ANALYZING THE HERBACEOUS FLORA OF LOHI BHER WILDLIFE PARK UNDER VARIABLE ENVIRONMENTAL STRESS

SHEIKH SAEED AHMAD[*] AND HUMA EHSAN

Department of Environmental Sciences Fatima Jinnah Women University Rawalpindi

Abstract

A study was conducted in Lohi Bher Wildlife Park, to identify the species grouping in relation to environmental factors. The floristic composition was analyzed using multivariate analysis technique Canonical Correspondence Analysis (CCA). A total of 35 herbaceous plant species from 66 quadrats were recorded. The study demarcated the vegetation structure and its relationships to selected environmental factors. The most important factor influencing the herbaceous vegetation was soil moisture. Linear model response curve justified the fact that *Cymbopogon jwarancusa* showed least stress against soil moisture. Whereas with reference to maximum stress the species showed diverse response, indicating that soil moisture plays a major role in species assemblage. This study provides the basic information to preserve and improve the roadside vegetation, of for reservation native flora.

Introduction

The most important thing in protection and management of habitats and wildlife is vegetation. With the rapid shifting in distribution of species and wide-ranging resulting from ongoing global environmental change, it is probable that in few decades few plant communities will completely disappear and appearance of entirely novel communities will occur (Jennings e*t al*., 2009). Protected areas are designed to safeguard the rich diversity of plants and animal life on earth. Natural ecosystems and the habitat they contain are subjected to some degree of control and protection for conservation of vegetation (Sinha, 1998). Wildlife Sanctuary mostly former princely hunting grounds, now to be off limits to the public, with similar prohibitions as for a national park, plus a ban on the introduction of exotic species and domestic animals (Mallon & Kingswood, 2001).

Study of floristic composition of vegetation is crucial for conservation management by providing habitats for wildlife and contributing to the ecologically sustainable management of natural resources (Ejtehadi *et al*., 2005; Tastad *et al*., 2010). Vegetation documentation and classification are efforts required for biological conservation, from planning and inventory to direct resource management (Jennings *et al*., 2009). Canonical Correspondence Analysis identifies the relationships between environmental factors and plant species and indicates differences in plant species composition. Combining the data of climate, vegetation and soil by CCA shows that the distribution of vegetation is closely related to the variety of climate and to soil distribution (Ali & Kauser, 2006; Hussain *et al*., 2011). CCA is used to evaluate the effect of soil type, topography because they are the main factors affecting woody vegetation of the locality (Jabeen & Ahmad, 2009). A study was conducted by Ali & Malik (2010) in Islamabad in drain passages to assess vegetation communities and their relationship with underlying soil properties using CCA, explaining the effect of soil physio-chemical properties on distribution pattern of vegetation. Similar study was conducted by Ahmad *et al*. (2010). They analyzed roadside vegetation in Abbottabad by using multivariate analysis techniques i.e CCA. Results showed 63 plants species and 5 major communities along major roadsides. A study was conducted by Jabeen & Ahmed (2009) in Ayub National Park, Rawalpindi .applied CCA to determine the soil vegetation relationship and to classify floristic composition of Ayub National Park. CCA results showed the grouping of vegetation with edaphic factors i.e., soil EC, pH and heavy metals detection.

Islamabad is located in the Pothohar Plateau in the north of the country at 33°26′N 73°02′E / 33.43°N 73.04°E / 33.43; 73.04 at foot of the Margalla Hills. Wildlife Park Lohi Bher is situated on Islamabad Lahore, Highway, about 7 kilometers from the Islamabad International Airport. The objectives of the present study was to analyze and quantify the vegetation in Lohi Bher Wildlife Park using ordination techniques, and to recognize the species assemblage under the influence of different environmental variables causing stress in species assemblage.

