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## Conservation Assessment of Hindu-Kush Mountain Region of Pakistan: A Case Study of Utror and Gabral Valleys, District Swat, Pakistan

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**Abstract:** An ethnobotanical project was carried out to investigate conservation status of the flora of Utror and Gabral. The twin valleys are located in the remote northwestern part of District Swat. The area is gifted with diverse and unique flora, as it is adjacent to the confluence point of Himalayas, Hindu-Kush and Karakorum. Over exploitation of plant resources combined with improper harvesting and post harvesting techniques have intensified pressure on ethnobotanically priced flora of the area. Present study revealed that 17.61% of the total utility plants of Utror and Gabral valleys are threatened, of which 4.54% are Endangered, 5.68% Vulnerable, 4.54% Rare and 2.84% Near Threatened. The study confirmed that the area possesses great potential for cultivation and sustainable harvesting of economically important plant resources. Species like *Colchicum luteum*, *Dioscorea deltoidea*, *Bistorta amplexicaulis*, *Caltha alba*, *Valeriana jatamansii*, *Viola biflora*, *Viola canescens*, *Polygonatum verticilatum*, *Acorus calamus*, *Podophyllum emodi*, *Saussorea lappa*, *Paeonia emodi* and *Geranium wallichianum* can be introduced as marginal crops in the area. Conservation status of *Acorus calamus*, *Podophyllum emodi*, *Saussorea lappa*, *Polygonatum verticilatum*, *Paeonia emodi*, *Ephedra gerardiana*, *Bunium persicum* and *Berberis vulgaris* indicate that these plant species need special attention before they are eroded genetically.

**Key words:** Conservation, Utror and Gabral, conservation status scale, Hindu-Kush Himalayas, Swat

### INTRODUCTION

Over the past three decades, conservationists, natural resource managers and environmental policy makers have recognized that the conservation of biological diversity depends upon protecting and managing intact natural habitats. Such recognition has given greater importance and urgency to the international efforts to establish and maintain biosphere reserves, wildlife sanctuaries, national parks, forest reserves and other protected areas.

Pakistan's record of natural resource conservation is linked with its history of conquest and colonization. Over the past millennia, successive waves of invaders poured through its northern passes into the fertile plains of the subcontinent to the southeast. Indigenous populations were forced into the mountains and foothills to eke out a bare subsistence, which, among other things, entailed clearing of forests for agriculture and grazing. They eventually settled down as small scale farmers in the perennial stream fed mid elevations and as semi transhumant in the higher altitudes (Kothari, 1998).

The post independence period (1947 onwards) witnessed an acceleration of the economic and social transformations underway in the colonial era. The commercialization of agriculture, industrial growth and the demographic explosion continued to exert relentless pressure on the stock of natural capital. Land use changes occurred on a large scale across the country, in the form of irrigation engineering, large dam construction, draining of wetlands, clearing of land for agriculture, industry, mining, roads and settlements. Forest and river ecosystems, already under threat during the colonial period, began to lose their self-sustaining capabilities. The physical threats to the environment were further exacerbated by the collapse of traditional social structures, as people moved in search of better economic opportunities, losing touch with their roots and traditions. A combination of poverty diversified economic opportunities and the increased commercial value of natural resources (timber, fuel wood, medicinal plants and edibles) encouraged resource overuse rather than conservation.

The management system, designed for a specific purpose, was unable to cope with these changes. The multiple and often conflicting interests of commercial loggers, private developers, government and military agencies, hunters and impoverished communities placed it under relentless strain. The administration tended to choose the path of least resistance, coming down with a heavy hand on the disempowered communities and colluding for personal gain and profit with vested interests. Rising prices of timber, fuel wood and forest products, an erosion in the standard of living of the forest custodians, fines and penalties that were selectively applied and failed to match the nature of the transgression and royalties that were appropriated by the rich and powerful, combined to create a complex of perverse incentives antithetical to conservation. The irony is that the key inroads into forest resources began to be made by commercial and development groups which management was not in a position to oppose and in fact, cooperated with. On the other hand, it targeted communities, whose needs were of an essentially subsistence nature and who had their rights and traditions been honored could have collaborated with the authorities in the sustainable management of forest resources.

