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VEGETATION ASSESSMENT OF SAWAN WARI OF NARA DESERT, PAKISTAN

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Abstract

Vegetation assessment of Sawan Wari of Nara Desert was carried out in the month of October, 2001. Different vegetation parameters like cover, frequency and density were recorded using Quadrate method. These values were computed to obtain Importance Value Index (IVI) and plant communities were delineated. Five plant communities were constructed from 5 distinct habitats i.e., 1) *Phragmites-Typha-Saccharum* in wetland; 2) *Calligonum-Dipterygium-Salvadora* in desert; 3) *Saccharum-Pluchea-Typha* in marshland; 4) *Desmostachya-Brachiaria-Cynodon* in agriculture habitat and 5) *Salvadora-Desmostachya-Posopis* in protected forest. The most densely populated species was *Typha elephantina* followed by *Salvadora oleoides, Saccharum bengalense, Phragmites karka, Saccharum spontaneum, Prosopis juliflora* and *Dipterygium glaucum* with various IVI values. The most frequent species *Euphorbia prostrata* was present in all habitats, followed *Alhagi maurorum, Desmostachya, Saccharum spontaneum* found in 4 habitats. A total of 136 plant species belonging to 73 genera and 44 families have been identified. In addition one species of fern, one species of gymnosperm, 6 sedges and 25 species of Poaceae were determined. The leading plant families which played a key role in the formation of vegetation of the study were Poaceae (18.38%), Fabaceae (8.82%), Amaranthaceae (5.15%) and Convolvulaceae, Cyperaceae (4.14% each).

Introduction

"Sawan Wari**"** the study area, is located on both, the right and left bank of Nara canal. This canal is perennial one, emerges from Sukkur Barrrage on left bank of River Indus. It flows southeastward through the District Sukkur, Khairpur and ends in Sanghar. It irrigates on both its sides. Wheat, cotton sugarcane and cluster bean are major crops cultivated in its vicinity. It lies between 26° 44' to 26° 56' 30" north latitude and 68° 53' to 69° in east longitudes.

The major components of this area are: (a) Wetland Area, (b) Desert, (c) Marshland, (d) Agricultural land/Cultivated land and (e) Protected Forest. Both the banks of Nara canal became wetland under constant seepage and over flowing of canal water in summer.

The study area is recognized as a desert (Nara) due to the presence of large number of sand dunes (*Bhitt*). The word desert in its real sense is Latin one "*desertire*", meaning abandoned. It emphasizes lack of water; refers to a dry, barren, treeless region, usually sandy (a region of arid nature). There are a number of definitions of desert. The one, keeping in consideration the climate as well as vegetation could be as "an area in which the annual potential evapo-transpiration is greatly in excess of the annual precipitation, where the development of biota is over a substantial part of the year largely limiting by the availability of water and where a close canopy of vegetation is not formed. This falls under an Arid/Semi Arid region. There is low and unevenly distributed rainfall, low humidity, high air temperature with diurnal and seasonal ranges, high wind velocity, soil too poorly developed to show any structure and organic matter (Agarwal, 1991). Such conditions are resulted in changing the flora of the area. Due to hostile climate of the desert areas of the country, proper attention could not be given by scientist and only few studies on the flora have been reported (Chaudhri & Chuttar, 1966; Bhatti *et al.*, 2001).

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A number of studies have been reported on the vegetation of different zones of world (Kandari, 1990; Hajra & Rao, 1990; Asmus, 1990; Shimizu, 1991; Sing & Gupta, 1992; Hussain & Shah, 1989; Hussain *et al.*, 1992, 1995 and 2000). A few papers have been published/presented from the Nara Desert (Bhatti *et al.*, 1998, 2001; Qureshi *et al.*, 2001 and 2006; Qureshi and Bhatti, 2008a, 2008b). But no study was undertaken reporting the vegetation of this area. The present study was carried out to evaluate the plant life of the study area. To the best of our knowledge, this area did not botanize and nothing has been written with reference to its flora. Therefore, this is a first attempt on the vegetation of this area.

Materials and Methods

The vegetation study was undertaken in the month of October, 2001. Seventy-five quadrates measuring 20X20m ($400m^2$) were taken from different habitats after every 1-2 km range. The quantitative account of vegetation such as cover, density and frequency were recorded using Quadrate method by following the work of Braun-Blanquet (1932). Importance Value Index (IVI) was obtained for each species that was calculated by adding relative density, relative frequency and relative cover percentages and divided by three. On the basis of highest IVI, sampled vegetation was delineated into different plant communities. When two or more species closely approached each other in order of IVI, the community shared the names of these dominants. The community was named on the basis of highest IVI (Qureshi and Bhatti, 2001). Species other than the dominants were classified into co-dominants, associates and rare. Plants were identified with the help of floristic literature (Jafri, 1966; Nasir & Ali 1970-1989; Ali & Nasir 1990-1991; Ali & Qaiser, 1993-2001; Matthew, 1981-83; Batanouny, 1981; Boulos, 1991; Shetty & Singh, 1987 & 1991; Bhandari, 1978; Qureshi, 2004).

