



Baseline Study of Vegetation in Doyan Valley District Astore, Gilgit-Baltistan, Pakistan

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Abstract

The total covered Area of Gilgit-Baltistan is about 72496 square kilometers, bordering with China, Afghanistan and India. The flora and fauna of the Gilgit-Baltistan are unique because of their natural ecological zones there are 1,000 species of vascular plants are known to occur in northern mountain regions of Pakistan. Most of endemic plants are found in the northern mountains. Medicinal plants are important source of drugs for the treatment of various ailments of human kind. Out of 5,700 plant species in Pakistan, 400-600 species are considered to have medicinal use in unani and other medicines

Rural people especially poor households also extract and process medicinal plants to meet their daily needs such as fodder, medicine and shelter. The present study has been conducted in Doyan valley, Astore to make an assessment of the flora of the valley. The main objective of the study was to identify and enlist existing plant species and their distribution in the study area and preparation of a taxonomical checklist of the species with their scientific, vernacular and local names. A total of 80 plant species belonging to different families were recorded and specimens of unidentified plants species collected for further proper identification.

It was observed that during the study olive, Chilgoza, birch and spruce were abundantly found in the study area. The abundance of floral species is beneficial for livestock grazing while maintaining the ecosystem. Floral species have importance because many have medicinal and aromatic properties while so many others are used as timber and fodder. However, the most important aspect associated with plants is that they are the main source of oxygen for life on earth. The report mentions threats to the floral and their root causes and recommendations have also been suggested for improvement.

Introduction

The Gilgit-Baltistan of Pakistan is located at 35°-37°N (latitude) and 72°-75°E (longitude). Having almost 1.8 million (one point eight million) population (GBWFE, 2013) and is spread over an area of 72, 496 sq. km. This region has been divided into seven districts; Gilgit, Diamer, Skardu, Ghanche, Ghizer, Astore and Hunza-Nagar. Each of these districts has been sub divided into sub division. Gilgit is the Headquarter of the Gilgit-Baltistan. The annual population growth rate is 2.47 percent. The average household size is 8 persons. Each of the districts has different cultures and often the original language of each area is different as well. There are seven separate language groups in Gilgit-Baltistan i.e. Shina, Balti, Wakhi, Khour, and Broshiski.

Most of the area consists of rugged mountains. Only one person of the area is under agriculture while rest is covered by mountains, rivers and glaciers (66%), rangelands (23%) and forest (4%) (IUCN, 2002) These mountains provide opportunity for life and habitat for high altitude plants and animals. The biodiversity of mountain ecosystems include diversified herbs, trees, insects, reptiles, avifauna and large wild mammal species. These resources provide base for sustainability of the region which can be achieved through ensuring the sustainable use and conservation of these resources. About 5700 species of flowering plants have been reported from Pakistan, and almost 400 of these endemic species and around 1000 species of vascular plants are known to occur in northern mountain regions of Pakistan. In spite of unscientific management and ruthless exploitation of some valuable plants species in the region, Gilgit-Baltistan still supports hundreds of endemic floral species and is said to be the hub for medicinal and aromatic plants in this region. Unfortunately the region's floral diversity has not yet been assessed, but it is believed to support some of the richest plant communities in Pakistan, including many significant plants species. Gilgit-Baltistan is dominated by one of the most mountainous area on earth, which are, Hindu Kush; Himalaya; and Karakoram. In this mountain range 101 peaks are found 7,000 meters above sea level, including Nanga Parbat, Rakaposhi and K-2.

The flora is unique because of their natural ecological zones. Each zone has wide variety of flora and fauna. In Gilgit-Baltistan different types of medicinal and aromatic plants are found. At present medicinal plants are faced with several threats, which are over exploitation, lack of proper management, free grazing and mechanization for agriculture. Based on ecological zone five main types of forests exist in Gilgit-Baltistan, namely, Mountain Sub-Tropical Scrub, Mountain Dry Temperate Coniferous, Mountain Dry Temperate Broadleaved, Sub-Alpine and Northern Dry Scrub. Each zone has different climatic condition because of their different climatic conditions different flora and fauna are found in each zone. However, some flora and fauna are endangered like snow leopard, Marco polo sheep and Brown bear (Rao and Marwat, 2003). Total forest covered area in Gilgit-Baltistan is 281,600 ha. Out of this 64,512 ha is Protected Forest and 217,088 ha Reserve Forest. In Gilgit-Baltistan, forests are typically found in parts of district of Diamer, Gilgit, and Astore.

