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Ethnomedicinal profile and conservation status of plant biodiversity in Alexander the Great Valley, District Shangla, Pakistan

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A comprehensive study was carried out to elaborate ethno-medicinal profile and conservation status of Plant biodiversity in Alexander the great Valley, District Shangla, Pakistan. It is one of the world's most interesting and historical areas, not only for its natural resources and medicinal plant diversity but also for old relics or ruins of Alexander the Great that is attracting national and global interest. The valley is named as Alexander the great Valley due to stay of Alexander the great, and its old relics or ruins are still found in the Pir Sar area. The study revealed 32 medicinal plants belonging to 26 families consisting of 19 taxa of annual herbs followed by 6 taxa of trees, 4 taxa of shrubs, 2 taxa of climbers and 1 taxon of saprophyte. For documenting the ethno-medicinal and socio economic profile of the study area, a simple questionnaire was developed and filled through interview from representative of various ethnic groups. The botanical name, followed by local name, family, part used and ethno-medicinal uses in different folk was recorded. The main aim of the study was to document and explore the indigenous knowledge of local people belonging to different ethnic and socio economic backgrounds of the study area about medicinal plants.

Key words: Medicinal plants, conervation, Alexander Valley, Shangla, Pakistan.

INTRODUCTION

Valley is endowed with a series of mountains and narrow valleys. The mountains are the western extreme of Hindu Kush range. The valley lies from 34° 31/ to 33° 08/ North latitude and 72° 33/ to 73° 01/ East longitude. The area represents the phytogeographical features of Sino-Japanese region (Ali and Qaiser, 1986).

It is a beautiful valley in Chakesar Tehsil, District Shangla, North West Frontier Province (NWFP), Pakistan. The valley is known as Alexander the great Valley due to the stay of Alexander the great and its old relics or ruins in the Pir Sar area. It is one of famous and historical place as ruins of the Alexander great are traced in this hot spot and are located 2350 m above sea level. Alexander the great stayed here in 326B.C century and he builds a number of buildings in the area, which are now turned into ruins. These are archeological relics or sites that are valuable but unfortunately these ruins are abolishing due to following reasons. Local people do not know about the importance of these ruins and hence do not care of it. Government does not take any effective step to measure and protect these important old sites. The total area of the valley is 30 km^2 while the total population of valley is about 7000. The valley has latitudinal variation ranging from 1700 m in the South tomore than 2500 m in the North. The highest peaks are Kandawono Sar and Bori Mar Sar having an altitude of 2500 and 2400 m respectively while valley floor is 1700 m on the average. The valley is bounded on the East side

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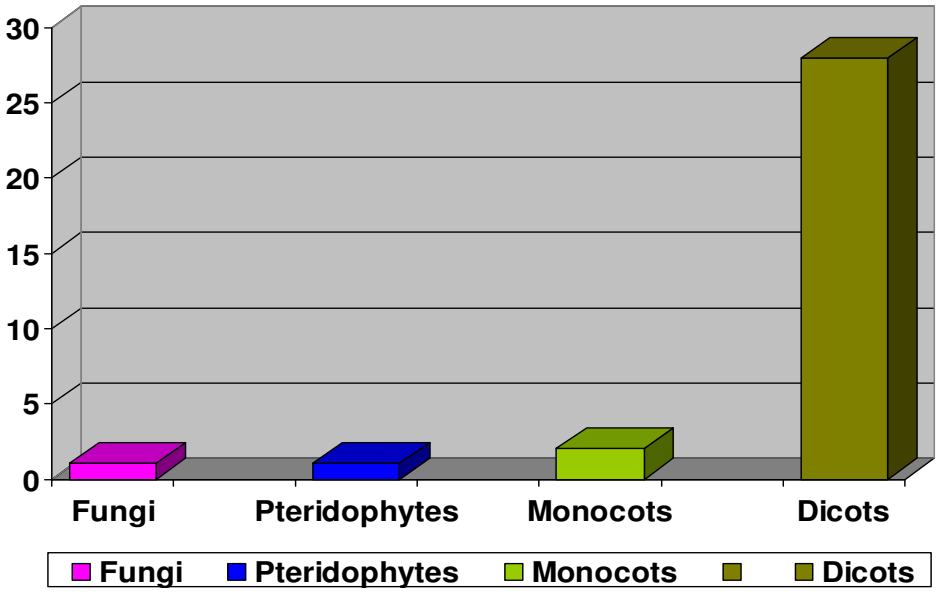

