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FLORISTIC DIVERSITY AND ETHNOBOTANY OF SENHSA, DISTRICT KOTLI, AZAD JAMMU & KASHMIR (PAKISTAN)

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Abstract

A floristic study was carried out in Senhsa, District, Kotli, Azad Kashmir. Ethnobotanical data of plants were obtained from local key informants, mainly based on semi-structured interviews. The study area is floristically very rich having thick vegetation cover. A total of 112 plant species distributed in 97 genera and 51 families were documented. Of these 84 species (42.71%) are used in medicine, followed by as fodder (35 spp., 18.23%), marketing (26 spp., 13.54%), fuel (24 spp., 12.50%) and ornamental (14 spp., 7.29%). The most frequently used plant parts are leaves (77 spp., 27.50%) followed by stem (49 spp., 17.50%), fruits (46 spp., 16.43%), seeds (40 spp., 14.29%), flowers (36 spp., 12%) and roots (32 spp., 11.43%). Habit of medicinal plants includes herbs (56 spp., 50%), followed by trees (32 spp., 18.75%), shrubs (21 spp., 18.75%), and climbers (3 spp., 2.68%). The area is rich in vegetation and blessed with a variety of resources. The people are dependent on these natural resources especially for their food, shelter, fodder, timber, fuel, and health-care.

Introduction

Plant resources provide materials for survival, medicinal, forage values, but also possess and preserve cultural heritages, biological information and indigenous knowledge (Morgan, 1981; Hameed *et al.*, 2011). Ethnobotany plays an important role in understanding the dynamic relationships between biological diversity and social and cultural systems (Ahmad *et al.*, 2008; Husain *et al.*, 2008). Unfortunately, very little attention has been paid to the ethnobotanical aspects of plants as only hakims are associated with medicinal plants (Shinwari, 1996, Ahmad *et al.*, 2008; Ahmad *et al.*, 2011; Hameed *et al*., 2011; Shinwari *et al*., 2011).

People in mountainous areas of Pakistan use plants for various ailments and for long time they have been dependent upon plant resources for their food, health, shelter, fuel and other purposes (Hussain & Khaliq, 1996; Ahmad *et al.*, 2009; Alam *et al.*, 2011). The medicinal plants of Himalayas are specific (Dhar *et al*., 2000) and their distribution is restricted to small areas. Bokhari (1994) carried out Ethnobotanical and vegetation analysis of Machyara National Park, Muzaffarabad, Azad Jammu and Kashmir and reported 10 plant communities in different regions of the park. Zandial (1994) worked on the ethnobotany of the same park and reported 104 important species of plants including trees, shrubs and herbs. Medicinal plants reported from Samahni Valley, Azad Kashmir are used for a number of human diseases (Ishtiaq *et al.*, 2006).

People of Azad Jammu & Kashmir are still dependent largely on medicinal plants for folk remedies, hence creating immense pressure on native vegetation by over-exploiting them. Pakistan is fairly large country gifted with a variety of climates, ecological zones and topographical regions. Particularly in the mountainous region like Kashmir, diversity of economically important plants is fairly rich (Shinwari, 1996; Ahmad *et al.*, 2010; Alam *et al*., 2011). Since the area of Kotli District is relatively less explored, the present study was conducted to explore conservation status of native flora, document floral wealth and their medicinal uses, create awareness among local people for sustainable use of economically important plants, and accumulate wide and dispersed knowledge about plant-people relationship.

Materials and Methods

Study area: Azad Jammu & Kashmir is rich in plant diversity because of the diversified habitats, such as lakes, rivers, streams, springs, meadows, steep mountain slopes and roads, cultivated fields, waste lands, etc. District Kotli is a hilly area rising gradually towards the high mountains of District Poonch, which stretches over an area of 1,862 km^2. District Kotli is administratively divided into four tehsils viz, Kotli, Sehnsa, Nikyal and Charhoi (Fig. 1). The study area, Sehnsa, has an altitude of 600-760 m above sea level. It lies between longitude 73° 33'57" to 73° 53'17"N and latitude 33° 29'22" to 33° 40'44" E. In the east of Sehnsa lies Kotli city. It is surrounded in southern side by Mirpur, western side of Rawalpindi and northern side of Sudhanoti. The annual rainfall is 1227.91 mm, being maximum during July to August (Pakistan Metrological Department, Jail Road, Lahore, 2006).