Material and Methods

Vegetation data of Lohi Bher Wildlife Park was taken by quadrat method. Within each quadrat, herbaceous plants and their estimated cover values were recorded using visual estimation by the Domin cover scale (Kent & Coker, 1995). For the clear communities demarcation study area of Lohi Bher Wildlife Park can be divided into two zones. Zone 1 of study area was located on the left side of main road of Lohi Bher Wildlife Park. Twenty four quadrats were laid down in Zone 1. Zone 2 of study area was located on right side of main road of Lohi Bher Wildlife Park. In this distribution of plant communities was recorded from 42 quadrats. Sampling was done during the months of April to late June. Quadrat size of 1×1 m^2 was used because mostly herbs and shrubs were present in the area. Quadrats were laid down randomly. The spring season starts in April, when most of the plants are in flowering stages. Species were identified and deposited in herbarium of Fatima Jinnah Women University, Rawalpindi and nomenclature was followed by Nasir & Ali (1972).

Results

Using CCA the data was subjected for response curve analysis to identify relationship between vegetation and environmental variable. A total of 35 species belonging to 22 families were recorded from 66 quadrats in Lohi Bher Wildlife Park (Table 1). To ascertain the better understanding only ten dominating species were described and discussed. The response curve of different species against environmental variables was analyzed using soil moisture as an environmental variable. Linear model was used to construct the symmetrical distributions.

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*Corresponding author E-mail: drsaeed@fjwu.edu.pk 00 92 321 5167726

Table 1. Complete list of species/families found in Lohi Bher Wildlife Park, Islamabad.

S. No.	Botanical name (Species)	Families
1.	*Malvastrum Coromandelianum* (L.)	Malvaceae
2.	*Achyranthes Aspera* L.	Amaranthaceae
3.	*Justicia adhatoda* Nees	Acanthaceae
4.	*Asphodelus tenuifolius* Cavan.	Asphodelaceae
5.	*Chenopodium album* L.	Chenopodiaceae
6.	*Cannabis sativa* L.	Cannabinaceae
7.	*Oenothera rosea* Soland.	Onagraceae
8.	*Taraxacum officinale* Weber	Asteraceae
9.	*Aristida cyanatha* Nees ex Steud.	Araucariaceae
10.	*Gnaphalium* sp.	Asteraceae
11.	*Allium caeruleum* Pall.	Alliaceae
12.	*Ajuga parviflora* Bth.	Lamiaciae
13.	*Parthenium hysterophorus* L.	Asteraceae
14.	*Cymbopogon jwarancusa (jones)* Schult.	Poaceae
15.	*Lactuca serriola* L.	Asteraceae
16.	*Torilis leptophylla* (L.)	Apiaceae
17.	*Linum strictum* L.	Linaceae
18.	*Anagallis arvensis* L.	Primulaceae
19.	*Galium aparine* L.	Rubiaceae
20.	*Lepidium pinnatifidum* Ledeb.	Brassicaceae
21.	*cenchrus setigerus* Vahl	Poaceae
22.	*Carthamus oxyacantha* M.B.	Asteraceae
23.	*Capsella bursa-pastoris* (L.) Medic.	Brassicaceae
24.	*Convolvulus arvensis* L.	Convolvulaceae
25.	*Conyza Canadensis* (L.)	Asteraceae
26.	*Centaurea calcitrapa* L.	Gentianaceae
27.	*Croton* sp.	Euphorbiaceae
28.	*Calendula* sp.	Asteraceae
29.	*Enneapogon* sp.	Gramineae
30.	*Medicago polymorpha* L.	Fabaceae
31.	*Euphorbia helioscopia* L.	Euphorbiaceae
32.	*Heliotropium anomalum* Hook. & Arn.	Boraginaceae
33.	*Oxalis pes-caprae* L.	Oxalidaceae
34.	*Nasturtium officinale* R. Br.	Brassicaceae
35.	*Inula* sp.	Asteraceae

In zone 1 a total of 32 species belonging to 19 families were recorded from 24 quadrats of study area. All species of zone 1 showed different response against soil moisture than over all species of study area. *Cymbopogon jwarancusa* was at top because its upper quartile is 70 and lower quartile was 40 while median was 65 with respect to soil moisture. *Anagallis arvensis* was below *Cymbopogon jwarancusa* because it had upper quartile 60 and lower quartile 20, median 42.5. *Linum strictum* had upper quartile 45 and lower quartile 20 while median 40. *Cannabis sativa* had upper quartile 55 and lower quartile 0 and median about 37.5. *Nasturtum officinale* had 0 upper quartile and 0 lower and 0 median that is why it was at the point lowest of all as in Fig. 1.

