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Phytosociological Assessment of Natural Reserve of National Park Lalsuhanra (Punjab, Pakistan)

Mohammad Arshad, ¹Salah-ud-Din, Altaf-ur-Rehman Rao
Cholistan Institute of Desert Studies, Islamia University, Bahawalpur, Pakistan
¹University of Agriculture, Faisalabad, Pakistan

Abstract: To analyze the vegetation a phytosociological study of fenced and unfenced reserves of National Park Lalsuhanra was conducted. Three sites were selected at i) fenced unirrigated ii) fenced irrigated iii) unfenced desert area. Three quadrats measuring 100 x 100 m² were laid on each site to record the frequency, density and coverage of plant species. Plant communities were determined on the basis of Importance Value Index (IVI) and each was named after the leading species. A total of 19 plant species in the fenced unirrigated, 17 in fenced irrigated and 13 in unfenced, unirrigated desert area were recorded. Plant communities recognized were 1) *Farsetia hamiltonii*-*Stipagrostis plumosa*, in fenced unirrigated 2) *Cymbopogon jvarancusa* - *Fagonia cretica* in fenced irrigated and 3) *Stipagrostis plumosa* - *Acacia jacquemontii* in unfenced unirrigated desert area. The natural vegetation of all the three sites in the reserve areas of National Park Lalsuhanra was mainly herbaceous but in degrading form. Because of overgrazing the vegetation cover in unfenced desert areas was in decreasing state as compared to protected area.

Key words: Phytosociology, natural reserve, habitats, plant communities, national park

Introduction

National Park Lalsuhanra is an important segment of Cholistan desert lies between 28-29° Northern latitude and 71-73° Eastern latitude having an altitude 350'-375' above the sea level. It is a treasury of natural and historical land-mass spreading over 1,27,480 acres, with 20,974 acre area reserved for irrigated plantation, 1,01,726 acres are dry-land (desert area) and 4,780 acre are wet-land (Pond/Lake) (Shah, 1990). Scientific information relating to the composition of vegetation was considered a prerequisite for proper rehabilitation of this area because this forms the basic element for the conservation of important and endangered flora and fauna of Cholistan desert it forms the basic element.

In Pakistan some quantitative investigations on plant communities of different areas have been conducted where much stress has been paid on their phytosociological aspects (Imtiaz-ul-Haq and Khattak, 1982a, 1982b; Ahmad, 1986; Kayani 1984; Tareen, 1990 and 1991; Chughtai *et al.*, 1978; Dasti and Agnew 1994; Akbar and Arshad 1999) but very little on Lalsuhanra National Reserve. Rao *et al.* (1989) studied the Cholistan desert and identified eleven distinct phytosociological categories distinguished by the most plants were found to be site specific.

The aim of the present investigation was to study the phytosociology and degree of dominance among the plant species along with the determination of major plant communities in the reserve area of National Park Lalsuhanra. It is expected that findings obtained from this study will provide some benchmark of the flora for future developmental aspects of this biosphere reserve (National Park Lalsuhanra).

Materials and Methods

Study area: National Park Lalsuhanra is located 32 km East of Bahawalpur city on the both sides (Banks) of the Canal Desert Branch. Part of the park located on the left bank of the canal is irrigated and is artificially planted with endemic tall tree species, while the other part of the park on the right side is fenced but remains natural scrub type (rainfed).

Three distinct sites were chosen in the area for phytosociological study of vegetation. First study site Pati Sar was selected in the fenced enclosure receiving no irrigation. Second study site Ladam Sar was in a fenced enclosure, receiving regular irrigation. The third study site (25/RD) was open free grazing area. The soil at the study sites was sandy to loam showing very poor water holding capacity thus generally remained dry, poor in organic matter and nutrition but high in salinity and sodicity.

Vegetation Study: The vegetation was studied by quadrat method (Oosting, 1957; Chul and Moody, 1983). In each study site criteria for the selection of a stand were, adequate size of sample area and relatively visual homogeneity of vegetation. From each site three quadrats measuring 100 x 100 m², having four sub-quadrats of 10 x 10 m², (one in each corner of the 100 x 100 m² quadrat) were established for the study of vegetation. Data on quantitative phytosociological attributes such as frequency, density, and

plant cover was recorded during 1995.