Vegetation survey: Frequent surveys were conducted during October, 2008 to September, 2009. The native flora was recorded by quadrat sampling method. Ten quadrats were laid at each study site along a jeepable track after every 10 km distance throughout the Senhsa District. In addition, data of different ethnobotanical aspects were collected from various localities by arranging meetings, interviews, dialogues and discussions with rural, knowledgeable people, hakims and shepherds, e.g. local name; parts used and categories of individual species. About 100 individuals were interviewed belonging to different age groups.

Economic use classification, preservation and identification: Plants were classified on the basis of their economic value, medicinal, fodder, fuel, ornamental and marketing. The plant specimens were collected, pressed, dried and mounted on herbarium sheets and identified with the help of floristic literature (Nasir & Ali, 1970-1989; Ali & Nasir, 1990-1992; Ali & Qaiser, 1992-2009). The correctly identified specimens were deposited in the herbarium of Pakistan Museum of Natural History (PMNH).

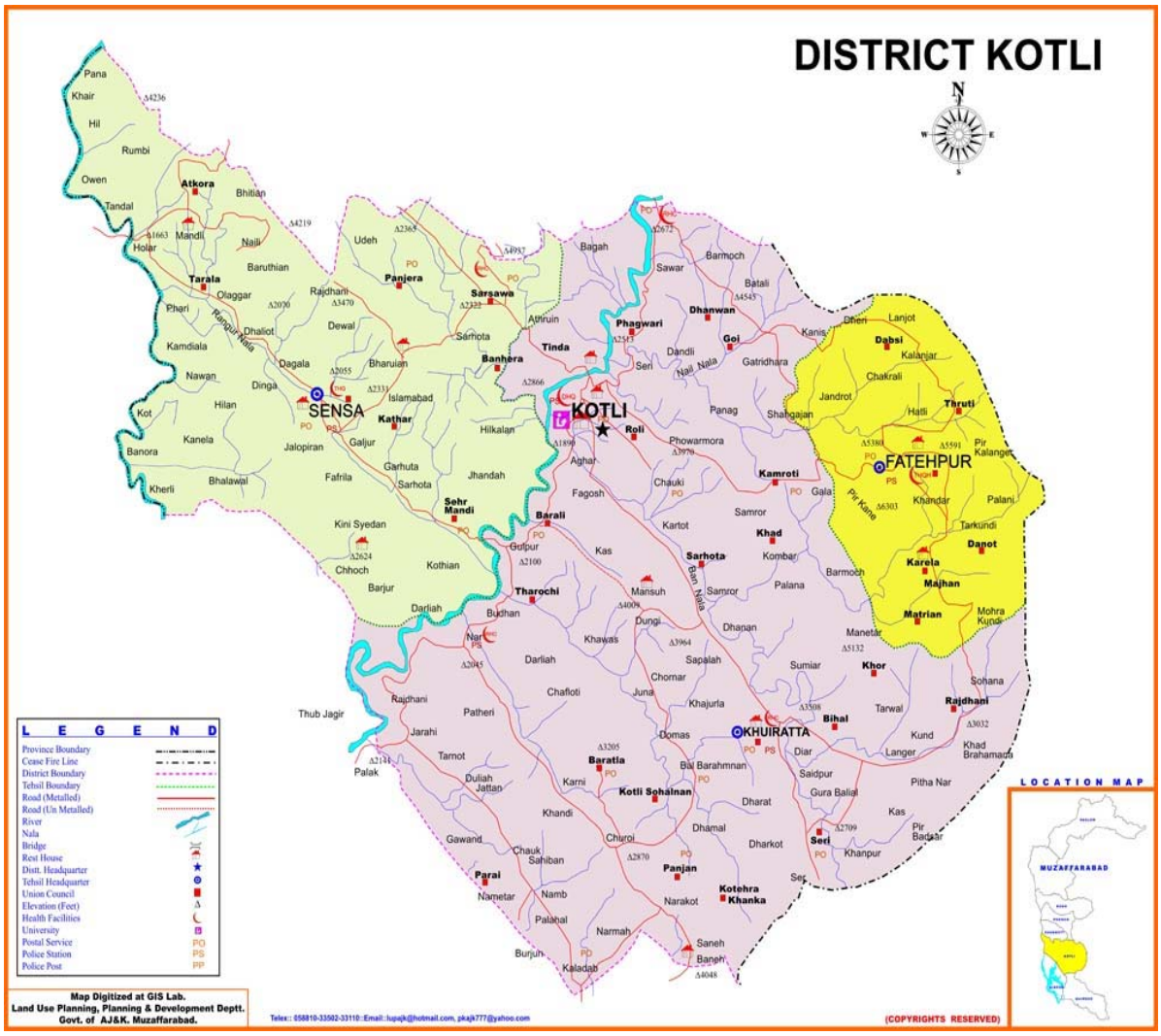

Fig. 1. Map of Dsitrict Kotli, Azad Jammu & Kashmir.

Results and Discussion

Conservation status, viz., critically endangered, endangered, vulnerable and least concern was recorded on the basis of density in accordance with IUCN Red List Database. Medicinally important species like *Ajuga bracteosa*, *Mallottus philippinensis*, *Butea monosperma*, and *Zanthoxylum armatum* are critically endangered not only locally, but also in the whole region. Among endangered species, *Cissus carnosa*, *Juglans regia*, *Olea ferruginaea*,, *Phyllanthus emblica*, *Viola canescens* are the notable species, which are at high risk of being endangered.

