2.34
322	*Prunus cerasoides* D.Don	7	5	0	0	0	0	5	6	23	10	2.30
323	*Prunus cornuta* (Wall. ex Royle) Steud.	2	3	2	5	0	2	11	4	29	12	2.42
324	*Prunus domestica* L.	68	25	14	28	0	0	0	7	142	68	2.09
325	*Prunus persica* (L.) Batsch	67	12	8	23	0	0	6	6	122	67	1.82
326	Pteridium aquilinum (L.) Kuhn	32	0	0	0	45	0	0	26	103	45	2.29
327	*Pteris cretica* L.	0	6	0	0	0	0	0	11	17	12	1.42
328	*Pteris vittata* L.	0	5	0	0	0	0	0	12	17	13	1.31
329	*Punica protopunica* Balf. F.	5	8	3	4	0	5	0	1	26	12	2.17
330	*Pyrus communis* L.	67	23	0	19	0	0	0	0	109	67	1.63
331	*Pyrus pashia* Buch.-Ham. ex D. Don	13	0	7	22	0	0	0	8	50	25	2.00
332	*Quercus baloot* Griff.	12	23	0	23	7	5	6	0	76	56	1.36
333	*Quercus dilatata* Royle	0	0	14	73	34	0	45	23	189	73	2.59
334	*Quercus incana* Roxb.	0	0	21	57	25	0	24	0	127	57	2.23

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335	*Quercus semecarpifolia* Smith	0	7	0	13	0	0	0	0	20	15	1.33
336	*Ranunculus arvensis* L.	0	0	0	0	0	21	0	0	21	21	1.00
337	*Ranunculus muricatus* L.	0	8	0	0	0	19	0	0	27	22	1.23
338	*Ranunculus sceleratus* L.	0	9	0	0	0	21	0	0	30	25	1.20
339	*Raphanus sativus* L.	67	45	14	0	0	0	0	0	126	67	1.88
340	*Reinwardtia indica* Dumort.	0	0	0	0	0	4	0	8	12	11	1.09
341	*Rhamnus triquetra* (Wall.) Brandis	0	12	15	11	0	0	0	0	38	22	1.73
342	*Rhus punjabensis* J.L. Stewart ex Brandis	6	0	3	12	0	0	0	0	21	15	1.40
343	*Ricinus communis* L.	0	7	0	0	0	6	0	8	21	11	1.91
344	*Robinia pseudo-acacia* L.	0	0	16	45	0	0	0	12	73	45	1.62
345	*Rosa brunonii* Lindl.	8	0	6	5	0	0	0	5	24	24	1.00
346	*Rosa chinensis* Jacq.	12	20	0	0	0	0	0	23	55	23	2.39
347	*Rosa moschata* Herrm.	6	0	9	0	0	0	0	16	31	21	1.48
348	*Rosa webbiana* Wall. ex Royle	0	7	0	0	0	0	0	7	14	12	1.17
349	*Rottboellia exaltata* (L.) L.f.	0	0	25	0	0	0	0	0	25	25	1.00
350	*Rubia cordifolia* L.	13	12	0	0	0	0	0	6	31	22	1.41
351	*Rubus ellipticus* Sm.	13	6	0	0	0	0	0	0	19	15	1.27
352	*Rubus fruticosus* L.	56	6	18	7	0	0	0	8	95	56	1.70
353	*Rubus niveus* Thunb.	12	0	10	0	0	0	0	6	28	13	2.15
354	*Rubus ulmifolius* subsp. *sanctus* (Schreb.) Sudre	15	0	0	0	0	0	0	0	15	15	1.00
355	*Ruellia tuberosa* L.	0	5	0	0	0	0	0	4	9	9	1.00

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
356	*Rumex dentatus* L.	34	18	0	31	0	0	0	0	83	49	1.69
357	*Rumex hastatus* D. Don	41	23	0	0	0	0	0	0	64	49	1.31
358	*Rumex nepalensis* Spreng.	21	9	0	6	0	0	0	0	36	32	1.13
359	*Saccharum spontaneum* L.	0	5	0	0	8	0	11	6	30	25	1.20
360	*Sageretia thea* (Osbeck) M.C. Johnston	8	7	7	21	0	0	0	5	48	23	2.09
361	*Sagittaria trifolia* L.	15	0	0	0	0	0	0	0	15	15	1.00
362	*Salix babylonica* L.	0	5	0	20	12	0	21	6	64	23	2.78
363	*Salix flabellaris* Andersson	0	0	0	0	0	0	0	15	15	15	1.00
364	*Salix tetrasperma* Roxb.	0	8	0	15	13	0	12	5	53	23	2.30
365	*Salvia lanata* Roxb.	32	12	0	0	0	0	0	0	44	35	1.26
366	*Salvia moocroftiana* Wall. ex Benth.	0	41	0	0	0	0	0	0	41	41	1.00
367	*Salvia plebeia* R. Br.	0	12	0	0	0	0	0	0	12	12	1.00
368	*Sanguisorba minor* Scop.	8	5	0	0	0	0	0	0	13	11	1.18
369	*Sarcococca saligna* (D.Don) Muell.-Arg.	0	51	0	0	12	0	0	16	79	53	1.49
370	*Scandix pecten-veneris* L.	12	0	12	0	0	0	0	0	24	24	1.00
371	*Scrophularia nodosa* L.	0	12	0	0	0	0	0	0	12	12	1.00
372	*Scrophularia umbrosa* Dum.	0	9	0	0	0	0	0	0	9	9	1.00
373	*Scutellaria chamaedrifolia* Hedge & Paton	0	9	8	0	0	0	0	0	17	15	1.13
374	*Setaria pumila* (Poir.) Roem. & Schult.	0	0	29	0	0	0	0	10	39	34	1.15
375	Setaria viridis (L.) P. Beauv.	0	0	21	0	0	0	0	0	21	21	1.00
376	*Sigesbeckia orientalis* L.	0	8	0	0	0	0	0	0	8	8	1.00

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
377	*Silene conoidea* L.	25	0	0	0	0	0	0	0	25	25	1.00
378	Silybum marianum (L.) Gaertn.	26	42	0	0	0	0	0	0	68	55	1.24
379	*Sinapis alba* L.	3	2	3	0	0	0	0	5	13	7	1.86
380	*Sisymbrium irio* L.	0	11	0	0	0	0	0	0	11	11	1.00
381	*Skimmia laureola* (DC.) Sieb. & Zucc. ex Walp.	0	51	0	0	0	0	0	54	105	54	1.94
382	*Solanum melongena* L.	25	6	0	0	0	0	0	0	31	25	1.24
383	*Solanum nigrum* L.	76	83	0	0	0	0	0	0	159	89	1.79
384	*Solanum pseudo-capsicum* L.	0	0	0	0	0	4	0	8	12	8	1.50
385	*Solanum surattense* Burm. f.	0	12	0	0	0	0	0	0	12	12	1.00
386	*Solanum tuberosum* L.	59	8	0	0	0	0	0	7	74	59	1.25
387	*Solanum villosum* (L.) Moench	70	75	0	0	0	0	0	0	145	78	1.86
388	*Solena amplexicaulis* (Lam.) Gandhi	6	13	0	0	0	0	0	0	19	18	1.06
389	*Sonchus oleraceus* L.	12	6	0	0	0	0	0	0	18	17	1.06
390	*Sorbaria tomentosa* (Lindl.) Rehder	0	11	18	0	0	0	0	0	29	21	1.38
391	*Sorbus aria* Crantz	8	0	0	6	0	0	0	0	14	8	1.75
392	Sorghum bicolor (L.) Moench.	0	9	19	0	5	0	8	8	49	19	2.58
393	Sorghum halepense (L.) Pers.	0	6	41	0	0	13	0	0	60	46	1.30
394	*Spinacia oleracea* L.	35	9	0	0	0	0	0	0	44	35	1.26
395	*Spiraea canescens* D. Don	0	0	6	6	0	5	0	0	17	11	1.55
396	*Stachys parviflora* Benth.	0	8	0	0	0	5	0	0	13	12	1.08
397	*Stellaria media* (L.) Vill.	30	15	34	0	0	12	0	3	94	34	2.76

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
398	*Swertia cordata* (G.Don) Clarke	0	13	6	0	0	0	0	0	19	17	1.12
399	*Tagetes minuta* L.	0	8	0	0	0	4	0	10	22	21	1.05
400	*Taraxacum officinale* F.H. Wigg	4	16	0	0	0	0	0	7	27	25	1.08
401	*Taxus wallichiana* Zucc	5	6	0	0	6	4	8	5	34	15	2.27
402	*Teucrium stocksianum* Boiss.	0	55	0	0	0	0	0	0	55	55	1.00
403	*Thalictrum cultratum* Wall.	0	8	0	0	0	0	0	0	8	8	1.00
404	*Themeda anathera* (Nees ex Steud.) Hack.	0	0	56	0	12	0	8	4	80	61	1.31
405	*Thymus linearis* Benth.	45	75	0	0	0	0	0	23	143	75	1.91
406	*Tradescantia pallida* (Rose) D.Hunt	0	4	0	0	0	0	0	10	14	10	1.40
407	*Trianthema portulacastrum* L.	0	8	14	0	0	6	0	0	28	23	1.22
408	*Tribulus terrestris* L.	0	55	0	0	0	0	0	0	55	55	1.00
409	*Trichodesma indicum* (L.) R. Br.	0	25	0	0	0	0	0	0	25	25	1.00
410	*Trichosanthes cucumerina* L.	10	3	0	0	0	0	0	0	13	10	1.30
411	*Trifolium alexandrianum* L.	34	0	38	0	0	0	0	31	103	38	2.71
412	*Trifolium repens* L.	0	15	6	0	0	0	0	9	30	23	1.30
413	*Trifolium resupinatum* L.	45	0	48	0	0	0	0	16	109	48	2.27
414	*Trigonella foenum-graecum* L.	75	84	0	0	0	0	0	0	159	90	1.77
415	*Trillium govanianum* Wall. ex Royle	6	35	0	0	0	0	0	0	41	35	1.17
416	*Triticum aestivum* L.	127	12	127	12	11	26	13	16	344	127	2.71
417	*Tulipa clusiana* DC	4	0	0	0	0	0	0	18	22	20	1.10
418	*Typha latifolia* L.	3	3	0	0	10	0	7	4	27	12	2.25

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
419	*Ulmus wallichiana* Planch.	0	5	6	6	0	0	9	0	26	18	1.44
420	*Urochloa panicoides* P. Beauv.	0	0	8	0	0	0	0	0	8	8	1.00
421	*Urtica dioica* L.	12	16	0	0	0	0	0	11	39	34	1.15
422	*Vaccaria hispanica* (Miller) Rauschert	8	5	0	0	0	0	0	0	13	12	1.08
423	*Valeriana hardwickii* Wall.	0	15	0	0	0	0	0	0	15	15	1.00
424	*Valeriana jatamansi* Jones	0	57	0	0	0	0	0	9	66	58	1.14
425	*Valeriana pyrolifolia* Decne.	0	25	0	0	0	0	0	0	25	25	1.00
426	*Verbascum thapsus* L.	0	18	0	5	0	0	0	6	29	23	1.26
427	*Verbena officinalis* L.	3	14	0	0	0	0	0	0	17	15	1.13
428	*Veronica anagallis-aquatica* L.	12	8	0	0	0	0	0	0	20	15	1.33
429	*Veronica polita* Fries	9	8	0	0	0	0	0	0	17	16	1.06
430	*Viburnum cotinifolium* D. Don	34	0	0	28	0	0	0	0	62	40	1.55
431	*Viburnum grandiflorum* Wall. ex DC.	61	23	0	23	0	0	0	15	122	67	1.82
432	*Vicia bithynica* (L.) L.	5	0	10	0	0	0	0	0	15	12	1.25
433	*Vicia sativa* L.	0	0	0	0	0	8	0	17	25	23	1.09
434	Vigna mungo (L.) Hepper	48	0	12	0	0	0	0	10	70	48	1.46
435	*Vigna radiata* (L.) Wilczek	11	4	0	0	0	0	0	0	15	11	1.36
436	Vigna unguiculata (L.) Walp.	34	13	0	0	0	0	0	0	47	34	1.38
437	*Vincetoxicum hirundinaria* Medicus	0	0	0	0	0	0	0	20	20	20	1.00
438	*Viola betonicifolia* Sm.	0	21	0	0	0	0	0	0	21	21	1.00
439	*Viola canescens* Wall. ex Roxb.	0	65	0	0	0	0	0	0	65	65	1.00

Sr#	Plant species	Food	Medicinal	Fodder	Fuel	Construction	Veterinary	Tools	Miscellaneous	Total use reports (N)	No.of Informant	UVI
440	*Viscum album* L.	0	16	0	0	0	13	0	0	29	21	1.38
441	*Vitex negundo* L.	0	51	0	0	0	0	18	51	120	54	2.22
442	*Vitis jacquemontii* Parker	18	13	0	0	0	0	0	0	31	18	1.72
443	*Vitis vinifera* L.	34	18	0	0	0	0	0	0	52	34	1.53
444	*Wikstroemia canescens* Meisn.	0	0	0	0	0	0	0	20	20	20	1.00
445	*Withania somnifera* (L.) Dunal	0	9	0	0	0	0	0	7	16	15	1.07
446	*Wulfenia amherstiana* Benth.	0	12	0	0	0	0	0	0	12	12	1.00
447	*Xanthium strumarium* L.	0	8	0	0	0	6	0	4	18	12	1.50
448	*Zanthoxylum armatum* DC.	31	19	0	12	0	8	9	12	91	71	1.28
449	*Zea mays* L.	87	6	87	47	0	12	5	18	262	89	2.94
450	*Ziziphus jujuba* Mill.	45	34	6	8	0	5	0	6	104	45	2.31
451	*Ziziphus nummularia* (Burm. f.) Wight & Arn.	9	4	3	5	0	0	0	3	24	9	2.67
452	*Ziziphus oxyphylla* Edgew.	3	6	5	8	0	0	0	3	25	11	2.27
453	*Ziziphus spina-christi* (L.)Willd.	5	2	4	5	0	0	0	2	18	8	2.25

Table 3.2. Age wise and gender wise extent of ethnobotanical knowledge.

Age Group	Male			Female			Total		
	No	Information	Avg U.V	No	Information	Avg U.V	No	Information	Avg U.V
<25	603	662	1.1	83	101	1.22	686	763	1.11
26-50	2208	2656	1.29	813	1117	1.37	3021	3773	1.25
>50	5213	9435	1.81	5067	9204	1.82	10280	18639	1.81
Total	8024	12753	1.59	5963	10422	1.75	13987	23175	1.66

3.6 CONCLUSION

The aim of the present project was to undertake an ethnobotanical survey of plants used by the inhabitants of the study area. From the total flora of 820 species of the study area, 453 species are reported economically important by the natives. These people possess empirical uses of plants and reported a high proportion of plants for medicinal, food, forage, fuel, construction, ethno-veterinary and other multifarious uses. The ethnobotanical survey revealed that native species still serve multifarious purposes and remain an important natural resource for rural communities. Irrespective to gender difference, the older people relatively possess better knowledge of plants than younger. This valuable asset of indigenous knowledge accumulated as a result of experiences spanned over generations of human history, is on the verge of extinction due to expansion of modernization. This needs to be properly documented and utilized for conservation of biodiversity and sustainable development. The survey indicated that *Juglans regia, Morus alba, M. macroura, M. nigra, Olea ferruginea, Cotoneaster racemiflorus, Melia azedarach, Pinus roxburghii, Prunus cornuta, Aesculus indica, Cedrus deodara, Ficus palmata, Hibiscus cannabinus, Indigofera heterantha, Juniperus communis, Prunus persica, Punica protopunica, Quercus baloot, Taxus wallichiana, Zanthoxylum armatum* and *Ziziphus jujuba* were important plants which are still heavily used to meet different needs of the local communities. However, all these

species are naturally growing and non-domesticated which mostly slowly regenerate and facing a rapid decline in their natural population. Policy makers and development agencies should address and integrate local people's species preferences and conservation priorities in their global strategy for poverty relief. Some claims about the use of medicinal plants need to be properly evaluated by pharmacists and medical practitioners.

Chapter 4

PLANT BIODIVERSITY CONSERVATION

4.1 INTRODUCTION

Plants (individually or collectively as vegetation) can offer a wide range of benefits to people (Hamilton and Hamilton, 2006; Pei and Huai, 2007; Pei *et al.*, 2010; Jain, 2011). Plant resources are the most accessible source of products and incomes for poor societies, and are subsequently under extensive pressure. Sustainable utilization and conservation of biodiversity are essential for the continuation of ecosystem functioning and ecosystem services provision (Srivastava and Vellend, 2005; Kienast *et al.*, 2009, Khan *et al.*, 2013b). Traditional knowledge is important in maintaining biodiversity. Land use change, including deforestation for wood extraction or cultivation, and the over harvesting of forest plants are the main factors causing loss. Traditionally, people living in forest areas have had a high dependency on forest resources for their livelihoods, so that the decline in these resources can have the potential to threaten their survival (Pei, 1998). While scientists interested in conservation have generally paid attention especially to species surviving and sustainable use, plants also contribute to conservation through their roles in delivering ecosystem services.

Natural ecosystems cannot be understood, managed and conserved without recognizing the cultural influences that have shaped and still influence them. Cultural diversity linked to biological diversity holds the key for ensuring resilience in both social and ecological systems (Schaaf, 2003). Research methods associated with ethobotany can be powerful tools for working out how best cultural and biological diversity can be associated to meet the challenges of today (Pei, 2013). In addition to the three most widely accepted biodiversity conservation criteria, i.e. rarity, threat and endemism, there are other important criteria that should be considered; historical, traditional and educational values. Traditional

ecological knowledge in Asia in general and in the remote valleys of the western Himalayas and Hindu Kush in particular, can play a key role in the formulation and implementation of conservation strategies. Such knowledge reflects a life time's experience of the relationship between human cultures and the natural environment. Increasing urbanization and industrialization cause losses of traditional knowledge as the natural environment becomes degraded or as people move away from their native villages (Khan *et al.,* 2013b).

There is no thorough work, such as a Red Data Book, on endangered plant species in the Hidu Kush-Himalayan region, despite its unique endemic flora. There has been very limited and fragmented published work on only a few IUCN Red List plant species (Ali, 2008; Alam and Ali, 2009, 2010; Ali and Qaiser, 2011, Khan, 2012), so one can find very few comparators to evaluate endangered and critical plant species at a national level (Ali, 2008). Due to lack of a complete list of endemic plants, it is difficult to apply the strict IUCN criteria for ascertaining the conservation status of the plants, however ethnobotanical data and phytosociological field data can be used together to assign conservation status to the flora of the area at local level.

4.2 REVIEW OF LITERATURE

Sustainable use and conservation of biodiversity are essential for the continuation of ecosystem functioning (Kienast *et al.,* 2009). Extensive use of natural vegetation has decreased the species richness and population of native floras thus deteriorating the provisioning of services in natural ecosystems. Plant biodiversity can, however, be restored and the risks of ecosystem degradation reduced, if measures such as reforestation, establishment of protected areas, greater awareness of the local inhabitants and *ex-situ* conservation of rare and threatened species be initiated (Khan *et al.,* 2013b). The prerequisite of any long term conservation plan is the assessment of local flora for conservation

prioritization. IUCN red-listing of species is one such effort on global level. In spite of its significance, there has been very limited and sporadic published work on only a few species from selected areas.

Shrestha *et al.*. (2006) identified 312 species of dicotyledons from trans-Himalayan Dolpo and Mustang in Nepal and found that 155 species were Himalayan endemic, 18 were Nepal endemic while the remaining showed affinities to other phytogeographical elements, like Holarctic, Central Asiatic and South East Chinese regions. They pointed out climatic barrier as the main reason of endemism in the area.

Assessment of plant diversity and prioritization of communities for conservation in Mornaula Reserve forest, Himachal Pradesh, India was done by Pant and Samant (2007). They recorded habitat characteristics, altitude and dominant species for each of the 123 sites sampled. They reported 289 species forming 31 communities from the area and prioritized communities for conservation on the basis of species richness, nativity, endemism, economic importance and rare endangered species. Species diversity and population status of threatened plants in different Landscape Elements (LSEs) of the Rohtang pass, Western Himalaya, Himachal Pradesh, India was highlighted by Singh *et al.*. (2008). They conducted ground surveys in nine unique LSEs located within an elevation range between 3624 and 4332 meters, using 56, $1m^2$ quadrats for herbs and 7, 25 m^2 quadrats for shrubs laid in stratified random manner. They recorded 50 species of 15 families from the area. The highest species richness (18) and value of Shannon diversity ($H^{/}$ =2.2648) were recorded for *Picrorhiza kurroova* LSE in moist area on north-east facing slope, while the lowest values were recorded for *Rhododendron anthopogon* dominated LSE where the Simpson index of dominance (D) was 0.4205. They pointed out five species of medicinal plants to be threatened according to IUCN criteria including *Bergenia stracheyi* (29.25 individuals/m2), *Picrorhiza kurroova* (19.83 individuals/m2) and *Aconitum heterophylum* (1 individual/m2). They suggested

effective ecotourism planning and plant conservation measures to protect the bioresources of the area to face continuous anthropogenic pressure.