A total of 34 species belonging to 21 families were recorded from 42 stands in zone 2 of study area. As per analysis *Cymbopogon jwarancusa* was at top and showed very less stress with reference to soil moisture because its upper quartile was 90 and lower quartile was 55 while median was 75 with respect to soil moisture. *Aristida cynathe* was below *Cymbopogon jwarancusa* because it had upper quartile 60 and lower quartile 25, median 42.5. *Anagallis arvensis* had upper quartile 55 and lower quartile 10 while median 40. *Torilis leptophylla* had upper quartile 60 and lower quartile 0 and median about 10. *Achyranthes aspera* has 0 upper quartile and 0 lower and 0 median and it was at the point lowest of all as in Fig. 2.

Linear model response curve of all species against environmental variables (soil moisture) was also tested. A total 35 species belonging to 22 families were recorded from 66 quadrats in Lohi Bher Wildlife Park. *Cymbopogon jwarancusa* was at top and was most abundant specie because its upper quartile was 90 and lower quartile was 45 while median is 70 with respect to soil moisture. *Anagallis arvensis* was below *Cymbopogon jwarancusa* because it had upper quartile 60 and lower quartile15, median 40. *Aristida cynathe* had upper quartile 60 and lower quartile 25 while median 40. *Adhatoda vasica* has 0 upper quartile and 0 lower and 0 median and it was at the point lowest of all as in Fig. 3.

Soil of the study area was neutral and dry. pH of soil lies between 6-7, mostly 7.5 pH was recorded in the soil of study area. Organic matter of soil ranges from 7-9, pH also affect the availability of nutrients. The soil moisture of this area was in quite less amount ranges from 0.8-1.2%.

Discussions

The present study examined the species distribution in different areas of Lohi Bher Wildlife Park, Rawalpindi. A total of 35 herbaceous plant species were recorded from the different locations of the Park. The presence of a diverse range of herbaceous plant species in the area supports the view that the Park can serve as an important habitat for preservation of the local flora. Ordination technique CCA describes the affiliation of the group to compute environmental variables and also shows the major links between the species and environmental factors (Kashian *et al.,* 2003 and Ahmad, 2011). In present study organic matter, soil moisture and pH were chosen as environmental variables. CCA was performed on the species data collected in zone 1, Zone 2 and overall species. The data of species was further subjected to construct Linear Model Response Curve. This analysis indicated that soil moisture of this area was favorable for growth of *Cymbopogon jwarancusa,* *Anagallis arvensis* and *Aristida cynathe* while in zone 1 and overall specie graph herbs Justicia a*dhatoda* and *Lepidium latifolium* showed very less response with soil moisture of the study area. A study was conducted by Ali & Kauser, (2006) in

which CCA was used to calculate environmental parameters correlated with species distribution as soil moisture, pH, electric conductivity, Ca$^+$ and heavy metals. Another study was conducted by Shah *et al*. (2010) using CCA, moisture, pH, salinity and available nitrogen were major soil factors that caused variation in distribution pattern. The dominance of *Cymbopogon jwarancusa* showed that the soil of Lohi Bher Wildlife park had a less and the abundance of *Anagallis arvensis* also showed that soil of study area had less moisture and suitable for the growth of herbs and weeds. Large number of