A total of 112 plant species belonging to 97 genera and 51 families were documented (Table 1). Of these 84 spp. (42.71%) species are used in medicinal (Fig. 2), followed by fodder 35 spp. (18.23%), marketing 26 spp. (13.54%), fuel 24 spp. (12.50%) and ornamental 14 spp. (7.29%). The most frequently used plant parts are leaves 77 spp. (27.50%). They are followed by stem 49 spp. (17.50%), fruits 46 spp. (16.43%), seeds 40 spp. (14.29%), flowers 36 spp. (12%), and roots 32 spp. (11.43 %, Fig. 3). The analysis of the data (Fig. 4) showed that majority of plants are herbs 56 spp. (50%), followed by trees 32 spp. (18.75%), shrubs 21 spp. (18.75%), and climbers 3 spp. (2.68%).

The present study of ethnobotanical inventory about plants allows us to draw some possible conclusions about the impacts of their uses and the likely near future needs and planning that should be done for conservation and development. A large proportion of the population, living in remote areas, rely on medicinal plants for health of the local flora such as *Justicia adhatoda*, *Acacia nilotica*, *Calotropis procera*, *Ricinus communis*, *Morus nigra*, *Dodonaea viscosa*, *Achyranthus aspera*, *Ipomoea carnea*, *Taraxacum officinale*, *Eriobotrya japonica*, *Cissuss carnosa*, *Melia azedarach*, *Eucalyptus citriodora* and *Ficus carica*, to meet almost every need of their lives. Similar reports have come from nearby areas of Azad Kashmir such as District Muzaffarabad (Saghir *et al*., 2001), Samahni Valley, District Bhimber (Ishtiaq, 2006) and Poonch Valley (Ajaib *et al.*, 2010). Knowledge of medicinal plants does not appear to be homogenous among the native people of the area. Men are more informative of traditional knowledge of medicinal plants than the women in the area (Hamayun, 2003).

Table 1. Ethnobotanical uses of plant species in Senhsa, district Kotli (Azad Jammu & Kashmir).

