

STATUS OF PLANT DIVERSITY AT KUFRI (SOONE VALLEY) PUNJAB, PAKISTAN AND PREVAILING THREATS THEREIN

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Abstract

To examine the species composition in the Soone Valley, Punjab, Pakistan, the Kufri site was selected on the basis of some ecological attributes *i.e.*, topography, soil type and the nature of prevailing disturbances. Data regarding the composition of plant diversity revealed that among the woody leguminous plants *Acacia modesta* was the most commonly occurring species. *Prosopis juliflora* occurred very commonly and formed mono-species stands, while *Dalbergia sissoo* was absent altogether. Among the herbaceous weedy legumes *Medicago polymorpha* and *Melilotus indica* were commonly found during the winter seasons. At higher altitudes *Olea ferruginea* formed a good association with *Acacia modesta*. Throughout the examined site, *Dodonaea viscosa* and *Justicia adhatoda* occurred very abundantly, because both species had resistance for grazing and fuel needs. Cutting of woody plants and shrubs for fuel purposes and their lopping for grazing the domestic animals are the two major threats to the entire local vegetation in this valley. Accidental fires caused by careless honey hunters also, sometimes become uncontrollable and wipe out most of the vegetation to a large extent.

Introduction

Soone Valley in district Khushab (Punjab) Pakistan is considered the heart of the Salt Range. It falls within the subtropical region. The topography of the Soone valley is variable. Average height of the hills in this valley varies from 400 to 1000 m (Khan, 1960). The highest peak (1527 m) is known as Soone Skaser, comprising undulating lands and natural springs. It comprises the famous brine lake "Khabeki" which was declared as "Ramsor, Wetland Habitat", for migratory birds by the Government of Pakistan in 1976 (WWF, 1994; Hussain, 2002).

Some factors like intensive deforestation and unlimited expansion of urban areas have considerably reduced the extent of plant communities world over (Khan, 1960; Boza, 1993). The plant communities are also losing their species richness at high rate due to clear cutting (Johnson *et al.*, 1993) and extensive exploitation of grasslands for rearing animal herds (Peet *et al.*, 1983). Deteriorating environmental conditions such as aridity, soil salinity, soil erosion and acid rain in different parts of the world had forced the ecologists to devise suitable measures for the conservation of highly endangered plant communities (Hussain, 2003).

Table 1. Soil physical and chemical characteristics of the experimental site.

Elevation (m)	714
Slope (%)	64
Aspect	South-western
Soil texture	Sand stone
Moisture contents (%)	10.89
EC (dS m ⁻¹)	3.20
PH	8.48
N mg/g (d.wt)	124
P mg/g (d.wt)	87
K mg/g (d.wt)	69
Habitat description	Moderately slopy
Vegetation type	Dominant herbs with grasses
Plant community	<i>Acacia modesta</i> and <i>Adhatoda vasica</i>

The climate of the Soone Valley remains comparatively less hot and dry during the summer as compared to its fellow lands in the central Punjab, because the windstorms occasionally experienced here usually accompanied with rainfall. The winter remains for a very short duration, during which frost is experienced at some places for a couple of weeks. Due to this considerable heterogeneity in the macro- and micro-environments of the region, large plant and animal diversity is expected to be indigenous to it (GOP, 2003).

It is evident that the information about the Kufri Site (Soone Valley) and its vegetation has been fragmentary and incomplete in the literature. In order to fill this gap this work was undertaken to explore the diversity of plant species at this particular site and identification of possible threats to the precious plant diversity.

Materials and Methods

Site selection and data collection: The study site namely Kufri, located in the Soone Valley, Pakistan was selected mainly on the basis of variation in its ecological attributes, especially topography, hydrology, vegetation type and soil composition. Data were collected from three different habitats considering differences in their aspect, topography and soil type. The soil was analyzed for its physical and chemical properties according to USDA Staff (Handbook-60; 1962) and summarized in Table 1.

Data regarding vegetation was collected by the quadrat method. Ten randomly selected quadrates measuring 10 m² for woody species and 1 m² for herbaceous plant species were taken from each habitat. The numbers of individuals of each leguminous as well as non-leguminous species were counted to work out the density and frequency. The frequency and density of each plant species was worked out using the following formulae:

$$\text{Frequency \%} = \frac{\text{Number of quadrates in which a species occurred}}{\text{Total number of quadrates taken}} \times 100$$

$$\text{Density \%} = \frac{\text{Total number of individuals of a species in a quadrat}}{\text{Total number of individuals of all the species in a quadrat}} \times 100$$

Table 2. Composition of plant diversity indigenous to the Kufri site in the Soone Valley, Punjab, Pakistan.