Results

Five plant communities were found in five distinct habitats such as 1) *Phragmites-Typha-Saccharum* in wetland; 2) *Calligonum-Dipterygium-Salvadora* in desert; 3) *Saccharum-Pluchea-Typha* in marshland; 4) *Desmostachya-Brachiaria-Cynodon* in agriculture habitat and 5) *Salvadora-Desmostachya-Posopis* in protected forest (Table 1). Eleven species contributed in the formation of plant communities of the area under study. The most densely populated species was *Typha elephantina* followed by *Salvadora oleoides, Saccharum bengalense, Phragmites karka, Saccharum spontaneum, Prosopis juliflora* and *Dipterygium glaucum* with various IVI ranges (Table 2).

The most frequent species *Euphorbia prostrata* which was present in all habitats followed by *Alhagi maurorum, Desmostachya bipinnata* and *Saccharum spontaneum* found in 4 habitats. There were 60 species found in two habitats; while 58 species were present in a single habitat. A total of 136 plant species belonging to 73 genera and 44 families have been identified. In addition one species of fern, one species of gymnosperm, 6 sedges and 25 species of Poaceae were determined. The leading plant families which played a key role in the formation of vegetation of the study were Poaceae (18.38%), Fabaceae (8.82%), Amaranthaceae (5.15%) and Convolvulaceae, Cyperaceae (4.14% each).

Table 2. ANOVA of Plants which contributed for delineation of plant communities in Sawan Wari.

Dominant species	Sum	Average	Variance
Brachiaria eruciformis (J.E. Smith) Griseb.	52.84	10.568	209.6937
Calligonium polygonoides L.	46	9.2	230.4602
Cynodon dactylon (L.) Pers.	37.48	7.496	113.7235
Desmostachya bipinnata (L.) Stapf.	106.05	21.21	169.3466
Dipterygium glaucum Decne.	51.49	10.298	237.4296
Phragmites karka (Retz.) Trin	35.57	7.114	253.045
Pluchea lanceolata Oliv & Hiern.	41.6	8.32	193.4112
Saccharum bengalensis Retz.	86.91	17.382	295.5185
Saccharum spontaneum L.	103.9	20.78	251.4126
Salvadora oleoides Decne.	63.83	12.766	309.9955
Typha elephantina Roxb.	65.43	13.086	323.1317
Habitat			
Wetland	179.09	16.28091	262.5995
Desert habitat	119.16	10.83273	212.5846
Marshy habitat	141.02	12.82	233.3358
Agricultural/Cultivated habitat	111.74	10.15818	204.2199
Protected forest	140.09	12.73545	226.9704

The typical vegetation of different habitats is discussed below:

1. Wetland habitat: This habitat is established on both the banks of Nara canal. In total 52 plant species were recorded from this habitat. The plant community *Phragmites-Typha-Saccharum* was dominating this habitat comprising of *Phragmites karka, Typha elephantina* and *Saccharum bengalense* (Table 1). Furthermore, second sub-community consisting on *Fimbristylis acuminata, Brachiaria eruciformis* and *Cyperus difformis* was found in the studied habitat. The other allied species include *Saccharum spontaneum, Populus euphratica, Digera muricata, Cyperus iria* and *Oxystelma esculentum*. Four species viz., *Brachiaria eruciformis, Cyperus rotundus, Phragmites karka, Saccharum bengalense* and *Typha elephantina* were very frequently distributed throughout the habitat whereas, 13 species were found as rare.