Family	Botanical name	Local name	Part used	Ethnobotanical uses
Acanthaceae	*Justicia adhatoda* L.	Kora bakar	Fl,S	Me
Adiantaceae	*Adiantum venustum* D. Don.	Fern	L,R	Me
Agavaceae	*Agave cantala* Roxb.	Sandal	L	O
	Aloe vera (L.) Burm.f.	Kanwar gandal	L	Me
Amaranthaceae	*Achyranthes aspera* L.	Pootha kanda	L,S,R,F,Fr	Me
	Amaranthus spinosus L.	Ganhar	L,Fr,Sd	Me,Fo,M
	Amaranthus viridis L.	Ghanhari	L,Fr,Sd	Me,M
Apiaceae	*Anethum graveolens* L.	Soya	L,F,Fr,Sd	Me,O,M
	Coriandrum sativum L.	Dhania	L,S	Me,M
Anacardiaceae	*Mangifera indica* L.	Aam	Fr	M
Apocynaceae	*Carissa opaca* Stapf ex. Haisnes	Granda	L,R,Fr	Me
	Nerium oleander L.	Gandeera	L,S,R	Me,M
Asclepiadaceae	*Calotropis procera* (Willd.) R.Br.	Akk	L,R,F	Me,O,M
Astraceae	*Artemisia scoparia* Waldst. & Kit.	Chahoo	L,F	Me,Fo
	Helianthus tuberosus L.	Arvi	Fr	Me
	Launaea procumbens Roxb.	Methi hand	R	Me
	Taraxacum officinale Weber.	Hand	L	Me
	Xanthium strumarium L.	Unknown	L,S,R,F,Fr,Sd	Me,Fo
Bombacaceae	*Bombax ceiba* L.	Sinmbal	S,F	M
Boraginaceae	*Cordia myxa* L.	Lasura	L,Fr	Me
	Cynoglossum lanceolatum Forssk.	Lunduri	L,R	Me,Fo
	Trichodesma indica (L.) R.Br.	Doosi	L	Me
Brassicaceae	*Brassica compestris* L.	Sersoon	L,S,Sd	O,M
	Lepidium pinnatifidum Ladeb.	Halian	L,Sd	Me
	Raphanus sativus L.	Mooli	L,S	Me,Fo
Cactaceae	*Opuntia dillenii* Haw.	Thor	L,Fr	Me,M
Caesalpiniaceae	*Bauhinia variegata* L.	Kalyar	Sd	Me
	Cassia fistula L.	Amaltas	L,S,Sd	Me,Fu,M
Cannabinaceae	*Cannabis sativa* L.	Bhang	L,S,R	Me,M
Celastraceae	*Maytinus royleanus* Wall.	Patakhi	L,R,F,Fr,Sd	Me
Convolvulaceae	*Ipomoea carnea* Jacq.	Jangli baker	L,S,R	Fo,O
	Ipomoea pentaphylla (L.) Jacq.	Aair	Sd	Fo,O
Cucurbitaceae	*Luffa cylindrica* (L.) Roem.	Kali tori	R,Fr	Me
	Momordica balsamina L.	Jangli karalla	Fr	Me
Cuscutaceae	*Cuscuta reflexa* Roxb.	Neeli dari	L,S,R,F,Fr	Me
Dryopteridaceae	*Dryopteris ramosa* (Hope) C. Chr.	Fern	L,R	Me
Euphorbiaceae	*Euphorbia helioscopia* L.	Doodal	L,S,R,F,Fr,Sd	Me,Fo
	Euphorbia hirta Forssk.	Unknown	L, R,F,Fr,Sd	Me
	Mallottus philippinensis (Lam.) Muell-Arg.	Kamila	R,Fr	Me,Fo,Fu
	Phyllanthus emblica L.	Amla	L,S,R,Fr	Fu
	Ricinus communis L.	Hrnoli	Sd	Me
Fumariaceae	*Fumaria parviflora* L.	Papra	L,R,F,Fr,Sd	Me
Juglandaceae	*Juglans regia* L.	Akhrot	L,S,Fr,Sd	Me,Fo,Fu,O,M
Lamiaceae	*Ajuga bracteosa* Wall. ex Benth.	Kori booti	L,S,R,F,Fr,Sd	Me,Fo,M
	Anisomeles indica (L.) O.Ktze.	Unknown	L,R,F,Fr,Sd	Me
	Mentha longifolia L.	Chitta pudina	L,S	Me,Fo,M
	Mentha royleana L.	Kala pudina	L,S	Fo
	Micromeria biflora Benth.	Baburi	L,R,F,Fr,Sd	Me,Fo
	Ocimum basilicum L.	Niazboo.	L	Me,Fo,M
	Otostegia limbata (Benth.) Boiss	Chitta jand	L	Me,Fo
Liliaceae	*Allium cepa* L.	Piyaz	L	Me
	Allium sativum L.	Thoom	L	Me
Lythraceae	*Woodfordia fruticosa* (L.) Kurz.	Tawi	F	Me
Malvaceae	*Malva sylvestris* L.	Sonchal	L,R,F	Me,Fo,O
	Malvastrum coromandelianum L.	Gogi booti	L	Fo
Meliaceae	*Melia azadirchta* L.	Dreak	L,S,R	Me,Fu,O

Table 1. (Cont'd.).