Objectives of the Study:

The present study was carried out with the following objectives. The main objective of the report is to develop a baseline study on the vegetation of Doyan valley. However, the specific objectives were;

- Identify and enlist existing plant species and their abundance in the study area.
- Prepare a taxonomical checklist of the species with their scientific, vernacular and local names and their status in the study area.
- Document and describe plants species of “special concern” regarding the economic and ecological perspective found in the study area.
- Describe and assess potential threats on floral species of the study area.

Most of the people of Gilgit-Baltistan are dependent on wild plant for fuel, as food supplements, medicine, construction material and livestock feed. Medicinal plants are important source of drugs for the treatment of various ailments of human kind. Out of 5,700 plant species in Pakistan, 400-600 species are considered to have medicinal use in unani and

other medicines. Medicinal plants are valuable component of Northern mountain biodiversity. At present medicinal plants are faced with several threats. These plants are under pressure from increasing human population. Following medicinal plants are found in Astore Doyan valley.

Table: 1. Trees in Doyan valley

S. No	Common Name	Local Name	Urdu Name	Scientific Name
1.	Willow	Chitee biyoo	Baid	<i>Salix alba</i>
2.	Birch	Jonzee	Bhoj patter	<i>Betula utilis</i>
3.	Blue pine	Chee	Kail	<i>Pinus wallichiana</i>
4.	Pencil cedar	Chilee	Sanobar	<i>Juniperus macropoda</i>
5.	Spruce	Kachul	-	<i>Picea simithiana</i>
6.	Ash	Kasonar	-	<i>Fraxinus xanthoxyloides</i>
7	-	Garoli	Chilgoza	<i>Pinus gerardiana</i>

Table: 2. Medicinal Plants in Doyan valley

S. No	Common Name	Local Name	Urdu Name	Scientific Name
1.	Mullein	Tamoko	Janglitambak o	<i>Verbascum Thapsus</i>
2.	Wild thyme	Tumoro	Jangli chai	<i>Thymus linearis</i>
3.	Bergenia	Suspur	-	<i>Bergeniastracheyi</i>
4.	Ravand	Markochal/Jaroc huntal	-	<i>Rheum spiciforme</i>
5.	Plantain	Kay-e-khapy	-	<i>Plantago major</i>
6.	Wild strawberry	Buruz/ aynchey	Janglimava	<i>Fragaria vesca</i>
7.	Gaozban	Kazban	-	<i>Onosmabracteatum</i>
8.	Curcle sock	Churki	Khatibuti	<i>Rumex hastatus</i>
9.	Capper	Kabir	Kabir	<i>Capparis spinosa</i>
10.	Stinging nettle	Jumi	Bichuboti	<i>Urtica dioica</i>
11	Wild rue	Ispandur	Harmal, ispan	<i>Peganum harmala</i>
12.	Horse mint	Faleel	-	<i>Manthasylvestris</i>
13.	Chicory	Iskenagee	-	<i>Chicorium intybus</i>
14.	Santonica	Khakamuz	-	<i>Artemisia giminalis</i>
15.	Cummin seeds	Hayoo/ phluso	Zeera	<i>Cuminum cyminum</i>
16.	-	Hapochi	-	<i>Astragalus strobilifera</i>
17.	Wild onion	Hat cashoo/ paloon	Jaglipias	<i>Allium schoenoprasum</i>
18.	-	Beshksoor	-	<i>Aconitum chasmanthum</i>