Species name	Local name	Family	Frequency (%)	Density (%)
Leguminous species				
<i>Acacia modesta</i>	Phulai	Mimosaceae	70	7.32
<i>Acacia nilotica</i>	Kikar	Mimosaceae	20	6.62
<i>Dalbergia sissoo</i>	Shisham	Papilionaceae	-	-
<i>Medicago denticulata</i>	Maina	Papilionaceae	80	12.90
<i>Melilotus indica</i>	Sinji	Papilionaceae	80	10.10
<i>Prosopis juliflora</i>	Walaiti Kikar	Mimosaceae	30	2.44
<i>Sophora mollis</i>	Khumbi	Papilionaceae	20	0.70
<i>Lathyrus aphaca</i>	Dokani	Papilionaceae	-	-
<i>Vicia sativa</i>	Rewari	Papilionaceae	-	-
Non leguminous species				
<i>Achyranthes aspera</i>	Puthkanda	Amarantaceae	10	1.01
<i>Capparis decidua</i>	Karir	Capparidaceae	-	1.40
<i>Dodonaea viscosa</i>	Sanatha	Sapindaceae	70	7.00
<i>Buxus papileosa</i>	Papper	Buxaceae	-	-
<i>Gymnosporia royleana</i>	Kander	Celastraceae	20	0.50
<i>Justicia adhatoda</i>	Bahakar	Acanthaceae	60	2.44
<i>Olea ferruginea</i>	Kao	Oleaceae	60	10.10
<i>Ostegia limbata</i>	Awani	Labiataeae	30	1.05
<i>Salvadora oleoides</i>	Won	Salvadoraceae	-	-
<i>Ziziphus mauritiana</i>	Ber	Rhymnaceae	30	1.40
<i>Ziziphus nummularia</i>	Mallah ber	Rhymnaceae	40	4.00
Grasses & Sedges				
<i>Cynodon dactylon</i>	Khabbal	Poaceae	60	10.10
<i>Saccharum griffithii</i>	Sarkanda	Poaceae	30	4.0
<i>Saccharum spontaneum</i>	Kai	Poaceae	20	3.50
<i>Cyperus rotundus</i>	Deela	Cyperaceae	20	1.74
Other (unidentified)			30	1.40

Threats to plant diversity in this site were identified by interviewing 100 residents of the area including government officials, press reporters, public representatives, NGO representatives and through personal observation.

Results and Discussion

The data presented in Table 2 regarding the composition of plant diversity indigenous to the Soone Valley indicate that overall six leguminous and eight non-leguminous plant species occurred very commonly. Three grasses and one sedge species were also found frequently.

Of the herbaceous legumes, *Medicago polymorpha* and *Melilotus indica* were found more frequently and in the highest density than the others. They formed uniform occurrence in almost all the replicates. As regards woody legumes *Acacia modesta* occurred abundantly followed by *Prosopis juliflora* while *Acacia nilotica* was found with rare frequency (Table 2).

As regards the composition of non leguminous species, broad leaf plant species like *Justicia adhatoda* occurred abundantly, whereas *Dodonea viscosa* was recorded as the dominant plant species, having the highest density as well as frequency of occurrence. *Olea ferruginea* formed a good association with *Acacia modesta* throughout the valley especially at higher altitudes. *Ziziphus mauritiana* occurred with 30% frequency of occurrence. *Ziziphus nummularia* dominated as it had higher density as well as frequency of occurrence (Table 2).

Among the grasses, *Cynodon dactylon* showed the highest density and frequency of occurrence at all the habitats. It was followed by *Saccharum griffithii*, while the frequency of occurrence of *Saccharum spontaneum* was at par with that of *Cyperus rotundus*. The only sedge species *Cyperus rotundus* was recorded in 20% of the quadrates. Ahmed (1964) also observed the same while studying the vegetation of the Salt Range in terms of its frequency and density. He concluded that *Acacia modesta*, *Dodonaea viscosa* and *Olea ferruginea* were dominant species of the region and expressed his view about the imperfectness of the flora collected (Table 2). Similar conclusions were also made by Hussain (2002, 2003).

Chaudhry *et al.*, (2001) conducted some phyto-sociological studies in Chumbi Surla, wildlife sanctuary, Chakwal in close vicinity to Soone Valley in terms of density and frequency of different plant and animal species. They also examined *Acacia modesta* among the broadleaved and *Cynodon dactylon* among the grasses are most dominant and palatable species. They also emphasized the need of improving the status of useful trees like *Olea ferruginea*, *Dodonaea viscosa* and *Ziziphus nummularia*.

Overall, the increasing population pressure in the Soone Valley is the greatest threat not only to plant bio-diversity, but to all the natural resources (Hussain, 2002). The direct evidence to account for the presence of poor vegetation is the aridity of the valley. It is also reported in the literature that 2000 to 3000 years ago heavy rainfall was observed in this region followed by progressive desiccation was noted (Hussain, 2002, 2003). It is possible that the forest has been destroyed both by the biotic influence and due to desiccation confronting this area. Large-scale deforestation has progressively increased the regional temperature (Ahmed, 2002) and devastated the vegetation of the entire Soone Valley. Hence, the slopes once covered by lush green forests have now become almost barren.

Undoubtedly, fuel, timber and fodder are important commodities for livelihood and wood cutting for these essential items is a great dilemma. Unwise cutting and clearing of forests result in extensive loss of plant and animal biodiversity (Chaughtai & Yousaf, 1976). So cutting of a large number of plants in the forests of Soone Valley being a routine practice may also be regarded a major threat to plant diversity (Khan, 1960; Ali *et al.*, 1987; Marwat, 1988).

In the site most of the villages are located at an elevation of 7,50 meter above sea-level, so it takes more time to cook food due to slightly lower atmospheric pressure and chilling in winters. These factors enhance the requirement of fuel wood. Furthermore, *Olea ferruginea* branches are frequently cut to fulfill the demand of the local market. These branches are processed into fancy walking sticks and sold in the markets of large cities of Pakistan (Ahmed, 2002; Hussain, 2003). All these anthropogenic factors lead to deforestation of the area thereby disturbing the plant diversity therein.

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