Pak. J. Bot., 45(SI): 157-164, January, 2013.

ROLE OF INDIGENOUS KNOWLEDGE IN BIODIVERSITY CONSERVATION OF AN AREA: A CASE STUDY ON TREE ETHNOBOTANY OF SOONA VALLEY, DISTRICT BHIMBER AZAD KASHMIR, PAKISTAN

MUHAMMAD ISHTIAQ*, MEHWISH MAQBOOL, TANVEER HUSSAIN AND AMIN SHAH[1]

Department of Botany, Mirpur University of Science & Technology (MUST) Bhimber Campus, Azad Kashmir, Pakistan
[1]Department of Biological Sciences, University of Sargodha, Sargodha, Pakistan
**Corresponding author: E-mail: drishtiaqajk@gmail.com*

Abstract

The present research work was carried out to construct ethnobotanical profile (EBP) of indigenous knowledge of being employed in fragment of Soona Valley (SV), Tehsil Samahni, District Bhimber, (A.K.) Pakistan and its consequences in Biodiversity Conservation. The study was conducted through an intensive, systematic and comprehensive survey in two stages during the year 2009. The floristic inventory and EBP was formulated in order to identify plant species present in the area and their economic use in SV. A total of 70 informants of both genders participated in the study survey and male community (79%) had more information about the plants than women (21%). Ethnobotanical enumerations of 58 woody plant species (24 families) were recorded and among these 30 species were of high significant value. The community examined demonstrated a significant knowledge of woody species in the area that can be used to satisfy local needs, especially of wooden materials, fodder, construction and ethnomedicines (39 spp). Decoction, extraction and whole fruit were popular form of ethnomedicinal ingestion. In spite of diversity of total plant diversity observed, the utilitarian potential was concentrated in reduce number of species demonstrating high relative importance. For reliability of EBP informations fidelity level (FL %), direct matrix ranking (DMR) and priority ranking (PR) were also calculated. It was demonstrated that *Terminalia belerica, Butea monosperma, Terminalia arjuna, Phyllanthus emblica, Tribulus terristris* and *Cordia obliqa* were threatened species. This study will be a step towards for new drug discovery by using this traditional knowledge about the woody species of the area. It will also provide guiding torch for conservation of threatened woody and other medicinal plant species.

Introduction

Ethnobotany (EB) has been in life of man since his emergence on the planet and it demonstrates the extent of biodiversity in an area. Ethnobotany is study of relationship between man and plants and their mutual consequences on each other. Ethnobotany was coined by John Harshberger in 1896, which is "to study the plants used by the primitive and aboriginal people" (Harshberger, 1896; Ishtiaq *et al*., 2006, Qasim *et al*., 2010). From ancient times, it is recognized that traditional ethnobotanical knowledge (TEK) of plants has been frequently applied in system of medicure by indigenous communities in different areas of globe in form of cultural activities and botanic medicinal recipes and in biodiversity conservation processes commenced by different departments (Ishtiaq *et al.*, 2006b, Shinwari & Qaisar, 2011). Ethnobotany is a multi-disciplinary science encompassing botany, anthropology, economics, and linguistics, which studies the ways in which a society relates to its environment. These relationships can be social, economic, symbolic, religious, commercial, and artistic. In recent era, a trend in shifting from mere documentation process of EB data to a more practical one is acknowledged and emphasized for conservation and sustainable use of plant resources.

Pakistan is admixture of diverse types of environment. She enjoys presence of various ethnic groups, fauna, flora and climates. Flora of Pakistan has been distributed in four phytogeographical zones: Irano-Turanian (46%), Sino-Himalayan (10%), Saharo-Sindian (9.5%), and Indian element (4.5%). The country has more than 6,000 species of wild plants of which about 600~2000 are used partially or holistically in folklore medicines (Hamayun *et al*., 2003; Ishtiaq *et al.*, 2007). A considerable ethnomedicinal and ethnobotanical research has been conducted on different areas of Pakistan (Delcourt *et al.*, 1960; Hocking, 1958; Hussain & Khalique, 1996; Jain, 1991; Joshi, 1995; Katewa & Arora, 1997; Katewa & Guria, 1997; Shinwari & Shah 1996; Shinwari & Khan, 1999; Siddiqui *et al.*, 1988; Zaman, 1970; Ishtiaq *et al.*, 2004, 2006, 2007, Gul *et al*., 2012, Sarwat *et al*., 2012). Azad Kashmir is beautiful mountainous lush green area with rich and diverse plant biodiversity and many endemic plants of Pakistan are found in the area. Different studies on EB have been conducted in various areas of Azad Kashmir partially but still huge natural treasure of Kashmir is yet to be fully explored for its mysteric and potential use (Bukhari, 1994; Zandial, 1994; Rizwana, 2007; Ishtiaq *et al.*, 2006)**.** Ishtiaq and coauthors have conducted work on Valley Samahni on different aspects of ethnobotany but hitherto it is required to explore the area comprehensively for its floristic and pharmaceutics perspectives (Ishtiaq *et al*., 2001, 2006, 2007). Extensive exploitation at domestic and commercial has thrilled the plant biodiversity in threaten zone.

In the area trees and their population density in an area is indicator of plant community stability and its effects on the biotic and abiotic factors do modify the ecosystem. The research area is rich in alpine biodiversity with subsidiary communities of shrubs and herbs. The paramount importance of woody trees and other tree products from forests or outside of forest is attracting increasing attention in the science community (Holding *et al.*, 2001). In any region, tree species have huge potentials to provide options for rural livelihoods and biodiversity conservation (Pasiecznik *et al.*, 2006). Trees are contributing a great role in poverty mitigation serving as subsistence "safety nets" or low income "gap fillers" for any rural community of the region. In addition to

environmental stabilization, trees are useful for industrial, cultural, pharmaceutical, and socio-economic purposes to man, contributing billions of dollars yearly to the world's economy. Estimates have shown that about 95 percent of cooking and heating energy comes from trees (Anon., 1994). Traditional villagers and nomadic tribes of many developing countries have always used trees in herbal medicines to promote healing and meet other life subsistence (Bussmann, 2006; Okoli *et al.*, 2007; Focho *et al.*, 2009). It was demonstrated that most commonly used parts of plants were fruit, root, stem, flower and bark (Fig. 1) while predominately usage form of ethnomedicines prepared from these woody plants were decoction, extraction and fruit respectively (Fig. 2).