The residents of the Utror and Gabral use medicinal plants for curing diseases and also sell some of them in the local market for earning their live hood. About 44 medicinal plants are collected in the area during the months of May, June, July and August. Out of these 44 species collected and marketed, 8 species of medicinal plants are endangered, 8 species are vulnerable and 8 species are rare. Bulk of these medicinal plants are used locally and only *Berberis lycium*, *Bergenia ciliata*, *Podophyllum hexandrum*, *Colchicum luteum*, *Dioscoria deltooides*, *Viola* sp. *Pistacia integrimma*, *Morchella esculenta*, *Paeonia emodi*, *Rheum australe*, *Aconitum hetrophyllum*, *Valeriana jatamansi*, *Acorus calamus*, *Juglans regia*, *Diospyrus lotus* and *Bistorta amplexicaulis* makes their way to national and international markets (Hamayun *et al.*, 2005).

A survey conducted in Utror and Gabral showed that medicinal plants collectors include women (48.26%), men (27.0%) and children (24.74%). Almost 90% of these medicinal plants are sold in the local market in fresh form as the collectors are poor and needy. Some species are cleaned, dried in the sun and stored in plastic bags. The percentage of losses is much higher in the storage because the collectors are unaware about the proper storage methods of these plants. The availability of medicinal plants decreased during the past 20 years. According to aged villagers, medicinal plants were abundant in the vicinities of human settlements some 20

years back. However, the population of medicinal plants drastically decreased due to increased marketing pressure on medicinal plants, lack of job opportunities in the area, non sustainable harvesting methods like digging of whole plant and increased population of the area. The medicinal plants are now collected in large volumes from remote areas of Desan, Ghos, Ladhu, Pala-Shair, Sind, Molat, Gozba, Deej, Tosi and Kagishdin (Hamayun *et al.*, 2005).

**Utror and Gabral:** Utror and Gabral valleys are situated between 35°20' to 35°48' N latitude and 72°12' and 72°32' E longitude. The population of Utror is 6888 and the area of the valley is about 47400 ha (Census Report, 1998). Utror valley is surrounded by Gabral and Bhan valleys on the east, upper Dir district on the west, Kalam valley on the south and Gabral valley on the north. It is 15 km from Kalam, the centre of Swat Kohistan. The altitude of the valley at Utror proper is 2300 m and reaches to 2900 m at Kandol Lake. Gabral valley lies over an area of about 38733 hectares. The population of Gabral is 3238 (Census Report, 1998). The valley is surrounded by Chitral District in the north, Utror valley in the south and southwest, upper Dir district in the west and Bhan and Mahodand valleys in the east. It is 5 km distant from Utror proper and 20 km from Kalam. The altitude of the valley ranges from 2580 m at Baila to 5160 m at Karkaray Lake top.

Both Utror and Gabral valleys are parts of Swat Kohistan. Kohistan means land of mountains in Persian language. There are three areas under the name Kohistan. These include Indus Kohistan lying on both banks of river Indus from Chilas down to Bisham, Swat kohistan in the north of Swat valley with Kalam as its centre and Dir kohistan at the north of Dir valley (Inam-ur-Rahim and Viaro, 2002).

## MATERIALS AND METHODS

Present study was carried out during 2001 to 2003. Conservation status of ethnobotanically valued flora of Utror and Gabral was studied by developing a new conservation assessment scale. The IUCN criteria for threatened categories were also used (Version 3.1) with some modification in order to get a clear picture with out any complication. IUCN (2001) included nine different categories, which were modified to seven categories in the present study and criteria for Rare and Secure category was also included.