Family	Botanical name	Local name	Part used	Ethnobotanical uses
Mimosaceae	*Acacia modesta* Wall.	Pulai	L,S	Me,Fu,O
	Acacia nilotica (L.) Willd.ex Del.	Kiker	L,S	Me,Fu
	Albizia labbek (L.) Benth.	Seree	S,Sd	Me,Fu,M
Moraceae	*Brossonetia papyrifera* Vent.	Jangli toot	L,S,F,Fr	Fu
	Ficus carica L.	Tosa	Fr	Me,Fu
	Ficus palmata Forssk.	Phagwari	L,S,Fr	Me,Fu
	Ficus religiosa L.	Pipal	S	Me,Fu
	Ficus virgata Roxb.	Runbul	Fr	Fu
	Morus nigra L.	Kala toot	L,S,Fr	Me,Fo,Fu
Musaceae	*Musa paradisiaca* L.	Kela	L,S,Fr	Me
Myrtaceae	*Callistemon ctirinus* (Curt.) Stapf	Bottle brush	S	Fo
	Eucalyptus citriodora Pakere.	Safeda	L,S,F	Fu
Nyctaginaceae	*Boerhavia diffusa* L.	Sanati	L,S,R,F,Fr,Sd	Me
Oleaceae	*Jasminum officinale* L.	Chanmbeli	R,F	Me,O
	Olea ferruginaea Royle	Kahoo	L,S,Sd	Me,Fo,Fu
Oxalisdaceae	*Oxalis corniculata* L.	Jandoro	L,S,R,F,Fr,Sd	Me
Palmae	*Phoenix sylvestris* (L.) Roxb.	Khajoor	Fr	Me
Papilionaceae	*Butea monosperma* (Lam.) Taub.	Chichra	L,S	Me
	Dalbergia sisso Roxb.	Tahli	L,S	Fu,M
	Lathyrus aphaca L.	Jangli matter	F,Sd	Me,Fo,M
	Lathyrus odoratus L.	Phool matter	F,Sd	Fo
	Trigonella foerum -gracium L.	Methi	L,S,Sd	Me,Fo,M
Pedaliaceae	*Sesamum indicum* L.	Til	Sd	Me
Pinaceae	*Pinus roxburghii* Sarg.	Cheer	S,Sd	Fu,O,M
Poaceae	*Arundo donax* L.	Kana	L	Fo
	Chrysopogon serrulatus Trin.	Bari gass	L	Fo
	Cynodon dactylon (L.) Pers.	Khabal	L	Me,Fo
	Heteropogon contortus L.	Sariyala gass	L,S	Me,Fo
	Saccharum spontaneum L.	Kai	L	Fo
	Sorghum bicolor L.	Bajra	Sd	Me,Fo
	Sorghum halepense L.	Bru gass	L,R,Sd	Fo
	Zea mays L.	Makai	L,S,Sd	Fo
Polygonaceae	*Parsicaria nepalensis* (Meissn.) Gross.	Choora	L,R,F,Fr,Sd	Me
	Rumex nepalensis Spreng.	Aliphiri	L	Fo
Punicaceae	*Punica granatum* L.	Daroona	S,F,Sd	Me,M
Rhamanaceae	*Ziziphus mauritiana* Lam.	Bairi	L,S,R,F,Fr,Sd	Me
	Zizipus nummularia (Burm.f.) Wight & Arn.	Jand	L,S,F	Me,Fu
Rosaceae	*Eriobotrya japonica* (Thumb.) Lindl.	Locat	L,Fr,Sd	Me,Fu,M
	Prunus armeniaca L.	Aari	Fr,Sd	Me,Fu
	Prunus persica (L.) Bat Sch.	Rawara	L,S,F,Fr	Fu
	Pyrus pashia Ham. ex D.Don.	Tangi	Fr	Fu
	Rosa brunonii Lindl.	Tarnari	F	Me,O
	Rosa chinensis Jacq..	Gulab	F	Me,O
	Rubus ellipticus Hook.f.	Akhra	L,S,Fr	Me
Rutaceae	*Citrus limonum* (L.) Burm.f.	Nimbo	Fr	Me,M
	Zanthoxylum armatum DC.	Timber	S,Fr	Me,Fu
Sapindaceae	*Dodonaea viscosa* L.	Snatha	L,S	Me
Scrophulariaceae	*Verbascum thapsus* L.	Gidder tammako	L,R,F,Fr,Sd	
Solanaceae	*Capsicum annuum* L.	Surkhmirch	Fr,Sd	Me,M
	Nicotiana tabacum L.	Jangli tammako	L,F,Sd	Me
	Solanum nigrum L.	Kach mach	L,S,R,F,Fr,Sd	Me,O
	Solanum surattense Burm. f.	Mokri	Fr	Me
	Withania somnifera (L.) Dunal.	Aksun	R	Me
Tiliaceae	*Grewia tenax* (Forssk.) Fiori	Taman	L,S	Me,Fo
Violaceae	*Viola canescens* Wall. ex Roxb.	Banafsha	L,S,F	Me,Fo
Vitaceae	*Cissus carnosa* L.	Daakh	L,F,Fr	Me,M