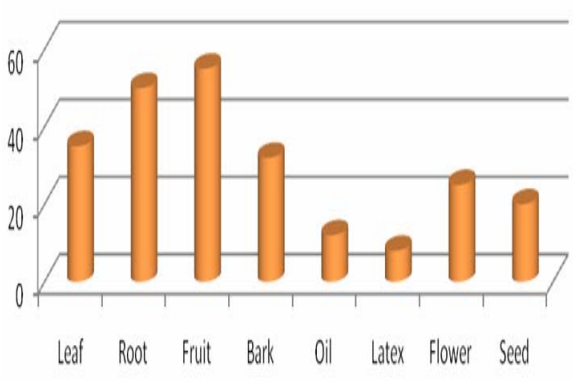

Fig. 1. Percentage age of use of different plant parts in ethnomedicines in the study area (Soona Valley).

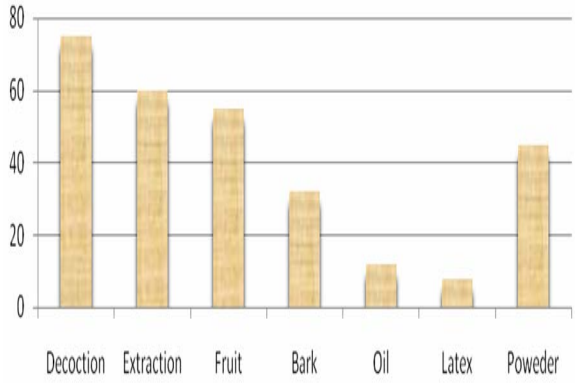

Fig. 2. Preparation mode of ethnomedicines in the study area (Soona Valley).

Soona Valley is beautiful and fabulous part of Tehsil Samahni and it provides good resource of plant biodiversity. The coniferous forest in this area is becoming so rare that it will be internecine for man and plants. The vegetation is currently dominated by shrubs and pastures with patches of some wild trees and farms (Ishtiaq *et al.*, 2006). Trees growing in SV areas are contributing to the wide-ranging needs of the rural communities. In the area, trees are used for multiple purposes such as construction, furniture, agro-agriculture instruments, honey production, food, dye, fiber, fodder, medicines, fuel wood, fencing, timber wood, charcoal, resin, building materials, air breakers, production of kitchen utensils, cultural, religious or judicial and traditional ritual functions. Trees and tree-products are used as major income generating resource for poor inhabitants in the world (MacKay, 1994; Ishtiaq, *et al.*, 2007). It is determined that ethnobotanical knowledge on the usefulness of these woody plants remains high, poor methods of exploitation, agriculture and over-exploitation are putting the most species under pressure of extinction (Ishtiaq *et al.*, 2006, 2007).

The objective of this investigation was therefore to document and analyze the uses of indigenous and cultivated species of trees growing in the open areas prior to their possible elimination through urbanization, deforestation and social development. Findings of research are summarized with preparation of some recommendations for the local people and government departments of the concerned region to protect, preserve and conserve the plant (tree) biodiversity for sustainability of forest ecosystem for future.

Materials and Methods

Study area: Soona Valley (SV) is one of the beautiful vales of Tehsil Samahni District Bhimber, State of Azad Kashmir, Pakistan. It is located at line of control (LOC) and it builds border zone between India and Pakistan in Kashmir territorial region. Geographically, it is located at 33.05º latitude and 74.82º longitudes. It covers ca.1270 km^2 and it has some important towns *viz:* Chayee, Baroh, Haripoor and Khori. It has north facing and south facing high mountains with 1080-18975ft altitude and variable topography situated in sub-tropic zone (Ishtiaq *et al.*, 2006b, 2007). The valley is inhabited by major tribes *viz*., Jat, Rajpoot, Gujar, Bokarwals, Malik, Mirza, Arrain, Syed and Butt (Kashmiries).

The climate of SV is at variance. The average maximum and minimum temperature is 28.9ºC and 15.8ºC, respectively. December and January are the coldest months of the year with 6.34ºC and 5.22ºC average temperatures, respectively. Minimum temperature recorded during December is 3.2 degree centigrade (Table 1). The precipitation of valley is 1233 mm/year. Average rainfall is 102.8 mm/ month (Table 1). Humidity remains high in rainy season and in winters. The highest value of humidity is 83.4, recorded in August at morning. The lowest value of humidity is 29 recorded in the month of May at evening (Table 1).

Data collection methodology: To collect and document EB data of tree species of SV various planned field trips were launched during year 2009. Direct observation, participatory appraisal technique, structured and semi-structured interview of community and questionnaire methodology were employed to find occurrence density and compile EB informations (Martin, 1995; Ishtiaq *et al*., 2007). Prior to visits to the area, heads of villages and other concerned officers were approached and objectives of study were introduced and cooperation was sought. Interviews of both genders were recorded preferably of 40 years or above age.

Table 1. Annual temperature, humidity and rainfall of the Soona Valley, Dist. Bhimber (AK).