Vegetation analysis: Quantitative vegetation parameters viz., relative density, relative frequency and relative cover for each plant species were computed from the quadrat data. The Importance Value Index (IVI) for each species was obtained by direct summation of relative density, relative frequency and relative cover following Curtis and McIntosh (1951), Chul and Moody (1983), Mueller-Dombois and Ellenberg (1974). The species having the highest IVI were considered as the leading dominants of the community. Other vegetation recorded in the community area was grouped as dominants, co-dominants, associates and rare plant species. When two or three plant species closely approached each other in order of IVI value the community shared the names of these dominants (Marwar *et al.*, 1990).

Results and Discussion

Phytosociological inventory based upon IVI in the fenced area receiving no irrigation (Pati Sar) showed a total of 19 plant species. *Farsetia hamiltonii* and *Stipagrostis plumosa* having importance values index 47.27 and 33.36 emerged as leading dominants at this study site (Table 1). Dominant and co-dominant species arranged in decreasing order of Importance Value Index were *Tamarix dioca*, *Calligonum polygonoides*, *Lasiurus scindicus*, *Haloxylon salicornicum*, *Prosopis cineraria* and *Aeluropus lagopoides*. While *Suaeda fruticosa*, *Capparis decidua* and *Cymbopogon jvarancusa* were the associated plant species of this plant community. The remaining species i.e., *Ochthochloa compressa*, *Leptadenia pyrotechnica*, *Tribulus longepetalus*, *Dipterygium glaucum*, *Cenchrus ciliaris*, *Tribulus terrestris*, *Eragrostis barrelieri* and *Heliotropium strigosum* were distinguished as the rare number of this community area.

At fenced and irrigated area (Ladam Sar) a total of 12 plant species were recorded (Table 2). The plant community emerged at this study site was characterized by the dominance of *Cymbopogon jvarancusa* and *Fagonia cretica* having Importance Value Index 49.43 and 32.82. In order of Importance Value Index the dominants and co-dominants recorded in this community area were *Haloxylon salicornicum* (22.51), *Prosopis cineraria* (22.51), *Ochthochloa compressa* (21.38), *Acacia nilotica* (19.35) and *Sccharum munja* (17.14). *Capparis decidua*, *Aerva persica*, *Salsola baryosma* and *Tamarix dioca* were the associated plant species having an Importance Value Index of 12.71, 11.92, 10.46, and 10.17, respectively. While *Withania somnifera* was identified as rare plant species of this community area.

In unprotected desert area (25/R.D) a total of 13 plant species were recorded (Table 3) out of which *Stipagrostis plumosa* and *Acacia jacquemontii* having 68.68 and 53.35 Importance Value Index emerged as leading dominants in this community. According to the Importance Value Index dominant and co-dominant species were *Haloxylon salicornicum* (30.63), *Lasiurus scindicus* (30.11), *Calligonum polygonoides* (28.87), *Heliotropium strigosum* (25.26) and *Farsetia hamiltonii* (16.37). *Cymbopogon jvarancusa* and *Ochthochloa compressa* were the associated plant species having IVI 14.53. While

Table 1: Summary of phytosociological data at fenced and un-irrigated reserve area of National Park Lalsuhanra (Pati Sar)