**Assessment criteria:** Ranking is a qualitative process and it takes into account several factors, which function as guidelines rather than arithmetic rules. The ranker's overall

knowledge of the element allows him or her to weigh each factor in relation to others and to consider all pertinent information for a particular element. The factors considered in ranking species and communities are similar, but the relative weight given to the factors differs.

**Data collection pertinent to conservation status assignment:** In Utror and Gabral, the plant resources are utilized ruthlessly and thus most of the threatened plants are of ethnobotanical importance. In order to study the conservation status of ethnobotanically important flora, transect walks were made during different seasons throughout the area, which covered all slopes, aspects and altitudes. Local people especially plant collectors got valuable information about plants abundance, distribution and localities of their maximum availability. This information was confirmed through field visits. Personal observations were made in the field keeping several parameters in consideration. Field observations include, Range extent and area of occupancy, Exploitation level, Plants availability, Habitat alternation, Conservation efforts, Plant collection techniques, Part collected, Invasive plants, Threats (Pollution, Urbanization, Lack of awareness, Deforestation etc.). The plant species were then categorized into Critically Endangered, Endangered, Vulnerable, Rare, Near Threatened and Secure.

## RESULTS

During present study, three areas of major concern were tried to address in order to reduce pressure on plant resources and ensure their sustainable use. The three areas were

- Awareness of local people towards conservation
- Finding present conservation status of the flora
- Finding causes of deforestation and suggestions for reducing pressure on plant resources of the area.

However, the area need concrete efforts as on the part of Government and other funding agencies as the people are very poor and the area even lack basic education, health, infrastructure and job opportunities.

**Conservation awareness:** The vast majority (more than 80%) of Utroris and Gujar from Gabral are illiterate and poor. These people are unaware of the importance of the flora for ecosystem and sustainable use of plant resources. An effort was made to educate these people and for this purpose meetings were held with people in Utror and Gabral. The local elders were consulted and their grievances were noted. Lectures were also delivered at Government High School, Utror and the students were

told about the importance of biodiversity and role of plants in an ecosystem. They were also informed about present status of indigenous plants and how ruthlessly the local people utilize them. The student took keen interest in the subject.

**Present conservation status:** Different villages and surrounding areas in Utror and Gabral were extensively surveyed in order to get a clear picture of present conservation status of the flora. Local people provide a reliable source of information's in this respect. Questionnaire method was adopted for the purpose. Most of threatened plants are ethnobotanically valued and are utilized for different purposes in the area. Data showed that there are 31 threatened plants, of which 8 plant species are Endangered, 10 Vulnerable, 8 Rare and 5 Near Threatened. The entire threatened flora is found to be of ethnobotanical importance. Thus 17.61% of the total ethnobotanically valued plants of Utror and Gabral are threatened, of which 4.54% are Endangered, 5.68% Vulnerable, 4.54% Rare and 2.84% Near Threatened (Fig. 1). These threatened plant species with part used, their availability status over the last 10 years, collection methods and present conservation status is given in Table 1.

**Causes of deforestation in project area:** The valleys of Gabral and Utror are situated in the western Himalayas and thus contain a very diverse flora of dry temperate zones. In the last decades, 1980s on ward, due to increased population, tourism and urbanization trends, the indigenous flora of the area is under continuous pressure as habitat destruction is slowly but surely under process. Some of the reasons for the decreasing forest cover in the area are.