L: leaves, S: stems, R: roots, F: flowers, Fr: fruits, Sd: seeds, M: medicinal, Fo: fodder, Fu: fuel, O: ornamental, M: market

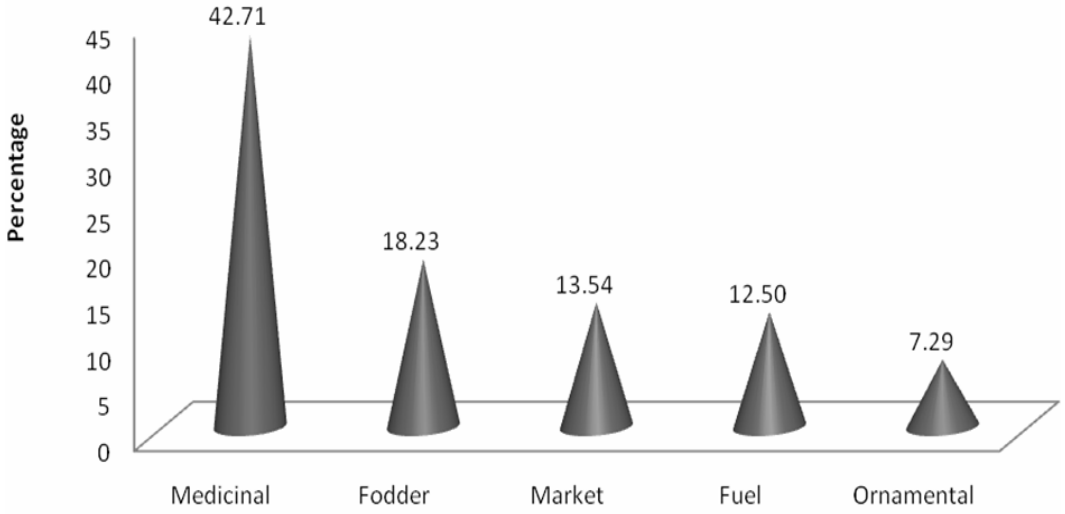

Fig. 2. Consumption percentage of economic plants in Senhsa, district Kotli

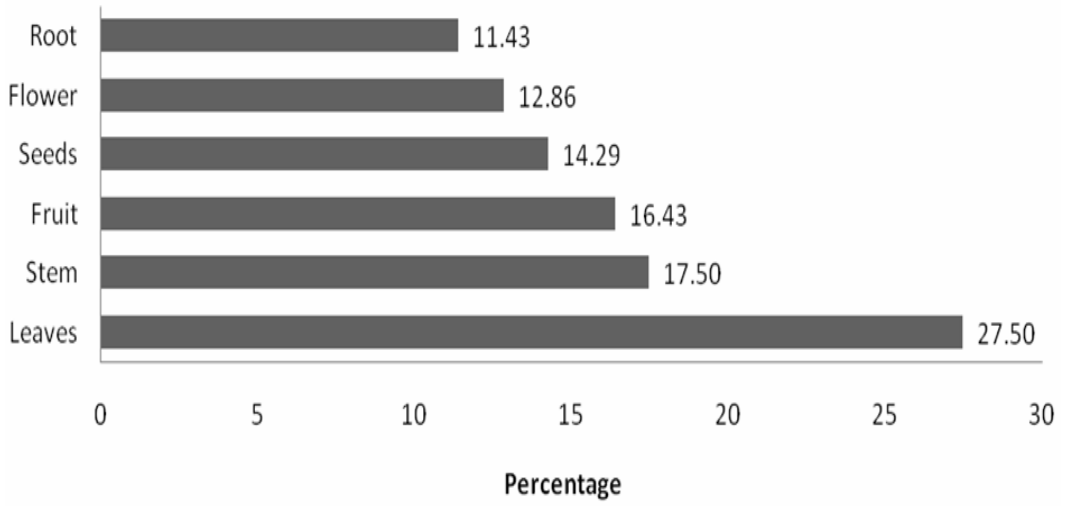