The impact of invasion by *Ageratum conyzoides* on the diversity and composition of vegetation in Shivalik hills of Himachal Pradesh, India was analyzed by Dogra *et al.*. (2009). They noted that this highly adaptive invasive weed from sub-tropical America has grown in Shivalik hills as monocultures, in grasslands, forests, agricultural and horticultural fields. They found that in comparison to control, the average number of species has reduced by 32.1%, the α-diversity has reduced by 41.21% and dry biomass by 48.46%. Based on their findings they concluded that the invasive species is negatively affecting the diversity and productivity of the native vegetation in Shivalik hills.

Alam and Ali (2010) assessed the conservation status of the critically and endangered plant species *Androsace rasselii* which is endemic to Gilgit, Pakistan and pointed out that the species is now confined to only two localities viz, Ultar Nullah and Shatu Bar and has the overall population of 69 individuals limited to a geographic range of 0.4 Km^2 occupancy and 21.85 Km^2 extent of occurrence. Immediate conservation measures were recommended by the authors to reclaim this critically endangered species. Similarly, Ali and Qaiser (2010) studied the conservation status of *Astragalus gahiratensis*, which is endemic to Chitral, Pakistan and found only 127 mature individuals of the plant in four localities in 2005, 28 mature individuals in three localities in 2006 and 107 mature individuals in four locations in 2007. They pointed out the main threat to the decline of species as habitat degradation caused by soil erosion due to deforestation and overgrazing. In three selected localities they noted 13.79 to 75% decrease in population. The authors have recommended the inclusion of the species in Red Data Book of I.U.C. N with critically endangered (CE) status and prompt action to conserve this species.

Shrestha *et al.*. (2010) reviewed bio-diversity conservation in community forests of Nepal and termed it a success story, because of restoration of degraded habitats, biodiversity conservation, increased supply of forest products, empowering disadvantaged groups, generating income and developing human resource. Main reasons for the success were seeding plantations, controlling of wild life hunting, grazing and fire, regulating forests encroachment and protecting soil erosion prone and water resource areas. Some important reason for decline in biodiversity and ecosystem function were removal of unwanted species during silvicultural practices, leaf litter collection, elite class dominance in decision making and depletion of traditional knowledge.

Singh and Samant (2010) pointed out habitats, communities and species for conservation prioritization in Lahaul valley, cold desert reserve forest, India and identified native, endemic, economically important and threatened species. According to the study, prioritizing species and habitats for conservation is necessary under the prevailing rapid loss of biodiversity due to habitat loss and overexploitation.

For bio-resource conservation in Solang valley watershed in western Himalaya, Kumar *et al.*. (2011) used remote sensing techniques to map the plant communities in the area and concluded that parameters like relative area under different landscape units, vegetation classes and prominence values of prioritized species for conservation needed regular monitoring for which baseline information should be gathered.

The critically endangered flora of district Battagram, Pakistan was evaluated by Haq (2012) and assigned threat level categories to twelve economically important plant species according to IUCN criteria. In Chakesar valley, district Shangla, Pakistan, the 127 economically important plant species were categorized as endangered (47 spp., 37%), vulnerable (32 spp., 25%), rare (36 spp., 28%) and infrequent (12 spp., 9%) (Shah and Hussain, 2012).

Khan *et al.*. (2013) reviewed the sustainable utilization and conservation of plant biodiversity in montane ecosystem of Naran Valley, Pakistan and identified 64 species of plants endemic to Hindukush Himalaya, out of which 20 were critically endangered, 14 were endangered, 12 were vulnerable, 11 were near threatened and one was of least concern. They were of the opinion that both phytosociological and ethnobotanical data may be taken concomitantly for prioritizing species for conservation measures. Floristic diversity and conservation status of native and endemic species in Murari Devi and surrounding areas of Mandi district in Himachal Pradesh, North-Western Himalaya was studied by Sharma and Sharma (2014) and reported 384 plant species, out of which 112 were native to the Himalayas. Out of the native flora 31.25% species were near endemic and 0.01% endemic to Himalayas. Overexploitation, habitat loss and invasion of non-native plants were considered as the main causes of depleting native and endemic flora of the area.

4.3 MATERIALS AND METHODS

The study was conducted in Kabal valley, Swat from September, 2010 to August, 2013. The area was sampled in random stratified manner and data from 314 releves was recorded. For the purpose of assessing conservation status of the recorded species on local level the following parameters were used.

4.3.1 Percentage frequency:

It was derived from our phytosociological field data and was calculated as follows:

$$\text{Percentage frequency} = \frac{\text{Number of sampling points in which a species occurs}}{\text{Total number of sampling points}} \text{ X } 100$$

4.3.2 Ethnoecological perception:

The local ethnobotanical uses, trend of population dynamics of each species and the extent of exploitation pressure were based on the questionnaire data taken from the indigenous people. Endemic status was assigned to some species according to published literature as indicated in the Table 4.1.

4.3.3 I.U.C.N. categorization:

Based on the data derived from the ecological evaluation and local people perception, conservation status of the plant species was ascertained according to I.U.C.N. categorization (Version 3.1, IUCN, 2001), up to the broader levels of Least Concern (LC), Near Threatened (NT), Vulnerable (VU), Endangered (EN) and Critically Endangered (CR). Due to limitations of the study in terms of time and resources the strict IUCN criteria for assigning alpha-numeric status was not applied.

4.4 RESULTS

Out of the total 820 species identified from the study area (Kabal valley, Swat), 685 were recorded in the sampling plots (releves). Based on quantitative and ethnobotanical data, their status is determined and compiled under Table 4.1. On analyzing the data, it has been observed that majority of plant species (566 spp., 82.63%) were Least Concern (LC) as these species were fairly distributed in the area with comparatively large population sizes and no apparent threat of extinction. Rest of the species were conservation concerned with further categorization such as Vulnerable (9.05%), Near Threatened (4.53%), Critically Endangered (2.04%) and Endangered (1.75%).

Our list of Critically Endangered species include *Cedrus deodara, Colchicum luteum, Dactylorhiza hatagirea, Juglans regia, Polygonatum verticillatum, Phytolacca latbenia, Ribes himalense, Taxus wallichiana, Trillium govanianum* and *Ulmus wallichiana* (Table 4.1). Endangered species in our area included *Cornus macrophylla, Delphinium vestitum, Heracleum candicans,*

Juniperus communis, Paeonia emodi, Podophyllum emodi, Prunus cerasoides and *Skimmia laureola*. Most of these species are multi-purpose plants and are heavily exploited in the area.

4.5 DISCUSSION

The richness in plant diversity in an area is not evaluated merely by the number of species occurring there but by intensity of association and dependence of the indigenous communities on plant wealth (Jain, 2000). Out of the total 820 species identified in the present study from Kabal valley, Swat (Table 2.2), 685 plant species (Table 4.1) were recorded in the sampling plots (releves). Ethnobotanical data sets based on indigenous traditional knowledge can be tallied and analysed together with data from vegetation surveys to provide a better understanding and management of ecosystems (Negi, 2010; Khan, 2012; Khan *et al.,* 2013b). According to the literature, 91 plant species (13.28%) were endemic to Hindu Kush-Himalayan region (Ali *et al.,* 1972-2009; Shrestha *et al.,* 2006; Singh and Samant, 2010; Kumar *et al.,* 2011; Khan *et al.,* 2013b; Sharma and Sharma, 2014), while six species were endemic to Pakistan (Ali *et al.,* 1972-2009). Due to wide ecological amplitude, larger population size and comparatively low biotic pressure, majority of the plant species (566 spp., 82.63%) were under the Least Concern (LC) category. Thirty one plant species (4.53%) were Near Threatened (NT). Fragmented populations restricted to narrow regions with extreme pressure of exploitation has resulted in 62 species (9.05%) to the Vulnerable (VU) status, 14 species (2.04%) to the Critically Endangered (CR) status and12 species (1.75%) to the Endangered (EN) status (Fig. 4.1). Overexploitation has resulted in threatening the plants on local level (Shrestha *et al.,* 2006; Khan *et al.,* 2013b).

From the study area 10 species such as The Critically Endangered species include *Cedrus deodara, Colchicum luteum, Dactylorhiza hatagirea, Juglans regia, Polygonatum verticillatum, Phytolacca latbenia, Ribes himalense, Taxus wallichiana, Trillium govanianum* and *Ulmus wallichiana* (Table 4.1). Two species viz., *Cedrus deodara* and *Taxus wallichiana* have also been

recorded as Critically Endangered from other areas of Pakistan (Haq, 2012; Khan *et al.*, 2013b). Endangered species in our area included *Cornus macrophylla, Delphinium vestitum, Heracleum candicans, Juniperus communis, Paeonia emodi, Podophyllum emodi, Prunus cerasoides* and *Skimmia laureola*. Amongst them, *Heracleum candicans, Paeonia emodi, Podophyllum emodi, Prunus cerasoides* and *Skimmia laureola* have been assigned the same status in other areas (Haq, 2012; Shah and Hussain, 2012; Khan *et al.*, 2013b). Most of these species are multi-purpose plants and are heavily exploited in the area. This overexploitation is the main cause for their threatened status (Khan *et al.*, 2013b; Sharma and Sharma, 2014).

Appreciation of the ethnoecological knowledge of the indigenous communities would certainly be helpful to biodiversity conservation and sustainable development. Biodiversity is especially concentrated in parts of the world inhabited by indigenous people who live with and interact with them. The people are the direct users and guardians of the regional biodiversity (Hu Huabin, 2002). The recognition and protection of indigenous people's rights in their knowledge, innovations and practices relating to bio-diversity is assuming an increasing urgency. The importance of traditional cultural beliefs to biodiversity conservation has been recognized internationally (Jain, 1987; Hamilton, 1993). Ecological assessment of the native species using various ecological methods is key to understand the actual status of the species and develop appropriate strategy and action plan for the conservation of native and endemic species. It is suggested that proper strategy and policy dealing with conservation management for prioritized species and habitats may be formulated so that effective management of forests and plant bio-resources could be achieved.

Table 4.1. Conservation status of plant species in Kabal valley, Swat based on their percentage frequency, perception of abundance and exploitation pressure and IUCN categorization at regional level.

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
1	*Abies pindrow*	12.7	M, C	High	D	Endemic to HKH (Ali *et al.*, 1972-2009; Singh and Samant, 2010)	VU
2	*Acacia modesta*	4.5	Fu	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
3	*Acacia nilotica*	0.3	M, Fu	High	D		LC
4	*Acer cappadocicum*	0.3	Fu, T	High	D		NT
5	*Achillea millefolium*	3.2	M, Fo	Moderate	D		VU
6	*Achyranthes aspera*	7	M	Low	C		LC
7	*Achyranthes bidentata*	4.5		Low	C		LC
8	*Aconitum laeve*	1.3	M	V. High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	CR
9	*Acrachne racemosa*	1.3	Fo	Moderate	C		LC
10	*Adenostemma lavenia*	1.6		Low	C		LC
11	*Adiantum capillus-veneris*	2.9	M	V. High	D		NT
12	*Adiantum caudatum*	0.6	M	Moderate	D		LC
13	*Adiantum incisum*	1.9		Low	C		LC
14	*Adiantum venustum*	8.3	M	High	D		NT
15	*Adonis aestivalis*	0.6		Nil	C		LC
16	*Aegopodium alpestre*	2.5		Low	C		LC
17	*Aesculus indica*	3.8	M, C, V	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	NT
18	*Agrimonia eupatoria*	3.5	M	Low	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
19	*Agrostis gigantea*	1		Nil	C		LC
20	*Agrostis stolonifera*	1.9		Nil	C		LC
21	*Ailanthus altissima*	4.8	Fo, Fu	Low	C		LC
22	*Ajuga bracteosa*	6.1	M	High	D		VU
23	*Ajuga parviflora*	3.2	M	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
24	*Alisma plantago-aquatica*	1	F, M	Low	C		LC
25	*Alliaria petiolata*	4.1	F, M	Low	C		LC
26	*Allium ampeloprasum var. porrum*	1.9	F, M	High	D		NT
27	*Allium jacquemontii*	1.3		Nil	C		LC
28	*Alnus nitida*	1.6	M, Fu	Moderate	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
29	*Alopecurus myosuroides*	2.5	Fo	Low	C		LC
30	*Alternanthera pungens*	0.6		Nil	I		LC
31	*Alternanthera sessilis*	3.5		Nil	C		LC
32	*Amaranthus graecizans*	1.9	F, M, Fo	High	D		LC
33	*Amaranthus hybridus*	1.6		Nil	I		LC
34	*Amaranthus retroflexus*	4.8		Nil	I		LC
35	*Amaranthus spinosus*	1.9	M, Fo, V	Low	I		LC
36	*Amaranthus viridis*	4.5	F, M	High	D		LC
37	*Ampelopsis vitifolia s. vitifolia*	0.6		Nil	C		LC
38	*Anagallis arvensis*	2.9	F	Low	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
39	*Anaphalis margaritacea*	1.6	M	Low	C		LC
40	*Anaphalis viridis*	2.9		Low	C		LC
41	*Anchusa arvensis s. orientalis*	2.5		Low	I		LC
42	*Andrachne cordifolia*	3.8	Fo, V	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
43	*Androsace foliosa*	3.2		Low	C	Endemic to Pakistan (Ali *et al.*, 1972-2009)	LC
44	*Androsace rotundifolia*	3.8	M	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
45	*Angelica glauca*	2.2		Low	C	Endemic to HKH (Khan *et al.*, 2013b)	LC
46	*Anthriscus nemorosa*	1.9		Low	C		LC
47	*Apluda mutica*	4.5	Fo, M, V	High	C		LC
48	*Aquilegia pubiflora*	4.5	Fo, M, V	High	D		VU
49	*Arabidopsis himalaica*	1.9		Low	C	Endemic to HKH (Shrestha *et al.*, 2006)	LC
50	*Arabidopsis stricta*	1.3		Low	C		LC
51	*Arabidopsis thaliana*	1.6		Low	C		LC
52	*Arabis amplexicaulis*	1		Low	C	Endemic to HKH (Shrestha *et al.*, 2006)	LC
53	*Arabis bijuga*	1		Nil	C		LC
54	*Arabis tibetica*	1.3		Nil	C		LC
55	*Arenaria neelgerrensis*	2.5		Nil	C		LC
56	*Arenaria*	7.3		Nil	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
	serpyllifolia						
57	*Arisaema flavum*	5.1		Nil	C		LC
58	*Arisaema jacquemontii*	10.2	M	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
59	*Aristida adscensionis*	7		Low	C		LC
60	*Aristida cyanantha*	2.2	T	High	D		NT
61	*Arnebia decumbens*	1.6		Nil	C		LC
62	*Artemisia capillaris*	2.9	M	High	D		VU
63	*Artemisia dubia*	2.9		Low	C		LC
64	*Artemisia scoparia*	8	M	High	C		LC
65	*Artemisia vulgaris*	8.3	M	High	D		LC
66	*Arthraxon prionodes*	4.8	Fo	Low	C		LC
67	*Arundo donax*	0.6	T, C	High	D		LC
68	*Asparagus adscendens*	3.8	F, M	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
69	*Asparagus filicinus*	1.6	M	V. High	D		CR
70	*Asparagus setaceus*	0.3		Nil	C		EN
71	*Asplenium adiantum-nigrum*	2.9		Nil	C		LC
72	*Asplenium septentrionale*	0.6		Nil	C		LC
73	*Asplenium trichomanes*	3.5	M	Nil	C		LC
74	*Aster alpinus*	1.6		Nil	C		LC
75	*Aster falconeri*	1.6		Nil	C	Endemic to HKH (Khan *et al.*, 2013b)	NT
76	*Aster flaccidus*	1.9		Nil	C		LC
77	*Astragalus alpinus*	1.3		Nil	C		LC
78	*Astragalus candolleanus*	3.2	M, Fo	Low	D	Endemic to HKH (Shrestha *et al.*,	NT