Figure 1. Diversity of medicinal plants in Changa valley, district Shanga.

by Jatkol and Kaladaka, on the West by Besham and river Indus, on the north side by Dandai and Takot while on the South by Chakesar (Annonymous, 1998, 2003). Figure 1.

The valley can be divided into four Sub valleys named, Kandaw, Kandawono, Bori Mar and Pir Sar having an altitude of 1700, 2400, 2600 and 2450 m, respectively. The valley is comprised of gently rolling topography in its Northern and Southern parts. Southern hilly areas are steeper while the northern moderately goes to high elevation. Generally, climate is cool and refreshing during summer but very cold and snowy during winter. Temperature may goes as high as 30°C in the month of June and July while generally remains below freezing point in the month of January and February. The annual rainfall varies from 800 to 1200 mm. Snowfall is the constant feature of the valley.

Majority of the people living in the area are Gujars Khail and Ajars Khail associated with very limited population of Mian and Mulla Khail. People residing in the area mostly speak Pushto and Gujri. Majorities of the people also depend on natural resources in the form of agriculture, forest, and livestock.

Coniferous forests are the major vegetation of the area. The valley has oak, blue pine and fir type of forests. Agriculture production is poor, cultivated land is scarce, maize cultivation is common in the area, while wheat is the rabbi crop of the valley. Horticulture is rare while deforestation, illegal cutting and over hunting are common.

The use of plants forms the basis of tradition systems of medicine all over the world. Plants are the basis of traditional medicine system all over the world. There is evidence that plant- base medicine goes back at least 100,000 years. In Pakistan, the Unani system is also largely plant-based. About 5000 out of China's total flora of 30,000 species are used in traditional Chinese medicine. Around 35,000 to 250,000 species of higher plant have been used for medicinal purposes (Walters and Hamilton, 1993).

Hocking (1958) estimated that in early 1950, up to 84% of the Pakistani population were dependent on tradition medicine for or most of their medicinal needs.

Joseph and Kharkongor (1990) reported 100 species of plants in 81 genera and 46 families having medicinal virtues, which are in commonly used.

Khaliq and Hussain (1995) reported ethnobotanical use of 140 species of 53 families from Dabargai hill District Swat.

Pie (1992) reported that the total number of plant species in the Hindu kush Himalaya is estimated to be as many as 25,000 or 10% of the world of which about 10,000 species or 2/3 are useful.

Ali et al. (2003) elaborate a market survey of Mingora city, Pakistan and reached the conclusion that local of the Swat valley collect 99 medicinal plants species and then sold into Mingora city; 40 medicinal plants dealers are associated with the business.

Shinwari (2003a) studied and documented the local use of 150 plant species from two villages (Bar Ghabair and Shuki Sair) but only up to the local nomenclature.

Sirajuddin et al. (2003) reported 33 plant species from Midan valley district Dir, Pakistan that is used for different gastrointestinal disorders.

Rehman et al. (2003) reported 55 plants species are traditionally used as healing agents while 10 species of medicinal plants worth Rs. 15.9 million were extracted and sold to the national and international markets.

Sirajuddin et al. (2003) reported 33 plant species from Midan valley district Dir, Pakistan that is used for different gastrointestinal disorders.

Hussain et al. (2006) reported 121 plants species from shawar valley, which are used for different purposes.

Islam et al. (2006) reported 30 plants as medicinal, 22 plants as weed with medicinal values and 18 plants species as pure weeds.