Month	Temperature ºC		Humidity %		Rainfall (mm)
	Max	Min	At 08:00 am	At 05:00 pm	
January	17.38	5.22	79.6	56.6	97.14
February	20.24	8.32	74.4	52.6	138.40
March	26.42	12.84	65.2	43	123.42
April	32.54	17.54	52.6	32.6	44.30
May	36.62	21.98	47	29	46.32
June	38.18	23.38	53.6	34.4	88.04
July	37.18	23.48	76.2	55.6	264.94
August	33.32	22.84	83.4	67.6	255.26
September	32.74	20.64	76.6	58.2	84.48
October	29.66	16.04	71	49.2	31.68
November	23.8	10.74	71	49.8	16.82
December	18.8	6.34	77.6	56.4	42.60
Average	28.9	15.8	69.0	48.75	102.8

Household as well as shepherds and other stockholders of the forest trees were selected as respondents. To collect EB data, interviews were conducted in native language as respondents and investigators were easily communicating. The interviews were supplemented by direct observations and plant specimen collection. Informants were asked to name trees they knew, and to reveal the uses of the respective species. Informants often accompanied the investigators to the field to collect plant material. In cases of illiterate informants, photographs and fresh plant specimens from the field were presented to them and questionnaires were filled from their responses. Data collected from field surveys, interviews and observations were reviewed and all uncompleted responses were excluded. This left 110 valid respondent's data. The data were compiled in form of matrix and analyzed by qualitatively and quantitatively; responses from semi-structured questions were grouped into classes that expressed similar ideas, while percentages based on valid responses only, were calculated from structured questions. During the study trips plants specimens were collected and preserved in the field using standard methods proposed by Olorode (1984). The collected plants were identified in the filed and vernacular names told by local people (interviewees) and then these specimens were properly identified by a taxonomist (Dr. M. Ishtiaq). For further authentication and reliability of data, botanical names and families of each plant specimen were reconfirmed with help of herbaria comparison, taxonomic literature, manuals and Flora of Pakistan (Stewartd, 1982; Nasir & Ali, 1970-1995; 1970-2002). The prepared and preserved herbaria were placed in of Department of Botany, MUST, Bhimber Campus, Bhimber Azad Kashmir, Pakistan.

Data analysis: Data on plant species, families, uses, origin, availability, botanical and vernacular names were entered into MS excel worksheet and summarized as proposed by Cook (1995). The collected data was compared with previous research conducted on the same area or on same topic by using books, e-books and net. The data after review were screened and only verified and reliable informations were retained for further analysis. The reliability of EB work and information was determined by Informant Consensus Factor (ICF), fidelity level (FL), data matrix ranking (DMR) and priority ranking (PR) techniques with Personal Computer (Ishtiaq *et al*., 2007; 2012; Fisseha *et al*., 2009).

The fidelity level (FL), the percentage of informants claiming the use of a certain plant for the same major purpose, was calculated for the most frequently reported usages or ailments as:

$$FL\ (\%) = \frac{Np}{N} \times 100$$

where Np is the number of informants that claim a use of a plant species used for a particular purpose/disease, and N is the number of informants that use the plants as a botanic/medicine to fill/treat any given demand/disease (Alexiades, 1996). This method is helpful in the selection of plants for further studies in pharmaceutical analysis and other research projects. DMR and PR methods depict population density of tree species and their conservation status in the area.

Results and Discussion

The present study was conducted in the far and remote area Soona Valley (SV) located in District Bhimber of Azad Kashmir. A total of 70 informants of both genders were considered in the study survey and male community (79%) had more information about the plants than women (21%) as mentioned in Table 3. Every tree species recorded in this survey has been utilized in different life supporting programmes by local inhabitants. The area has dynamic climate which plays important role in rich plant biodiversity (Table 1). A total of 58 tree species belonging to 24 families were recorded in this EB study and all of them were reported as being useful in the lives of the local populations (Table 2). The EB data of woody species of SV is documented and arranged in alphabetical order of botanical name, vernacular name, family and traditional ethnobotanical uses (Table 2). The family index (FI) depicts that most predominantly tree species used in EB by people of the area belong to family Rhamanceae, Mimosaceae and Rutaceae, respectively (Table 7).

Table 2. List of woody species and their ethnobotanical application in Soona Valley, District Bhimber, A K.