19.	Afsenteen	Zhoon	-	<i>Artemisia maritime</i>
20.	Indian valerian	Ganeshpawrobat i	Mushk bala	<i>Valeriana jatamansii</i>
21.	Kasni chicory	-	-	<i>Chicorium intybus</i>
22.	-	Chontal	-	<i>Rheum wabbianum</i>
23.	Plantago	Shiliti	Ispagol	<i>Plantago major</i>
24.	Indian valerian	Ganeshpawrobat i	-	<i>Valeriana</i>
25.	Berry	Ishkeen	Kashmal	<i>Berberis lyceum</i>
26.	Banafsha	Lillo	-	<i>Viola pilosa</i>
27.	-	Tal sharing	-	<i>Onosmahispidium</i>
28.	Worm seed	Zhoon	Afsanteen	<i>Artemisia maritime</i>
29.	Stinging nettle	Jomi	Bichuboti	<i>Urticadiocia</i>
30	-	Phaypush	-	<i>Isodonrugosus</i>
31	-	Booshiphoner	-	<i>Saussuria lappa</i>
32	-	Susur (astori) / talacharchum (gilgiti)	-	<i>Rhododendromanthrop ogen</i>
33	-	Halskur	-	<i>Hedysarum falconeric</i>
34.	Mandrake	Esmane	Ban kakari	<i>Podophyllum emodi</i>

Table: 3. Herbs in Doyan valley

S. No	Common Name	Local Name	Scientific Name
1.	Wild thyme	Tumaroo	<i>Thymus serpyllum</i>
2.	Berginia	Suspur	<i>Berginiastracheyi</i>
3.	Mullein	Janglitamakoo	<i>Verbescum Thapsus</i>
4.	Wild strawberry	Aynchy	<i>Fragaria vesca</i>
5.	Ephedra	Soom	<i>Ephedra intermedia</i>
6.	Artemisia	Zhoon	<i>Artemisia maritime</i>
7.	Cumin seed	Kamsalzeera	<i>Cuminum cyminum</i>

Table: 4. Shrubs in Doyan valley

S. No	Common Name	Local Name	Scientific Name
1.	Juniper berries	Matharee	<i>Juniperus communis</i>
2.	Seabuckthorn	Borue	<i>Hippophae rhamnoides</i>
3.	Goose berry	Shomuloo	<i>Ribes alpestres</i>
4	Berberis	Ishkeen	<i>Berberis lyceum</i>
5	Tamarix	Hapackhokaoo	<i>Tamarix gemanica</i>

6	-	Bezar/Byar	<i>Podophyllum species</i>
7	Tamarix	Hookro	<i>Tamarixgallica</i>
8	Wild rose	Shingie	<i>Rosa webbiana</i>

Table: 5. Grasses in Doyan valley

S. No	Scientific Name
1.	<i>Agropyroncaninum</i>
2.	<i>Agropyrondentatum</i>
3.	<i>Agrostis gigantean</i>
4.	<i>Carex spp.</i>
5.	<i>Clamagrostis</i>
6.	<i>Dactylisglomerata</i>
7.	<i>Festucaovina</i>
8.	<i>Oryzopsis spp.</i>
9.	<i>Pennisetumfilaccidum</i>
10.	<i>Pennisetumlanatum</i>
11.	<i>Plileumalpinum</i>
12.	<i>Poa spp.</i>
13.	<i>Psendophara mites</i>
14.	<i>Trisetum spp.</i>

Table: 6. Forbs in Doyan valley

S. No	Scientific Name
1.	<i>Anaphaliscontorta</i>
2.	<i>Astragalus spp.</i>
3.	<i>Fragariavesca</i>
4.	<i>Iris spp.</i>
5.	<i>Medicago spp.</i>
6.	<i>Nepataspicata</i>
7.	<i>Plantagolanceolata</i>
8.	<i>Plantago major</i>
9.	<i>Plantagoovate</i>
10.	<i>Polygonumalpinum</i>
11.	<i>Potentilla spp.</i>
12.	<i>Rumexnepalansis</i>
13.	<i>Saxifraga ciliate</i>
14.	<i>Taraxicumofficinalis</i>
15.	<i>Thymus serphyllum</i>
16.	<i>Trifoliumpretense</i>
17.	<i>Trifoliumrepens</i>

Study Area:

Doyan valley conservation organization conducted baseline surveys on floral diversity in Doyan valley with collaboration of WWF-Pakistan under the project “*Conservation of Chilgoza Forests and Olive in Doyan Valley District Astore, Gilgit-Baltistan*”. This valley is located in the east of Bunji and about 50 KM away from Tehsil Jaglot, District Gilgit. There is about 400 house hold. The majority of the villagers rear cattle and almost dependent on pastures. There were four huge pastures. Local communities utilize these pastures in summer months (April to November). Due to the long season livestock over grazed palatable grass species and increase soil erosion in the area. The Kawolly pasture is present in Doyan valley provide best habitat for wildlife especially for Astor Markhor. The free grazing system is commonly practiced in the area. It is observed during study about eight thousand cattle (goat, sheep, cow and yak) were there in pasture. Overgrazing may cause a decrease in primary productivity (Reinold et al. 1975). During study 88 species of herbs, shrubs, forbs and grasses were collected from which 87 species have been identified while one specie locally named as Tundal has to be identified.

The high altitude mountain areas and pastures are a hub for diversified plants species and associated fragile mountain ecosystem that provide livelihood opportunities to hundreds inhabitants. Pakistan has a great diversity of both climate and land; from scorching deserts to relatively moist temperate hill forests resulting in an estimated 4940 native plant species presently known, covering 193 different plant families. (R. Akter 1987). Mr. Ghulam Rasool (1989) in his book “Medicinal plants of Northern Area” discussed 45 species of wild plants and classified them medicinal, agro forestry plants and fruit plants and also discussed the traditional uses.

The rapid destruction of diverse tropical forest, around which the majority of people live use traditional medicines, is related to the recent increase of interest in finding new antiviral and other agents. There is sufficient reason to justify learning what plant people use, how they use them and under what circumstances the plants prove efficacious. (Lewis and Lewis (1995), these plants are also used by the local herbal healers and hakims as traditional medicines. Chopra (1992) described and classified gymnosperms into five orders (including ancient gymnosperms). He also highlighted on the importance of gymnosperms in nature and in human life. Lal *et al.*, (1994) described fifty plant species (including *Taxusbaccata* which is used against colds) used as ethno medicines by Gaddis (migratory shepherds of western Himachal Pradesh) for treating cattle as well as humans.

According to world health organization (WHO) 80% of the developing world depends upon traditional system of medicines because of their easy accessibility as about 40% of the world's poor people have no access to the government health services. The world's 18% of top 150 prescription drugs are derived from plant sources (Kate Laird 1999) The indigenous knowledge about medicinal plant are also limited and still people are in practice to remove medicinal and aromatic plants (MAPs) without using the scientific way of extraction which cause vanishing the resource altogether.

2. Materials and Methods

This study was carried out in October, 2013. The field survey of pasture was done to collect plant specimens. The Ethno botanical information and traditional uses of plants were documented for report writing. Identified species noted in a pocket note book and samples of

unidentified plants were preserved for proper identification. Collected specimens were given field number and were properly pressed with the help of plants presser. Photographs were also taken with the help of a digital camera. Three field guide books “Wild flowers of Pakistan” Written by Yasin J. Nasir and Rubina A. Rafiq Edited by T J Roberts (1995) “The Flowers of Himalaya” by Oleg Polunin and Adam Stainton (1984) were used in the field.

2.1. Field equipment

The equipment used during the field work were digital camera, plants presser, blotting papers, Note book, Map, pencils, polythene bags, sassier, balance and inch tape.

2.1.1 Specimen Samples

In biological samples of different floral species were collected from different location carefully with the help of scissor and soon after raped with blotting paper and pressed with presser to ensure proper preservation of the specimen. The plants specimens were brought and properly identified with the help of available literature (Flora of Pakistan, Stewart 1972, Nasir and Rafique 1995) at GCIC. The unknown plant species submitted to Dr. SherWali Khan (Botanical expert from KIU) for identification.

2.1.2 Sample Size

Samples of 20 plots representing 10% each of the total surrounding area of the pasture were selected through random sampling technique. Data collected during the vegetation surveys were initially proposed to be undertaken by assessing 100 x 100m plots along transect on every 20m distance of each.

2.1.3 Data Assessment

Review of all existing data, including a search of the books, database for priority listed species for proper identification and validation use was done. The gathered data was tabulated and comprised details such as; scientific name, family, local name and folk uses. The species were further classified on the basis of their class and family.