MATERIALS AND METHODS

Study was conducted in the blooming and flowering season of spring 2006. Toposheet and geological information were obtained from the office of Geological Survey of Pakistan, Peshawar. Working plan of the area and population data were obtained from census report (1998), from the Geography Department University of Peshawar. Data for medicinal plants of the area were collected from the goods transporters agencies and the flora is identified with the help of Flora of Pakistan. For knowing the ethno botanical and socio economic profile of the people, a simple questionnaire was developed and filled through interview randomly through different walks of life, that is, farmers, timber dealers, shopkeepers belonging to medicinal purchase, and elders of the area. With the help of questionnaire, plant use and indigenous knowledge regarding the traditional uses of plants were collected. The data collected a variety of plant resources with diverse indigenous uses Table 1.

RESULTS AND DISCUSSION

Medicinal plants are valuable source of drugs in tradition system of medicine. They are locally used as a crude drug for the treatment of human and live stock heath care since time immemorial. Medicinal plant diversity is the main source of health care especially in remote area of the country. The study revealed that there are 32 species locally used as indigenous system of medicine for the curing of various health diseases.

Most of the species were used for curing different diseases such as fever, cooling effect, diuretic, diaphoretic, diabetic, abdominal pain, arthritis, laxative, purgative, vermifuge, aphrodisiac, anticancer, ulcers, jaundice, cough, toothaches, blood pressure, emetic, gastric troubles, rheumatism joints, mouth diseases, skin diseases, urinary disease. asthma, constipation, diarrhea and antispasmodic.

Ethno botanically, the valley is rich in medicinal plants and most of the people are utilizing these plants as a primary source of health care. Important medicinal plants of the area are *Adiaantum capillus veneris, Viola canscens Geranium wallichianum Hedrea helix, Rumex nepalenis, Oxalis, corniculate, Juglan regia, valeriana, Urtica dcoica* etc. These are the most common and most of the elderly persons directly utilize these plants resources for primary health care while new generation have little knowledge regarding these plants.

Some important medicinal plants like *Marchella esculenta* (Morel) locally known as Gujhai, is fried and eaten for its delicious test. It is highly protientious and the current market rate is 15 to 18000 rupees per kg (dried form). It is considered as generally body tonic, one of the important and precious fungal plants, which can play a leading role in the economy of area. Plant is growing under shady plants during March to May on 1500 to 2500 m and is collected by the woman and children. Marchella is collected by the local are sold to people of high profile and traders with a price Rs. 3500 /kg (Dried Marchella).

Similarly, the delicious nuts of walnuts are edible, also used in culinary preparations, fruit are mental tonic and also used as sexual tonic. Leaves and bark are used for cleaning purposes of teethes and also for dying cloth. Its wood is used for making furniture and agriculture utensil.

Livestock rearing is an important part of the household and most of the population moving with their livestock between winter and summer villages to make best use of natural resources. Most of the people living there are nomadic type and stay there only from 3 to 4 months (March to September) and on returning severe winter they come back to their respective winter villages with the main aim to rear their cattle in the area.

People of valley rear livestock consisting of cows, buffaloes and goats for dairy products, Desi Ghee etc. Local people depend on natural resources in the form of agriculture, forest, and livestock. It plays a role of back bone for the local economy. Local people depend on natural resources in the form of agriculture, forest and livestock.

Spring is the only source of water in the area and local people made Rainy Lakes in different parts of the valley. Rainfall is the only source of water for these Lakes. These artificial lakes are used for multiple purposes and specially utilized in sever summer condition for livestock when there is deficiency of water in the valley. It is now nearly one year since the divesting earth quake of 8th October which hit the area and the resulted severe damage to their livestock and livelihoods but the area is completely ignored from quake relief and people have to stay in open sky for many months.