S.No.	Species name	Vern. name	Family	Ethnobotanical uses
1.	*Acacia nilotica* (L.) Delile.	Kikar	Mimosaceae	Md, Fur, Fod, Fen, Ss, St, Tw, Td, Fw, Hb, Tc
2.	*Albizzia lebbeck* (L.) Benth	Shireen	Mimosaceae	Md, Fr, Fur, Fod, Ss, St, Tw, Tr, Ti, Fw, At, Tw
3.	*Albizzia procera* Benth	Kikri	Mimosaceae	Md, Fur, Fod, Fen, Ss, Tw, Tr, Sc,Ti, Fw, At, Tw, Hb
4.	*Acacia modesta* Wall	Pulahi	Mimoaceae	Md, Fr, Fur, Fod, Fen, Ss, St, Tc, Tr, Td, Sc,Ti, Fw, At, Tw, Hb, Tw
5.	*Broussonetia papyrifera* Vent	Jangli Toot	Moraceae	Ss, St, Fw,
6.	*Bombax ceiba* L.	Simbal	Bombacaceae	Md, Fur, Fod, Ss, St, Tw, Td, Fw
7.	*Bauhinia variegata* L.	Kalyar	Caeselpinaceae	Md, Fur, Fod, Fen, Ss, St, Tc, Td, Fw, O, Hb, Veg
8.	*Butea monosperma* Lam. Taub.	Chichra	Papilionaceae	Md, Fod, O, Ss, St, Tc, Td, Fw, Ti, Hb
9.	*Cedrella toona* L.	Tun	Meliaceae	Fur, Fen, Ss, St, Sc, Fw, Tw
10.	*Cordia obliqa* Wild	Lasoora	Boraginaceae	Md, Fr, Fod, Ss, St, Tr, Fw, At, Tw
11.	*Cassia fistula* L.	Krinjal	Caesalpinaceae	Md, Fr, O, Ss,Tc,Td, Fw, At, Tw,Veg
12.	*Citrus acida* Roxb	Khatta	Rutaceae	Md, Fr, Fur, O, Fod, Fen, Ss, St, Tc, Tr, Ol, Td, Sc,Ti, Fw, At, Tw
13.	*Citrus aurantium* L.	Malta	Rutaceae	Md, Fr, O, Fod, Ol, Fw, Hb
14.	*Citrus medica* L.	Nemboo	Rutaceae	Md, Fr, O, Fod, Ol, Fw, Hb
15.	*Dalbergia sissoo* Roxb.	Tahli	Papilionaceae	Fur, Fen, Ss, St, Tc, Tr, Td, Sc,Ti, Fw, At, Tw
16.	*Eucalyptus globulus* Labill.	Safeda	Myrtaceae	Md, Fur, O, Ss, Tc, Td, Ti, Fw, At, Tw
17.	*Eriobotrya japonica* (Thunb.) Lindl.	Lokat	Rosaceae	Med, Fr, Fw
18.	*Eugenia jambolana* L.	Jamoo	Myrtaceae	Med, Fur, O, Fr, Fw, Ti, At, St
19.	*Ficus bengalensis* L.	Bor	Moraceae	Med, St, Fr, Fw, Fen, Ti, At, Ss, Td
20.	*Ficus carica* L.	Phakwari	Moraceae	Med, St,Fd, Fr, Fw, Fen, Ti, At, Ss
21.	*Ficus elastica* Roxb.	Rubber	Moraceae	Med, St, Fr, Fd, Fw, Fen, Td
22.	*Ficus varigata* L.	Kan Phakwari	Moraceae	Med, St, Fr,Fd, Fw, Fen, Ti, At, Ss,
23.	*Grewia optiva* Drum ex. Burret	Daaman	Tiliaceae	Med, St, Fr,Fd, Fw, Fen, Ti, At, Ss, Td, Hb, Bm
24.	*Launea coromandaliana* L.	Kalman	Anacardiaceae	Tr, St, Fw, Fen, Ti, At, Ss, Td
25.	*Mangifera Indica* L.	Aam	Anacardiaceae	Med, St, Fr, Fw, Fen, Ti, At, Ss, Td
26.	*Mallotus philipeinsis* Muell Arg.	Kameela	Euphorbiaceae	Med, St, Fw, At, Ss
27.	*Melia azadarach* L.	Darek	Meliaaceae	Med, St, Fw, Fen, Ti, At, Ss, Td, Hb
28.	*Melia azadarachta* L.	Neem	Meliaaceae	Med, Fr, Fw, Fen, Tc, Ti, At, Ss, Td
29.	*Morus alba* L.	Safed Toot	Moraceae	Med, Fr, Fw, Fen, Ti, At, Ss, St, Td, Bm
30.	*Morus nigra* L.	Kala Toot	Moraceae	Med, Fr, Fw, Fen, St, Ti, At, Ss, Td, Bm
31.	*Morus laevigata* Wall.ex Brandis	Shatoot	Moraceae	Fr, Fw, Fen, Ti, At, Ss, Td, St, Med, Bm
32.	*Olea ferruginea* Royle	Kahoo	Oleaceae	Med, St, Tc, Fw, Fen, Ti, At, Ss, Bm
33.	*Pinus roxburrghii* Sarg.	Chir	Pinaceae	Tr, O, St, Fr, Fw, Fen, Ti, Ol, At, Ss, Td, Med, Bm
34.	*Pinus wallichiana* A.B Jacks.	Chir	Pinaceae	Tr, O, St, Fr, Fw, Fen, Ti, Ol, At, Ss, Td, Med, Bm
35.	*Phoenix dactylifera* L.	Khajoor	Palmae	Med, Fr, Fw, O, Ss
36.	*Phyllanthus embllica* L.	Amala	Euphorbiaceae	Med, St, Fr, Fw, Fen, At, Ss, Td, Veg
37.	*Psidium guajava* L.	Amrood	Myrtaceae	Med, St, Fw, Fen, Ti, At, Ss
38.	*Punica ganatum* L.	Anaar	Myrtaceae	Med, At, Ss, Fr, Tc, Hb
39.	*Pyrus malus* L.	Seb	Rosaceae	Fr, Med, Fw, At, Ss, Hb
40.	*Prunus armeniaca* Marsh.	Anaar	Rosaceae	Fr, Med, Fw, At, Ss, Hb
41.	*Prunus persica* (L.) Batsch	Aroo	Rosaceae	Fr, Med, Fw, At, Ss, Hb
42.	*Pyrus communis* L.	Nashpati	Rosaceae	Fr, Med, Fw, At, Ss
44.	*Populus alba* L.	Peepal	Salicaceae	Tw, O, Med, Fw, Ti, At, Ss, St
45.	*Salix babylonica* L.	Baid	Salicaceae	O, Tw, Fw, Ti, Tr, Ss, St, Bm
46.	*Salix tetrasperma* Roxb.	Baid	Salicaceae	O, Tw, Fw, Ti, Tr, Ss, St, Bm
47.	*Tribulus terristris* L.	Phakray	Zygophyllaceae	Med, Fr, Tw, Fw, Tr, Ss,
48.	*Terminalia arjuna* Wight. & Arn.	Amaltas	Combretaceae	Med, Ol, Tc, Fw, Ti, Tr, Ss, St, Hb
49.	*Terminalia belerica* Roxb.	Behra	Combretaceae	Med, Ol, Tc, Fw, Ti, Tr, Ss, St, Tw
50.	*Terminalia catappa* L.	Wild almond	Combretaceae	Med, Ol, Fw, Ti, Tr, Ss, St, Tw
51.	*Vitex negundo* L.	Ban	Verbenaceae	Ol, Tc, Fw, Ti, Tr, Ss, St, Td, Bm
52.	*Woodfordia fructicosa* (L) Kurz	Thawi	Lythraceae	Med, Ol, Tc, Fw, Tr, Ss, St, Td, Tw
53.	*Zanthoxulum alatum* D.C.	Timber	Rutaceae	Med, Ol, Fw, Tr, Sc, St, Hb
54.	*Ziziphus jujuba* Mill.	Jand	Rhamnaceae	Med, Fr, Tw, Fw, Ti, Tr, Ss, St, Td
55.	*Ziziphus nummularia* (Burm.f.) Wight. & Arn.	Kokan bair	Rhamnaceae	Med, Fr, Tw, Fw, Ti, Tr, Ss, St, Hb
56.	*Zizyphus sativa*	Bair	Rhamnaceae	Fod, Fr, Tc, Fw, Ti, Tr, Ss, St, Td, Hb
57.	*Zizyphus Mauritiana*	Barey Bair	Rhamnaceae	Med, Fod, Fr, Tw, Fw, Ti, Tr, Ss, St, Hb
58.	*Zizyphus oxyphila*	Bair	Rhamnaceae	Med, Fr, Tw, Fw, Ti, Ss, St, Td, Hb