specie *Anagallis arvensis* is present in Karachi (Salam *et al*., 2011). The little abundance of Justicia a*dhatoda* showed that soil moisture is in less quantity. In Margalla Hill national park *Justicia* a*dhatoda* is also present with scanty grass cover as the soils in the area were dry and graveled due to exposed surface and erosion (Ayaz *et al*., 2004). The study emphasized the urgent need for preservation on native flora and establishment of similar parks for conservation and mitigation of natural habitats and native flora and fauna.
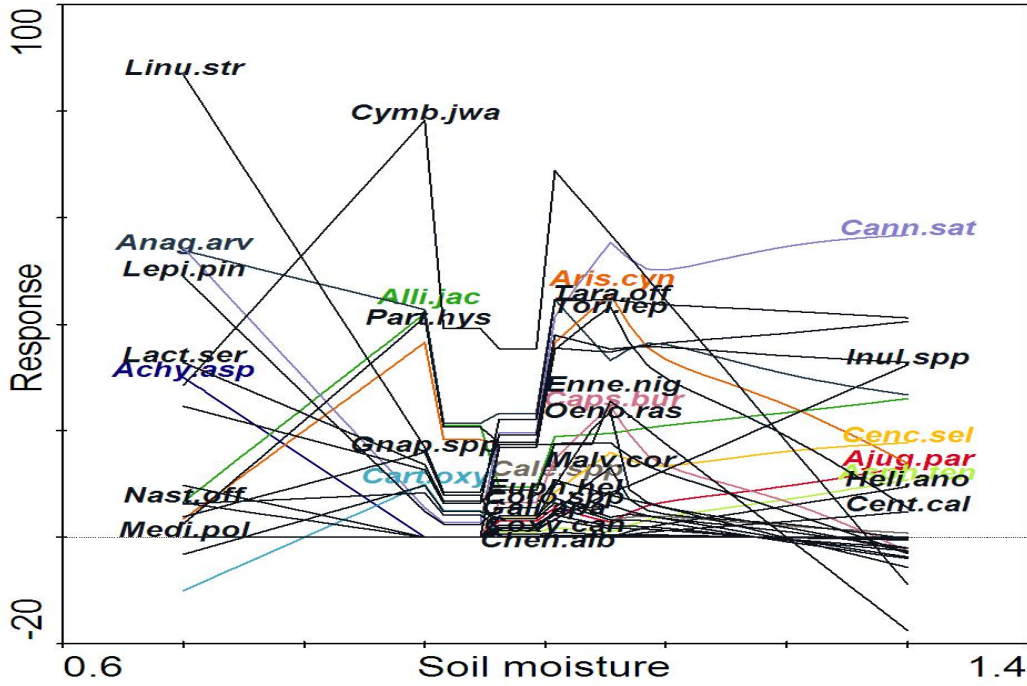