BIODIVERSITY AND ITS CURRENT CONSERVATION STATUS

A collection of plants predominantly of trees in a specific area is said to be Forest (According to the Society of American Forestry). It is believed that 4 billion trees are cut down every year throughout the world. Massive deforestation and overgrazing are the major threats to forest. The principal cause is demographic pressure; Pakistan growth rate is 3.1% per annum, which make it one of the most populist countries in the world. The decreasing of forest vegetation is due to local consumption. It is a harmful truth that Pakistan stand ravaged by unchecked deforestation. Massive de-forestation started in the 1990. Deforestation rate was

Table 1. Check list of the medicinal plant species and its uses distributed in Changa valley distict Shangla.

S/N	Plant species (botanical name)	Family	Local name	Habit	Part used	Folk and medicinal uses
1	*Adiantum venustum* D. Don	Adaintaceae	Sumbul	Herb	Fronds	Plant is used for coldness of body temperature and also used for cleaning and sparkling of teethes and effective against toothaches. Fronds is also diuretic and expectorant
2	*Taraxacum officinale*	Asteraceae	Alak genai	Herb	Young shoots and flowers	The decoction of flowers and shoots is tonic and diuretic. It is also utilized against jaundice and constipation
3	*Hedera nepalensis* K. Koch	Araliaceae	Prewathe or Zelye	Climber	Leaves, fruit	The leaves are stimulant and anti diabetic. Decoction of leaves is used for abdominal pain, also diuretic and is effective against urinary trouble. Fruits are purgative while the leaves are also utilized for blood pressure
4	*Berberis lyceum* Royle.	Berberidaceae	Kwarae	Shrub	Leaves, Fruits, Bark	Bark of the root is utilized for ulcer. Fruits, root, stem, and bark are tonic. Root is antiseptic, arthritis, carminative, refrigerant and aphrodisiac
5	*Cannabis sativa* L.	Cannabinaceae	Bhang	Shrub	Leaves, flowering tops and seeds	The dried and fresh leaves are used as narcotic. The leaves are also stimulant and sedative and diuretic. Flowering tops are also sedative and narcotic
6	*Dioscorea deltoidea* Wall. ex Griseb.	Dioscoraceae	Qanis	Climber	Root	The root is effective as a uterine sedative. They are effective in expelling tap worms from the body. The tubers are diuretic, expectorant and used for killing of fish
7	*Diospyros lotus* L.	Ebenaceae	Tor Umlok	Tree	Fruit, wood, leaves	The fruits are edible, which are tonic and carminative, and use for gastric problems
8	*Ricinus communis* L.	Euphorbiaceae	Harhanda	Shrub	Seeds, oil	Leaves are emetic and purgative. Poultice is made from crushed leaves of plant, which is used by women to increase breast milk and also for swelling
9	*Quercus dilatata* Lindl. ex Royle.	Fagaceae	Banj	A slow growing tree	Wood and nuts	Seeds are edible, astringent and diuretic. Seeds are also used in diarrhea and indigestion
10	*Geranium wallichianum* D. Don ex Sweet	Geraniaceae	Sra zela	Herb	Root	Herb is tonic and used to lower the blood pressure while decoction of plant is used for fever, cough and jaundice.
11	*Hypericum perforatum* L.	Guttiferaceae	Shin chaie	Herb	Leaves	Leaves is tonic and used as Beverage
12	*Morchella esculenta* (L.) Pers ex. Fr	Halveliaceae	Gujai	Fungi	Plant	*Marchella esculenta* (Morel) locally known as Gujhai, fried and eaten for its delicious test. It is highly protientious and the current market rate is 15 to 20000 rupees per kg (Dried Form). It is considered as generally body tonic
13	*Juglans regia* L.	Juglandaceae	Ghoz, Akhrot	Tree	Nuts, bark and leaves.	Root bark (Dandasa) is used for cleaning teeth while leaves are used to color lips. The fruit of *juglan* is edible and used for increasing mental and sexual capacity
14	*Ajuga bracteosa* Wall. Ex. Benth	Lamiaceae	Buti	Herb	Leaves	The leaves are also used as cooling agent. The leaves of the plant are kept in water for 24 h, the leaves are then removed and juice of plant is then used for stomach problem
	Mentha longifolia L.		Valene	Herb	Plant	The fresh leaves are used in constipation. Dried leaves are crushed and powdered, and used for diarrhea and also the are effective against abdominal. Plant is also used as stimulant and antisepti
	Mentha spicata L		Valene	Herb	Fruits and shoots	The dried leaves are refrigerant and diuretic. Plant is stimulant and antiseptic and also used as carminative
	Plectranthus rugosus		Spairke	Shrub	Leaves	The shoots are antiseptic, anti-inflammatory and also used in jaundice. Shoots are also used for toothache