Key: Md; medicinal, Fr; fruit, Fur; furniture, Hb; Honey bee, O; ornamental, Fod: Fodder, Fen; fencing, Ss; soil stabilization, St; shade tree, Tc; teeth cleaner, Tr; thatching roofs, Ol; oil, Veg; vegetable; Td; tannins and dyes, Sc; spices and condiments, Ti; textile industry, Fw; fuel wood, At; agricultural tools, Tw; timber wood, Bm; Basket making

Table 3. Biodata frequencies of the respondents to the questionnaires.

S.No.	Respondents		Frequency (%)
1.	**Gender:**	Male	79.00
		Female	21.00
2.	**Marital status:**	Single	48.00
		Married	52.00
3.	**Level of education:**	Primary school	24.00
		Secondary school	20.00
		Post-secondary schools	22.00
		University	11.00
		No formal education	23.00
		Indigenous	62.00
4.	**Origin :**	Non-indigenous (PIM)	18.00
		Migrants (LOC)	20.00

Table 4. Frequency of most endangered tree species in Soona Valley.

Species	Frequency (%)
Terminalia belarica	25.50
Butea monosperma	20.50
Terminalia arjuna	15.00
Phyllanthus embllica	10.40
Tribulus terristris	8.25
Cordia obliqa	6.60
Ficus bengalensis	5.75
Launea coromandaliana	4.40
Phoenix dactylifera	3.60

Table 5. Frequency of the fuel woods used in Soona Valley.

S.No.	Users	Species	Frequency (%)
1.	House wives	*Pinus roxburrghii*	35.00
		Mallotus philipeinsis	15.30
		Acacia modesta	11.70
		Dalbergia sissoo	9.50
		Melia azadarach	8.00
		Butea monosperma	6.50
		Launea coromandaliana	5.40
		Acacia nilotica	4.00
		Cordia obliqa	4.60
2.	Hotels	*Pinus roxburrghii*	45.00
		Acacia modesta	35.30
		Dalbergia sissoo	15.70
		Acacia nilotica	04.00
3.	Blacksmith	*Acacia modesta*	60.00
		Dalbergia sissoo	25.30
		Acacia nilotica	10.70
		Pinus roxburrghii	04.00
4.	Nomadics	*Mallotus philipiensis*	55.00
		Acacia modesta	25.00
		Pinus roxburrghii	12.00
		Dalbergia sissoo	08.00

Table 6. Frequency of the timber wood used in Soona Valley.

S.No.	Users	Species	Frequency (%)
1.	Artists/Wood carvers	*Dalbergia sissoo*	54.50
		Pinus roxburrghii	35.50
		Acacia modesta	10.00
2.	House/Constructions	*Pinus roxburrghii*	46.00
		Dalbergia sissoo	32.00
		Acacia modesta	22.00
3.	Furniture workers	*Dalbergia sissoo*	57.00
		Pinus roxburrghii	22.60
		Acacia modesta	20.40
4.	Mortal makers	*Pinus roxburrghii*	47.00
		Dalbergia sissoo	23.00
		Zizuphus nimularia	30.00

Table 7. Family index (with highest number of tree species used) in the study area (Soona Valley).

S.No.	Family	No of genera	No of species	Ranking
1.	Rhamnaceae	1	5	1st
2.	Mimosaceae	2	4	2nd
3.	Rutaceae	2	4	3rd
4.	Rosaceae	3	3	4 th
5.	Moraceae	3	3	5th
6.	Meliaceae	2	3	6 th

The inhabitants and border security forces (BSF) use trees as major of fuel cooking and heating purpose. The hotel owners, bakers and blacksmiths also use tree in commercial production as cheaper source of fuel which generates severe threat and pressure to these species (Ishtiaq *et al*., 2007). Fuel species of SV include *Pinus roxburrghii* (35%), *Mallotus philipiensis* (15.3%), *Acacia modesta* (11.7%), *Dalbergia sissoo* (9.5%), *Melia azadarach* (8%), *Butea monosperma* (6.5%), *Launea coromandaliana* (5.4%), *Acacia nilotica* (4%) and *Cordia obliqa* (4.6%) are frequently utilized (Table 5).

Some species are exotic, introduced by department of forestry such as *Eucalyptus globulus, Brousnetia papyrifera* and *Callistemon viminalis.* Most of the tree species are wild (77%) while 33% have been cultivated. EB data depicts that trees are used for different purposes including 39 species are used as medicines, 31 edible fruit species, 03 vegetable species, 10 basket and mat making species, 49 fuel wood species, 13 fodder species, 11 Timber wood species, 10 teeth cleaner species, 29 shadow tree species, 19 soil stabilizing species, 07 ornamental species, 25 fencing species, 22 thatching roofs species, 12 oil yielding species, 27 tannin and dye species, 06 spices and condiments species, 35 textile industry species, 32 agricultural species, 17 honey bee species (Table 2). It was demonstrated in previous research that many tree plants had been used in folklore medicines and veterinary therapies in the Azad Kashmir and Pakistan (Ishtiaq *et al*., 2007; Ahmad *et al*., 2003; Ashfaq *et al*., 2003). Thirty one species produce edible fruits species (Table 2) and *Zizyphus oxyphila, Ziziphus nummularia, Pyrus communis, Prunus persica, Prunus armeniaca, Phoenix dactylifera, Morus laevigata, Morus alba, Ficus carica, Eriobotrya japonica, Citrus aurantium, Punica granatum* are predominantly fruit species found in SV and people use those in daily life.