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
						2006)	
79	*Astragalus densiflorus*	0.6		Nil	C		LC
80	*Astragalus depressus*	0.3		Nil	C		LC
81	*Astragalus graveolens*	1.9	F, Fo	High	D		NT
82	*Astragalus leucocephalus*	0.3		Nil	C		LC
83	*Astragalus pyrrhotrichus*	1.6	F	Low	C		LC
84	*Astragalus rhizanthus*	0.3		Nil	C	Endemic to HKH (Singh and Samant, 2010)	LC
85	*Astragalus tribulifolius*	1.3		Nil	C		LC
86	*Athyrium attenuatum*	0.6		Nil	C		LC
87	*Athyrium filix-femina*	1		Nil	C		LC
88	*Athyrium vidalii*	0.3		Nil	C		LC
89	*Avena fatua*	1	Fo, V	High	I		LC
90	*Barbaraea vulgaris*	0.3		Nil	I		LC
91	*Barleria cristata*	2.9	M	Low	D		LC
92	*Berberis lycium*	29.3	M, Fu	V. High	D	Endemic to HKH (Sharma and Sharma, 2014)	VU
93	*Bergenia ciliata*	3.8	M	V. High	D	Endemic to HKH (Khan *et al.*, 2013b)	VU
94	*Bergia ammannioides*	1		Nil	C		LC
95	*Bidens biternata*	5.7		Nil	I		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
96	*Bidens radiata*	1		Nil	C		LC
97	*Bistorta amplexicaulis*	4.1	M, Fo	V. High	D	Endemic to HKH (Khan *et al.*, 2013b)	VU
98	*Boerhavia procumbens*	2.5	M, Fo	High	D		LC
99	*Bosea amherstiana*	5.7	M	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
100	*Bothriochloa bladhii*	2.2	Fo, T	Low	C		LC
101	*Brachiaria eruciformis*	0.6		Low	C		LC
102	*Brachiaria ramosa*	1.3	Fo	High	I		LC
103	*Brachiaria reptans*	1.9		Nil	C		LC
104	*Brachypodium distachyon*	2.9		Nil	I		LC
105	*Brachypodium sylvaticum*	0.6		Nil	C		LC
106	*Bromus oxyodon*	1		Nil	C		LC
107	*Bromus pectinatus*	3.5	Fo	Low	C		LC
108	*Broussonetia papyrifera*	0.6	Fu	Low	I		LC
109	*Bryonia monoica*	1		Nil	C		VU
110	*Buddleja crispa*	3.2	M, Fu	Low	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
111	*Buglossoides arvensis*	1.3		Nil	I		LC
112	*Bulbostylis densa*	0.6		Nil	I		LC
113	*Bunium persicum*	1	F	High	D		CR
114	*Bupleurum falcatum*	3.8		Nil	C	Endemic to HKH (Shrestha *et al.*,	LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
						2006)	
115	*Buxus wallichiana*	1.6	M, Fu, T	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	NT
116	*Calamintha debilis*	1.3		Nil	C		LC
117	*Calendula arvensis*	1.9	M	Nil	C		LC
118	*Calotropis procera s. hamiltonii*	1	M, V	Low	D		VU
119	*Caltha alba*	1	F, M	Moderate	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
120	*Campanula pallida*	3.8		Nil	C		LC
121	*Campanula tenuissima*	1.3		Nil	C	Endemic to Pakistan (Ali *et al.*, 1972-2009)	LC
122	*Cannabis sativa*	4.5	M, V	Low	I		LC
123	*Capsella bursa-pastoris*	1	M, V, Fo	Low	C		LC
124	*Cardamine flexuosa*	0.3		Nil	C		LC
125	*Cardamine impatiens*	1.3		Nil	C		LC
126	*Cardaria pubescens*	1.6		Nil	C		LC
127	*Carex acutiformis*	1.3		Nil	C		LC
128	*Carex canescens*	3.8	Fo	Moderate	C		LC
129	*Carex cardiolepis*	2.5		Nil	C		LC
130	*Carex foliosa*	1.6		Nil	C		LC
131	*Carex nivalis*	1		Nil	C		LC
132	*Carex psychrophila*	5.4		Nil	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
133	*Carex sanguinea*	1.3		Nil	C		LC
134	*Carex*	3.8		Nil	C	Endemic to HKH	LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
	schlagintweitiana					(Ali *et al.*, 1972-2009)	
135	*Carpesium abrotanoides*	1		Nil	I		LC
136	*Carpesium cernuum*	1.9		Nil	I		LC
137	*Carthamus lanatus*	0.3		Nil	C		LC
138	*Carthamus oxyacantha*	3.8	F, M	High	D		LC
139	*Cedrus deodara*	0.3	C, M, V	V. High	D	Endemic to HKH (Sharma and Sharma, 2014)	CR
140	*Celosia argentea*	0.3	F, M, Fo	Low	C		LC
141	*Celtis caucasica*	3.5	F, Fo, Fu	Low	C		LC
142	*Celtis eriocarpa*	11.8	F, Fo, Fu	Low	C		LC
143	*Celtis tetrandra*	2.9	F, Fo, Fu	Low	C		LC
144	*Cenchrus ciliaris*	1		Nil	C		LC
145	*Centaurea iberica*	1		Nil	C		LC
146	*Cerastium dahuricum*	2.5		Nil	C		LC
147	*Cerastium glomeratum*	3.2		Nil	C		LC
148	*Ceratocephala falcata*	1		Nil	C		LC
149	*Ceratophyllum demersum*	0.6		Nil	C		LC
150	*Ceterach dalhousiae*	3.5	M	Low	C		LC
151	*Cheilanthes pteridioides*	1.9		Nil	C		LC
152	*Chenopodium album*	5.1	F, M, Fo	High	C		LC
153	*Chenopodium ambrosioides*	3.8	M, V	Low	C		LC
154	*Chenopodium botrys*	2.5	M	Low	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
155	*Chenopodium murale*	1.6	F	Low	C		LC
156	*Chrozophora tinctoria*	1.3		Nil	C		LC
157	*Chrysopogon gryllus s. echinulatus*	3.5	Fo, V	High	C	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
158	*Chrysopogon serrulatus*	8.6	Fo	Low	C		LC
159	*Cichorium intybus*	1	F, M, V	Moderate	C		LC
160	*Cirsium arvense*	1.9		Nil	I		LC
161	*Cirsium falconeri*	5.4		Nil	C		LC
162	*Clematis grata*	1.9	M, V	Low	C		LC
163	*Clematis graveolens*	0.6		Nil	C		LC
164	*Clematis montana*	1	M	Moderate	C		LC
165	*Cleome viscosa*	1.3		Nil	C		LC
166	*Clinopodium umbrosum*	1.3		Nil	C		LC
167	*Clinopodium vulgare*	3.5	M, Fo	Low	C		LC
168	*Cnicus benedictus*	0.6		Nil	C		LC
169	*Colchicum luteum*	5.1	M	High	D		CR
170	*Colocasia esculenta*	0.3	F	High	C		LC
171	*Commelina benghalensis*	2.2	M, Fo	High	I		LC
172	*Commelina paludosa*	1		Nil	C		LC
173	*Convolvulus arvensis*	0.3	M, Fo, V	Low	C		LC
174	*Conyza bonariensis*	1.9		Nil	I		LC
175	*Conyza canadensis*	4.5	M	Low	I		LC
176	*Conyza stricta*	1.9		Nil	C		LC
177	*Corchorus olitorius*	1.3	M, F	High	C		LC
178	*Cornus macrophylla*	1.3	M, Fu	V. High	D		EN
179	*Coronopus didymus*	0.6		Nil	I		LC
180	*Corydalis diphylla*	2.2		Nil	C	Endemic to HKH (Ali *et al.*, 1972-	LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
						2009)	
181	*Cotinus coggyria*	4.5	M, Fu, T	High	D		NT
182	*Cotoneaster affinis*	2.2		Nil	C		LC
183	*Cotoneaster microphyllus*	0.6	F, Fo, Fu	Low	C		LC
184	*Cotoneaster nummularia*	6.7	M, Fu	Low	C		LC
185	*Cotoneaster racemiflorus*	14.3	F,M, Fu	High	D		NT
186	*Cousinia thomsonii*	1.6		Nil	C		LC
187	*Crepis foetida*	1.3		Nil	C		LC
188	*Crepis lignea*	1		Nil	C		LC
189	*Crepis multicaulis*	1.3		Nil	C		LC
190	*Crotalaria medicaginea*	1.9		Nil	C		LC
191	*Cucumis melo s. agrestis v. agrestis*	0.6	V	Low	C		LC
192	*Cuscuta capitata*	2.2		Nil	C		LC
193	*Cuscuta gigantea*	0.3		Nil	C		LC
194	*Cymbopogon jwarancusa*	1.3	M, Fo	Low	D		VU
195	*Cymbopogon martini*	4.1		Low	C		LC
196	*Cynanchum auriculatum*	1.3		Nil	C		LC
197	*Cynodon dactylon*	18.2	M, Fo, V	Low	C		LC
198	*Cynoglossum glochidiatum*	4.1		Nil	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
199	*Cynoglossum lanceolatum*	5.1		Nil	C		LC
200	*Cyperus alopecuroides*	0.6		Nil	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
201	*Cyperus articulatus*	1		Nil	C		LC
202	*Cyperus compressus*	0.3		Nil	C		LC
203	*Cyperus difformis*	2.5		Nil	C		LC
204	*Cyperus glomeratus*	1		Nil	C		LC
205	*Cyperus iria*	0.6		Nil	C		LC
206	*Cyperus niveus*	4.5		Nil	C		LC
207	*Cyperus rotundus*	4.1	M, Fo	Low	I		LC
208	*Cyperus serotinus*	0.3		Nil	C		LC
209	*Dactylis glomerata*	4.1	Fo	Low	C		LC
210	*Dactyloctenium aegyptium*	1.9	M, Fo	Low	C		LC
211	*Dactylorhiza hatagirea*	1.3	M	High	D	Endemic to HKH (Kumar *et al.*, 2011)	CR
212	*Daphne mucronata*	10.8	M,Fu, V	High	D		LC
213	*Daphne papyracea*	1.9		Nil	C	Endemic to HKH (Sharma and Sharma, 2014)	LC
214	*Datura stramonium*	1.6	M, V	Low	C		LC
215	*Debregeasia saeneb*	2.9	F, M, Fu	Moderate	D		LC
216	*Delphinium denudatum*	4.1	M, V	Moderate	D		VU
217	*Delphinium vestitum*	0.6		Nil	D	Endemic to HKH (Kumar *et al.*, 2011)	EN
218	*Descurainia sophia*	1	F, M, Fo	Low	C		LC
219	*Desmodium elegans*	3.2	M, Fu	Moderate	D	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
220	*Desmostachya bipinnata*	1.9	M,Fo, V	Low	I		LC
221	*Dianthus crinitus*	2.2		Nil	C		LC
222	*Dichanthium annulatum*	8.9	Fo, T	Moderate	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
223	*Dicliptera bupleuroides*	8.3		Nil	C		LC
224	*Digera muricata*	1.3	F, M, Fo	Low	I		LC
225	*Digitaria ciliaris*	1.6		Nil	I		LC
226	*Digitaria sanguinalis*	1.3	M, Fo	Low	I		LC
227	*Digitaria violascens*	0.6		Nil	I		LC
228	*Diospyros lotus*	6.4	F, C, T	High	D		NT
229	*Dodonaea viscosa*	15.9	Fu, M, V	High	D		NT
230	*Dryopteris filix-mas*	0.3	M, V	Low	C		LC
231	*Dryopteris juxtaposita*	1.6	F	High	D		VU
232	*Dryopteris stewartii*	0.3		Nil	C	Endemic to Pakistan (Ali *et al.*, 1972-2009)	LC
233	*Duchesnea indica*	1.6	F, M	Moderate	C		LC
234	*Echinochloa colona*	1.6	Fo	Moderate	I		LC
235	*Echinochloa crus-galli*	1.3	M, Fo, V	Moderate	C		LC
236	*Echinops sphaerocephalus*	0.3		Nil	C		LC
237	*Eclipta prostrata*	2.2	M, V	Low	I		LC
238	*Elaeagnus umbellata*	1	F, M, Fu	High	D		VU
239	*Eleocharis palustris*	1.3		Nil	C		LC
240	*Eleusine indica*	1.9	M, Fo	Low	C		LC
241	*Elsholtzia ciliata*	1.3		Nil	C		LC
242	*Epilobium hirsutum*	3.8	M, V	Low	C		LC
243	*Epilobium leptophyllum*	0.6		Nil	C		LC
244	*Epipactis helleborine*	0.3		Nil	C		LC
245	*Epipactis veratrifolia*	2.5		Nil	C		LC
246	*Equisetum arvense*	2.2	M	Low	C		LC
247	*Equisetum ramosissimum*	1		Nil	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
248	*Eragrostis cilianensis*	0.3		Nil	I		LC
249	*Eremostachys superba*	0.3		Nil	C		LC
250	*Eriophorum comosum*	1.9		Nil	C		LC
251	*Erodium cicutarium*	1.3		Nil	C		LC
252	*Eryngium coeruleum*	1.9		Nil	C		LC
253	*Eucalyptus camaldulensis*	1.6	M, C, Fu	Moderate	I		LC
254	*Eulaliopsis binata*	1.3	T	V. High	D		LC
255	*Euonymus hamiltonianus*	3.2	Fo, Fu, T	Moderate	D		NT
256	*Euonymus pendulus*	0.3		Nil	C		LC
257	*Euphorbia falcata*	1		Nil	C		LC
258	*Euphorbia helioscopia*	1	V	Low	C		LC
259	*Euphorbia hirta*	1	M, V	Low	C		LC
260	*Euphorbia maddenii*	1		Nil	C		LC
261	*Euphorbia peplus*	0.3		Nil	C		LC
262	*Euphorbia prostrata*	3.5	M	Low	C		LC
263	*Euphorbia wallichii*	5.7	M, V	Moderate	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
264	*Fallopia dumetorum*	0.6		Nil	C		LC
265	*Ficus palmata*	9.2	F, M, V	High	D		LC
266	*Ficus sarmentosa*	1.6	M	Low	C		LC
267	*Filago hurdwarica*	1.9		Nil	C		LC
268	*Fimbristylis bisumbellata*	1		Nil	C		LC
269	*Fragaria nubicola*	5.7	F, M	Moderate	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
270	*Fumaria indica*	2.2	M	Moderate	I		LC
271	*Gagea pakistanica*	3.8		Nil	C	Endemic to HKH	LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
						(Ali *et al.*, 1972-2009)	
272	*Galinsoga parviflora*	4.5		Nil	I		LC
273	*Galium acutum*	0.3		Nil	C		LC
274	*Galium aparine*	6.7	M, Fo	Low	C		LC
275	*Galium asperuloides*	5.7		Nil	C	Endemic to HKH (Khan *et al.*, 2013b)	LC
276	*Galium divaricatum*	1.9		Nil	C		LC
277	*Galium elegans*	1.9		Nil	I		LC
278	*Galium rotundifolium*	2.5	M, Fo	Low	C		LC
279	*Galium tenuissimum*	1.9		Nil	C		LC
280	*Galium tricornutum*	0.6		Nil	C		LC
281	*Gentianodes argentea*	5.7		Nil	D	Endemic to Pakistan (Ali *et al.*, 1972-2009)	NT
282	*Gentianodes olivieri*	0.6		Nil	C		LC
283	*Geranium collinum*	1.6		Nil	C		LC
284	*Geranium lucidum*	1.3		Nil	C		LC
285	*Geranium nepalense*	2.2		Nil	C		LC
286	*Geranium ocellatum*	0.3	M	Low	C		LC
287	*Geranium rotundifolium*	3.5		Nil	C		LC
288	*Geranium Swatense*	4.8	M	High	D	Endemic to Pakistan (Ali *et al.*, 1972-2009)	NT
289	*Geum urbanum*	4.1	M	Low	C		LC
290	*Girardinia palmata*	1.3		Nil	C		LC
291	*Gnaphalium uliginosum*	1		Nil	C		LC
292	*Goodyera repens*	1.3		Nil	C		LC
293	*Gratiola officinalis*	1		Nil	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
294	*Grewia optiva*	0.3	F, Fo, V	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
295	*Habenaria digitata*	0.6		Nil	C		LC
296	*Hackelia macrophylla*	2.9		Nil	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
297	*Hedera nepalensis*	2.9	M	High	D		VU
298	*Heliotropium europaeum*	1		Nil	C		LC
299	*Heliotropium strigosum*	1		Nil	C		LC
300	*Hemerocallis fulva*	0.6	F, M	Low	C		LC
301	*Heracleum cachemiricum*	1.3		Nil	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
302	*Heracleum candicans*	0.6		Nil	C	Endemic to HKH (Khan *et al.*, 2013b)	EN
303	*Heracleum canescens*	2.9		Nil	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
304	*Heteropogon contortus*	5.7	Fo, C, V	Low	C		LC
305	*Hieracium umbellatum*	0.3		Nil	C		LC
306	*Hordeum murinum*	0.6		Nil	C		LC
307	*Hydrilla verticillata*	1		Nil	C		LC
308	*Hylotelephium ewersii*	1.3	M, F, V	Low	C		LC
309	*Hyparrhenia hirta*	3.5	Fo	Low	C		LC
310	*Hypericum perforatum*	4.5	M	High	D		VU

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
311	*Hypodematium crenatum*	0.6		Nil	C		LC
312	*Impatiens bicolor*	3.2		Nil	C		LC
313	*Impatiens brachycentra*	3.2		Nil	C		LC
314	*Impatiens edgeworthii*	4.8		Nil	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
315	*Impatiens glandulifera*	1.9	M	Low	C	Endemic to HKH (Singh and Samant, 2010)	LC
316	*Impatiens pallida*	1.3	M	Low	C		EN
317	*Imperata cylindrica*	0.3	M, Fo, C	Low	C		LC
318	*Indigofera heterantha v. gerardiana*	30.9	C, T, M,Fu	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	NT
319	*Indigofera heterantha v. heterantha*	4.8		Low	D	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
320	*Indigofera linifolia*	1.9		Nil	C		LC
321	*Inula species*	1.9		Nil	C		LC
322	*Ipomoea eriocarpa*	0.3		Nil	C		LC
323	*Ipomoea purpurea*	0.6	M	Moderate	C		LC
324	*Iris germanica*	1.6	M	Low	D		LC
325	*Iris hookeriana*	2.2		Nil	C	Endemic to HKH (Khan *et al.*, 2013b)	NT
326	*Isachne himalaica*	0.6	Fo	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
327	*Isatis costata*	0.3	M	Low	C		LC
328	*Isodon coetsa*	1		Nil	C		LC
329	*Isodon rugosus*	27.7	M, Fu, C	V. High	D		NT

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
330	*Ixiolirion tataricum*	0.6		Nil	C		LC
331	*Jasminum humile*	4.1	M, Fo, Fu	Low	C		LC
332	*Jasminum officinale*	4.1	M, Fo, Fu	Moderate	D		LC
333	*Juglans regia*	2.5	F, M, T	V. High	D	Endemic to HKH (Sharma and Sharma, 2014)	CR
334	*Juncus articulatus*	3.8		Nil	C		LC
335	*Juncus bufonius*	1.3		Nil	C		LC
336	*Juncus inflexus*	0.3		Nil	C		LC
337	*Juniperus communis*	1.3	F,M,V,Fu	V. High	D		EN
338	*Justicia adhatoda*	6.1	M, V	High	D		LC
339	*Justicia peploides*	0.3		Nil	C		LC
340	*Justicia vahlii*	0.6		Nil	I		LC
341	*Kickxia ramosissima*	1.9		Nil	C		LC
342	*Kobresia laxa*	0.6		Nil	C		LC
343	*Kyllinga brevifolia*	1.6		Nil	C		LC
344	*Kyllinga nemoralis*	1.3		Nil	C		LC
345	*Lactuca dissecta*	0.3		Nil	C		LC
346	*Lactuca serriola*	1	F	Low	C		LC
347	*Lamium album*	3.5	F	Low	C		LC
348	*Lamium amplexicaule*	0.6	F, M, Fo	Moderate	C		LC
349	*Lathyrus aphaca*	1	F, Fo	Low	C		LC
350	*Lathyrus hirsutus*	0.3		Nil	C		LC
351	*Lathyrus pratensis*	1		Nil	C		LC
352	*Lathyrus sphaericus*	0.6	F	Low	C		LC
353	*Launaea nudicaulis*	2.5		Nil	C		LC
354	*Launaea procumbens*	1.6		Nil	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
355	*Lemna minor*	0.6		Nil	I		LC
356	*Leontopodium himalayanum*	2.9		Nil	C		LC
357	*Leonurus cardiaca*	1.3		Nil	I		LC
358	*Lepidium apetalum*	3.8	F, M	Low	I		LC
359	*Leptochloa panicea*	0.3		Nil	I		LC
360	*Leptorhabdos parviflora*	0.6		Nil	C		LC
361	*Lepyrodiclis tenera*	1		Nil	C		LC
362	*Lespedeza juncea*	4.1	M, Fo, T	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
363	*Leucas cephalotes*	1.3	M, Fo	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
364	*Leucas lanata*	4.5		Nil	C		LC
365	*Lilium polyphyllum*	1	M	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
366	*Limonium macrorhabdon*	3.8	M	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
367	*Linum corymbulosum*	1.3		Nil	C		LC
368	*Lolium perenne*	3.5		Nil	C		LC
369	*Lolium persicum*	0.3		Nil	C		LC
370	*Lolium temulentum*	1.3	Fo, V	Low	C		LC
371	*Lonicera japonica*	0.6		Nil	C		LC
372	*Lonicera myrtillus*	1.3		Nil	C	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
373	*Lotus corniculatus*	2.5	M, F	Low	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
374	*Lycopus europaeus*	1	M	Low	C		LC
375	*Lygeum spartum*	0.3		Nil	C		LC
376	*Lysimachia chenopodioides*	0.6		Nil	C		LC
377	*Lysimachia pyramidalis*	0.3		Nil	C		LC
378	*Malcolmia africana*	0.6		Nil	C		LC
379	*Malva neglecta*	1.6	F, M	High	D		LC
380	*Malvastrum coromendelianum*	4.5	M	Low	I		LC
381	*Marrubium vulgare*	1.9	M	Low	C		VU
382	*Marsilea polycarpa*	1.6	M, V	Low	C		LC
383	*Matricaria matricarioides*	1		Low	C		LC
384	*Maytenus royleanus*	12.7	Fo, Fu	Moderate	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
385	*Maytenus wallichiana*	4.1	Fu	Moderate	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
386	*Mazus japonicus*	2.5		Nil	I		LC
387	*Medicago falcata*	0.6		Nil	C		LC
388	*Medicago lupulina*	3.5	F,M, Fo	Low	C		LC
389	*Medicago minima*	1.6	F, Fo	Low	C		LC
390	*Medicago orbicularis*	0.3		Nil	C		LC
391	*Medicago polymorpha*	4.8	F, Fo	High	C		LC
392	*Melia azedarach*	5.1	M, Fu, T	High	D		NT
393	*Melilotus alba*	1.3		Nil	C		LC
394	*Melilotus indica*	1.3	M	Low	C		LC
395	*Mentha longifolia*	1.6	F, M	High	D		LC
396	*Microlepia strigosa*	0.6		Nil	C		LC
397	*Micromeria biflora*	9.6	M	Moderate	C	Endemic to HKH	LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
						(Shrestha *et al.*, 2006)	
398	*Mirabilis jalapa*	0.3	M	Moderate	C		LC
399	*Mollugo nudicaulis*	1.3		Nil	I		LC
400	*Mollugo pentaphylla*	0.3		Nil	I		LC
401	*Monochoria vaginalis*	1	M, F	Low	C		LC
402	*Monotheca buxifolia*	0.3	F	High	D		VU
403	*Moraea sisyrinchium*	1.6	V	Low	D		LC
404	*Morus alba*	3.8	F, M, T	High	C		LC
405	*Morus nigra*	4.5	F, M, T	High	C		LC
406	*Myriactis nepalensis*	3.2		Nil	C		LC
407	*Myriactis wallichii*	0.6		Nil	C		LC
408	*Myriactis wightii*	1.3		Nil	C		LC
409	*Myrsine africana*	5.4	M, Fu	High	D		VU
410	*Narcissus tazetta*	4.1	M, V	Moderate	C		LC
411	*Nasturtium officinale*	3.8	F, M	Moderate	C		LC
412	*Nepeta cataria*	1.9	M, V	Low	C		VU
413	*Nepeta erecta*	7	F, V, Fo	Low	C	Endemic to HKH (Kumar *et al.*, 2011)	LC
414	*Nepeta govaniana*	1.9		Nil	C		LC
415	*Nepeta laevigata*	2.2		Nil	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
416	*Nerium oleander*	1	M	Low	C		LC
417	*Neslia apiculata*	0.6		Nil	I		LC
418	*Nonea edgeworthii*	0.6		Nil	C		LC
419	*Notholirion thomsonianum*	0.3	M	Low	C		LC
420	*Oenanthe javanica*	1	F, M	Moderate	C		LC
421	*Oenothera rosea*	4.1	M, Fo	Low	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
422	*Olea ferruginea*	25.2	M,T,Fu	V. High	D		LC
423	*Onopordum acanthium*	1.9	F, M	Low	I		LC
424	*Onosma hispida*	1.3		Nil	C		LC
425	*Onychium contiguum*	3.2		Nil	C		LC
426	*Ophiopogon intermedius*	0.3		Nil	C		LC
427	*Origanum vulgare*	15.3	M, F, V	Low	C		LC
428	*Orobanche alba*	0.6	M	Low	C		LC
429	*Orobanche cernua*	0.3		Nil	C		LC
430	*Otostegia limbata*	8.6	M, Fu	Low	C	Endemic to Pakistan (Ali *et al.*, 1972-2009)	LC
431	*Oxalis corniculata*	9.6	F, M, Fo	Moderate	C		LC
432	*Oxalis pes-caprae*	0.3		Nil	C		LC
433	*Oxytropis cachemiriana*	0.6		Nil	I	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
434	*Oxytropis thomsonii*	1		Nil	I		LC
435	*Paeonia emodi*	3.8	M	V. High	D	Endemic to HKH (Khan *et al.*, 2013b)	EN
436	*Papaver dubium*	0.3	F	Low	C		LC
437	*Papaver hybridum*	0.3		Nil	C		LC
438	*Papaver pavoninum*	1.6		Nil	C		LC
439	*Parapholis incurva*	0.3		Nil	C		LC
440	*Parietaria alsinaefolia*	0.6		Nil	C		LC
441	*Parnassia nubicola*	3.8	F, M	Low	C	Endemic to HKH (Shrestha *et al.*, 2006)	VU
442	*Parnassia nubicola s. occidentalis*	0.3	F, M	Low	C		VU