Fig. 3. Usage of plant parts for different economic purposes in Senhsa, district Kotli.

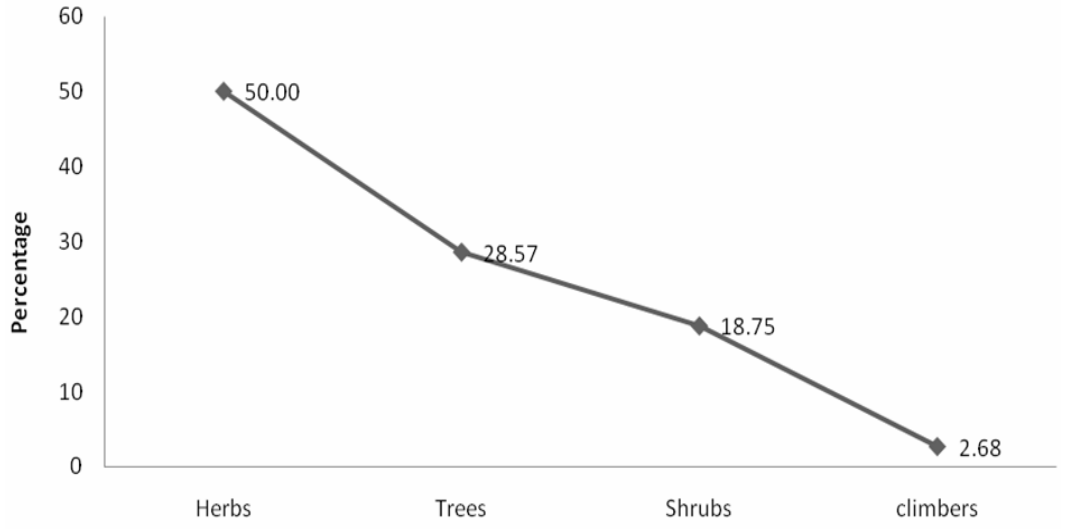

Fig. 4. Life forms of different economic plants in Senhsa, district Kotli.

Table 2. Conservation status of economically important plant species in Senhsa, district Kotli (Azad Jammu & Kashmir).