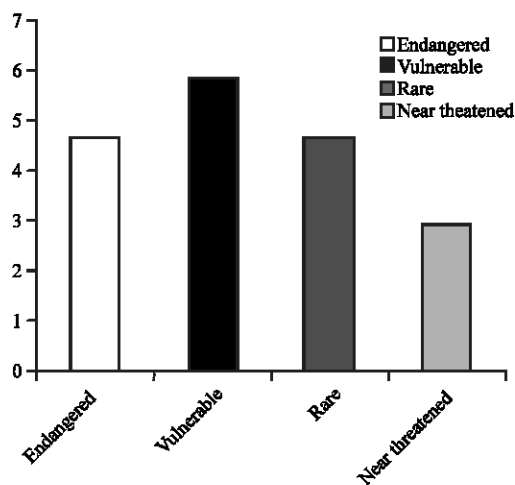


Fig: 1: Threatened flora of Utror and Gabral, District Swat

Table 1: Threatened economic plants of Utror and Gabral, District Swat, Pakistan

Botanical name	Part used	Availability status in last 10 years	Collection method	Conservation status
<i>Aconitum hetrophyllum</i>	Roots	Decreased	Digging	Vulnerable
<i>Aconitum violaceum</i>	Roots	Decreased	Digging	Vulnerable
<i>Acorus calamus</i>	Rhiz.	Decreased	Digging	Endangered
<i>Adiantum venustum</i>	Whole	Decreased	Cutting	Vulnerable
<i>Berberis lycium</i>	Roots	Decreased	Digging	Vulnerable
<i>Berberis vulgaris</i>	Roots	Decreased	Digging	Endangered
<i>Bergenia ciliata</i>	Leaves	Persistent	Plucking	Near Threatened
<i>Bistorta amplexicaulis</i>	Rhiz.	Decreased	Digging	Vulnerable
<i>Bunium persicum</i>	Fruit	Decreased	Picking	Endangered
<i>Cedrus deodara</i>	Whole	Decreased	Cutting	Near Threatened
<i>Calendula arvensis</i>	Roots	Decreased	Digging	Rare
<i>Colchicum luteum</i>	Rhiz.	Decreased	Digging	Rare
<i>Dioscorea deltoidea</i>	Root	Decreased	Digging	Vulnerable
<i>Ephedra intermedia</i>	B/Lvs	Decreased	Cutting	Vulnerable
<i>Ephedra gerardiana</i>	B/Lvs	Decreased	Cutting	Endangered
<i>Geranium wallichianum</i>	Roots	Decreased	Digging	Rare
<i>Mentha longifolia</i>	Whole	Persistent	Plucking	Rare
<i>Morchella esculenta</i>	Whole	Decreased	Picking	Rare
<i>Origanum vulgare</i>	Roots	Decreased	Digging	Rare
<i>Paeonia emodi</i>	Rhiz.	Decreased	Digging	Endangered
<i>Pistacia integrima</i>	Pod	Decreased	Picking	Vulnerable
<i>Plantago lanceolata</i>	Seeds	Persistent	Picking	Rare
<i>Podophyllum emodi</i>	Rhiz.	Decreased	Digging	Endangered
<i>Polygonatum verticilatum</i>	Rhiz.	Decreased	Digging	Endangered
<i>Rheum australe</i>	Rhiz.	Decreased	Digging	Rare
<i>Saussorea lappa</i>	Roots	Decreased	Digging	Endangered
<i>Skimmia laureola</i>	Leaves	Persistent	Plucking	Near Threatened
<i>Thymus linearis</i>	Seeds	Decreased	Picking	Vulnerable
<i>Valeriana jatamansii</i>	Rhiz.	Decreased	Digging	Vulnerable
<i>Viola canescens</i>	Lvs/fl.	Persistent	Plucking	Near Threatened
<i>Viola biflora</i>	Lvs/fl.	Persistent	Plucking	Near Threatened

Abbreviations: Lvs and stands for leaves, Rhiz and rhizome, B for bark and fl. for flowers



Fig. 2: Potato fields (above 3000 m.)