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
443	*Parrotiopsis jacquemontiana*	4.8	Fu, T	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
444	*Paspalum dilatatum*	0.3	Fo	Low	C		LC
445	*Paspalum paspalodes*	4.1	Fo	Low	I		LC
446	*Pelargonium zonale*	3.8	M	Low	C		LC
447	*Pellaea nitidula*	3.8		Nil	C		LC
448	*Pennisetum flaccidum*	2.9	Fo	Low	C		LC
449	*Pennisetum orientale*	7.6	Fo	Moderate	C		LC
450	*Periploca aphylla*	7.6	M	Low	C		LC
451	*Periploca hydaspidis*	0.3		Nil	C		LC
452	*Persicaria capitata*	2.2	M	Low	C		LC
453	*Persicaria glabra*	0.3	M	Moderate	C		LC
454	*Persicaria hydropiper*	1.9	M	Moderate	C		LC
455	*Persicaria lapathifolia*	1	M	Moderate	C		LC
456	*Persicaria maculosa*	0.6	M	Low	C		LC
457	*Persicaria mitis*	1.3		Nil	C		LC
458	*Persicaria nepalensis*	1.6		Nil	C		LC
459	*Petrorhagia alpina*	0.6		Nil	C		LC
460	*Phagnalon rupestre*	2.5		Nil	C		LC
461	*Phleum paniculatum*	0.6		Nil	C		LC
462	*Phlomis bracteosa*	2.5	M	Low	D	Endemic to HKH (Khan *et al.*, 2013b)	LC
463	*Phyla nodiflora*	1.9		Nil	C		LC
464	*Phyllanthus fraternus*	2.2	M	Low	C		LC
465	*Physalis divaricata*	2.5	M	Low	C		LC
466	*Phytolacca latbenia*	1	F, M	High	D		CR

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
467	*Picea smithiana*	10.8	C, T, Fu	V. High	D	Endemic to HKH (Khan *et al.*, 2013b)	VU
468	*Pilea umbrosa*	4.8		Nil	C		LC
469	*Pimpinella diversifolia*	1.3		Nil	C		LC
470	*Pinus roxburghii*	17.5	M,Fu, C	High	D	N.Endemic to HKH (Sharma and Sharma, 2014)	VU
471	*Pinus wallichiana*	29.9	C, M, Fu	V. High	D	N.Endemic to HKH (Sharma and Sharma, 2014)	VU
472	*Piptatherum gracile*	3.2		Nil	C		LC
473	*Piptatherum laterale*	0.6		Nil	C		LC
474	*Piptatherum munroi*	1.9		Nil	C		LC
475	*Pistacia chinensis* subsp. *integerrima*	3.5	M	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
476	*Plantago lagopus*	6.7		Nil	C		LC
477	*Plantago lanceolata*	7.3	M	Low	C		LC
478	*Plantago major*	5.7	M	Moderate	C		VU
479	*Platanus orientalis*	0.3	C, T	High	D		VU
480	*Poa alpina*	8.6	Fo	Low	C		LC
481	*Poa annua*	6.1	Fo	Low	C		LC
482	*Poa bulbosa*	4.1	Fo	Low	C		LC
483	*Poa infirma*	2.5		Nil	C		LC
484	*Poa polycolea*	3.8		Nil	C		LC
485	*Poa pratensis s. angustifolia*	3.5		Nil	C		LC
486	*Podophyllum emodi*	1.9	M	V. High	D	Endemic to HKH (Khan *et al.*, 2013b)	EN
487	*Polygala abyssinica*	2.5	M	Moderate	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
488	*Polygala crotalarioides*	1		Nil	C		LC
489	*Polygala erioptera*	0.3		Nil	C		LC
490	*Polygonatum geminiflorum*	1.6	M	High	D		EN
491	*Polygonatum multiflorum*	2.2	M, V	High	D		VU
492	*Polygonatum verticillatum*	1.9	F,M, V	V. High	D		CR
493	*Polygonum aviculare*	3.2	F,M,	Moderate	C		LC
494	*Polygonum paronychioides*	0.3		Nil	C		LC
495	*Polygonum plebejum*	1	F, M	Low	C		LC
496	*Polypogon fugax*	0.3		Nil	I		LC
497	*Polystichum aculeatum*	1.6		Nil	C		LC
498	*Polystichum platyphyllum*	1.3		Nil	C		LC
499	*Polystichum polyblepharum*	1.3		Nil	C		LC
500	*Populus ciliata*	0.6	Fu, C	High	I		LC
501	*Populus nigra*	1.9	Fu, C	High	I		LC
502	*Portulaca oleracea*	1	Fo, M	High	C		LC
503	*Potamogeton crispus*	0.6		Nil	C		LC
504	*Potamogeton nodosus*	1		Nil	C		LC
505	*Potamogeton perfoliatus*	0.6		Nil	C		LC
506	*Potentilla argentia*	1.9		Nil	C		LC
507	*Potentilla nepalensis*	7.3	M	Low	C		LC
508	*Potentilla reptans*	3.5	M	Low	C		LC
509	*Potentilla supina*	0.3	M, Fo	Low	C		LC
510	*Pouzolzia*	0.6		Nil	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
	pentandra						
511	*Prangos pabularia*	0.6	M	Low	C		EN
512	*Prenanthes brunoniana*	1.3		Nil	C		LC
513	*Primula denticulata*	2.5	M	High	D	Endemic to HKH (Shaheen and Shinwari, 2012)	VU
514	*Prunella vulgaris*	5.7	M	Moderate	C		LC
515	*Prunus cerasoides*	1.3	F	High	D		EN
516	*Prunus cornuta*	4.5	F, Fu, T	High	D		VU
517	*Pseudomertensia parvifolia*	2.9		Nil	C		LC
518	*Pteridium aquilinum*	8	C, F	Low	C		LC
519	*Pteris cretica*	1.3	M	Low	C		LC
520	*Pteris vittata*	0.6	M	Low	C	Endemic to HKH (Khan *et al.*, 2013b)	LC
521	*Punica granatum*	2.2	F, M, Fu	High	D		VU
522	*Pycreus flavescens*	0.6		Nil	C		LC
523	*Pycreus polystachyos*	0.3		Nil	C		LC
524	*Pycreus pumilus*	0.6		Nil	C		LC
525	*Pycreus sanguinolentus*	0.6		Nil	C		LC
526	*Pyrus pashia*	3.5	F, M	Moderate	D		LC
527	*Quercus baloot*	6.8	T, M	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	NT
528	*Quercus dilatata*	12.7	C, Fu, T	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
529	*Quercus incana*	10.5	C, Fu, T	High	D	Endemic to HKH (Ali *et al.*, 1972-	VU

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
						2009)	
530	*Quercus semecarpifolia*	2.9	Fu	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	NT
531	*Ranunculus arvensis*	1	V	Low	I		LC
532	*Ranunculus laetus*	4.1		Nil	C		LC
533	*Ranunculus muricatus*	0.6	M, V	Low	I		LC
534	*Ranunculus sceleratus*	0.6	M, V	Low	I		LC
535	*Reinwardtia indica*	1	V	Low	C	N.Endemic to HKH (Sharma and Sharma, 2014)	LC
536	*Rhamnus triquetra*	1.3	M,Fo, Fu	Moderate	D	N.Endemic to HKH (Sharma and Sharma, 2014)	NT
537	*Rhus punjabensis*	0.3	F, Fo, Fu	Moderate	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
538	*Ribes himalense*	0.3		Nil	D	Endemic to HKH (Ali *et al.*, 1972-2009)	CR
539	*Ricinus communis*	0.3	M, V	High	D		VU
540	*Robinia pseudo-acacia*	0.3	Fo, Fu	Low	I		LC
541	*Rorippa indica*	1		Nil	I		LC
542	*Rorippa islandica*	0.6		Nil	I		LC
543	*Rosa brunonii*	8	F, Fo, Fu	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
544	*Rosa moschata*	1	F, Fo	Low	C		LC
545	*Rosa webbiana*	4.1	M	Low	C		LC
546	*Rostraria cristata*	0.6		Nil	I		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
547	*Rosularia adenotricha*	1.6		Nil	C		LC
548	*Rottboellia exaltata*	1.6	F	Moderate	D		VU
549	*Rubia cordifolia*	1.6	F, M	Moderate	C	Endemic to HKH (Shrestha *et al.*, 2006)	LC
550	*Rubus ellipticus*	1.3	F, M	Moderate	D		VU
551	*Rubus fruticosus*	8.9	F, M, Fu	High	D		NT
552	*Rubus niveus*	4.5	F, Fu	High	D		VU
553	*Rubus ulmifolius*	5.4	F	Moderate	D		NT
554	*Ruellia tuberosa*	0.6	M	Low	I		LC
555	*Rumex dentatus*	3.2	F, M, Fu	Low	D		LC
556	*Rumex hastatus*	10.2	F, M	Low	C		LC
557	*Rumex nepalensis*	11.1	M, F, Fu	Low	C		LC
558	*Saccharum spontaneum*	1	M. C, T	Low	C		LC
559	*Sageretia thea*	8.6	F, Fu	Moderate	D		LC
560	*Sagina apetala*	0.6		Nil	C		LC
561	*Sagittaria trifolia*	1	F	Low	C		LC
562	*Salix babylonica*	1.6	M,Fu, C	Low	C		LC
563	*Salix flabellaris*	1		Low	C	Endemic to HKH (Khan *et al.*, 2013b)	LC
564	*Salix tetrasperma*	1.3	M,Fu, C	Low	C		LC
565	*Salvia lanata*	2.2	F, M	High	D	Endemic to HKH (Sharma and Sharma, 2014)	VU
566	*Salvia moocroftiana*	4.5	M	Moderate	C	Endemic to HKH (Khan *et al.*, 2013b)	LC
567	*Salvia nubicola*	2.2		Nil	C	Endemic to HKH (Sharma and Sharma, 2014)	LC
568	*Salvia plebeia*	1.6	M	Low	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
569	*Sanguisorba minor*	3.5	F, M	Low	C		LC
570	*Sarcococca saligna*	9.6	M	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
571	*Saussurea alpina*	0.6		Nil	C		LC
572	*Saxifraga sibirica*	1.6		Nil	C		LC
573	*Scabiosa candollei*	4.1		Nil	C		LC
574	*Scandix pecten-veneris*	1.9	F, Fo	Low	C		LC
575	*Schoenoplectus litoralis*	1.3		Nil	C		LC
576	*Schoenoplectus mucronatus*	1		Nil	C		LC
577	*Scilla griffithii*	4.8		Nil	C		LC
578	*Sclerochloa dura*	0.6		Nil	I		LC
579	*Scrophularia canina*	0.6		Nil	C		LC
580	*Scrophularia dentata*	0.3		Nil	C		LC
581	*Scrophularia nodosa*	1.6	M	Low	C		LC
582	*Scrophularia species*	0.3		Nil	C		LC
583	*Scutellaria chamaedrifolia*	4.5	M, Fo	Low	C		LC
584	*Sedum hispanicum*	6.7		Nil	C		LC
585	*Selinum filicifolium*	0.6		Nil	C		LC
586	*Senecio chrysanthemoides*	4.8		Nil	C		LC
587	*Serratula pallida*	1.3		Nil	C		LC
588	*Seseli libanotis*	1		Nil	C		LC
589	*Setaria pumila*	1	Fo	Low	C		LC
590	*Setaria viridis*	3.8	Fo	Low	C		LC
591	*Sibbaldia procumbens*	2.5		Nil	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
592	*Sigesbeckia orientalis*	1	M	Low	C		LC
593	*Silene conoidea*	0.6	F	Low	I		LC
594	*Silene indica v. cashmeriana*	3.2		Nil	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
595	*Silene viscosa*	3.8		Nil	C		LC
596	*Silene vulgaris*	1.6		Nil	C		LC
597	*Silybum marianum*	0.3	M	Low	I		LC
598	*Sinapis alba*	0.3	F, M, Fo	Low	I		LC
599	*Sisymbrium altissimum*	0.3		Nil	I		LC
600	*Sium latijugum*	1.3		Nil	C		LC
601	*Skimmia laureola*	1.3	M	V. High	D		EN
602	*Smilax glaucophylla*	1.3		Nil	C		LC
603	*Solanum nigrum*	5.4	M, F	High	C		LC
604	*Solanum pseudo-capsicum*	0.3	V	Low	C		LC
605	*Solanum surattense*	0.3	M	Low	C		VU
606	*Solanum villosum*	2.2	M, F	High	C		LC
607	*Solena amplexicaulis*	1	F, M	High	D		LC
608	*Sonchus arvense*	0.3		Nil	I		LC
609	*Sonchus asper*	0.6		Nil	C		LC
610	*Sonchus oleraceus*	0.6	F, M	Moderate	C		LC
611	*Sorbaria tomentosa*	5.7	M, Fo	Moderate	D		LC
612	*Sorbus aria*	0.6	F, Fu	Moderate	D		CR
613	*Sorghum halepense*	2.5	Fo	Low	C		LC
614	*Sparganium erectum*	1		Nil	I		LC
615	*Spergularia media*	1.6		Nil	C		LC
616	*Spiraea bella*	3.5		Nil	C		LC
617	*Spiraea canescens*	3.8	Fo, Fu	Low	C	Endemic to HKH (Singh and Samant,	LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
						2010)	
618	*Stachys emodi*	1		Nil	C		LC
619	*Stachys floccosa*	0.3		Nil	C		LC
620	*Stachys palustris*	0.3		Nil	C		LC
621	*Stachys parviflora*	1.9	M, V	Low	C		LC
622	*Stellaria media*	7	F, M	Moderate	C		LC
623	*Stellaria uliginosa*	1.3		Nil	C		LC
624	*Strobilanthes urticifolia*	4.1		Nil	C		LC
625	*Swertia cordata*	3.5	M, Fo	Low	C		LC
626	*Symphyotrichum squamatum*	0.6		Nil	I		LC
627	*Tagetes minuta*	2.2	M, V	Low	I		LC
628	*Taraxacum officinale*	9.9	M, F	Low	C		LC
629	*Taxus wallichiana*	4.1	M, C, T	V. High	D		CR
630	*Teucrium royleanum*	3.5		Nil	C		LC
631	*Teucrium stocksianum*	7.3	M	High	D		VU
632	*Themeda anathera*	6.4	Fo, C	Low	C	Endemic to HKH (Ali *et al.*, 1972-2009)	LC
633	*Thlaspi arvense*	2.2		Nil	C		LC
634	*Thymus linearis*	9.6	M	High	D		VU
635	*Torilis japonica*	1.3		Nil	C		LC
636	*Tragopogon pratensis*	1.3		Nil	C		LC
637	*Tragus roxburghii*	0.6		Nil	C		LC
638	*Trianthema portulacastrum*	0.6	M, Fo, V	Low	I		LC
639	*Tribulus terrestris*	1	M	High	C		LC
640	*Trichodesma indicum*	3.5	M	Low	C		LC
641	*Trifolium repens*	4.5	M, Fo	Low	C		LC

No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
642	*Trigonella monantha*	0.3		Nil	C		LC
643	*Trigonella monantha s. incisa*	1		Nil	C		LC
644	*Trillium govanianum*	2.2	M	V. High	D	Endemic to HKH (Khan *et al.*, 2013b)	CR
645	*Trisetum spicatum*	0.3		Nil	C		LC
646	*Tulipa clusiana*	4.1	F	Low	C		LC
647	*Typha latifolia*	1	C, T	Moderate	C		LC
648	*Ulmus wallichiana*	1.3	M, Fu, T	V. High	D	Endemic to HKH (Khan *et al.*, 2013b)	CR
649	*Urochloa panicoides*	1		Nil	I		LC
650	*Urtica dioica*	4.8	M, F	Low	C		LC
651	*Utricularia aurea*	0.6		Nil	C		LC
652	*Valeriana hardwickii*	1.3	M	Low	C		VU
653	*Valeriana jatamansi*	6.4	M	High	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
654	*Valeriana pyrolifolia*	1.3	M	High	D		VU
655	*Valerianella szovitsiana*	1		Nil	C		LC
656	*Verbascum thapsus*	2.5	M, Fu	Low	C		LC
657	*Verbena officinalis*	3.5	M	Low	C		LC
658	*Verbena tenuisecta*	0.6		Nil	I		LC
659	*Veronica anagallis-aquatica*	2.9	F, M	Low	C		LC
660	*Veronica hederifolia*	1.6		Nil	C		LC
661	*Veronica laxa*	7.3		Nil	C		LC
662	*Veronica persica*	4.1		Nil	C		LC
663	*Veronica polita*	1	F, M	Low	C		LC
664	*Viburnum cotinifolium*	3.5	F, Fu	Moderate	D	Endemic to HKH (Khan *et al.*, 2013b)	NT
665	*Viburnum*	15.3	F, Fu, M	High	D	Endemic to HKH	NT

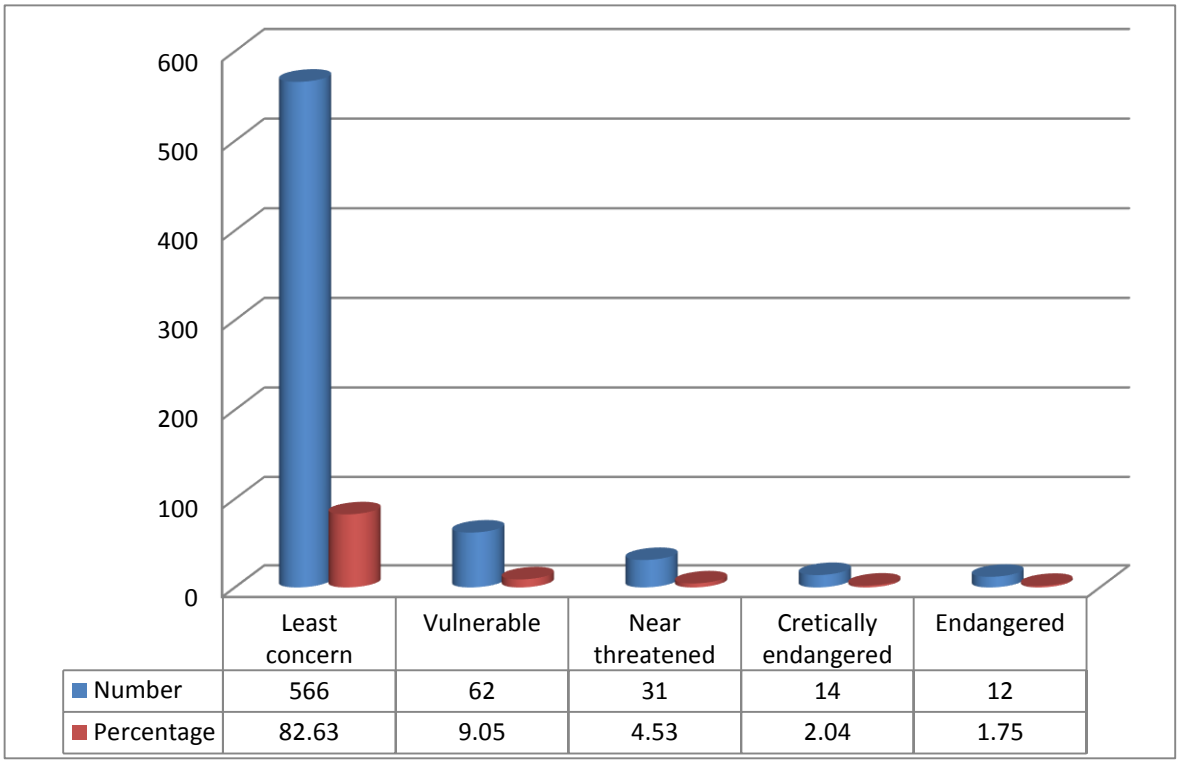
No.	Species	%Frequency*	Major Use Class	Pressure level	Trend**	Endemic status	Conservation Status
	grandiflorum					(Ali *et al.*, 1972-2009)	
666	*Vicia monantha*	2.2		Nil	C		LC
667	*Vicia sativa*	1.9	V	Low	C		LC
668	*Vincetoxicum arnottianum*	1.9		Nil	C		LC
669	*Vincetoxicum hirundinaria*	1.6		Nil	C		LC
670	*Viola betonicifolia*	1.9	M	Moderate	D		VU
671	*Viola canescens*	5.1	M	High	D	Endemic to HKH (Sharma and Sharma, 2014)	VU
672	*Viscum album*	0.3	M, V	Moderate	C		VU
673	*Vitex negundo*	9.6	M, T	High	D		NT
674	*Vitis jacquemontii*	1.3	F, M	Low	D		VU
675	*Vulpia myuros*	1.6		Nil	C		LC
676	*Wikstroemia canescens*	4.1		Low	C		LC
677	*Withania somnifera*	1.3	M	High	D		VU
678	*Wulfenia amherstiana*	2.2	M	Low	C		LC
679	*Xanthium strumarium*	2.2	M	Low	I		LC
680	*Zanthoxylum armatum*	3.8	F, M, Fu	High	D		VU
681	*Ziziphus jujuba*	3.2	F, M, Fu	High	D		NT
682	*Ziziphus nummularia*	1.6	F, M, Fo	Moderate	D		NT
683	*Ziziphus oxyphylla*	1.9	F, M, Fo	Moderate	D	Endemic to HKH (Ali *et al.*, 1972-2009)	VU
684	*Ziziphus spina-christi*	0.3	F, M, Fu	High	D		VU
685	*Zosima absinthifolia*	1		Nil	C		LC

*Frequency from phytosociological field data **Data obtained through ethnobotanical questionnaire

Abbreviations: HKH = Hidukush Himalaya

Use Classes: M = Medicinal plant, C = Construction, F = Food, Fo = Fodder, Fu = Fuel, T = Tools, V = Veterinary medicine

Trend: D = Decreasing, I = Increasing, C = Constant



	Least concern	Vulnerable	Near threatened	Cretically endangered	Endangered
Number	566	62	31	14	12
Percentage	82.63	9.05	4.53	2.04	1.75

Fig. 4.1: Summary of conservation status of the flora of Kabal valley, Swat

4.6 COCLUSION

In Kabal valley, Swat, Pakistan like the other remote valleys of the Hindukush-Himalayas people exploit natural resources and vegetation according to their local needs and they have empirical

knowledge of the plant bio-resources around them. The use of plants for immediate requirements like medicinal uses, grazing and fodder, food, fuel and other implements imposes a high pressure on the plant biodiversity. Human activities and biodiversity are in conflict with each other. People choose species only because of their own needs and hence put pressure on rare species. In this study, taking both the knowledge of local people about the uses and trend of abundance of plant species (ethnobotanical data) and field data from vegetation survey (phytosociological data) were evaluated together, which indicated a close coincidence between the findings from both data sets highlighting a high extinction risk for plant species which are most valued. Many of the valuable plant species fall under the threatened status of IUCN categories as their population is decresing day by day and need proper *in-situ* management and *ex-situ* propagation to protect them from decline and ultimate vanishing. Conservation of ecosystem biodiversity is an intricate and complicated process that requires modern scientific as well as traditional wisdom to address the deteriorating scenario in wake of climate change, alarming human population growth and over-exploitation of biological resources. Appreciation of the ethnoecological knowledge of the indigenous communities would certainly be helpful to biodiversity conservation and sustainable development. Biodiversity is especially concentrated in parts of the world inhabited by indigenous people (like Kabal valley) who live with and interact with them. The people are the direct users and guardians of the regional biodiversity. Any effort without the active envolvement of the indigenous people could not bring the required optimum benefits.