Plant species	Rel. density	Rel. frequency	Rel. cover	Importance Value Index
<i>Farsetia hamiltonii</i>	37.32	8.33	1.62	47.27
<i>Stipagrostis plumosa</i>	23.90	8.33	1.13	33.36
<i>Tamarix dioica</i>	0.38	4.16	23.00	27.54
<i>Calligonum polygonoides</i>	0.70	8.33	18.42	27.45
<i>Lasiurus scindicus</i>	6.47	11.11	4.72	23.70
<i>Haloxylon salicornicum</i>	2.02	9.72	5.82	15.56
<i>Prosopis cineraria</i>	3.94	5.55	5.77	15.26
<i>Aeluropus lagopoides</i>	10.14	4.16	0.84	15.14
<i>Suaeda fruticosa</i>	4.71	6.94	2.49	14.14
<i>Capparis decidua</i>	0.04	1.38	9.99	11.41
<i>Cymbopogon jvarancusa</i>	3.94	4.16	2.06	10.16
<i>Ochthochloa compressa</i>	0.58	1.38	6.24	8.20
<i>Leptadenia pyrotechnica</i>	0.04	1.38	6.68	8.10
<i>Tribulus longipetalus</i>	0.31	2.77	3.74	6.82
<i>Dipterygium glaucum</i>	1.01	4.16	1.64	6.81
<i>Cenchrus ciliaris</i>	1.44	2.77	1.87	6.08
<i>Tribulus terrestris</i>	0.78	1.38	1.56	3.72
<i>Eragrostis barrelieri</i>	0.97	1.38	0.62	2.97
<i>Heliotropium crispum</i>	0.47	1.38	0.97	2.78

Table 2: Summary of phytosociological data at fenced and irrigated reserve area of National Park Lalsuhanra (Ladam Sar)

Plant species	Rel. density	Rel. frequency	Rel. cover	Importance Value Index
<i>Cymbopogon jvarancusa</i>	10.20	34.46	5.07	49.43
<i>Fagonia cretica</i>	10.20	20.19	2.43	32.82
<i>Haloxylon salicornicum</i>	4.08	11.34	11.26	22.51
<i>Prosopis cineraria</i>	12.24	2.85	7.42	22.51
<i>Ochthochloa compressa</i>	4.08	10.50	6.80	21.38
<i>Acacia nilotica</i>	10.20	4.48	4.67	19.35
<i>Saccharum munja</i>	10.20	2.64	4.30	17.14
<i>Capparis decidua</i>	2.04	0.09	10.58	12.71
<i>Aerva persica</i>	2.04	0.81	9.07	11.92
<i>Salsola baryosma</i>	4.08	2.23	4.15	10.46
<i>Tamarix dioica</i>	6.12	0.91	3.14	10.17
<i>Withania somnifera</i>	2.04	0.09	1.51	3.64

Table 3: Summary of phytosociological data at un-fenced and un-irrigated reserve area of National Park Lalsuhanra (25/R.D)

Plant species	Rel. density	Rel. frequency	Rel. cover	Importance Value Index
<i>Stipagrostis plumosa</i>	16.90	51.30	0.68	68.68
<i>Acacia jacquemontii</i>	2.81	0.15	50.39	53.35
<i>Haloxylon salicornicum</i>	15.49	1.86	13.28	30.63
<i>Lasiurus scindicus</i>	15.49	9.22	5.40	30.11
<i>Calligonum polygonoides</i>	12.67	0.67	15.53	28.87
<i>Heliotropium strigosum</i>	9.85	14.43	0.98	25.26
<i>Farsetia hamiltonii</i>	5.63	8.47	2.27	16.37
<i>Cymbopogon jvarancusa</i>	8.45	3.65	2.43	14.53
<i>Ochthochloa compressa</i>	4.22	9.50	0.63	14.35
<i>Leptadenia pyrotechnica</i>	2.81	0.27	0.90	5.07
<i>Salsola baryosma</i>	1.40	0.31	2.72	4.43
<i>Fagonia cretica</i>	1.40	0.03	2.72	4.15
<i>Cenchrus ciliaris</i>	2.81	0.07	0.90	3.78

Leptadenia pyrotechnica, *Salsola baryosma*, *Fagonia cretica* and *Cenchrus ciliaris* were distinguished as rare members of this community with Importance Value Index of 5.07, 4.43, 4.15 and 3.78, respectively. The results described above indicate that the natural vegetation of all the three study sites in the reserve areas of National Park Lalsuhanra is mainly

herbaceous but in degrading form. Because of overgrazing the vegetation cover in unfenced desert area was in decreasing state as compared to other sampled sites. The fenced area showed a dominance association trends of grass - shrub land and woodlands.

On the basis of this study it is plausible to conclude that protection of the natural flora of the area from over grazing is necessary, especially during the time when the desirable plants set their seeds. Protection is essential to maintain the desirable forage plant species in a good proportion, to avoid invader plant species and to rehabilitate the natural flora.

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