Conservation status	Plant species
Critically endangered	*Ajuga bracteosa, Jasminum officinale, Mallottus philippinensis, Micromeria biflora, Butea monosperma, Zanthoxylum armatum*
Endangered	*Albizia labbek, Cissus carnosa, Dalbergia sisso, Juglans regia, Lepidium pinnatifidum, Olea ferruginaea,, Pinus roxburghii, Parsicaria nepalensis, Punica granatum, Phyllanthus emblica, Rosa brunonii, Grewia tenax, Trichodesma indica, Viola canescens*
Vulnerable	*Acacia modesta, Arundo donax, Anisomeles indica, Artemisia scoparia, Bombax ceiba, Cynoglossum lanceolatum, Carissa opaca, Ficus palmate, Ficus virgata, Maytinus royleanus, Ipomoea pentaphylla, Mentha royleana, Nerium oleander, Otostegia limbata, Rubus ellipticus, Saccharum spontaneum, Woodfordia fruticosa, Zizipus nummularia*
Data deficient or least concern	*Adiantum venustum, Agave cantala, Achyranthes aspera, Boerhavia diffusa, Bauhinia variegate, Cassia fistula, Cannabis sativa, Calotropis procera, Chrysopogon serrulatus, Cynodon dactylon, Cuscuta reflexa, Dryopteris ramosa, Heteropogon contortus, Justicia adhatoda, Malvastrum coromandelianum, Mentha longifolia, Momordica balsamina, Ricinus communis, Solanum surattense, Taraxacum officinale, Verbascum thapsus, Withania somnifera, Xanthium strumarium*
Agricultural weeds	*Amaranthus spinosus, Amaranthus viridis, Euphorbia helioscopia, Euphorbia hirta, Fumaria parviflora, Lathyrus aphaca, Launaea procumbens, Malva sylvestris, Oxalis corniculata, Rumex nepalensis, Sorghum halepense, Solanum nigrum*
Invasive	*Brossonetia papyrifera, Dodonaea viscosa, Ipomoea carnea, Opuntia dillenii*
Cultivated	*Acacia nilotica, Allium cepa, Allium sativum, Aloe vera, Anethum graveolens, Brassica compestris, Callistemon ctirinus, Capsicum annuum, Citrus limonum, Cordia myxa, Coriandrum sativum, Eriobotrya japonica, Eucalyptus citriodora, Ficus carica, Ficus religiosa, Helianthus tuberosus, Lathyrus odoratus, Luffa cylindrical, Mangifera indica, Melia azadirchta, Morus nigra, Musa paradisiacal, Nicotiana tabacum, Ocimum basilicum, Phoenix sylvestris, Prunus armeniaca, Prunus persica, Pyrus pashia, Raphanus sativus, Rosa chinensis, Sesamum indicum, Sorghum bicolor, Trigonella foerum-gracium, Zea mays, Ziziphus mauritiana*

Fuel wood is likely one of the main causes of forest destruction in the study area, because the winter season is long and very harsh. People need fuel for heating and cooking. The most often reported fuel woods, e.g., *Dalbergia sissoo*, and *Pinus roxburghii* are under immense pressure. Similar study was conducted by Shinwari & Khan (1999) in Margalla Hills National Park, who reported a number of species under high pressure of over-exploitation. The leading threat to the trees and shrubs of the Sulaiman Range is the fuel shortage and that during long and severe winter season a huge amount of wood is used as fuel (Martin, 1995). Alternate sources of energy will prove very encouraging for conservation of floral health in addition to reforestation and sustainable utilization of available resources. Constructive and captivating conservation activities should be based on ethnobotanical study of the area, because it provides basic platform for conservation and community development activities (Martin, 1995).

Local communities depend on farming and livestock rearing. Thirty five species were identified as fodder species in the area. In the summer season, livestock graze upper lands. During the winter season, the livestock is kept inside the sheds or even within the houses due to heavy snow fall in upper mountainous areas. Overgrazing is a common practice in such mountainous areas, as reported by Jabeen (2006) in the moist temperate forest of Nathia Gali. As a result, highly nutritious and palatable species are being gradually replaced by less palatable ones (Table 2). One of the effective solutions is the rotational grazing, which will be very helpful in conservation practices. It is the need of the hour to focus an immediate attention for plant conservation from the government and NGO's with the help of local people by creating awareness in them.

Conclusion and Recommendations

The study showed that the area has plenty of medicinal plants to treat a wide spectrum of human ailments. Lack of compassion in the present generation has wiped out many rich wild flora of the area. It is an urgent need to take action and create awareness about the usefulness of the flora so that people can save this wealth. Cultivation of threatened medicinal plants should be encouraged by the local community in order to relieve pressure on these plants. It is hoped that this study and will provide a useful information on the conservation and sustainable use of the natural resources of the area.

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