3. Results & Discussion

3.1 Overexploitation of vegetation

Over-exploitation of the natural resources has become a natural practice in the vicinity pasture especially birch and spruce. Lopping and uprooting of trees is frequently practiced in order to get timber and fuel wood and medicinal herbs. This continuous activity will lead to a restricted growth and reduced natural regeneration in this area.

3.2 Excessive use of pastures

Local communities utilize these pastures in summer months (April to November). Due to the short season the shepherds come to the area with their livestock and use the pastures intensively. The livestock over graze palatable grass species and increase soil erosion in the area. The free grazing system is commonly practiced in the area. It is observed during studies about eight thousand cattle (goat, sheep, cow and yak) were there in pasture. Overgrazing may cause a decrease in primary productivity (Reinold et al. 1975) an increase in water turbidity (Logan, 1975) and areas devoid of vegetation (Bassatt, 1980). Khan (1992) studied those population trends of waterfowl species declined due to increase in human and livestock activities.

3.3 Medicinal plants harvesting for commercial and subsistence use

People In this valley use the medicinal herbs for commercial purposes; due to lack of sufficient livelihood opportunities, they rely on these natural resources, which provide them a source of income. Fodder for livestock, medicinal uses; over exploitation and extraction of valuable species becoming extremely difficult to meet the commercial and subsistence requirements from the degraded these resources.

3.3.1 Illicit cutting

The use of wood for housing, furniture, cooking and heating is quite inefficient. This leads to higher extraction of wood from the forests than necessary. It is necessary to design improved housing, cooking and heating equipment to decrease the dependency on forest for fuel. This would lead to less wood usage and hence less pressure on the forests.

3.4 Climate change

In the 21st century the change in climatic condition is the worst problem for universe. Climate change is thought to be causing more frequent droughts resulting in reduced water levels and the drying out of many lakes in central Asia. This phenomenon may be a great threat to the natural resources. Change in climatic conditions is the result of deforestation and pollution in the world.

3.5 Weak law enforcement

There are some weaknesses in government rules and regulations. During the last few decades some of the valuable trees have been cut down. There is a need for strong law enforcement regarding protection and conservation of the forest with assistance from government line departments and concerned communities.

4. Root causes

4.1 Poverty

Poverty related issues emerge as a major root cause of unsustainable use of forest and wild life. As resources, that is actually or perceived to be common property. The slow development process, poor access to markets, lack of investment in local processing or value added activities and over exploitation by intermediaries' results in poor living standards of communities and livelihood. In these circumstances, they have few alternatives to excessive deforestation to meet their needs, raring of cattle and extraction of medicinally important plants to generate income in order to survive. This has led directly to depletion of pasture and vegetation, and resulted in reduction of habitat for key species.

4.2 Lack of awareness

At persistent lack of awareness is evident in policy making and public attitude regarding almost all forms of natural resource management including pasture management and conservation. Dealers were found to be generally unaware of rare status of some plant species. Custodian Communities also lack awareness of the importance of the flora and their associated biodiversity and continue to degrade these resources through harmful practices.

4.3 Population growth

Population in Gilgit-Baltistan has been increasing at a rate of 2.74% per annum and 84% of the population is rural and most of it derives its fuel needs from forests. So, increasing population means an increased burden on forests for fuel wood and other uses.

4.4 Lack of knowledge about floral species and their status

No detail study has been done by any individual or an organization so far on flora, so organizations working on natural resource conservation should work on awareness raising and encourage young students to boost the conservation efforts. However WWF-Pakistan and GB forest department are currently working for this purpose but there is room for more to be done.

5. Conclusion and Recommendations:

It was recorded that plants are playing a very basic role in the life of locals as compared to any other resource. A reflection of the role of plant in the daily life of the people is given here. A number of plant species are utilized as a fuel wood including naturally grown sea buckthorn, *Artemisia* spp. and *Junipers* excels etc. Because of over exploitation, some wild species are becoming rare. Present study reveals that the area is very rich in terms of biodiversity and ethno botanical knowledge. Report presents a thorough outlook of the plants of the area.