Fig. 3: Deforestation (Desan Forest)

**Deforestation for cultivation:** The trend of cutting trees for getting cultivation land has increased in the recent years. This practice is very common in the area as cultivated patches are everywhere in the forest, especially in the Ladhu side of Utror valley. In these newly acquired lands, local people cultivate potatoes, which is the prime cash crop of the area (Fig. 2). One can see men, women and children working in the potato fields in the forests surrounding the villages. In Gabral valley, this practice is not as common as bulk of the population of Gabral are Gujars and they got no rights in local forests. This habit of acquiring land through deforestation is very fatal and if unchecked will convert the valuable forests into cultivated fields.

**Population explosion:** The population of the area has increased many folds in the recent past. The main reason beside increased fertility rates is the migration of Gujars from district Dir and Kohistanis from Indus Kohistan. The migration of locals from their homes to low lying areas during winter season has decreased, thus increasing demands on forest resources. In addition, people from different parts of the country are continuously purchasing lands in the area in order to built homes so that they can spend summer season there. This increase in population along with human lust to earn more by smuggling valuable timber wood has resulted in the clearing of forests with an increased rate (Fig. 3 and 4).



Fig. 4: Deforestation (Above 3000 m)



Fig. 5: Land slides (Common scene in Utror and Gabral)

**Forest fires:** Forest fires constitute a potential threat to the flora of Utror and Gabral. In majority of cases forest fires are caused by careless human attitudes. People working in their fields or nomads grazing their herds, while warming themselves, cooking meal or preparing tea, do not extinguish fire completely and thus cause forest fires. Patches of burnt forest can be seen in the area.

**Natural hazards; avalanches and land slides:** Avalanches and landslides are frequent in the area and cause considerable destruction to the forest. Avalanches are very common during winter season, as moving avalanches kill herbs, shrubs and even trees. Landslides also increased with decreasing forest cover (Fig. 5).

**Tourism:** During the last decade, the number of tourist visiting the area has increased as the famous tourist resort of Kalam is greatly polluted by hundreds of hotels and large number of tourists during the summer season. In Utror valley, new hotels are under construction. Tourism will surely develop local economy but also conceal threats to the local flora.

**Low literacy/lack of awareness:** Utror and Gabral are situated in the remote area of Swat and thus lack basic facilities of education and roads. The literacy rate is very

low in the area. It is estimated to be 17% according to 1998 census report but this estimate is doubtful and it is about 9 to 13%. Female education is negligible as no functional Girl school is present in the area. This low literacy rate have greatly contributed to lack of awareness on the part of local people as they are unaware about the importance of these indigenous forests to them and to the ecosystem. Illiteracy has also resulted in unsustainable use of forest resources in the area.

**Over grazing and browsing:** The current grazing/browsing intensity is also causing great concerns for conservationists. During summer season, herders come from different parts and lease the lush green pastures in Utror and Gabral. These nomads are called Ajars. Locals also move to upper parts along with their livestock and reside in their make shift homes there for whole summer season. During the period the pastures are completely devoid of grass and the young plants are also browsed.

**Medicinal plants collection:** Medicinal plants are collected in the area and then sold in the local markets. Medicinal plants collected in the area include, *Podophyllum emodi*, *Paeonia emodi*, *Bergenia ciliata*, *Veleriana jatamansii* and *Bistorta amplexicaulis* etc. The collectors involved are locals and also unaware about the proper methods of medicinal plants collection and storage. Thus huge amounts of medicinal plants are lost every year.

**Forest resources and their usage:** Forests are used by the local population in a luxurious and unsustainable way.

- Huge amounts of valuable wood are used as fuel wood in the area annually. In winter, consumption increases many folds as wood is burnt 24 h for keeping the rooms warm. *Cedrus deodara* (cost Rs. 1300 per sq. feet in Peshawar) is the principal fuel wood species although less precious plants of *Quercus dilatata*, *Abies pindrow* and *Picea smithiana* are available for the purpose.
- Plants species of *Cedrus deodara*, *Pinus wallichiana*, *Abies pindrow* and *Picea smithiana* are used for fencing cultivated fields. In this way large quantity of precious wood is lost.
- Wood of *Cedrus deodara* is extensively and lavishly used in the construction of houses. Timber wood is used for making roofs and in some families, floors of the rooms also. In majority of houses, wood sleepers are used extensively in making walls of living rooms. Wood sleeper and logs are placed in between stones for this purpose.