Chapter 5

GENERAL DISCUSSION

Kabal valley, district Swat, Pakistan is rich in plant biodiversity with 820 species belonged to 497 genera and 137 families. These are distributed in various groups in which ferns were 33 species, 8 species of gymnosperms, 184 species monocotyledons and 595 species were dicotyledons. Since the study area is located in the Hindukush mountain range with the elevational ranges of 836 to 3012 meters above sea level, there was good diversity of flora in terms of size compared with the District Swat as well as the whole country. It revealed that the area contributed 14.2% of the total flora of Pakistan and 51% of the flora of Swat. Comparing with the flora of Pakistan, Gymnosperms and ferns were richly found in the territory (34.8% and 25.8%, respectively) due to moderate precipitation, followed by monocotyledons (16.1%) and dicotyledons (13.2%).

Poaceae was found the largest family with 98 species that contributed 11.95% of the total flora, followed by Asteraceae (70 spp., 8.54%), Fabaceae (48 spp., 5.85%), Lamiaceae (42 spp., 5.12%), Rosaceae (36 spp., 4.39%), Brassicaceae (33 spp., 4.02%), Cyperaceae (31 spp., 3.78%), Apiaceae (21 spp., 2.56%), Caryophyllaceae (20 spp., 2.44%), Scrophulariaceae (17 spp., 2.07%), Ranunculaceae (16 spp., 1.95%), Euphorbiaceae, Polygonaceae and Solanaceae (15 spp., 1.83% each), while the rest of the families were represented by less than 14 species. *Euphorbia* was found to be the largest genus that contributed 11 species, followed by *Cyperus* (10 species), *Astragalus* (9 species), *Carex* (8 species), *Galium* and *Persicaria* (7 species each) and *Geranium*, *Scrophularia*, *Solanum* and *Poa* (6 species each), while the rest of genera shared less than 6 species.

With reference to habit, nine categories of life span of the flora were identified in which perennial herbs had dominant fraction having 341 species (41.59%), followed by

annual herbs (309 spp., 37.68%), deciduous shrubs (53 spp., 6.46%), deciduous trees (44 spp., 5.37%), climbers (22 spp., 2.68%), evergreen shrubs (20 spp., 2.44%), evergreen trees (16 spp., 1.95%), biennial herbs (8 spp., 0.98%) and parasites (7 spp., 0.85%).

Comparing with the flora of Swat (Stewart, 1968) and Anotated Catalogue of W. Pakistan & Kashmir (Stewart, 1972), 535 species (65.24%) were native to the area, 80 species (9.76%) new to Swat, 76 species (9.27%) were cultivated, 70 species (8.54%) as weeds to the arable lands, 29 species (3.54%) naturalized in the area, 24 species (2.93%) new to Pakistan, four species (0.49%) were exotic invasive and two species (0.24%) recently inrtoduced in the area (Table 2.2 , Fig. 2.4).

Comparing the flora of Pakistan, to the best of our knowledge, *Adiantum gravesii, Doryopteris decipiens, Polystichum platyphyllum, P. polyblepharum, Athyrium vidalii, Gymnocarpium dryopteris, Eriophorum comosum, Pennisetum purpureum, Anaphalis viridis, Aster alpinus, Bidens radiata, Crepis lignea, Myriactis wightii, Phagnalon rupestre, Saussurea alpina, Impatiens pallida, Stellaria holostea, Astragalus alpinus, A. depressus, Sorbus aria, Scrophularia canina* and *S. umbrosa* are supposed to be new records for Pakistan (Table 2.3). As far as to the contribution to the flora of Swat, *Trikeraia hookeri, Adenostemma lavenia, Anaphalis margaritacea, Aster falconeri, A. flaccidus, Echinops sphaerocephalus, Gnaphalium uliginosum, Leontopodium himalayanum, Matricaria aurea, M. matricarioides, Myriactis nepalensis, Prenanthes brunoniana, Sigesbeckia orientalis, Symphyotrichum squamatum, Anchusa arvensis* subsp. *Orientalis, Gastrocotyle hispida, Arabis amplexicaulis, Cardaria pubescens, Sinapis alba, Campanula tenuissima, Lonicera japonica, Lepyrodiclis tenera, Silene indica* var. *cashmeriana, Euonymus pendulus, Maytenus wallichiana, Cuscuta capitata, C. gigantea, Bergia ammannioides, Euphorbia heterophylla, E. hypericifolia, E. peplus, Astragalus densiflorus, A. filicaulis, Melilotus alba, Oxytropis cachemiriana, O. thomsonii, Vicia bithynica, Calamintha debilis, Nepeta cataria, Scutellaria*

*chamaedrifolia, Stachys palustris, Utricularia aurea, Mollugo nudicaulis, M. pentaphylla, Oxalis pes-caprae, Plantago lagopus, Polygala crotalarioides, P. erioptera, Lysimachia chenopodioides, L. pyramidalis, Clematis barbellata, Delphinium vestitum, Ziziphus spina-christi, Sanguisorba minor, Spiraea bella, Galium divaricatum, Gratiola officinalis, Mazus japonicus, Scrophularia dentata, Girardinia palmata, Parietaria alsinaefolia, Pouzolzia pent*and*ra, Valeriana hardwickii, Valerianella muricata, Ampelopsis vitifolia* and *Parthenocissus quinquefolia* are reported for the first time from the district Swat (Table 2.3).

Nine different plant communities viz, 1) Nasturtium-Paspalum-Veronica in Wetland, 2) Abies-Picea-Viburnum Coniferous Forest, 3) Pinus-Quercus-Berberis Mixed Forest, 4) Pinus-Indigofera Blue Pine Forest, 5) Celtis-Olea-Cynodon Sacred Groves Broad Leaved Forest, 6) Diosperos-Pinus-Quercus Mid Hill Degraded Forest, 7) Dodonaea-Isidon-Berberis Xeromorphic Scrub, 8) Pinus-Quercus-Galium Protected Chir Pine Forest and 9) Isodon-Berberis-Indigofera were established influenced by different topographic and edaphic factors. Species distribution is strongly influenced by altitude, latitude, pH, aspect and soil texture as depicted by DCA joint plot (Fig. 2.6).

The existence and establishment of a plant association reflects the plant type and habitat condition under which they develop (Malik, 1986). Our present work delineated nine associations with different floristic elements and micro-environmental conditions. The spatial distribution and floristic composition of plant associations in the area seem to be determined by a complex of environmental factors including climate, topography, soil and biotic influence, which undergo changes of different degrees due to interactions among themselves and result in micro-gradients (Hanson and Churchill, 1965) that result in the formation of numerous habitats and vegetational groups (Eriksson and Bergstrom, 2005).

The climate determines the large scale patterns in physiognomy and potential species distribution but other factors such as soil characteristics are important as well because they

influence plant distribution on smaller scale i.e. more local scale (Bakkenes *et al.*, 2002). The climate of Kabal valley is characterized by extremes of temperature and moderate rainfall, with more rain received in the spring and monsoon seasons, which is responsible for the establishment of stratified forests in the area (Ilyas *et al.*, 2012). Topography is one of the main factors that play important role in the structural characteristics of vegetation. Different altitudes, aspects and slopes harbor different associations. North facing slopes are moister than South facing slopes and thus harbor thick vegetation with high species diversity than south facing slopes (Hussain *et al.*, 1995; Hussain *et al.*, 1997; Yohay and Ronen, 1999; Khan *et al.*, 2011). The drier, steeper, south facing slopes in the hilly areas contains heliophytes while the moist, less steep, northern slopes have sciophytes.

Soil plays key role in plant selection through evolutionary change (Barbour *et al.*, 1980) and a close relationship between the vegetation of a particular area and its soil exists (Ali *et al.*, 2004). The physical properties of soil like depth (Khan *et al.*, 2011), texture (Hussain *et al.*, 1995) permeability to water and water holding capacity (Solon *et al.*, 2007) play an important role in establishment of plant communities. Chemical characteristics exert physiological stresses on plants through their effects on plant water relations, nutrient availability and uptake and toxicity effect and due to execs of certain chemical elements. Optimum pH for nutrient availability is between 5 and 7.5 with the greatest availability at about 6.5 (Monsen *et al.*, 2004). The soils of Kabal valley were coarse textured with the highest percentage of sand followed by silt and least clay contents. The pH of soil varied from 4.9 to 8.3 (6.64±0.78). The soil type of association of wetlands was slightly alkaline with highest pH (7.92±0.2) and thus supported a vegetation type that was totally different from other associations.The rest of communities were established on slightly acidic soils. Slight differences in the available nutrients are positively correlated with variations in community structure (Noor and Khatoon, 2013).

Life form is important physiognomic attribute which has been widely used in vegetation studies (Qadir and Shetvy, 1986; Hussain *et al.,* 1997; Devi and Sharma, 2004). A community existing under a given set of climatic conditions and biotic interactions can usually be characterisized by a certain frequency distribution of life form types among its members. The overall vegetation of Kabal valley was dominated by Therophytes, followed by Hemicryptophytes. Hemicryptophytes are the characteristics of temperate region (Cain and Carto, 1959), while Therophytes are the characteristics of harsh climate like deserts (Shimwell, 1971). The prevalence of Therophytes as the dominant group also indicates that the environmental conditions and/or biotic influences are probably less suited to the phanerophytes. Though the climate is potentially favourable for phanerophytes but has been changed into Therophytic by intense biotic exploitation in the form of wood extraction, felling, deforestation, overgrazing and modification of forest in the form of terrace cultivation (Devi and Sharma, 2004). Highest number of Therophytic and Hemicryptophytic flora indicate the shorter life cycle and mode of perennation due to peculiar environmental conditions of the area.

Leaf size has also been widely used in vegetation studies (Cain and Castro; 1959; Shimwell, 1971; Qadir and Shetvy 1986; Hussain *et al.,* 1995). Leaf size knowledge may help in understanding of the physiological processes of plants and plant communities (Oosting, 1956). The vegetation of Kabal valley is dominated by Nanophylls, Leptophylls and Microphylls. According to Cain and Castro (1959) and Shimwell (1971), Nanophylls and Microphylls are the characteristics of temperate region and Kabal valley climatically fall within this zone. Decrease in leaf size indicate harsh environmental conditions and has been noted with increasing altitude (Shehzad *et al.*, 1999; Zahidullah, 2004; Ilyas *et al.,* 2013).

The present enumeration indicated that the native people ethnobotanically used 453 plants (55.24% of the total) of 119 families. Amongst them, Poaceae was the leading family

with 54 species that shared 11.92% of the ethnobotanical flora (Table 3.1). In all, eight use value categories (UVC) viz. Construction, ethno-veterinary, fodder, food, fuel, medicine, miscellaneous and tools were recognized from 453 ethbotanical taxa. The UVC for all plants is compiled in Table 3.2. The data revealed that *Juglans regia*, *Morus alba, M. macroura, M. nigra* and *Olea ferruginea* were the most important species which were utilized by the natives to fulfill their all eight major use categories. The other important species were *Cotoneaster racemiflorus, Melia azedarach, Pinus roxburghii,* and *Prunus cornuta* that fulfilled seven human need categories and accordingly ranked second in nature. It was followed by *Aesculus indica, Cedrus deodara, Ficus palmata, Hibiscus cannabinus, Indigofera heterantha, Juniperus communis, Prunus persica, Punica protopunica, Quercus baloot, Taxus wallichiana, Zanthoxylum armatum* and *Ziziphus jujuba* which were used in six use categories (Table 3.2). It is indicated that six species were used in 8 major use categories, followed by 7 UVC (7 spp.), 6 UVC (13 spp.), 5 UVC (26 spp.), 4 UVC (54 spp.), 3UVC (93 spp.), 2 UVC (162 spp.), while 92 species were used in fulfilling single use categories. This kind of census depicts the anthropogenic pressure on the valuable plant species in the study area.

The census of ethnobotanical information is provided in Fig. 3.3. Most of the species were used as folk medicine (344 spp., 75.94%), since the area has a rich diversity of flora due to different habitat types and geomorphic features. Generally, the people living in the area are solely dependant on medicinal plants to overcome their health problems due to unavailability of modern health facilities and far flung from the cities (Qureshi and Bhatti, 2008).

Indigenous people have long had a significant interdependence with the lands and environments in which they live. These lands and environment are vital for their survival, providing a wide array of substance for food, shelter and implements. They also provide a source for a variety of objects for both ritual and everyday use. The land and environment is

also significant in indigenous people's cultural, religious and social systems. Indigenous peoples are custodians and stewards of their lands and environments and have been entrusted by ancestral characters to care for these through successive generations. Indigenous peoples have a vast knowledge of and capacity for developing practices and products from their environments (Davis, 1998, Hu Huabin, 2002).

With reference to biodiversity and conservation, the majority of the plant species (566 spp., 82.63%) were under the Least Concern (LC) category that may be due to wide ecological amplitude, larger population size and comparatively low biotic pressure. It was followed by Near Threatened (31 spp., 4.53%). Fragmented populations restricted to narrow regions with extreme pressure of exploitation have resulted in 62 species (9.05%) to the Vulnerable (VU) status, 14 species (2.04%) to the Critically Endangered (CR) status and12 species (1.75%) to the Endangered (EN) status.

The main biotic factors influencing the vegetation of Kabal valley are the improper land use in the form of terrace cultivation, deforestation and overgrazing. Generally an interaction of climatic, edaphic and topographic factors controls the growth and occurrence of an individual. The biotic interference, however, completely upsets this natural process and results in quite an unpredictable pattern of distribution of vegetation (Kapur and Sarin, 1985). The species composition as well as vegetation patterns is mainly determined by man's impact and only to a minor extent by natural site factors (Asmus, 1990). Man is one of the major ecological agents controlling the balance in an ecosystem by various direct and indirect ways (Hussain and Ilahi, 1991; Miehe *et al.,* 2009). One of the major practices in the area is conversion of forest land into agricultural land by clearing vegetation. Terrace cultivation is beneficial in the beginning because of the available rich organic matter but the land becomes susceptible to wind and water erosion and to slumping off (Daubenmire, 1974; McGranahan

et al., 2013), thus reducing the fertility and vegetation cover of the area. An indirect effect, which is related to and dependent upon the forest cover is the loss of precipitation due to deforestation (Hussain, 1981).

Deforestation is the other important factor affecting the vegetation of Kabal valley. In Swat and Shangla districts, 13% of the forest cover has been reduced during 2001-2009 due to security conflict (Qamar *et al.,* 2012). Defined broadly deforestation can include not only conversation to non-forest, but also degradation that reduces forest quality, the density and structure of the trees, the ecological services supplied, the biomass of plants and animals, the species diversity and genetic diversity. By a narrow definition, deforestation is the removal of forest cover to an extent that allows for alternative land use (Seligman and Perevolotsky, 1994). Deforestation has multiple causes with the particular mixture of causes varying from place to place (Helmut and Lambin, 2001; Consiglio *et al.,* 2006; Shaheen *et al.,* 2011). The main reasons for deforestation in Kabal valley are fuel wood/ timber wood collection, occasional fires and clearing of forest for terrace cultivation. Deforestation is the forerunner of many associated and subsequent ecological problems which ultimately merges with the socioeconomic problems (Hussain, 1981; Khan *et al.,* 2012).

Another important ecological problem of Kabal valley is the overgrazing and browsing of cattle, including goats, sheep, cows and donkeys. The problem is more severe in the low elevated hills than the higher ones. It is an established fact that grazing inhibits the development and growth of woody vegetation and intensive grazing may reverse the course of succession in such in ecosystems (Seligman and Perevolotsky, 1994; Gotosa *et al.,* 2013). Yet several studies have indicated that a grazing may play a more complicated role in determining the dynamic relationships between herbaceous and woody vegetation components. For example, grazing may open niches for woody seedling establishment by reducing biomass of competing herbaceous vegetation (Mitchell and Kibry, 1990; De Bello *et*

al., 2006). Overgrazing exert stresses (i.e. trampling) and is more important than edaphic factors in determining the community composition (Rajwanshi *et al.,* 1985) which modifies the original vegetation pattern (Karajiana Kidou and Kokkini, 1988). Soil erosion is a side effect of the ill managed grazing, which causes loss of top fertile soil (Hussain, 1981; Per *et al.,* 2007; Pokhriyal *et al.,* 2012). Furthermore, it indirectly accelerates soil erosion by reducing plant cover and regeneration (Hussain and Ilahi, 1991). Marked differences prevail in the overgrazed and non grazed areas in terms of floral diversity (Hussain *et al.*, 1997, De Bello *et al.,* 2006; Sher *et al.,* 2010; Khan *et al.,* 2012; Gotosa *et al.,* 2013). Various social problems such poverty, lack of awareness, poor education and seasonal vegetation utilization exist in the study area responsible for the enormous anthropogenic pressures on the vegetation in the Kabal valley that exerted huge pressure on the natural vegetation (Khan *et al.,* 2013b).

The present study indicated that Kabal valley has great potential for biodiversity conservation in the form of ecosystem diversity, species diversity and genetic diversity. The area also provides valuable natural resources. If the anthropogenic and other biotic interferences continue in the area at the present pace, the valuable plant Bioresource of Kabal valley may be wasted and lost soon like other hilly areas of the Swat i.e. Docut hills (Hussain *et al.,* 1997). The area needs proper attention by government agencies, naturalists and nongovernmental organizations for protection, management, sustainable use and improvement. Any effort directed to improving the area cannot be successful without the cooperation and involvement of local inhabitants. The indigenous people have the capability to recognize, classify, name and perceive nature that lead them to understand the ecology, reproductive biology and uses of organism in their ecosystem (Hu Huabin, 2002; Pei and Luo Peng,2002; Bisong and Essien, 2010). Thus it is suggested that the conservation of biodiversity and cultural diversity should be considered as integral needs in the process of

development today (Pei and Luo Peng, 2002; Negi, 2010). In spite of the fact that the people of the area are dependent on the plant resources of the area, patches of vegetation have been left safe in the Muslim graveyards, depicting rich plant biodiversity and thick vegetation cover, since they give respect and sanctity to shrines (Chaghtai *et al.,* 1983; Hussain *et al.,* 1993; Ahmad *et al.,* 2009). There is a co-evolutionary relationship between biological and cultural diversity (Pei *et al.,* 2010). Recent studies have revealed that traditional beliefs related to religion are powerful forces promoting environmental preservation, including conservation of biodiversity (Anthwal *et al.,* 2010; Negi, 2010; Pei, 2013). It can also be concluded that traditional knowledge should be given due importance in a long term strategy to conserve the natural vegetation of the area.