2. Desert habitat: Sand and hummocky dunes are main characteristic features of this habitat. They vary in their height ranges from few meters to above 80 meters. A long dry spell prevails since last 5 years. Hence, the herbaceous communities and ephemeral species could not emerge in these years. This habitat was dominated by *Calligonum-Dipterygium-Salvadora* plant community consisting on *Calligonum polygonoides, Dipterygium glaucum* and *Salvadora oleoides* (Table 1). In addition, *Ochthochloa-Stipagrostis-Tribulus* was found as second sub-community in this habitat. The species composition of the later community was *Ochthochloa comressa, Stipagrostis plumosa* and *Tribulus longipetalus.* The other associated common species include *Limeum indicum, Tamarix aphylla, Mollugo cerviana and Aerva javanica.* The well developed shrubs like *Calligonum polygonoides*, *Aerva javanica* and trees *Tamarix aphylla, Prosopis cineraria, Salvadora oleoides* and *Capparis decidua* manifest the permanent landscape over the dunes and interdunal gaps in this zone. Based on frequency%, *Calligonum polygonoides, Dipterygium glaucum* and *Limeum indicum* were very commonly observed in the area; whereas 15 species were rarely recorded from the studied habitat. In all 46 species are observed in this habitat.

3. Marshy habitat: There is no fresh water lake in this area, whereas few ponds/lakes have been observed around. These are formed as a result of seepage of Nara canal and become a waterlogged habitat. There were 36 species reported from this habitat Plant community *Saccharum-Pluchea-Typha* was found dominating in this habitat (Table 1). Species compositions of this association include *Saccharum spontaneum, Pluchea lanceolata* and *Typha elephantine*, whereas, *Prosopis cineraria, Trianthema triquetra* and *Typha domingensis* were co-dominant species associated together (Table 1). The commonest species of this habitat were *Saccharum spontaneum* and *Pluchea lanceolata* followed by *Prosopis cineraria, Trianthema triquetra* and *Typha* spp. Seven species were found rare within the habitat (Table 1).

4. Agriculture/Cultivated fields habitat: This habitat was located in between dunes (*valleys*). In all, 37 species were recorded from this habitat. *Desmostachya-Brachiaria-Cynodon* community dominated over this habitat (Table 1). The second sub-community was comprised of *Achyranthus aspera, Alhagi maurorum, Dactyloctenium aegyptium* and *Cenchrus ciliaris.* The common species of this habitat were *Achyranthus aspera, Brachiaria eruciformis, Cynodon dactylon* and *Desmostachya bipinnata* whereas, 5 species were found as rare.

5. Protected forest habitat: Since this is a protected habitat, therefore it had rich diversity with reference to its flora. Maximum number of species were recorded as compared to other habitats i.e. 65 species. *Salvadora oleoides, Desmostachya bipinnata* and *Posopis juliflora* were forming a dominant plant community within this protected area. The other allied sub-community comprised of *Saccharum spontneum, Crotalaria burhia, Aristida funiculata, Acacia jacquemontii* and *Cocculus pendulus* (Table 1). The fairly distributed species of this habitat were *Desmostachya bipinnata, Saccharum spontaneum, Prosopis cineraria, Aristida* spp., *Cleome scaposa* and *Dactyloctenium aegyptium* whereas 20 species were rarely observed.

Discussion

The highest species richness was recorded from protected forest (62 spp.) followed by wetland habitat (52 spp.), Desert (48 spp.) Agriculture habitat (39 spp.) and Marshland (35 spp.). This gradual decrease of richness might be due to overexploitation of resource base and degradation of vegetation within the studied habitats. Another reason could be climatic factors which influenced the distribution of species in certain habitats. This sort of studies has been reported from in and outside of the country. Hussain *et al.* (2000) studied the vegetation of Ghalegay hills, District Swat and recorded plant associations of three vegetation zones such as Subtropical semi-evergreen, subtropical chir pine and blue pine temperate zones. Their study supported three communities within three ecological zones of the study area. Likewise, Celik *et al*., (2003) carried out a vegetation study of Dilek Peninsula-Great Menderes Delta national park. They discovered 3 new plant associations. Similarly, Ahmad *et al.*, (2007) studied vegetation of Soon Valley with particular reference to leguminous plants. The results obtained on various parameters for species importance studied in Chotiari reservoir agree with the work of aforementioned studies. Similar type of studies had also carried out by Austin & Heyligers (1989) and Kirk-Patrick (1990).

During the study it has been observed that the vegetation of this area was under enormous biotic pressure for forage, fuel wood, timber wood, etc. These anthropogenic activities appeared to be a continuous threat for native species.

It is therefore suggested that

- Those species which are growing windward side of sand dunes should be conserved, because they are providing potential protection against wind erosion.

- The chopping and lopping of mature/under mature trees like *Prosopis cineraria*, *Tamarix aphylla* and *Salvadora oleoides* growing on the low-lying area (Valleys) should be avoided because of their usefulness for livestock. Not only this, they are providing excellent shade to flocks of animals in scorching summer.

- Very rare species such as *Neurada procumbens*, *Cleome brachycarpa* and *Boerhavia procumbens* should be properly conserved.

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