- Wooden planks of *Cedrus deodara* are used for making water channels through which water is brought from far flung streams in order to run turbines for the production of energy.
- Valuable tree logs are placed under the soil at the boundaries of cultivated fields in order to prevent landslides.

**Smuggling of timber wood:** Timber wood is smuggled from Utror and Gabral valleys with the help of corrupt forest officials.

- Sleepers are hidden in trucks loaded with potatoes and are thus smuggled to different parts of the country.
- Sleepers are thrown in Utror river and then caught in the low lying areas.
- Some people furniture in the area and then take it to their desired destination as furniture is not checked and confiscated.
- Influential people smuggle wood sleepers from the area by using their influence and contacts. Other bribes the pertinent forest officials.

**Protection and conservation measures:** The natural resources in the Hindu-Kush-Himalayas are deteriorating more rapidly than many other global ecosystems, but receive little attention internationally than other regions. The chief threat to the flora is the fuel shortages in the mountainous areas for the ever-growing population. The other threats include terracing of land for agricultural purposes; indiscriminate deforestation for economic reasons and overgrazing that has resulted in a severe biotic stress. In the western Himalayas along the foothills and lower slopes as far as human settlements reach, there is hardly any forest left. It is time now to realize that the traditional medicinal plants knowledge and other management systems are as important as the need to introduce modern innovative approaches to sustainable development and management of natural resources in order to sustain the livelihood of traditional societies in the Hindu-Kush-Himalayan region.

**Awareness campaigns and incentives:** Broad scale awareness campaigns should be launched in the area, so that people know the importance of indigenous flora and forests for the existing ecosystem. Incentives for the local population are also essential prerequisites for successful protection and conservation measures. The most important incentive would be the liking of annual tree cut with successful regeneration. Besides local should be given their due royalties with no delays and make this

whole chain free of corruption and corrupt elements. It is a common grievance in the area that some of the local elders (Maliks) are denying due shares in royalty to common villagers. The locals should be given job opportunities.

**Protection against browsing/grazing:** The browsing and grazing rate needs to be checked properly as it is threatening the ecosystem. Permanent closure of forests against browsing and grazing would neither be economic nor politically practicable. The envisaged means for protection are the following.

Ban should be placed on certain forests already on the verge of collapse due to over grazing and extensive browsing. Such a ban may be part of the contract between Utroris and nomadic Gujars leasing the pasturelands. If required, it may be strengthened through the forest guards.

Fencing of the forest by barbed wire, waste wood and branches will solve the problem to some extent although fences are commonly perceived in the area as a sign of ownership. This can be solved through consultation with local population. The more the local people involved in the implementation, the greater will be the achievements.

**Protection against encroachment and illicit tree felling:** Study revealed that control of forest guards is not effective in Utror and Gabral valley, while the local elders enjoy considerable influence on the local population. Prevention of new fields for cultivation in the forest and illicit trade of timber is only possible with the involvement of local communities.

The following measures are recommended for the purpose

- The local requirement of fuel wood and timber wood should be met efficiently. If these requirements are not met, it will be unsuccessful and frustrating undertaking for the forest official to prevent illicit tree felling by authoritative means.
- The forest official should concentrate on prevention of illicit timber trade as well as on forestry extension and social forestry measures.
- Local communities and institutions should be strengthened in order to get maximum towards the goals of conservation and sustainable use of plant resources.
- Locals involved in illicit tree felling should be punished by reducing their quota of annual cut.

**Soil conservation:** Soil conservation measures should include tree plantations and pasture management activities. Again, local population should be taken in to confidence, as they are the main actors of all conservation strategies.