Table 1. Cont.

15	*Colchicum lutium* L.	Liliaceae	Qiama gullay	Herb	Corm	Corm is utilized for rheumatism and arthritis
16	*Ficus carica* L.	Moraceae	Anzer	Tree	Fruit, latex	Fruits are laxative and used as nutritive, antispasmodic, and also used in constipation and urinary bladder problems
			Tor Toot	Tree	Fruits, leaves and bark.	The bark is used as purgative and vermifuge. The leaves are considered diaphoretic and emollient. The fruit is coolant and also effective to improve the digestion.
17	*Olea ferruginea* Royle	Oleaceae	Khona	Medium sized tree	Wood, leaves, bark	Holy tree of graveyard. Oil obtained from the fruit which is used as rubefacient and also effective in rheumatic joints. Branches and stem used for constipation. Leaves and bark is antiseptic, diuretic and tonic. Leaves decoction is also used for toothache
18	*Oxalis corniculata* L.	Oxalidaceae	Zmake taroke	Herb	Leaves	The fresh leaves are utilized to stop bleeding from wounds. The juice of plant is effective in stomach problems. The leaves are also coolant..
19	*Plantago lanceolatum* L.	Plantaginaceae	Jabai	Herb	Leaves and seeds	It is effective against dysentery and mouth disease. Leave is used as astringent or refrigerant
	Plantago major L.		Ghata jabai	Herb	Leaves and seeds	Leave is refrigerant and astringent while the seeds are tonic and also used for cooling effect. The inflorescence of plant is utilized for measles in children.
20.	*Podophylum hexandrum* Wall.	Podophyllaceae	Kakora	A shade loving Herb	Rhizomes	Plant is collected at commercial basis. Fruits are eaten for general body tonic. Seeds are also crushed to powder and used with glass of water for general body tonic. Fruit is also purgative. Powder rhizome is also used to control jaundice
21	*Bistorta amplexicaulis* (D. Don) Green	Polygonaceae	Tarwa pana, Anjabar	Herb	Leaf, root	The rhizome is grinded into powdered form and is taken with water for treatment of gout and rheumatism. Special tea is made from the rhizome, which is then used for fever and flue. The rhizome is also effective to cure ulcers
			Shalkhey	Leaves, roots.	Leaves, shoots	The leaves are diuretic and astringent while it soothes irritation caused by *Urtica dioica* which often found near the *Rumex*
	Rumex hastatus D.Don.		Tarokay	Herb	Leaves, shoots	The leaves and shoots are carminative, astringent, and diuretic. It is also used for stomachache. The juice of the plant is used for blood pressure and cooling effect while the powder of roots is used for abdominal pain.
22	*Punica granatum* L.	Punicaceae	Khona	A small bush like tree	Fruit, bark, leaves	Fresh juice is refrigerant and used in urinary problems. The pulp of fruit is cardiac and stimulant. Epicarp of the fruit is called Nersawey which is effective against gonorrhea, urinary diseases and for bronchial asthma. Leaves and fruit pericarp used in dysentery, whooping cough. . Bark of stem is used to cure fever.
23	*Bergenia ciliata* (Haw) Sternb.	Saxifragaceae	Ghat pana (Zakhm-e-Hayat)	Herb	Root	Root is grinded into powdered form and used as anti diabetic and expectorant. Root is tonic and also utilized for curing muscular pain and as general body tonic. The root is also used for sunburn, stomachache and running eye
24	*Datura stramonium* L.	Solanaceae	Harhanda	Herb	Young leaves and seeds	The plant is also used for curing fever, diarrhea and skin disease. The herb is used for jaundice and stomach problems. The juice of flower is useful in earache. The dried leaves are smoked the form of Chillum which is considered as expectorant. The seeds and leaves are used for antispasmodic, anodyne and narcotic purposes
	Solanum nigrum L.		Kach Mako	Herb	Fruit and shoots.	Herb is diuretic and used for curing hepatitis and sore throat. Juice of the leaves is used for skin diseases, also used for cleaning and washing the wounds