It was noticed that there was abundance of spruce and birch trees in the study area. The birch trees are high in risk, the shepherds collect the bark from trees and use for many purposes e.g. warping of butter and to cover the new constructed timber roof. It would be a risk factor for the birch trees. Some wild plants (*Kuhnachenopodium album*, *KabirCapparis spinosa* and *JumiUrtica Diocia*) being utilized as vegetable, some are threatening of the excessive used as fuel wood. May important medicinal species were found over there, the locals are well informative knowledge about their medicinal importance and they also use these plants as medicinal therapy.

- Junipers spruce and birch are under threat because of over exploitation, supply of alternate source as fuel wood can conserve these floras it is need new plantation while introducing ex-situ and in-situ technique.
- Chilgoza and olive trees are abundantly found in this valley, to generate income from this resource, a training workshop for picking, harvesting tools, and training in value addition, marketing of Chilgoza and the grafting of olive trees will increase the conservation of the forest.
- It has been observed that varieties of wild plants (The roots of *berberies* Heals up injuries, *Menthasyvestris* extract use in stomach troubles and use in toothpaste, the fruits of *Hippophaerhmnoides* are used for Ulcer, cancer, hair tonic and skin disease. *Peganumharmala* is used as a smoking agent. Smoke is good for sore eyes. The leaves of *Artemisia gimilinii*(khakhmoz) are used for stomach pain. While the *Plantago major* is used for stomach digestion and seeds are used for the constipation) are used by the people settled in surrounding catchments of the high elevation wetlands and other localities. They use not only the edible ones but also numerous medicinal and otherwise economic herbs for curing different diseases, common to the locality. While considering the importance of it is remembered to stop exploiting such type of medicinal herbs.
- Sustainable strategy for conservation of natural resources requires that conditions be created for livelihoods improvement opportunities that can ensure an enhanced but

stable flow of products and services, without degrading or depleting the potential of the forest resource base in the long run. Alternative income generation activities like bee keeping, mushroom cultivation, kitchen gardening, off-season vegetables, farmyard poultry, etc may be introduced with the objectives to reduce pressure on natural resources as well as alleviating poverty. Due attention be given to income generation potential of Non Timber Forest Products (NTFPs), particularly for rural women. This will help in alternate sustainable livelihood and sustainable conservation of wetlands resources.

- Gilgit-Baltistan is scarce in natural forestry and farm forestry plays an important role in bridging that gap. Firewood being a major source of energy in the GB, its sustained supply can be ensured by raising community based fuel wood block plantations together with farmland plantation without jeopardizing agricultural productivity. Multi-purpose trees can be introduced which suit local environments and provide fuel wood, timber and forage to meet the needs of the rural communities. This will not only reduce pressure on natural forests, but also provide easy access, particularly for women to collect firewood for their daily use. Involvement of local women in raising these plantations should therefore be emphasized.
- The increases development of the Gilgit-Baltistan hydroelectricity resources can be expressed to ease the demand, it is likely that fuel wood will continue to be an important energy sources in many areas. So government should give attention in hydro power sources to meet the demand of fuel wood consumption.
- Kerosene oil and LPG is currently the second most widely used energy sources in the area. It is readily available on the village/valley of Doyan, and is used primarily for lighting and cooking. Even in the Gilgit-Baltistan electrified regions, kerosene and LPG is commonly used because of frequently disruptions in the power supply. Because of the inflation in the market the current prices of the oil is too high the poor communities cannot afford therefore the government should give subsidy on oil and LPG to make possible to affordable to the local communities.
- The people settled in the villages are still rely on traditional system of healthcare not only because of its low price, but also due to very less side effects, as compared to the modern allopathic medicines and entirely dependants on plant resources. They collect the plant for medicinal uses, fuel wood, fodder, timber, and many other purposes. Bann should be imposed on extraction of threatened flora can benefit the survival of species.
- Field observations showed that vegetation of the area was generally threatened due to weak law enforcement, illicit cutting, overgrazing, soil erosion, solid waste spreading, unscientific extraction and lack of proper research and awareness are the visible threats to the natural vegetation so the stakeholders should focus on community about raising awareness on sustainable conservation of the flora.

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