CONCLUSION AND RECOMMENDATIONS

The present study highlighted that Kabal valley is harboring a rich plant biodiversity that serves not only as food, fodder, fuel, timber, medicinal and other multifarious uses at present day, but also reporting wild relatives of cultivated plants such as *Prunus cornuta, P. cerasoides, Pyrus pashia, Vitis jacquimontii* and wild grasses such as *Hordeum murinum, Leptochloa panicea*. These species may possess useful stress and disease tolerance characteristics and may provide necessary germplasm for the improvement of economic plants. Furthermore, native species have a significant ecological role in the ecosystem like controlling soil erosion, flood, nutrient recycling and overall regulating services. The followings are some suggestions to improve the resource base of the region:

1. The study area represented a good number of taxa along with some new floristic elements and plant associations, therefore such studies should be carried from various areas of District Swat and Dir to compile the complete flora and plant wealth that can be used for future studies.
2. Indigenous knowledge is mostly confined to the elderly people and is therefore on the verge of extinction. This is a valuable cultural and scientific resource, which need to be properly documented and preserved for future use.
3. Indigenous knowledge is the right of the local people; therefore instead of exploitation by non-locals, the benefit should reach to local people. A safeguard to this knowledge through intellectual property rights (IPRs) should be provided.
4. For conserving taxa, ethnoecological knowledge should be given due importance, since such information is practical hand and based on centuries old experience.

5. The people of the area should be trained to properly collect the medicinal plants at the right time and using standard post harvest processing to avoid excessive spoilage and loss.
6. In the area adjacent to the forest, the cultivation of medicinal plants should be promoted instead of other crops to provide more income generating opportunities for the locals.
7. *In situ* conservation procedures and protective measures should be adapted for the valuable but threatened medicinal and other economically important plants which are habitat restricted and difficult to grow outside their habitats like *Trillium govanianum, Podophyllum emodi, Valeriana pyrolifolia, Viola canescens, Taxus wallichiana, Bergenia ciliata* and *Paeonia emodi* etc., to save them from local extinction.
8. *Ex-situ* conservation of endangered and critically endangered species should be carried out with the help of local communities and social or governmental organizations.
9. Phytochemical screening and bioactivity assessment of the reported medicinal plants is necessary to validate the claims of the indigenous people.
10. Seed and gene banks of important and threatened plant species should be established in the nearby research and academic institutions.
11. For the conservation of the natural resources of the area, the area should be given the status of a protected area.
12. The people of the area may be provided with alternative sources of fuel wood like natural gas, liquid petroleum gas, scientifically designed kilns etc to reduce fuel wood extraction from the area.

13. Public awareness should be raised through education. The people must know the importance of plants, biodiversity, ecosystem and habitat conservation and the consequences associated with their depletion.
14. Non timber forest products (NTFPs) should be promoted on a sustainable use pattern as an alternative to the consumptive use of the forest.
15. Land tenure system and boundaries should be clearly defined to eliminate conflict and confusion, that sometimes, play havoc with the vegetation especially forest areas.
16. Over exploitation, overgrazing, deforestation for terrace cultivation and rapid increase in human population has made the area vulnerable to erosion, habitat destruction and final vanishing of plant bioresources. Proper management practices should be implemented to conserve the bioresources of the area.
17. Present biodiversity protection laws should be implemented in the real spirit of the law and special legislation is required for endangered flora.
18. Extensive reforestation is needed for the lower altitude areas. Local people may be provided with seedlings of *Pinus roxburghii, Olea ferruginea, Morus alba, Juglans regia* etc. for plantation and rehabilitation.

SUMMARY

Kabal valley, district Swat, Pakistan is rich in plant biodiversity, but little attempt has been made to evaluate it scientifically. To fill this research gap, the present study was conducted for phytosociological and ethnobotanical enumerations of the existing plant wealth of the study area. The vascular flora of Kabal valley, district Swat, Pakistan consisted of 820 species belonged to 497 genera and 137 families. These are distributed in various groups in which ferns were 33 species, 8 species of gymnosperms, 184 species monocotyledons and 595 species were dicotyledons. Amongst them, 535 species (65.24%) were native to the area, 80 species (9.76%) new to Swat, 76 species (9.27%) were cultivated, 70 species (8.54%) as weeds to the arable lands, 29 species (3.54%) naturalized in the area, 24 species (2.93%) new to Pakistan, four species (0.49%) exotic invasive and two species (0.24%) were recently introduced in the area. With reference to habit, nine categories of the life span of the flora were identified in which perennial herbs had a dominant fraction having 341 species (41.59%), followed by annual herbs (309 spp., 37.68%), deciduous shrubs (53 spp., 6.46%), deciduous trees (44 spp., 5.37%), etc.

Comparing the flora of Pakistan, to the best of our knowledge, *Adiantum gravesii, Doryopteris decipiens, Polystichum platyphyllum, P. polyblepharum, Athyrium vidalii, Gymnocarpium dryopteris, Eriophorum comosum, Pennisetum purpureum, Anaphalis viridis, Aster alpinus, Bidens radiata, Crepis lignea, Myriactis wightii, Phagnalon rupestre, Saussurea alpina, Impatiens pallida, Stellaria holostea, Astragalus alpinus, A. depressus, Sorbus aria, Scrophularia canina* and *S. umbrosa* are supposed to be new records for Pakistan.

The vegetation of the project area revealed nine different plant communities such as 1) Nasturtium-Paspalum-Veronica in Wetland, 2) Abies-Picea-Viburnum Coniferous Forest,

3) Pinus-Quercus-Berberis Mixed Forest, 4) Pinus-Indigofera Blue Pine Forest, 5) Celtis-Olea-Cynodon Sacred Groves Broad Leaved Forest, 6) Diosperos-Pinus-Quercus Mid Hill Degraded Forest, 7) Dodonaea-Isidon-Berberis Xeromorphic Scrub, 8) Pinus-Quercus-Galium Protected Chir Pine Forest and 9) Isodon-Berberis-Indigofera. These associations were established, governed by different topographic and edaphic factors as indicated by Detrended Correspondence Analysis (DCA).

The overall vegetation of Kabal valley is dominated by Therophytes with 43.94% contribution followed by Hemicryptophytes with a 21.31% contribution. Among the other life from classes 8.91% were Nanophanerophytes, 8.47% were Geophytes, 6.57% were Macrophanerophytes, 5.55% Chamaephytes, 3.36% were Hydrophytes and 1.90% were lianas. As a whole the vegetation may be designated as Thero-hemicryptophytic. With reference to leaf spectra, the area is of Nano-micro-leptophyllous type dominated by Nanophylls (33.72%), Microphylls (28.32%) and Leptophylls (24.53%). Mesophylls ranked fourth position with 12.85% share while Macrophylls were least in the area with just 0.58% share.

The study indicated that indigenous people used 453 plant species for various daily life requirements. In all, eight use value categories (UVC) viz., construction, ethno-veterinary, fodder, food, fuel, medicine, miscellaneous and tools were recognized from 453 ethbotanical taxa. Majority of the plants were used for more than one pupose, some even fulfilled all the eight use categories. Most of the species were used as folk medicine (344 spp., 75.94%).

With reference to biodiversity and conservation, a great majority of the plant species (566 spp., 82.63%) were under the Least Concern (LC) category that may be due to wide ecological amplitude, larger population size and comparatively low biotic pressure. It was

followed by Near Threatened (31 spp., 4.53%), Vulnerable (62 spp., 9.05%), 14 species (2.04%) to the Critically Endangered (CR) and12 species (1.75%) as Endangered.

Over exploitation in the form of deforestation, clearing of forests for terrace cultivation and overgrazing are the main anthropogenic problems of the area, besides natural calamities like floods, cloud bursts and plant diseases.

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Pak. J. Bot., 45(2): 605-615, 2013.

A PRELIMINARY CHECKLIST OF THE VASCULAR FLORA OF KABAL VALLEY, SWAT, PAKISTAN

MOHAMMAD ILYAS[1], RAHMATULLAH QURESHI[1*], MUHAMMAD ARSHAD[1] AND SARWAT NAZ MIRZA[2]

[1]*Department of Botany, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi, Pakistan.*
[2]*Faculty of Forestry, Range Management & Wildlife, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi, Pakistan.*
**Corresponding author e-mail: rahmatullahq@yahoo.com*

Abstract

The floristic survey of Kabal valley, Swat was carried out during 2009-2012 and a total of 593 species belonging to 408 genera and 130 families have been identified. Of them, 20 species of ferns, 8 species of Gymnosperms and 565 species of angiosperms (128 species of Monocotyledons and 437 species of Dicotyledons) were recognized. Poaceae was the largest family which contributed 65 grasses (10.96%), followed by Asteraceae (44 spp., 7.42%), while 13 largest families represented by 10 or more species accounted for 53.1% of the species. The largest genera were: *Cyperus*, *Persicaria* (7 spp. each), *Euphorbia*, *Solanum* (6 spp. each), *Impatiens*, *Prunus*, *Allium* and *Amaranthus* (5 spp. each). This checklist will provide a useful starting point for further ecological and bioprospective research of the area.

Introduction

Kabal valley is located in the North West of District Swat at a distance of about 15 Km from Saidu Sharif, Khyber Pakhtunkhwa, Pakistan. The area lies between 34°40′ to 34°60′ North and 72°0′ to 72°30′ East in Swat district. The average elevation of the area varies from 995 to 2892 meters from the mean sea level. The valley is U-shaped and open on southern side towards the river Swat, while from three sides i.e., east, north and west it is surrounded by an arc shaped series of hills having different elevations and aspects. The series of hills are offshoots of the Hindu Kush mountain range (Ahmed & Sirajuddin, 1996). The low lying areas of the valley are alluvial pans traversed by seasonal streams. These areas are very fertile supporting a variety of crops, vegetables and fruit orchards. The soils of hills are of the mountain type and are residual as well as transported (Hussain & Ilahi, 1991). Climatically the area falls in the temperate zone with four clearly defined seasons. Winters are harsh and long, while summers are mild and short. Total area of tehsil Kabal is 40026 hectares of which 20722 hectares is cultivated and 19304 hectares is uncultivated. The human population is approximately 0.4 million (Anon., 1999).

Floristic checklists are often the only source of botanical information for a particular area and may serve as a useful starting point for more detailed study (Keith, 1988). Because of their conciseness, the listing of species is easy to handle and less time consuming (Saima *et al*., 2010) that aids in the identification and correct naming of species, essential resources for biodiversity estimates and biogeographic studies. Furthermore, this information provides important public outreach and fundamental information to use in addressing the biodiversity crisis (Funk *et al*., 2007).

Many workers have contributed comprehensive checklists to the local floras. These include Qureshi (2008), Jafari & Akhani (2008), Djaha *et al*., (2008), Saima *et al*., (2009), Saima *et al.,* (2010), Fazal *et al.,* (2010), Qureshi & Bhatti (2010), Haq *et al*., (2010), Qureshi *et al*., (2011a,b) and Yalcin *et al*., (2011). Related works from adjoining areas include Stewart (1967) and Rashid *et al*., (1987). Because of the diverse topographic features and micro-habitats, the study area had a great potential for flourishing a rich plant biodiversity. Keeping into consideration, present study was planned with the objective to identify and enlist the vascular flora to provide a baseline for further ecological investigations and conservation measures.

Materials and Methods

The collection of plant specimens of vascular flora of Kabal valley was made during 2009-2012. For this purpose, the whole study area was thoroughly visited covering each season by walking method (Nazar *et al.*, 2008). During the survey, plant specimens were collected in triplicate, pressed, dried and mounted on standard herbarium sheets. Angiosperms and Gymnosperms were identified with the help of *Flora of Pakistan* (Nasir & Ali, 1970-1989; Ali & Nasir, 1989-1991; Ali & Qaiser, 1995-2012), while Pteridophytes were identified with the help of Cryptogamic Flora of Pakistan (Nakaiki & Malik, 1992, 1993). Nomenclature for taxa basically follows the abovementioned Floras but the accepted names were further validated from The Plant List and The International Plant Names Index (Anon., 2012a, b). All plant names were family-wise alphabetically arranged and provided in the result. The prepared voucher specimens were deposited in the herbarium of Department of Botany, Pir Mehr Ali Shah Arid Agriculture University Rawalpindi, Pakistan for record.

Results and Discussion

During the survey a total of 593 vascular plant species belonging to 408 genera and 130 families were recorded. It also includes 20 species of Pteridophytic species (ferns) and 8 gymnosperms. Amongst angiosperms, monocotyledons consisted of 128 species of 90 genera and 26 families, while dicotyledons group belonged 437 species of 299 genera and 93 families. Poaceae was the largest family represented by 65 species (10.96%), followed by Asteraceae (44 spp., 7.42%), Rosaceae (33 spp., 5.56%), Papilionaceae (32 spp., 5.4%) and Lamiaceae (30 spp., 5.06%). Other larger families represented by 10 or more species are Brassicaceae (22 spp.), Cyperaceae (18 spp.),

Solanaceae (15 spp.), Polygonaceae (14 spp.), Amaranthaceae (12 spp.), Ranunculaceae, Boraginaceae and Euphorbiaceae (10 spp. each). All these larger families collectively contributed 53.1% of the total species (Fig. 1). The families and plants in each group of vascular plants are arranged in alphabetical order. The numbers in parenthesis, with prefix MI are voucher numbers of the collected specimens, while the bold letters are the abbreviations of the major habitat types of the species. The abbreviations are: **A**-Agricultural fields, **W**-Waste places, **G**-Grasslands, **O**-Orchards, **F**-Forests, **M**-Marshes, **WC**-Water courses, **D**-Drier slopes, **S**-Sandy stream sides, **C**- cliffs, **MS**-Moist shady places, **R**-Rock crevices, **I**-Introduced species, **E**-Exposed ridges, **GY**-Graveyards and **P**-Parasites. Cultivated Species are marked with asterisk (*).

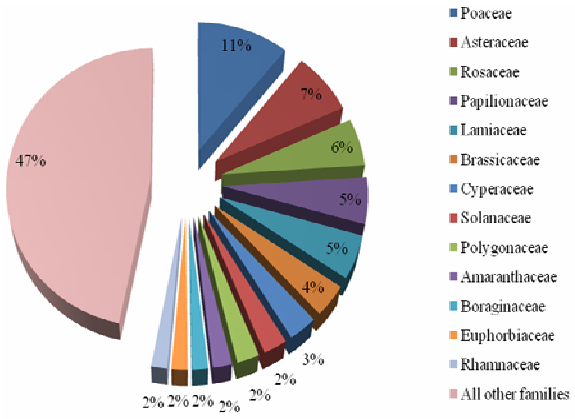

Fig. 1. Spectra of families in Kabal valley, Swat.

Pteridophytes

1. Adiantaceae

1. *Adiantum capillus-veneris* L. (MI-1009/ **MS**)
2. *A. caudatum* L. (MI-1010, **MS**)
3. *A. cuneatum* Langsd. et Frisch. (MI-1011/**C**)
4. *A. venustum* D. Don (MI-1012, **F**)
5. *Cheilanthes argentea* (Gmel.) Kunze (MI-1014/**R**)
6. *C. acrostica* (Balb.) Tod. (MI-1013/ **R**)
7. *Onychium japonicum* (Thunb.) Kze. (MI-1015/**F**)

2. Aspleniaceae

8. *Asplenium adiantum-nigrum* L. (MI-1066/ **R**)
9. *A. trichomanes* L. (MI-1067, **R**)
10. *Ceterach dalhousiae* (Hook.) C. Chr. (MI-1068/**R**)

3. Dennstaedtiaceae

11. *Microlepia strigosa* (Thunb.) Presl (MI-1224/**F**)
12. *Pteridium aquilinum* (L.) Kuhn (MI-1225/**F**)

4. Dryopteridaceae

13. *Dryopteris filix-mas* (L.) Schott (MI-1227/**MS**)
14. *D. juxtaposita* Christ (MI-1228/ **F**)

5. Equisetaceae

15. *Equisetum arvense* L. (MI-1234/**S**)
16. *E. hyemale* L. (MI-1235/**WC**)

6. Hypodematiaceae

17. *Hypodematium crenatum* (Forsk.) Kuhn (MI-1266/**R**)

7. Marsileaceae

18. *Marsilea quadrifolia* L. (MI-1315/**M**)

8. Pteridaceae

19. *Pteris cretica* L. (MI-1274/**WC**)
20. *P. vittata* L. (MI-1275/**MS**)

Gymnosperms

9. Cupressaceae

21.**Cupressus sempervirens* L. (MI-1202/**I**)
22. *Juniperus communis* L. var. *saxatilis* Pallas (MI-1203/**E**)

10. Pinaceae

23. *Abies pindrow* Royle (MI-1375/**F**)
24. *Cedrus deodara* (Roxb. ex D. Don) G. Don (MI-1376/**F**)
25. *Picea smithiana* (Wall.) Boiss (MI-1377/**F**)
26. *Pinus roxburghii* Sargent (MI-1378, **F**)
27. *P. wallichiana* A. B. Jackson (MI-1379/**F**)

11. Taxaceae

28. *Taxus wallichiana* Zucc (MI-1566/**F**)

Monocotyledons

12. Agavaceae

29. **Agave americana* L. (MI-1016/**I**)

13. Alismataceae

30. *Alisma plantago-aquatica* L. (MI-1018/**M**)
31. *Sagittaria trifolia* L. (MI-1019/**M**)

14. Alliaceae

32. *Allium ampeloprasum* var. *porrum* (L). Regel (MI-1020/**A**)
33. **A. cepa* L (MI-102/**A**)
34. *A. jacquemontii* Kunth (MI-1022/**D**)
35. *A. porrum* L. (MI-1023/**D**)
36. **A. sativum* L. (MI-1024/**A**)

15. Amaryllidaceae

37. *Ixiolirion tataricum* (Pall.) Herb. (MI-1037/**A**)
38. *Narcissus tazetta* L. (MI-1038/**A, GY**)

16. Araceae

39. *Acorus calamus* L. (MI-1052/**WC**)
40. *Arisaema flavum* (Forsk.) Schott (MI-1053/**F**)
41. *A. jacquemontii* Blume (MI-1054/**F**)
42. **Colocasia esculenta* (L.) Schott (MI-1055/**M**)

17. Asparagaceae

43. *Asparagus adscendens* Roxb. (MI-1062/**D**)
44. *A. filicinus* Buch.-Ham. ex D. Don (MI-1063/**F**)
45. **A. officinalis* L. (MI-1064/**I**)

18. Asphodelaceae

46. **Aloe vera* (L.) Burm. f. (MI-1065/**I**)

19. Cannaceae

47.**Canna indica* L. (MI-1159/**I**)

20. Colchicaceae

48. *Colchicum luteum* Baker (MI-1181/**D**)

21. Commelinaceae

49. *Commelina benghalensis* L. (MI-1182/**A**)
50. *C. paludosa* Blume (MI-1183, **M**)
51. **Tradescantia pallida* (Rose) D.Hunt (MI-1184/**I**)

22. Convallariaceae

52. *Polygonatum multiflorum* (L.) All. (MI-1185/**F**)
53. *Polygonatum verticillatum* (L.) All. (MI-1186/**F**)

23. Cyperaceae

54. *Carex acutiformis* Ehrh. (MI-1206/**WC**)
55. *Cyperus alopecuroides* Rottb. (MI-1207/**WC**)
56. *C. articulatus* L. (MI-1208/**WC**)
57. *C. compressus* L. (MI-1209/**WC**)
58. *C. corymbosus* Rottb. (MI-1210/**WC**)
59. *C. difformis* L. (MI-1211/**M**)
60. *C. niveus* Retz. (MI-1212/**D**)
61. *C. rotundus* L. (MI-1213/**W,A**)
62. *Eleocharis palustris* (L.) Roem. & Schult. (MI-1214/**M**)
63. *Erioscirpus comosus* (Wall.) Palla (MI-1215/**WC**)
64. *Fimbristylis dichotoma* (L.) Vahl (MI-1216/**D**)
65. *Kyllinga brevifolia* Rottb. (MI-1217/**M**)
66. *K. nemoralis* (J.R.Forster & G. Forster) Dandy ex Hutch. & Dalziel (MI-1218/**M**)
67. *Pycreus flavescens* (L.) Reichenb (MI-1219/**WC**)
68. *P. polystachyos* (Rottb.) P. Beauv. (MI-1220/**WC**)
69. *P. pumilus* (L.) Nees (MI-1221/**WC**)
70. *P. sanguin* (Vahl) Nees (MI-1222/**WC**)
71. *Schoenoplectus mucronatus* (L.) Palla (MI-1223/**M**)

24. Haemodoraceae

72. *Ophiopogon intermedius* D. Don (MI-1260/**D**)

25. Hyacinthaceae

73. *Scilla griffithii* Hochr. (MI-1263/**W**)

26. Hydrocharitaceae

74. *Hydrilla verticillata* (L. f.) Royle (MI-1264/**M**)

27. Iridaceae

75. *Iris germanica* L. (MI-1267/**GY**)
76. *I. hookeriana* Foster (MI-1268/**E**)
77. *Moraea sisyrinchium* (L.) Ker Gawl. (MI-1269/**A, WP**)

28. Juncaceae

78. *Juncus articulatus* L. (MI-1271/**S**)
79. *J. bufonius* L. (MI-1272/**S**)
80. *J. inflexus* L. (MI-1273/**WC**)

29. Lemnaceae

81. *Lemna minor* L. (MI-1304/**M**)

30. Liliaceae

82. *Notholirion thomsonianum* (D. Don) Stapf (MI-1305/**WC**)
83. *Tulipa clusiana* DC (MI-1306/**A**)

31. Orchidaceae

84. *Habenaria digitata* Lindl. (MI-1337/F)