Table 1. Cont.

25	*Urtica dioica* L.	Urticaceae	Sezonke	Herb	Young leaves and root	Roots are astringent. They cause severe irritation, which can be soothed by rubbing leaves of *Rumex nepalensis*.
26	Viola serpens wall.	Violaceae	Banafsha	Herb	Whole plant	Flowers collected at commercial scale and used as diaphoretic, antiseptic and febrifuge. Decoction of flowers is blood purifier and cooling agent. Roots are also considered to be used in jaundice

1.63% per year from 1990 to 2000 while the rate increased to 2.02% from 2000 to 2005. If deforestation continues with such rate then water resources will be drying up, weather temperature will increase and also, there may be significant changes in climate. Forest add to local humidity; it make the local climate cool; forest act as huge sponge, soaking up rainfall while anchoring soil; releasing water throughout spring forest also ensure local rainfall. Conifer forests also play a critical role in climate regulation by absorbing $co_{2\,n}$ which is responsible for global warning. The forest plays a key role to maintain and develop the economy of the area and indirectly the economy of the country. Forest act like huge sponge absorb water in the raining season and gradually release it in summer and mountain the volume of water in the streams and river. The water we drink is recycled by forest and the oxygen we breathe is also regulated by forest. Forest is known as huge industry of oxygen and also known as carbon skins which collect CO_2 from the atmosphere and thus help to reduce the global warming. Forest check erosion provides medicinal plants and habitat for wildlife. Therefore forest should be protected at any level if we want to secure life on earth.

The demand of energy is basic to everyone; its demand increases especially in those areas having no alternate source of energy, like this valley where the only source of energy are wood and due to high biotic pressure forests are cut down for fuel and also utilized for commercial purposes to settle our domestic economic problems. Deforestation is very common in the area. Local people and timber mafia are responsible for illegal cutting and the forest department of district Shangla has no effective checks to control these illegal cutting but join hand with timber mafia which encourage the drug mafia, as a result the forest cover is decreasing day by day. Forest fire also contributed to an increased rate of deforestation.

Forest fire, coal production (Skara) are also one of the reasons that reduced the valuable trees in the the area. Local community also utilized a traditional method (to make fire) for coal production, (Locally known as Skara) at the hollow stem of trees especially *Pinus and Abies*. It is one of the reasons which reduced the forest cover in the area (Figure 2). But some time fire is also caused by human activities. Over grazing has reduced the forage production of theses forest up to some extent. Important trees species of the area are *Pinus, Cedrus, Abies, Ficus, Punica, Aesculus, Quercus* etc while fruit trees are *Juglan regia, Punica granatum. Diospyrus lotus, Prunus* sp., *Pyrus, Malus* etc.

Mammals like monkeys and beer are the wildlife and beauty of the area. leopard, wolf, himalayan black beer and Jangali goats had been reported from the area but now they become extinct due to over hunting. Over hunting is common in the area. Characteristic bird's species like pigeons, chokor, Koklass Pheasants (baigors) are found in the area but due to over hunting, these important bird's species are going to become extinct in the area.