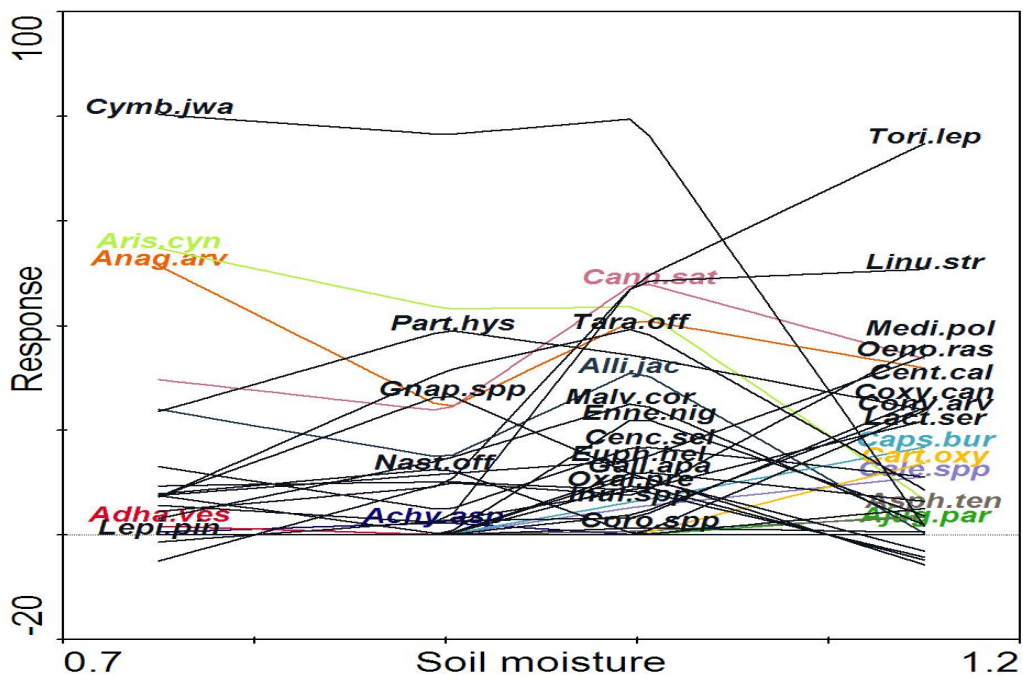Fig 1. Linear model response curve of Zone 1 species.

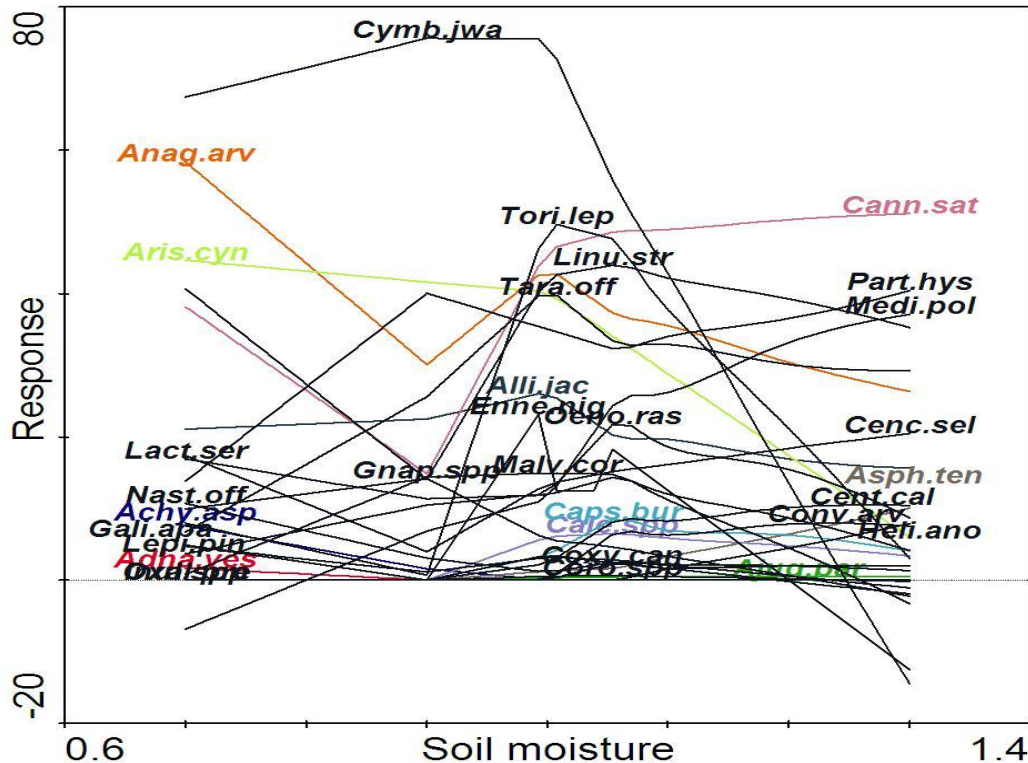Fig 2. Linear model response curve of Zone 2 species.

Fig 3. Linear model response curve of overall species.

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