32. Poaceae

85. *Acrachne racemosa* (Heyne ex Roem. & Schult.) Ohwi (MI-1384/**A,W**)
86. *Agrostis stolonifera* L. (MI-1385/**E**)
87. *Alopecurus myosuroides* Huds. (MI-1386/**M**)
88. *Apluda mutica* L. (MI-1387/**A, W**)
89. *Aristida adscensionis* L. (MI-1388/**D**)
90. *A. cyanantha* Nees ex Steud. (MI-1389/**D**)
91. *Arthraxon prionodes* (Steud.) Dandy (MI-1390/**A**)
92. **Arundo donax* L. (MI-1391/**WC**)
93. *Avena fatua* L. (MI-1392/**A**)
94. *Bothriochloa ischaemum* (L.) Keng (MI-1393/**D**)
95. *Brachiaria ramosa* (L.) Stapf (MI-1394/**A, W**)
96. *B. sylvaticum* (Huds.) P. Beauv. (MI-1395/**A, W**)
97. *Bromus pectinatus* Thunb. (MI-1396/**W**)
98. *Cenchrus ciliaris* L. (MI-1397/**D**)
99. *Chrysopogon gryllus* (L.) Trin. (MI-1398/ **F, G**)
100. *Cymbopogon commutatus* (Steud.) Stapf (MI-1399/ **D, G**)
101. *Cynodon dactylon* (L.) Pers. (MI-1400/**W, S, G**)
102. *Dactylis glomerata* L. (MI-1401/**F, G**)
103. *Dactyloctenium aegyptium* (L.) Willd. (MI-1402/**A, W**)
104. *Desmostachya bipinnata* (L.) Stapf (MI-1403, **D**)
105. *Dichanthium annulatum* (Forssk.) Stapf (MI-1404/**W, D, G**)

106. *Digitaria ciliaris* (Retz.) Koel (MI-1405/**A, W**)
107. *D. violascens* Link (MI-1406/**A, W**)
108. *Echinochloa colona* (L.) Link (MI-1407/**A, M**)
109. *E. crus-galli* (L.) P. Beauv. (MI-1408/**M**)
110. *Eleusine indica* (L.) Gaertn. (MI-1409/**W**)
111. *Eragrostis ciliaris* (L.) R.Br. (MI-1410/**A, W**)
112. *E. pilosa* (L.) P. Beauv. (MI-1411/**A, W**)
113. *Eulaliopsis binata* (Retz.) C.E. Hubbard. (MI-1412/**D**)
114. *Hemarthria compressa* (L.f) R. Br. (MI-1413/**A,WC**)
115. *Heteropogon contortus* (L.) P. Beauv. ex Roem. & Schult. (MI-1414/**D, G**)
116. *Hordeum murinum* L. (MI-1415/**W, GY**)
117. *Hyparrhenia hirta* (L.) Stapf . (MI-1416/**D**)
118. *Imperata cylindrica* (L.) Raeuschel. (MI-1417/**W, S**)
119. *Isachne himalaica* Hook.f. (MI-1418/**M**)
120. *Leptochloa panicea* (Retz.) Ohwi (MI-1419/**W**)
121. *Lolium multiflorum* Lam. (MI-1420/**A, W**)
122. *L. perenne* L. (MI-1421/**GY**)
123. *L. temulentum* L. (MI-1422/**A, W**)
124. *Oplismenus compositus* (L.) P. Beauv. (MI-1423/**F**)
125. *Panicum antidotale* Retz. (MI-1424/**D**)
126. *Paspalidium flavidum* (Retz.) A. Camus (MI-1425/**D**)
127. *Paspalum dilatatum* Poir. (MI-1426/**A**)
128. *P. paspalodes* (Michx.) Scribner (MI-1427/**M**)
129. **Pennisetum glaucum* (L.) R. Br. (MI-1428/**I**)
130. *P. orientale* L.C. Rich. (MI-1429/**D, W**)
131. *Phalaris minor* Retz. (MI-1430/**A**)
132. *Phleum alpinum* L. (MI-1431/**E**)
133. *Piptatherum gracile* Mez (MI-1432/**GY**)
134. *Poa alpina* L. (MI-1433/**E**)
135. *P. annua* L. (MI-1434/**A, W**)
136. *P. bulbosa* L. (MI-1435/**WC**)
137. *P. infirma* H. B. K. (MI-1436/**A, W**)
138. *Polypogon fugax* Ness ex Steud. (MI-1437/**W, S**)
139. *P. monspeliensis* (L.) Desf. (MI-1438/**W**)
140. *Saccharum spontaneum* L. (MI-1439/**W, S**)
141. *Sclerochloa dura* (L.) P. Beauv. (MI-1440/**W**)
142. *Setaria pumila* (Poir.) Roem. & Schult. (MI-1441/**A**)
143. *S. verticillata* (L.) P. Beauv. (MI-1442/**W**)
144. *S. viridis* (L.) P. Beauv. (MI-1443/**A, W**)
145. **Sorghum bicolor* (L.) Moench. (MI-1444/**I**)
146. *S. halepense* (L.) Pers. (MI-1445/**A**)
147. *Themeda anathera* (Nees ex Steud.) Hack. (MI-1446/**D, G**)
148. *Tragus roxburghii* Panigrahi (MI-1447/**G**)
149. *Vulpia myuros* (L.)C.C.Gmel. (MI-1448/**S**)

33. Potamogetonaceae

150. *Potamogeton crispus* L. (MI-1467/**M**)
151. *P. nodosus* Poiret (MI-1468/ **M**)
152. *P. perfoliatus* L. (MI-1469/ **M**)

34. Smilacaceae

153. *Smilax glaucophylla* Klotzsch (MI-1550/**D**)

35. Trilliaceae

154. *Trillium govanianum* Wall. ex Royle (MI-1571/**F**)

36. Typhaceae

155. *Typha latifolia* L. (MI-1572/ **M**)

37. Xanthorrhoeaceae

156. *Hemerocallis fulva* (L.) L. (MI-1592/**WC**)

Dicotyledons

38. Acanthaceae

157. *Barleria cristata* L. (MI-1001/**D**)
158. *Dicliptera bupleuroides* Nees in Wall. (MI-1002/**W, GY**)
159. *Justicia adhatoda* L. (MI-1003/**D,GY**)
160. *J. peploides* (Nees) T. Anders. (MI-1004/**A**)
161. *J. vahlii* Roth (MI-1005/**A**)
162. *Ruellia tuberosa* L. (MI-1006/**GY**)
163. *Strobilanthes urticifolia* Wall. ex Kuntze (MI-1007/**F**)

39. Aceraceae

164. *Acer cappadocicum* Gleditsch (MI-1008/**F**)

40. Aizoaceae

165. *Trianthema portulacastrum* L. (MI-1017/**A**)

41. Amaranthaceae

166. *Achyranthes aspera* L. (MI-1025/**W, GY**)
167. *A. bidentata* Blume (MI-1026/**F**)
168. *Alternanthera pungens* Kunth (MI-1027/**W**)
169. *A. sessilis* (L.) DC. (MI-1028/**W, S**)
170. *Amaranthus graecizans* L. (MI-1029/**W**)
171. *A. hybridus* L. (MI-1030/**W, S**)
172. *A. retroflexus* L. (MI-1031/**W**)
173. *A. spinosus* L. (MI-1032/**A, W**)
174. *A. viridis* L. (MI-1033/**A**)
175. *Bosea amherstiana* (Moq.) Hook. f. (MI-1034/**GY**)
176. *Celosia argentea* L. (MI-1035/**A**)
177. *Digera muricata* (L.) Mart. (MI-1036/**A**)

42. Anacardiaceae

178. *Cotinus coggyria* Scop. (MI-1039/**F**)
179. *Pistacia integerrima* J. L. Stewart ex Brandis (MI-1040/**F**)
180. *Rhus javanica* L. (MI-1041/**F**)

43. Apiaceae

181. *Aegopodium alpestre* Ledeb. (MI-1042/**D**)
182. *Bupleurum falcatum* L. (MI-1043/**D**)
183. **Coriandrum sativum* L. (MI-1044/**A**)
184. *Eryngium coeruleum* M. Bieb. (MI-1045/**W**)
185. **Foeniculum vulgare* Mill. (MI-1046/**A**)
186. *Heracleum canescens* Lindl. (MI-1047/**F**)
187. *Prangos pabularia* Lindl. (MI-1048/**D**)
188. *Scandix pecten-veneris* L. (MI-1049/**A, W**)
189. *Sium latijugum* C.B. Clarke (MI-1050/**D**)

44. Apocynaceae

190. *Nerium oleander* L. (MI-1051/ **WC**)

45. Araliaceae

191. *Hedera nepalensis* K. Koch (MI-1056/**F**)

46. Asclepiadaceae

192. *Calotropis procera* subsp. *hamiltonii* (Wight) Ali (MI-1057/**D**)
193. *Cynanchum dalhousiae* Wight. (MI-1058/**D**)
194. *Oxystelma esculentum* (L. f.) R. Brown (MI-1059/**D, C**)
195. *Periploca aphylla* Dcne (MI-1060, **D**)
196. *Vincetoxicum hirundinaria* Medicus (MI-1061/**D**)

47. Asteraceae

197. *Achillea millefolium* L. (MI-1069/**E**)
198. *Anaphalis margaritacea* (L.) Benth. (MI-1070/**C**)
199. *A. viridis* Cumm. (MI-1071/**F**)
200. *Artemisia scoparia* Waldst. & Kit. (MI-1072/**D, W, S**)
201. *A. vulgaris* L. (MI-1073/**D**)
202. *Aster alpinus* L. (MI-1074/**E**)
203. *A. altaicus* Willd. (MI-1075/**D**)
204. *Bidens biternata* (Lour.) Merr. et Sherff (MI-1076/**W**)
205. *Calendula arvensis* L. (MI-1077/**W, A**)
206. *Carpesium abrotanoides* L. (MI-1078/**O, WC**)
207. *C. cernuum* L. (MI-1079, **O, WC**)
208. *Carthamus lanatus* L. (MI-1080/**A, W**)
209. *C. oxyacantha* Bieb. (MI-1081/**A, D**)
210. *Centaurea iberica* Trev. (MI-1082/**W, S**)
211. *Cichorium intybus* L. (MI-1083, **S**)
212. *Cirsium arvense* (L.) Scop. (MI-1084/**D**)
213. *C. falconeri* (Hook. f.) Petr. (MI-1085/**E, F**)
214. *Cnicus benedictus* L. (MI-1086/**A, S**)
215. *Conyza bonariensis* (L.) Cronq. (MI-1087/**A, W**)
216. *C. canadensis* (L.) Cronq. (MI-1088/**A, W**)
217. *C. stricta* Willd. (MI-1089, **S**)
218. *Echinops sphaerocephalus* L. (MI-1090/**D**)
219. *Eclipta prostrata* (L.) L. (MI-1091/**M**)
220. *Galinsoga parviflora* Cav. (MI-1092/**A**)
221. *Gnaphalium uliginosum* L. (MI-1093/**F**)
222. **Helianthus annuus* L. (MI-1094, **A**)
223. *H. tuberosus* L. (MI-1095, **W**)
224. *Lactuca floridana* (L.) Gaertn. (MI-1096/**W**)
225. *L. serriola* L. (MI-1097, **D**)
226. *Launaea procumbens* (Roxb.) Ramayya & Rajagopal, (MI-1098/**W**)
227. *Leontopodium alpinum* Cass. (MI-1099/**F**)
228. *Matricaria aurea* (Loefl.) Schultz-Bip. (MI-1100/**W**)
229. *M. matricarioides* (Less.) Porter ex Britton (MI-1101/**W, F**)
230. *Onopordum acanthium* L. (MI-1102/**W, S**)
231. *Parthenium hysterophorus* L. (MI-1103/**W**)
232. *Senecio chrysanthemoides* DC. (MI-1104/**E**)
233. *Sigesbeckia orientalis* L. (MI-1105/**WC**)
234. *Silybum marianum* (L.) Gaertn. (MI-1106/**W**)
235. *Sonchus arvensis* L. (MI-1107/**W**)
236. *S. asper* (L.) Hill (MI-1108/**A,W**)
237. *S. oleraceus* L. (MI-1109, **W**)
238. *Taraxacum officinale* F.H. Wigg (MI-1110/**W, E**)
239. *Tragopogon pratensis* L. (MI-1111/**D**)
240. *Xanthium strumarium* L. (MI-1112/**W**)

48. Balsaminaceae

241. *Impatiens bicolor* Royle (MI-1113/**WC**)
242. *I. brachycentra* Kar. & Kir. (MI-1114/**F**)
243. *I. edgeworthii* Hook. f. (MI-1115/**F**)
244. *I. glandulifera* Royle (MI-1116/**WC**)
245. *I. pallida* Nutt. (MI-1117/**F, E**)

49. Berberidaceae

246. *Berberis lycium* Royle (MI-1118/**F, D**)

50. Betulaceae

247. *Alnus nitida* (Spach) Endl.Gen. (MI-1119/**WC**)

51. Boraginaceae

248. *Anchusa arvensis* subsp. *orientalis* (L.) Nordh. (MI-1120/**A**)
249. *Arnebia decumbens* (Vent.) Coss. & Kral (MI-1121/**D**)
250. *Buglossoides arvensis* (L.) Johnston (MI-1122/**A, W**)
251. *Cynoglossum lanceolatum* Forssk. (MI-1123/**S**)
252. *Hackelia macrophylla* (Brand) I.M. Johnston (MI-1124/**F**)
253. *Heliotropium europaeum* L. (MI-1125/**D**)
254. *H. strigosum* Willd. (MI-1126/**D, G**)
255. *Nonea edgeworthii* A. DC (MI-1127/**F, A**)
256. *Onosma hispida* Wall. ex G. Don (MI-1128/**D**)
257. *Trichodesma indicum* (L.) R. Br. (MI-1129/**D**)

52. Brassicaceae

258. *Alliaria petiolata* (M. Bieb.) Cavara & Grande (MI-1130/**W, GY**)
259. *Arabidopsis himalaica* (Edgew.) O.E. Schulz (MI-1131/**D, S**)
260. *A. thaliana* (L.) Heynh. (MI-1132/**D,E**)
261. *Barbaraea vulgaris* R.Br. (MI-1133/**D**)
262. *Brassica juncea* (L.) Czern. et Coss. (MI-1134/**A**)
263.**B. napus* L. (MI-1135/**A**)
264.**B. rapa* subsp. *campestris* (L.) Clapham (MI-1136/**A**)
265. *Capsella bursa-pastoris* (L.) Medik. (MI-1137/**A, W**)
266. *Cardamine flexuosa* With. (MI-1138/**W**)
267. *C. hirsuta* L. (MI-1139/**W**)
268. *Coronopus didymus* (L.) Smith (MI-1140/**W**)
269. *Lepidium apetalum* Willd. (MI-1141/**A, W**)
270.* *L. sativum* L. (MI-1142/**A**)
271. *Nasturtium officinale* R. Br. (MI-1143/**M**)
272. *Neslia paniculata* subsp. *thracica* (Velen.) Bornm. (MI-1144/**A**)

273. **Raphanus sativus* L. (MI-1145/**A**)
274. *Rorippa indica* (L.) Hiern (MI-1146/**WC**)
275. *R. islandica* (Oeder) Borbas (MI-1147/**WC, M**)
276. *Sisymbrium altissimum* L. (MI-1148/**W**)
277. *S. irio* L. (MI-1149/**W**)
278. *S. orientale* L. (MI-1150/**W**)
279. *Thlaspi arvense* L. (MI-1151/**W**)

53. Buddlejaceae

280. *Buddleja crispa* Benth. (MI-1152/**D**)

54. Buxaceae

281. *Buxus wallichiana* Baill. (MI-1153/**F**)
282. *Sarcococca saligna* (D.Don) Muell.-Arg. (MI-1154/**F**)

55. Cactacae

283. *Opuntia monacantha* Haw. (MI-1155/**D, W**)

56. Caesalpinaceae

284. *Caesalpinia decapetala* (Roth) Alston (MI-1156/**WC**)

57. Campanulaceae

285. *Campanula pallida* Wall (MI-1157/**D**)

58. Cannabaceae

286. *Cannabis sativa* L. (MI-1158/**W**)

59. Capparidaceae

287. *Cleome viscosa* L. (MI-1160/**A,S**)

60. Caprifoliaceae

288. *Lonicera myrtillus* Hook. f. & Thoms. (MI-1161/**E**)
289. *Viburnum cotinifolium* D. Don (MI-1162/**D**)
290. *V. grandiflorum* Wall. ex DC. (MI-1163/**F**)

61. Caryohyllaceae

291. *Arenaria serpyllifolia* L. (MI-1164/**E**)
292. *Cerastium dahuricum* Fisch. (MI-1165/E)
293. *C. fontanum* Baumg. (MI-1166/**A, W**)
294. *C. glomeratum* Thuill. (MI-1167/**A, S**)
295. *Dianthus crinitus* Sm. (MI-1168/**D**)
296. *Silene conoidea* L. (MI-1169/**A,**)
297. *S. viscosa* (L.) Pers. (MI-1170/**E**)
298. *S. vulgaris* (Moench) Garcke (MI-1171/**F**)
299. *Stellaria media* (L.) Vill. (MI-1172/**A**)

62. Celastraceae

300. *Euonymus hamiltonianus* Wall. (MI-1173/**F**)
301. *Maytenus royleanus* (Wall. ex Lawson) Cufodontis (MI-1174/**D**)

63. Chenopodiaceae

302. *Chenopodium album* L. (MI-1175/**A,S**)
303. *C. ambrosioides* L. (MI-1176/**W**)
304. *C. botrys* L. (MI-1177/ **S**)
305. *C. murale* L. (MI-1178/**D, S**)
306. *Kochia scoparia* (L.) Schrad. (MI-1179/**A**)
307. *Spinacia oleracea* L (MI-1180/**A**).

64. Convolvulaceae

308. *Convolvulus arvensis* L. (MI-1187/**A, W**)
309. *Ipomoea eriocarpa* R. Br. (MI-1188/**A**)
310. *I. purpurea* (L.) Roth (MI-1189/**A**)

65. Cornaceae

311. *Cornus macrophylla* Wall. ex Roxb. (MI-1190/**F**)

66. Crassulaceae

312. *Hylotelephium ewersii* (Ledeb.) H. Ohba (MI-1191/**C, R**)
313. *Sedum adenotrichum* Wall. ex Edgew. (MI-1192/**R**)

67. Cucurbitaceae

314. **Citrullus lanatus* (Thunb.) Mats. & Nakai (MI-1193/**A**)
315. *Cucumis melo* subsp. *agrestis* (Naud.) Grebensc. (MI-1194/**D,S**)
316. **C. sativus* L. (MI-1195/**A**)
317. **Cucurbita maxima* Duch. ex Lam. (MI-1196/**A**)
318.**Lagenaria siceraria* (Molina) Standley (MI-1197/**A**)
319.**Luffa aegyptiaca* Mill. (MI-1198/**A**)
320.**Momordica charantia* L. (MI-1199/**A**)
321. *Solena amplexicaulis* (Lam.) Gandhi (MI-1200/**D**)
322. **Trichosanthes cucumerina* L. (MI-1201/**A**)

68. Cuscutaceae

323. *Cuscuta europaea* L. (MI-1204/**P**)
324. *C. reflexa* Roxb. (MI-1205/**P**)

69. Dipsacaceae

325. *Scabiosa candollei* DC. (MI-1226/**D**)

70. Ebenaceae

326. **Diospyros kaki* L. f (MI-1229/**A, I**)
327. *D. lotus* L. (MI-1230/**F, D**)

71. Elaeagnaceae

328. *Elaeagnus umbellata* Thunb. (MI-1231/D)

72. Elatinaceae

329. *Bergia ammannioides* Heyne ex Roth (MI-1232/**M**)
330. *B. capensis* L. (MI-1233/**M**)

73. Euphorbiaceae

331. *Andrachne cordifolia* (Wall. ex Decne.) Muell. Avg. (MI-1236/**R**)
332. *Chrozophora tinctoria* (L.) Raf. (MI-1237/**D**)
333. *Euphorbia granulata* Forssk. (MI-1238/**A**)
334. *E. helioscopia* L. (MI-1239/**A, W**)
335. *E. hirta* L. (MI-1240/**W**)
336. *E. indica* Lam. (MI-1241/**A**)
337. *E. prostrata* Ait. (MI-1242/**D, A**)
338. *E. wallichii* Hook. f. (MI-1243/**E**)
339. *Phyllanthus fraternus* Webster (MI-1244/**A**)
340. **Ricinus communis* L. (MI-1245/**D, I**)

74. Fagaceae

341. *Quercus baloot* Griff. (MI-1246/**F**)
342. *Q. dilatata* Royle (MI-1247/**F**)
343. *Q. incana* Roxb. (MI-1248/**D**)
344. *Q. semecarpifolia* Smith (MI-1249/**F**)

75. Fumariaceae

345. *Corydalis govaniana* Wall. (MI-1250/**F**)
346. *Fumaria indica* (Hausskn.) Pugsley (MI-1251/**A**)

76. Gentianaceae

347. *Gentianella umbellata* (M.Bieb.) Holub (MI-1252/**D**)
348. *Swertia cordata* (G.Don) Clarke (MI-1253/**E**)