The inhabitants of SV use 39 tree species in their traditional medicaments against many diseases (Table 2) and among these *Acacia modesta, Acacia nilotica, Punica granatum, Butea monosperma, Terminalia belerica, Terminalia arjuna, Zanthoxulum alatum, Ziziphus jujuba, Phyllanthus embllica, Melia azadarach, Eugenia jambolana, Cordia obliqa, Acacia modesta* had been reported in previous research for their ethnomedicinal significance (Gupta *et al*., 1995; Lewis & Elvin 1995; Destagir, 2001; Hussain *et al*., 2005, 2007 & Ishtiaq *et al*., 2006, 2007).

Three species *Dalbergia sissoo* (54.5%), *Pinus roxburrghii* (35.5%) and *Acacia modesta* (10%) are predominantly used as timber by wood carves and furniture manufacturers (Table 6). Many of these species had been utilized in house constructions and daily life necessities but their usage is exponentially increased due to rapid explosion of population which generated a threat to these

tree species (Ishtiaq *et al*., 2006a, 2006b, 2007). The DMR analysis also proves that *Acacia modesta*, *Dalbergia sissoo*, *Pinus roxburrghii* and *Butea monosperma* are most extensively used by local communities for construction, fuel, hedging, and income generation leading to scarcity and thus thrilling these species into threatened and endangered zone (Tables 7 and 8).

Since administratively establishment of Samahni as subdivision, she had enjoyed its status and people of the area had been relying on the plants and particularly on tree species. Soona Valley (SV) is geographically located on border area zone and it has been victim of wars of 1965 and 1971 between Pakistan and India. Generally its role as buffer zone on LOC makes it very interesting for ethnobotanical study because people in this area do possess influence and impact of both Muslim and Hindu civilizations. During 1971 Indo-Pak riffle, biodiversity of SV was severely damaged due to cross border shelling and firing. After that, more often not there is shelling and firing continued across LOC from both sides which ooze into fire and cause severe damage to biodiversity of the area. Many woody tree species were used in military compounds for defensive and camouflage purpose that had exerted a dare pressure. Trees has also paramount role in time of peace as many residents use woody plant species for construction of their homes and domestic pets rooms. Hence, it is dare need of time to motivate and get cooperation of army personnel's and civilians to pay their heart and soul to protect already existing species and plant new trees to enjoy their future safely.

Many tree species were even worshiped pre-islam era and even now some trees are considered as sacred plants including *Ficus bengalensis*, *Olea ferruginea*, *Mangifera indica* and *Cedrella toona*. Hitherto many families of area believe in superstitions and they pay special homage and prestige to certain plant species for cure of different diseases (Ishtiaq *et al*., 2006). These tree species are present in graveyard and other saint shrines, and people protect them because they took these as sacred symbols.

The present EB research demonstrates some tree species are becoming threatened like *Terminalia* (25.5%) *Butea monosperma* (20.5%), *Phyllanthus emblica* (10.4%), *Terminalia arjuna* (15%), *Zanthoxulum alatum* and *Bauhinia variegata* broad leaved trees growing naturally with dwindling population in some isolated private pastures, graveyards and in scattered parts of forests (Table 4). These species are severely affected members of the existing biota and playing a vital role in stabilization of the fragile ecosystem, providing medication, a shelter to wild life and recreation for the inhabitants of the surrounding area. *Pinus roxburgii* is also under stark pressure because it is being used in construction, furniture, fuel source and source of livelihood for inhabitants of the area (Ishtiaq *et al*., 2006, 2007). Being located on LOC, illiteracy and poverty it is considered as remote area and no effective measures have hitherto conducted by local communities and concerned government experts for conservation and protection of these tree species.

In priority ranking (PR) analysis, it was found that construction of houses, fuel & fodder, urbanization, fire, agriculture expansion, timber mafia are imperative threats to the tree flora of Soona valley (Table 9), and it had been reported in earlier research (Ishtiaq *et al*., 2007).

This research will provide information about the bio potential of woody species of Soona valley and their role and importance in life of dwellers. This area is first explored for EB perspectives and it will provide innovative data for ethnobotany data bank of Pakistan and globe. It indicated that fire, over grazing, deliberate and un-knowingly cuttings of trees, population explosion and agro-forestry imbalance created by the people of area are main threats to the flora and immediate measures should be launched not only to protect plant biodiversity but also fauna of the area. It is a dire need to conserve the resources for our own and future generations' survival. Forests are renewable resources, if used sustainable manner and trees play major role in control the environmental pollution and provide livelihood not only to the local communities but to others communities of country (Ibrar *et al*., 2007; Ishtiaq *et al*., 2007). There different practices are employed to control deforestation and immediate plantation campaign initiation is one of those to protect and produce tree species (Ghulam *et al*., 2007). In some parts of country self governance has led to successful forest re-habitation through natural regeneration (Webb & Khurshid, 2000).