**Forest fires:** Forest fires pose a potential danger to the conservation of forests, specifically to the dense and young forest crop. Preventive measures include awareness campaigns. Construction of road network will facilitate the control of forest fires.

**Active government and NGO's participation:** The most important prerequisite for conservation and sustainability is education. The Government (Forest department) and NGO's are required to educate the people living in the area and it will aid to other conservation efforts.

## DISCUSSION

Plants and plant resources are always indispensable for any region as they show immense impact on the ecosystem and socio-economic conditions of the people inhabiting that region. Utror and Gabral valleys are one of the most exploited areas in District Swat. People collect plants not only for their own requirements but also for economic reasons. The collectors are unaware of the repercussions of such indiscriminate collection of valuable plant resources. As a result most of economic plants are threatened in the area and may become story of the past if existing conditions prevailed for a longer period. Present study showed that 31 plant species are threatened. Of which 8 plant species are Endangered, 10 Vulnerable, 8 Rare and 5 Near Threatened. Thus 17.61% of the total ethnobotanically valued plants of Utror and Gabral are threatened, of which 4.54% are Endangered, 0.68% Vulnerable, 4.54% Rare and 2.84% Near Threatened. Khan (2003) reported that due to population explosion, poverty and ignorance, the comparatively richer cover of the herbaceous flora has vanished from about 60% of their habitats. However, some of the pockets especially in the inaccessible areas and in some of the protected areas still have majority of the representatives of medicinal and aromatic plants. These plants need to be preserved before they disappear because of excessive commercial harvest and local uses. Wild vegetation, in addition to their non-tangible and indirect benefits, could potentially do a lot to the socioeconomic uplift of the rural poor population in the remote areas. People of such areas, could get their needs met if they are mobilized and helped in techniques related to the harvest, cultivation and marketing of wild plants. There are more than 420 endemic species of higher

plants in Pakistan. According to an estimate 100 species are being driven to extinction per day. Conservation biologists warn that 25% of all species could become extinct during the next 20 to 25 years. More than 15% of the flora of Pakistan is endangered, including many endemics (Shinwari *et al.*, 2000). Similar observation was carried out by Schippmann (2001) who stated that gathering of medicinal plants can provide an important source of income for local people, but if it is not appropriately managed, wild harvesting may jeopardize the long-term viability of plant populations and plant habitats. Many medicinal plant species are threatened with local, commercial and in some cases, biological extinction. The cause includes increasing damaged, a vastly increasing human population and intensive conversion of habitats. Concern over the fate of 14 internationally traded medicinal plants has led to their inclusion in the Appendices of the convention on International Trade in Endangered Species of Wild Flora and Fauna (CITES) and a further 233 plant species currently included in the Appendices have medicinal uses.

Despite the increasing use of medicinal plants, their future, seemingly, is being threatened by complacency concerning their conservation. Reserves of herbs and stocks of medicinal plants in developing countries are diminishing and in danger of extinction as a result of growing trade demands for cheaper healthcare products and new plant based therapeutic markets in preference to more expensive target-specific drugs and biopharmaceuticals. Such concerns have stimulated positive legal and economic interest.

Issues concerning intellectual property rights, compensation for loss of finance-rich biodiversity resources and the acquisition and safeguarding of traditional healthcare knowledge are no longer neglected. Bio prospecting of new drugs from medicinal plants and the exploitation of unprotected traditional knowledge in starting-up potentially new bio industries are the focus of new monitoring measures. Such concerns that call for adherence to and observation of cultural and intellectual property rights have been addressed and enshrined in the Chiang-Mai and Kari-Oca declarations. The first countries to seriously tackle these issues are China and India. Indeed, programmes dealing with medicinal plant conservation, cultivation, community involvement and sustainable development being initiated elsewhere, could benefit immensely from the Chinese and Indian experiences (World Bank, 1997).