77. Geraniaceae

349. *Erodium cicutarium* (L.) L'Herit, ex Aiton (MI-1254/**S**)
350. *Geranium lucidum* L. (MI-1255/**F**)
351. *G. nepalense* Sweet (MI-1256/**F**)
352. *G. rotundifolium* L. (MI-1257/**W**)
353. *G. swatense* Schönb.-Tem. (MI-1258/**F**)
354.* *Pelargonium zonale* L'Herit ex Soland. (MI-1259/**GY, I**)

78. Hamamelidaceae

355. *Parrotiopsis jacquemontiana* (Dcne.) Rehder (MI-1261/**F**)

79. Hippocastanaceae

356. *Aesculus indica* (Wall.ex Camb.) Hook.f. (MI-1262/**F**)

80. Hypericaceae

357. *Hypericum perforatum* L. (MI-1265/**D**)

81. Juglandaceae

358. *****_Juglans regia_ L. (MI-1270/**F, I**)

82. Lamiaceae

359. *Ajuga bracteosa* Wall. ex Benth. (MI-1274/**D**)
360. *A. parviflora* Benth. (MI-1275/**R**)
361. *Anisomeles indica* (L.) O. Kuntze (MI-1276/**F**)
362. *Calamintha debilis* (Bunge) Benth. (MI-1277/**S**)
363. *Clinopodium umbrosum* (M. Bieb.) C. Koch (MI-1278/**W**)
364. *C. vulgare* L. (MI-1279/**F**)
365. *Eremostachys superba* Royle ex Benth. (MI-1280/**D**)
366. *Isodon rugosus* (Wall. ex Benth.) Codd (MI-1281/**D**)
367. *Lamium album* L. (MI-1282/**F**)
368. *L. amplexicaule* L. (MI-1283/**A, W**)
369. *Leucas cephalotes* (Roth) Spreng (MI-1284/**E**)
370. *L. lanata* Benth. (MI-1285/**W**)
371. *Lycopus europaeus* L. (MI-1286/**M, W**)
372. *Marrubium vulgare* L. (MI-1287/**F**)
373. *Mentha longifolia* (L.) L. (MI-1288/**M, S**)
374. *M. spicata* L. (MI-1289/**A**)
375. *Micromeria biflora* (Buch.-Ham. ex D. Don) Benth. (MI-1290/**D**)
376. *Nepeta erecta* (Boyle ex Benth.) Benth. (MI-1291/**F**)
377. *N. laevigata* (D. Don) Hand.-Mazz (MI-1292/**D**)
378. **Ocimum basilicum* L. (MI-1293/**I**)
379. *Origanum vulgare* L. (MI-1294/**D**)
380. *Otostegia limbata* (Benth.) Boiss. (MI-1295/**D**)
381. *Prunella vulgaris* L. (MI-1296/**WC**)
382. *Salvia lanata* Roxb. (MI-1297/**D**)
383. *Salvia moocroftiana* Wall. ex Benth. (MI-1298/**D**)
384. *S. nubicola* Wall. ex Sweet (MI-1299/**F**)
385. *Scutellaria chamaedrifolia* Hedge & Paton (MI-1300/**D**)
386. *Stachys parviflora* Benth. (MI-1301/**D**)
387. *Teucrium stocksianum* Boiss. (MI-1302/**D**)
388. *Thymus linearis* Benth. (MI-1303/**D, E**)

83. Loranthaceae

389. *Viscum album* L. (MI-1307/**P**)

84. Malvaceae

390. **Abelmoschus esculentus* (L.) Moench (MI-1308/**A**)
391. **Alcea rosea* L. (MI-1309/**I**)
392. **Hibiscus sabdariffa* L. (MI-1310/**A**)
393. *H. syriacus* L. (MI-1311/**I**)
394. *Malva neglecta* Wallr. (MI-1312/**A, W**)
395. *M. parviflora* L. (MI-1313/**A**)
396. *Malvastrum coromendelianum* (L.) Garcke (MI-1314/**W, GY**)

85. Meliaceae

397. *Melia azedarach* L. (MI-1316/**A, GY**)

86. Mimosaceae

398. *Acacia modesta* Wall. (MI-1317/**D, GY**)
399. *A. nilotica* (L.) Delile (MI-1318/**D, GY**)

87. Molluginaceae

400. *Mollugo nudicaulis* Lamk. (MI-1319/**A, S**)

88. Moraceae

401.* *Broussonetia papyrifera* (L.) L'Herit. ex Vent. (MI-1320/**I**)
402. *Ficus carica* L. (MI-1321/**D**)
403. *F. palmata* Forssk. (MI-1322/**D**)
404. *F. sarmentosa* Bush: Ham. ex J.E. Smith (MI-1323/**C**)
405. *Morus alba* L. (MI-1324/**A**)
406. *M. macroura* Miq. (MI-1325/**A**)
407. *M. nigra* L. (MI-1326/**A**)

89. Myrsinaceae

408. *Myrsine africana* L. (MI-1327/**F**)

90. Myrtaceae

409.**Eucalyptus camaldulensis* Dehnh. (MI-1328/**I**)
410. *Myrtus communis* L. (MI-1329/**WC**)

91. Nyctaginaceae

411. *Boerhavia procumbens* Banks ex Roxb. (MI-1330/**S**)
412. **Mirabilis jalapa* L. (MI-1331/**GY, I**)

92. Oleaceae

413. *Jasminum humile* L. (MI-1332/**D**)
414. *J. officinale* L. (MI-1333/**F**)
415. *Olea ferruginea* Royle (MI-1334/**D, GY**)

93. Onagraceae

416. *Epilobium hirsutum* L. (MI-1335/**M, WC**)
417. *Oenothera rosea* L' Her. ex Ait. (MI-1336/**W, S**)

94. Orobanchaceae

418. *Orobanche alba* Steph. (MI-1338/**P**)

95. Oxalidaceae

419. *Oxalis corniculata* L. (MI-1339/**R, GY**)

96. Paeoniaceae

420. *Paeonia emodi* Wall. ex Royle (MI-1340/**F**)

97. Papaveraceae
421.*Papaver rhoeas* L. (MI-1341/**A**)

98. Papilionaceae

422. *Astragalus congestus* Baker (MI-1342/**E**)
423. *A. filicaulis* Kar. & Kir. (MI-1343/**F**)
424. *A. frigidus* (L.) A. Gray (MI-1344/**D**)
425. *Crotalaria medicaginea* Lamk. (MI-1345/**D**)
426. **Dalbergia sissoo* Roxb. (MI-1346/**A**)
427. *Desmodium elegans* DC. (MI-1347/**D**)
428. *Indigofera heterantha* var. *gerardiana* (Wall. ex Baker) Ali (MI-1348/**F**)
429. *I. heterantha* var. *heterantha* (Brandis) Baker (MI-1349/**D**)
430.**Lablab purpureus* (L.) Sweet (MI-1350/**A, I**)
431. *Lathyrus aphaca* L. (MI-1351/**A**)
432. *L. hirsutus* L. (MI-1352/**A**)
433. *L. pratensis* L. (MI-1353/**F**)
434. **Lens culinaris* Medic. (MI-1354/**A**)
435. *Lespedeza juncea* (L.f.) Pers. (MI-1355/**D**)
436. *Lotus corniculatus* L. (MI-1356/**D**)
437. *Medicago lupulina* L. (MI-1357/**E**)
438. *M. minima* (L.) L. (MI-1358/**D**)
439. *Medicago orbicularis* (L.) Bart. (MI-1359/**D**)
440. *M. polymorpha* L. (MI-1360/**A**)
441. *Melilotus indica* (L.) All. (MI-1361/**A, F**)
442. **Phaseolus lunatus* L. (MI-1362/**A**)
443. **P. vulgaris* L. (MI-1363/**A**)
444. **Pisum sativum* L. (MI-1364/**A**)
445. **Robinia pseudo-acacia* L. (MI-1365/**A.I**)
446. **Trifolium alexandrianum* L. (MI-1366/**A**)
447. *T. repens* L. (MI-1367/**E, WC, W**)
448. **T. resupinatum* L. (MI-1368/**A**)
449. **Trigonella foenum-graecum* L. (MI-1369/**A**)
450. *Vicia sativa* L. (MI-1370/**A**)
451. **Vigna mungo* (L.) Hepper (MI-1371/**A**)
452. **V. radiata* (L.) Wilczek (MI-1372/**A**)
453. **V. unguiculata* (L.) Walp. (MI-1373/**A**)

99. Phytolaccaceae

454. *Phytolacca latbenia* (Moq.) Walter (MI-1374/**D**)

100. Plantaginaceae

455. *Plantago lanceolata* L. (MI-1380/**A, E**)
456. *P. major* L. (MI-1381/**S, WC**)

101. Platanaceae

457. *Platanus orientalis* L. (MI-1382/**WC**)

102. Plumbaginaceae

458. *Limonium cabulicum* (Boiss.) O. Kuntze (MI-1383/**D**)

103. Podophyllaceae

459. *Podophyllum emodi* Wall. ex Royle (MI-1449/**F**)

104. Polygalaceae

460. *Polygala abyssinica* R.Br. ex Fresen (MI-1450/**R**)

105. Polygonaceae

461. *Bistorta amplexicaulis* (D. Don) Green (MI-1451/**F**)
462. *Fallopia dumetorum* (L.) Holub (MI-1452/**F**)
463. *Persicaria capitata* (Buch.-Ham. ex D. Don) H. Gross (MI-1453/**WC**)
464. *P. glabra* (Willd.) M. Gómes (MI-1454/**M**)
465. *P. hydropiper* (L.) Spach (MI-1455/**M**)
466. *P. lapathifolia* (L.) S. F. Gray (MI-1456/**M**)

467. *P. maculosa* S. F. Gay (MI-1457/**M**)
468. *P. mitis* (Schrank) Assenov (MI-1458/**M**)
469. *P. nepalensis* (Meisn.) H. Gross (MI-1459/**WC**)
470. *Polygonum aviculare* L. (MI-1460/**W**)
471. *P. plebeium* R. Br. (MI-1461/**S**)
472. *Rumex dentatus* L. (MI-1462/**D**)
473. *R. hastatus* D. Don (MI-1463/**D**)
474. *R. nepalensis* Spreng. (MI-1464/**E**)

106. Pontederiaceae

475. *Eichhornia crassipes* (Mart.) Solma (MI-1465/**M**)

107. Portulacaceae

476. *Portulaca oleracea* L. (MI-1466/**A**)

108. Primulaceae

477. *Anagallis arvensis* L. (MI-1470/**A, W**)
478. *Androsace foliosa* Dcne. ex Duby (MI-1471/**E**)
479. *A. rotundifolia* Hardwicke (MI-1472/**R, C**)
480. *Primula denticulata* Smith (MI-1473/**E, F**)

109. Punicaceae

481. *Punica granatum* L. (MI-1476/**D**)

110. Ranunculaceae

482. *Aconitum heterophyllum* Wall.ex Royle (MI-1477/**E, F**)
483. *Aquilegia pubiflora* Wall. ex Royle (MI-1478/**F**)
484. *Caltha alba* Camb. (MI-1479/**WC**)
485. *Clematis grata* Wall. (MI-1480/**D, A**)
486. *Delphinium denudatum* Wall. ex Hook. & Thoms. (MI-1481/**F**)
487. *Ranunculus arvensis* L. (MI-1482/**A, W**)
488. *R. diffusus* DC. (MI-1483/**S**)
489. *R. muricatus* L. (MI-1484/**A, W**)
490. *R. sceleratus* L. (MI-1485/**WC**)
491. *Thalictrum cultratum* Wall. (MI-1486/**F**)

111. Rhamnaceae

492. *Sageretia thea* (Osbeck) M.C. Johnston (MI-1487/**D**)
493. *Ziziphus jujuba* Mill. (MI-1488/**A**)
494. *Z. nummularia* (Burm. f.) Wight & Arn. (MI-1489/**D**)
495. *Z. oxyphylla* Edgew. (MI-1490/**D**)
496. *Z. spina-christi* (L.)Willd. (MI-1491/**D**)

112. Rosaceae

497. *Agrimonia eupatoria* L. (MI-1492/**F**)
498. *Cotoneaster affinis* Lindl. (MI-1493/**D**)
499. *C. integerrimus* Medic. (MI-1494/**F**)
500. *C. microphyllus* Wall. ex Lindl. (MI-1495/**D**)
501. **Cydonia oblonga* Mill. (MI-1496/**A**)
502. *Duchesnea indica* (Andrews) Focke (MI-1497/**W**)
503. **Eriobotrya japonica* (Thunb.) Lindl. (MI-1498/**A**)
504. *Fragaria nubicola* (Hook.f.) Lindl. ex Lacaita (MI-1499/**F, E**)
505. *Geum elatum* Wall. ex G. Don (MI-1500/**F**)
506. **Malus domestica* Borkh. (MI-1501/**A**)
507. *Potentilla argentea* L. (MI-1502/**D**)
508. *P. nepalensis* Hook. f. (MI-1503/**F, E**)
509. *P. supina* L. (MI-1504/**W, WC, S**)
510. *Prunus armeniaca* L. (MI-1505/**A**)
511. *P. cerasoides* D.Don (MI-1506/**F**)
512. *P. cornuta* (Wall. ex Royle) Steud. (MI-1507/**F**)
513. **P. domestica* L. (MI-1508/**A**)
514. **P. persica* (L.) Batsch (MI-1509/**A**)
515. **Pyrus communis* L. (MI-1510/**A**)
516. *P. pashia* Buch.-Ham. ex D. Don (MI-1511/**D**)
517. *Rosa brunonii* Lindl. (MI-1512/**F**)
518. **R. chinensis* Jacq. (MI-1513/**A**)
519. *R. moschata* Herrm. (MI-1514/**A**)
520. *R. webbiana* Wall. ex Royle (MI-1515/**F**)
521. *Rubus ellipticus* Sm. (MI-1516/**D**)
522. *R. niveus* Thunb. (MI-1517/**D**)
523. *R. sanctus* Schreb. (MI-1518/**F**)
524. *R. ulmifolius* Schott (MI-1519/**A**)
525. *Sanguisorba filiformis* (Hook. f.) Hand.-Mazz. (MI-1520/**W**)
526. *Sibbaldia procumbens* L. (MI-1521/**E**)
527. *Sorbaria tomentosa* (Lindl.) Rehder (MI-1522/**E**)
528. *Sorbus aria* L. (MI-1523/**F**)
529. *Spiraea canescens* D. Don (MI-1524/**D, R**)

113. Rubiaceae

530. *Galium aparine* L. (MI-1525/**A, W**)
531. *G. asperuloides* Edgew. (MI-1526/**F**)
532. *G. divaricatum* Pourr. ex Lam. (MI-1527/**W**)
533. *G. elegans* Wall. ex Roxb. (MI-1528/**W**)
534. *Rubia cordifolia* L. (MI-1529/**A**)

114. Rutaceae

535. **Citrus sinensis* (L.) Osbeck (MI-1530/**A**)
536. *Zanthoxylum armatum* DC. (MI-1531/**D**)

115. Salicaceae

537. **Populus ciliata* Wall. ex Royle (MI-1532/**WC**)
538. **P. nigra* L. (MI-1533/**WC**)
539. *Salix babylonica* L. (MI-1534/**M**)
540. *S. tetrasperma* Roxb. (MI-1535/**WC**)

116. Sapindaceae

541. *Cardiospermum halicacabum* L. (MI-1536/**D**)
542. *Dodonaea viscosa* (L.) Jacq. (MI-1537/**D**)

117. Sapotaceae

543. *Monotheca buxifolia* (Falc.) A. DC. (MI-1538/**D**)

118. Saxifragaceae

544. *Bergenia ciliata* (Haw.) Sternb. (MI-1539/**C**)
545. *Saxifraga sibirica* L. (MI-1540/**D**)

119. Scrophulariaceae

546. *Kickxia ramosissima* (Wall.) Janch. (MI-1541/**R**)
547. *Mazus japonicus* (Thunb.) O. Kuntze (MI-1542/**MS**)
548. *Scrophularia umbrosa* Dum. (MI-1543/**D**)
549. *Verbascum thapsus* L. (MI-1544/**D, S**)
550. *Veronica anagallis-aquatica* L. (MI-1545/**M**)
551. *V. laxa* Benth. (MI-1546/**F**)
552. *V. polita* Fries (MI-1547/**A, W**)
553. *Wulfenia amherstiana* Benth. (MI-1548/**R, C**)

120. Simaroubaceae

554. *Ailanthus altissima* (Mill.) Swingle (MI-1549/**A, I**)

121. Solanaceae

555. **Capsicum annuum* L. (MI-1551/**A**)
556. **C. frutescens* L. (MI-1552/**A**)
557.**Cestrum nocturnum* L. (MI-1553/**A**)
558. *Datura stramonium* L. (MI-1554/**W, S**)
559. **Lycopersicon esculentum* Miller (MI-1555/**A**)
560. **Nicotiana tabacum* L. (MI-1556/**A**)
561. *Physalis divaricata* D. Don (MI-1557/**S**)
562. *P. peruviana* L. (MI-1558/**A, S**)
563. **Solanum melongena* L. (MI-1559/**A**)
564. *S. nigrum* L. (MI-1560/**A, GY, S, W**)
565. *S. pseudo-capsicum* L. (MI-1561/**GY**)
566. *S. surattense* Burm. f. (MI-1562/**D, S**)
567. **S. tuberosum* L. (MI-1563/**A**)
568. *S. villosum* (L.) Moench (MI-1564/**A, GY, S**)
569. *Withania somnifera* (L.) Dunal (MI-1565/**D**)

122. Thymelaeaceae

570. *Daphne mucronata* Royle (MI-1567/**D**)
571. *Wikstroemia canescens* Meisn. (MI-1568/**F**)

123. Tiliaceae

572. *Corchorus olitorius* L. (MI-1569/**A**)
573. *Grewia optiva* Drummond ex Burret (MI-1570/**D**)

124. Ulmaceae

574. *Celtis caucasica* Willd. (MI-1573/**GY**)
575. *C. eriocarpa* Decne. (MI-1574/**A**)
576. *C. tetrandra* Roxb. (MI-1575/**GY**)
577. *Ulmus wallichiana* Planch. (MI-1576/**F**)

125. Urticaceae

578. *Debregeasia saeneb* (Forssk.) Hepper & J.R.I. Wood (MI-1577/**WC**)
579. *Girardinia palmata* (Forssk.) Gaudich. (MI-1578/**F**)
580. *Pilea umbrosa* Blume (MI-1579/**WC**)
581. *Urtica dioica* L. (MI-1580/**W, S**)

126. Valerianaceae

582. *Valeriana jatamansi* Jones (MI-1581/**W, S**)
583. *V. pyrolifolia* Decne. (MI-1582/**W, S**)

127. Verbenaceae

584. *Lantana camara* L. (MI-1583/**GY, I**)
585. *Phyla nodiflora* (L.) Greene (MI-1584/ **S**)
586. *Verbena officinalis* L. (MI-1585/**W, S**)
587. *V. tenuisecta* Briq. (MI-1586/**W**)
588. *Vitex negundo* L. (MI-1587/ **S, GY**)

128. Violaceae

589. *Viola betonicifolia* Sm. (MI-1588/**MS**)
590. *V. canescens* Wall. ex Roxb. (MI-1589/**R**)

129. Vitaceae

591. *Vitis jacquemontii* Parker (MI-1590/**D, F**)
592.* *V. vinifera* L. (MI-1591/**A**)

130. Zygophyllaceae

593. *Tribulus terrestris* L. (MI-1593/**A, W, S, D**)

The number of vascular plant species in Kabal valley is higher than other areas of comparable size (Table 1). The total area of Tehsil Kabal is 40026 hectares (Anon., 1999) which constitute 0.05% of the total area of Pakistan (79.61 mill. Hec.), but the present list has 593 species which constitute 10.3% of the total 5783 species as reported by Stewart (1972). The area of tehsil Kabal is 7.5% of the total Swat district (533700 hec.) but the number of species is 40.3% of the total reported for the Swat state by Stewart (1967). The flora found in the area may be an interest model for future studies dealing with ecological, morphological, physiological, and reproductive aspects. Study of floristic composition of vegetation is crucial for conservation management by providing habitats for wildlife and contributing to the ecologically sustainable management of natural resources (Ahmad & Ehsan, 2012). The present list could be an easy source of material to ethnopharmacobotanical studies, since several of the recorded species have medicinal uses in tehsil Kabal (Ahmad *et al.*, 2011). Additional research should be conducted to evaluate the intrinsic ecological values of the local flora and to incorporate characteristics of species composition with ecological functions (Zhao *et al.*, 2010). This will provide a baseline for planning proper conservation measures to safeguard the phytodiversity in face of the ever growing biotic stress.

Table 1. Number of plant species in different groups and their comparison to number of plants in District Swat and Pakistan.

Plant group	Number of species			Percentage proportion of species compared to	
	Kabal valley (Area=40026hec.)	Swat district (Stewart, 1967) (Area=533700hec.)	Pakistan (Stewart, 1972) (Area=79.61mill. hec.)	Swat district (Area=7.5%)	Pakistan (Area=0.05%)
Pteridophytes	20	55	128	36.4	15.6
Gymnosperms	8	13	23	61.5	34.8
Monocotyledons	128	306	1140	41.8	11.2
Dicotyledons	437	1167	4492	37.4	9.7
Total	**593**	**1541**	**5783**	**38.5**	**10.3**

Acknowledgement

The present work is part of PhD thesis of the first author.

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(Received for publication 17 September 2011)