Some constructive and imperative recommendations are made for protection and conservation of tree forest species of the Soona Valley:

1. The strict monitory system of forest should be prepared and implemented accordingly. Violations of these laws should be sentenced with capital punishment.
2. The conservation and afforestation programmes should be started with participation of local inhabitants using farm forestry ideas.
3. Alternative sources of fuel like kerosene oil, LPG and others should be introduced in the area and at subsidized rates should be provided.
4. Some special stoves and furnaces should be introduced that may reduce the loss and extra consumption of fuel wood.
5. Rapid and promptly growing plant species such as *Albizzia lebbeck* and *Eucalyptus globulus* should be introduce in barren and vacant farm lands to get more fuel wood.
6. Mainly and most important is that public awareness to people about protection and conservation of tree species should be sought through media and presentation and debates at school, colleges and public places.
7. Timber mafia activities should be mitigated by active participation of honest government officials and public committees.
8. NGOs should be invited to visit the area and participate in programme of nature conservation through their active role.
9. Forest area should be divided into different patches and allotted to local families of the areas to protect tree species and then in reward they use grass and other shrubs as fodder and fuel.
10. The youth talent of college and universities should be involved and their role may help to lessen the corruption and illegal activities of timber mafia.

Table 8. Direct Matrix Ranking (DMR) of tree plants with different uses other than medicinal value (total score of 10 informants) in the study area (Soona Valley).

S.No.	Uses	*Acacia modesta*	*Terminalia belarica*	*Butea monosperma*	*Zizyphus jujuba*	*Pinus roxburgii*	*Dalbergia sissoo*
1.	Construction	31	19	37	17	70	44
2.	Hedge, Fencing	55	9	11	21	12	21
3.	Fire wood	43	17	20	42	80	32
4.	Cash income	34	68	33	22	76	22
5.	Fodder	54	41	25	30	7	12
6.	Fruit, Food	12	53	4	45	45	5
	Total	198	135	89	115	175	87
	Rank	1st	3rd	5th	4th	2nd	6th

Table 9. Priority Ranking (PR) of factors perceived as threats to woody plant species based on their level of destructive effects in the study area, Soona Valley.

Threat factors	Respondents (R1-R6)						Total	% Age	Rank
	R1	R2	R3	R4	R5	R6			
Construction	3	5	4	2	4	3	21	11.60	6th
Fuel & Fodder	4	6	5	4	5	5	28	15.46	4th
Urbanization	4	5	9	7	3	5	33	18.23	3rd
Agriculture expansion	5	7	6	6	8	5	37	20.44	1st
Timber mafia	6	7	5	8	4	6	36	19.88	2nd
Fire	2	4	5	3	5	7	26	14.36	5th

Values 1-6 were given: 1 is the least destructive threat and value 6 is the most destructive threat

References

Ahmad, M., M.A. Khan and R.A. Qureshi. 2003. Ethnobotanical study of some cultivated plants of Chhuchh Region (District Attock). *Hamdard Medicus*., 46(3): 15-19.

Alexiades M.N: Selected guidelines for ethnobotanical research: A field manual. In: *Advances in Economic Botany* Vol. 10. Bronx: The New York Botanical Garden; 1996.

Ali, S.I. and E. Nasir. 1970-2002. Flora of Pakistan. National Herbarium, NARC, Islamabad and Department of Botany, University of Karachi, Karachi. Fasc. No. 1-207.

Al-Said, M.S. 1993. Traditional medicinal plants of Saudi Arabia. *American Journal of Chin. Medicine*, 21(3-4): 291-298.

Anonymous. 1994. Centres for plant diversity. A Guide and Strategy for their Conservation. WWF, Vol. 1, IUCN Publication unit, Cambridge, U.K.

Ashfaq, S., M. Ahmad and M. Arshad. 2003. Ethnomedicinal observations of medicinally important plants of Tehsil Fateh Jang, District Attock. *Pak. J. Arid. Agric*., 7(1): 25-33.

Bussmann R.W. 2006. Ethnobotany of the Samburu of Mt. Nyiru, South Turkana, Kenya. *J. Ethnobio. Ethnomed.* 2: 35.

Cook, F.M. 1995. Economic Botany Data Collection Standard. R.B.G., Kew.

Dastagir, G. 2001. Medicinal plants of Mai Dhani Hill, Muzaffarabad, Azad Jammu and Kashmir. *Hamdard Medicus*, 46: 29-35.

Delcourt, P.A., H.R. Delcourt, P.A. Cridlebaugh and J. Chapman. 1996. Holocene ethnobotanical and Paleoecological record of human impact on vegetation in Little Tennessee River valley, Tennessee, U.S.A.

Fisseha, M., D. Sebsebe and T. Tilahun. 2009. An ethnobotanical study of medicinal plants in Wonago Woreda, SNNPR, Ethiopia. *J Ethnobiol. Ethnomed*., 5: 28.

Focho, DA., W.T. Ndam and B.A. Fonge. 2009. Medicinal plants of Aguambu-Bamumbu in the Lebialem highlands, southwest province of Cameroon. *Afr. J. Pharm. Pharmacol*., 3(1): 1-13.

Ghulam, M.S., M.A. Khan, M. Hussain and Z. Jamal. 2007. An ethnobotanical note on fuel wood and timber plant species of Siran Valley, Pakistan. *J of Bio. Sci*., 7(2): 249-353.

Gul, F., Z.K. Shinwari and I. Afzal. 2012. Screening of indigenous knowledge of herbal remedies for skin diseases among local communities of North West Punjab. Pak. *J. Bot*., 44(5): 1609-1616.

Gupta, M.P., M.D. Corea, P.N. Soils, A. Jones and C. Galdames. 1995. Medicinal plants inventory of Kuna Indians: Part I. *Journal Ethnopharmacology*, 40: 77-109.

Hamayun, M. 2003. Ethnobotanical studies of some useful shrubs and trees of District Buner, NWFP, Pakistan. *J. Ethnobotanical Leaflets* (http://www.siu.edu/~ebl/).

Harshburger, J.W. 1896. Purpoe of ethnobotany. *Botanical Gazette*, 21: 146-154.