**Recommendations:** Efforts are needed to identify endemic, endangered, threatened flora of the area and to



point out ways and means for conservation of endangered flora. The following suggestions/recommendations are made in this respect.

- In Hindu-Kush-Himalayas coordinated efforts are needed for conservation, preservation, documentation and application of local indigenous knowledge in the regional activities pertinent to conservation. Appropriate conservation, cultivation and harvesting strategies are required for the purpose.
- The conservation and sustainable use of potential plant species needed to be addressed. This can be achieved through domestication techniques.
- The program like sustainable use of medicinal plants and accessibility of the community towards markets would help to uplift socio-economic conditions of these backward areas, which would further help the people to get basic facilities and thus lead better lives.
- Nurseries of some important medicinal plants should be established. Herbal Industries like Qarshi and Hamdard should be brought in contact with the local communities and it will provide the collector better economic returns and better conservation environment to the flora.
- Cultivation of the profitable medicinal plants like *Colchicum luteum*, *Bergenia ciliata*, *Dioscorea deltoidea*, *Bistorta amplexicaulis*, *Caltha alba*, *Valeriana jatamansii*, *Valeriana pyrolifolia*, *Viola biflora*, *Viola canescens*, *Salvia lanata*, *Berberis lycium*, *Polygonatum verticilatum*, *Acorus calamus*, *Aconitum heterophyllum*, *Podophyllum emodi*, *Paeonia emodi* and *Geranium wallichianum* can be introduced as minor crops on marginal fields.
- Conservation education including advance collection techniques, post collection processing techniques may be extended to the local communities especially to the plant collectors.
- Community mobilization and involvement may be ensured in conservation efforts. Community based organizations should be encouraged to play their due role.

- As tourism has become an industry and can earn tremendous amount of foreign exchange, therefore it should be promoted. Candole Lake, the most beautiful in Swat valley can become a hot spot for tourists.

## REFERENCES

- District Census Report, 1998. Population census organization, Statistics Division, Government of Pakistan, Islamabad, pp: 198- 201.
- Hamayun, M., M.A. Khan and S. Begum., 2005. Marketing of medicinal plants of Utror-Gabral Valleys, Swat, Pakistan. J. Ethnobot. Leaflets (<http://www.siu.edu/~ebl/>).
- Inam-ur-Rahim and A. Viaro, 2002. Swat, an Afghan Society in Pakistan. A joint publication of City Press and Graduate Institute of Development Studies, Geneva.
- IUCN., 2001. IUCN Red List Categories and Criteria: Version 3.1. IUCN Species Survival Commission. IUCN. Gland. Switzerland and Cambridge, UK., pp: 2: 30.
- Khan, A.A., 2003. Role of conservation of medicinal and aromatic plants in the socioeconomic development of rural poors. International Workshop on Conservation and Sustainable Uses of Medicinal and Aromatic Plants in Pakistan. Joint Venture by WWF-P, MINFAL and Qarshi Industries Pvt. Ltd.
- Kothari, A., 1998. Communities and Conservation, Natural Resource Management in South and Central Asia, Sage Publications, New Delhi, pp: 56.
- Schippmann, U., 2001. Medicinal plants significant trade. CITES Project S-109, Plants Committee Document PC9 9.1.3. (rev.). BFN Skripten-39, Bundesamt für Naturschutz, Bonn.
- Shinwari, Z.K., S.S. Gilani, M. Kohjoma and T. Nakaike., 2000. Status of medicinal plants in Pakistan Hindu-Kush Himalayas. Nepal-Japan Joint Symposium on Conservation of Natural Medicinal Resources and Their Utilization, Kathmandu, Nepal., pp: 235-242.
- World Bank, 1997. Medicinal Plants; Rescuing a Global Heritage. Eds. Lambert, J., J. Srivastava and N. Vietmeyer, Technical Paper, pp: 61.