RECOMMENDATIONS

1. Deforestation or illegal cutting should be measured to control deforestation as forests are vital for all and especially provide habitat for these indigenous people.
2. Incentive should be given to local people and owners to protect forest cover from illegal cutting as the local and owners of the area will play a key role to control deforestation.
3. Forest department do not play an active role to control deforestation. They join hand with timber mafia and encourage the local people; so the responsible persons and timber mafia should be discouraged and heavily fined so that they avoid such activities.
4. Local people would not be allowed to use valuable trees like *Pinus* sp. and *Abies* species for coal production, which is locally known as Skara.
5. Some important valuable trees are also used for energy purpose. If government provide alternate source of energy in the form of gas and electricity, the biotic pressure would be reduced to great extent.
6. Keeping honeybees is the old tradition in the area so the honey industry should be enhanced in

Figure 2. (A) Stony gateway to the Alexander the Great valley; (B) author collecting information about the medicinal plants; (C) thick forest in sub valley Borimar; (D) a view of deforestation in Kandawono area; (E) heavy deforestation in the area; (H) hollow trunk of Abies used for coal production (Skara).

the area to improve the local economy of the area.
7. Sustainable use and awareness campaign about important medicinal plant should be introduced in the area to improve the local economy of the area.
8. Horticulture is not yet practiced so horticulture is encouraged to eradicate poverty in the area.
9. Over hunting should be checked to protect important birds species like Koklass pigeons from extinction in the area.
10. Over grazing is also one of the factors that increase biotic pressure so it should be controlled in the area.
11. Being a beautiful valley of District Shangla, the area has a large potential of ecotourism and it should be enhanced to boost local economy.
12. It is very necessary to protect and safeguard the biodiversity of area; bird, hunting and timber mafia should be discounted to preserve the valley in its pristine form.
13. Pir Sar is one of famous and historical place as ruins of the Alexander the great found in this valley so it is very necessary that Government Should take vital steps to protect it and appoint local resident as employee for its protection.

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REFERENCES

Ali H, Yousaf MW, Ahmad H (2003). Potential and trade of locally

collected medicinal plants in Mingora City. Pakistan, WWF. Proc. Int. Workshop. Islamabad pp. 10-17.
Anonymous (1998). District census report of Swat 1998 Govt. of Pakistan. pp. 10-19
Hocking GM (1958). Pakistan Medicinal Plants-1 Quarterly. Planta Mater. Vegetation 9:103-119.
Hussain F, Islam M, Zaman A (2006). Ethnobotanical profile of plants of Shaw er Valley, District Swat Pakistan. Int. J. Biotechol. 3:301-307.
Islam M, Ahmad H, Rashid A, Razzaq A, Akhter N, Ikramullah A (2006). Weeds and medicinal plants of Shawer Valley, District Swat Pakistan. J. Weed Sci. 12:83-88.
Joseph J, Kharkongor P (1990). A preliminary Ethnobotanical Survey bin Khasi Jaintia hills, Meghalaya. Contribution to Ethnobotany of India pp. 191-199.
Khaliq A, Hussain F (1995). Ethnobotanical studies on some plants of Dabargia Hills, Distt. Swat. pp. 206-210
Pie SJ (1992). Mountain culture and forest resource management of Himalaya. In: D.W. Tiwari, “Himalayan Ecosystem” Intel. Book. District Dehra Dun, India pp. 97-102
Rehman M, Ahmad H, Khan A (2003). Marketable medicinal plants of Mankial Valley, Distt; Swat. WWF. Proc. Int. Workshop, Islamabad pp. 90-96.
Shinwari ZK (2003a). Study Existing use Regime of Key Floral Species, Identify Issues and Threats. Consultancy No 5. Palas Conservation and Development Project, Palas, Kohistan.
Sirajuddin S, Mir M, Ikramullah AK (2003). Traditional use of medicinal herbs for gastrointestinal disorders in Maidan Valley, Distt; Dir, WWF. Proc. Int. Workshop, Islamabad. Pp. 125-131.
Walters M, Hamilton A (1993). The Vital Wealth of Plants, Published by Ebenzer Baylis and Son Limited, Worcester. ISBN 2-88085-115-7 pp 12-40.