Holding, C.P. Njuguna and C. Gatundu. 2001. Farm sourced timber: The restructuring of the timber industry in Kenya–opportunities and challenges. Forest Extension, IUFRO, Vienna, Austria.

Hussain, F., A. Khaliq and M.J. Durrani. 1995. Ethnobotanical studies of some plants of Dabargi hills, Swat. Proceedings of First Training Workshop on Ethnobotany and its application to Conservation. National Herbarium/PASA/PARC. Islamabad, Pakistan, pp. 207-215.

Hussain, F., S. Mukaram and H. Sher. 2007. Traditional resource evaluation of some plants of Mastuj, district Chitral, Pakistan. *Pak. J. Bot*., 39(2): 339-354.

Ibrar, M., F. Hussain and A. Sultan. 2007. Ethnobotanical studies on plant resources of Ranyal hills, District Shangla, Pakistan. *Pak. J. Bot*., 39(2): 329-337.

Ishtiaq, M., Abdul Samad Mumtaz and Mir Ajab Khan. 2001. Leaf epidermal anatomy medicinal grasses of Islamabad, Attock and Mirpur (Azad Kashmir), *Pak. J. Biol. Sci*., 4(12): 1466-1469.

Ishtiaq, M., M.A. Khan and Wajahat Hanif. 2006. An ethnomedicinal inventory of plants used for family planning and sex diseases treatment in Samahni Valley, (A.K.) Pakistan, *Pak. J. Biol. Sci*., 9(14): 2546-2555.

Ishtiaq, M., Wajahat Hanif, M.A. Khan, M. Ashraf and A.M. Butt. 2007. An Ethnomedicinal Survey and Documentation of Important Medicinal Folklore Food Phytonims of Flora of Samahni Valley, (Azad Kashmir) Pakistan, *Pak. J. Biol. Sci*., 10(13): 2241-2256.

Jain, S.K. 1991. Dictionary of Indian folk Medicine and Ethnobotany. Deep Publication New Delhi.

Joshi, P. 1995. Ethnobotany of the Primitive Tribes in Rajasthan. Print well, Jaipur.

Katewa, S.S. and A. Arora. 1997. Some plants in folk medicines of Udaipur district (Rajasthan). *Ethnobotany*, 9: 48-51.

Katewa, S.S. and B.D. Guria. 1997. Ethnobotanical studies on some plants from Southern Aravalli hills of Rajasthan. *Vasundhara*, 2: 85-88.

Lewis, W.H. and M.P. Elvin. 1995. Medicinal plants as source of new therpeutics. *Annals Missouri Botanical Garden*, 82: 16-24.

London R.L. Okoli, O. Aigbe, J.O. Ohaju-Obodo and J.K. Mensah. 2007. Medicinal plants used for managing some common ailments among Esan People of Edo State, Nigeria. Pakistan *J. Nutritn* 6(5): 490-496.

MacKay, C.R. 1994. Survey on Important Bird Areas for Bannerman's Turaco, Tauraco bannermani and Banded Wattle-eye, Platysteira liticincta in North West Cameroon, interim report. Birdlife Secretariat.

Martin, G.J. 1995. Ethnobotany: A Method Manual. Chapman and Hall, London.

Nasir, E. and S.I. Ali. 1970-1995. Flora of West Pakistan and Kashmir. Pakistan Agriculture Research Council, Islamabad.

Olorode, O. 1984. Taxonomy of West African Flowering Plants. Longman.

Pasiecznik, N.M., M.C.M. Brewer, C. Fehr and J.H. Samuel. 2006. Turning trees to timber: A chainsaw milling manual. HDRA, Coventry, UK.

Qasim M., S. Gulzar, Z.K. Shinwari, I. Aziz and M.A. Khan. 2010. Traditional ethnobotanical uses of halophytes from Hub, Balochistan. *Pak. J. Bot*., 42(3): 1543-1551.

Rizawana, A.Q., M.A. Gufran, S.A. Gilani, K. Sultana and M. Ashraf. 2007. Ethnobotanical Studies of selected medicinal plants of Sudhan Gali and Gang Chotti hills, District Bagh, Azad Kashmir, *Pak. J. Bot*., 39 (7): 2275-2283.

Sarwat, Z.K. Shinwari and N. Ahmad. 2012. Screening of potential medicinal plants from district Swat specific for controlling women diseases. *Pak. J. Bot*., 44(4): 1193-1198.

Shinwari, M.I. and M.A. Khan. 1999. Ethnobotanical conservation status of Margalla Hills National Park, Islamabad. *Journal of Plant Resources and Environment*, 8: 53-60.

Shinwari, Z.K. and M. Qaisar. 2011. Efforts on conservation and sustainable use of medicinal plants of Pakistan. *Pak. J. Bot*., 43(Special Issue): 5-10.

Shinwari, Z.K. and M. Shah. 1996. The Ethnobotany of Kharan District Baluchastan. Proceedings of first Training Work shop on Ethnobotany and its Applications to Conservation. N.A.R.C., Islamabad: 14-25.

Siddiqui, M.B., M.M. Alam, W. Hussain and G.K. Sharma. 1998. Ethnobotanical study of plants used for terminating pregnancy. *Fitoterapia*, 59: 250-252.

Stewart, R.R. 1982. History and Exploration of Plants in Pakistan and adjoining area. National Herbarium, NARC, Islamabad.

Webb, E.L. and M. Khurshid. 2000. Divergent destinies among pine forests in Northern Pakistan: Linking ecosystem and local institutions. *Int. J. Sustain. Dev. World Ecol.*, pp. 189-200.

Wonago Woreda, SNNPR, Ethiopia. 2009. *Journal of Ethnobiology and Ethnomedicine*, 5: 28 doi: 10.1186/1746-4269-5-28.

Zaman, M.B. and M.S. Khan. 1970. Hundred drug plants of West Pakistan. Medical Plant Branch. Pakistan Forest Institute, Peshawar: 10-70.

(Received for publication 1 September 2012)