

# Classification of Plant Communities of Sialkot District Punjab, Pakistan & the Determination of Effects of Environmental Variables on their pattern of distribution

Arifa Zereen, Sheikh Saeed Ahmad, Zaheer-Ud-Din Khan, Almas Jahan

**Abstract**— This study is an endeavor to study different plant communities of Sialkot District and the effect of environmental variables on their pattern of distribution. A total of fifty one species after twenty seven families were recorded from the study area. Plants were properly identified with the help of flora of Pakistan and available literature. For statistical analysis of the data multivariate techniques were employed. For classification of plant communities Two Way Indicator Species Analysis (TWINSpan) program was used, which divided vegetation of the area into two major communities. First major community was further divided into two and second major community was divided into three sub communities. Canonical Correspondence Analysis (CCA) helped to develop correlation between species distribution pattern and environmental variables. Data used in CCA was based on water and soil samples chemical and physical analysis i.e., pH, EC, soil colour and soil water content. The results exhibited that different parameters of water tested were strongly influencing the grouping of species however soil pH also played significant role in plant distribution.

**Key Words**— Classification, Multivariate techniques, Soil, Vegetation, Water.

## 1 INTRODUCTION

District Sialkot is bounded by Jammu Kashmir on north, Gujrat on northwest Gujranwala on west and Narowal on south. Besides River Chenab that flows in the north of Sialkot, there are three seasonal Nalas namely Aik, Bher and Palkhu that pass through the district. Sialkot spreads over Piedmont and adjoining plains of Deg, Tawi and Chenab rivers. The area is comprised of old river terrace, Subrecent and Recent flood-plains and piedmont plains irrigated by tube wells and seasonal canals. Sialkot falls in sub-humid warm subtropical monsoon rain- region of Pakistan. The area has good agricultural potential and plays significant role in agronomic development of the country.

Present study was designed to record the flora of Sialkot district and determine the effects of soil and water parameters on distribution of plant communities of the area by applying multivariate techniques viz; TWINSpan and CCA. For classifying and conserving the flora of an area on long term basis Biological assessment is required [1], [2]. For analysis of vegetation data TWINSpan technique was applied [3]. Yousaf et al [4] classified the herbaceous vegetation along Rawal Dam into seven communities by employing TWINSpan analysis. In another study carried along Simly Lake, TWINSpan divided 21 species belonging to 19 families into two main groups which were further divided into sub groups [5].

CCA technique is a combination of Correspondence Analysis and Regression Method [6]. Distribution of plant communities is influenced by multiple of environmental factors, hence CANOCO program possesses the capacity to consider and manipulate these influences [7], [8]. Afzal et al [5] carried out research along Simly Lake, Islamabad. They used CCA to study the relationship of floristic data with organic content of the

soil and found its significant influence on distribution of species. Yousaf et al [4] utilized CCA to study the relationship between selected soil parameters and vegetation along Rawal Dam Islamabad. Their results showed that Manganese and Potassium were most effective nutrients determining vegetation distribution.

## 2 MATERIALS AND METHODS

### 2.1 Floristic Data

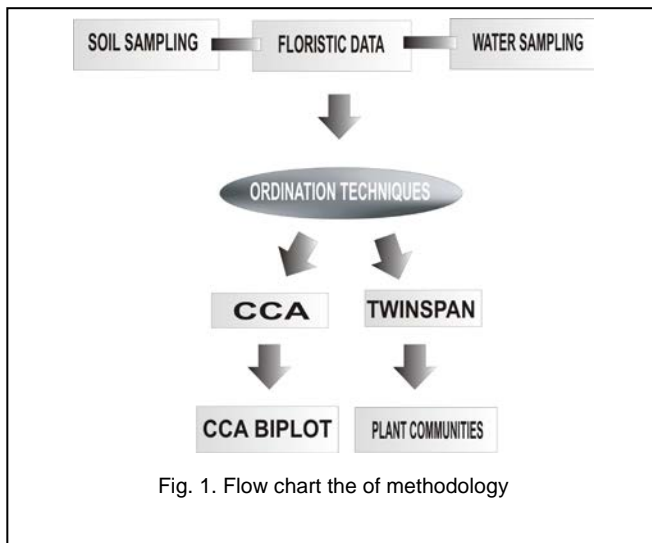
Sampling and data collection of vegetation was carried out at flowering stage, during spring season. Forty quadrats of different sizes viz., 1m<sup>2</sup> for grasses, 5 m<sup>2</sup> for shrubs and 10 m<sup>2</sup> for trees following Braun-Blanquet approach were used. Sampled plant species were identified by consulting Flora of Pakistan and Literature [9], [10], [11]. Percentage cover and frequency of vegetation were recorded [12].

### 2.2 Soil and Water Sampling and Analysis

Soil samples were collected from each quadrat and analyzed at Soil Survey of Punjab for its texture, colour, moisture content, pH and EC. Similarly water table depth, pH and EC were recorded for water samples [13].

### 2.3 Multivariate Techniques

The phytosociological statistics were analyzed by TWINSpan software that identified the major and sub plant communities at the study site. CCA was used to establish floristic-environment relationship. Matrix sheets prepared in Microsoft Excel were run in CANOCO and species scatter biplot graph was obtained.



Fifty one species after twenty seven families were recorded by studding forty quadrats in different sites of Sialkot study area. At first level of analysis this program divided the vegetation of the area into two major communities which were subsequently divided into smaller or sub communities. All the communities were named after leading dominant species.

#### Major Community 1: *Cynodon dactylon* - *Solanum nigrum*

This major community, *Cynodon dactylon* - *Solanum nigrum* was named so because of greatest presence of these species in the area and was further divided into two sub- communities namely *Cynodon dactylon*-*Convolvulus arvensis* and *Parthenium hysterophorus* -*Amaranthus viridis*

##### 1.1 *Cynodon dactylon* - *Convolvulus arvensis*

This sub community was recorded from margins of agricultural fields, uncultivated pieces of lands and road sides in a village of Tehsil Pasrur named Basiwala. This group was found in thirty two qutadrats. The most important species *Cynodon dactylon* exhibited good frequency value of 45 % and *Convolvulus arvensis* 35 %. Members of this sub community showed their appearance throughout the study area. The sub-community was comprised of fourteen species.

##### 1.2 *Parthenium hysterophorus* - *Amaranthus viridis*

The dominant species of this community were *Parthenium hysterophorus* and *Amaranthus viridis*. This community was located on the Pasrur to Gujranwala road. Both species were growing frequently on disturbed habitats such as road side, trampled and over grazed patches of land, crop fields and waste lands etc. Similar ecological amplitude and microclimatic conditions requirements made these species to grow together.

er. *Anethum graveolens*, *Trifolium resupinatum* and *Sonchus arvensis* were also part of this sub community.

#### Major Community 2: *Portulaca oleracea* - *Ranunculus muricatus*

The major community 2 labeled as *Portulaca oleracea* - *Ranunculus muricatus* due to the highest presence of these species in the area was further divided into three sub- communities namely *Portulaca oleracea*-*Withania somnifera*, *Ranunculus muricatus*- *Morus alba* and *Coronopus didymus*- *Vicia sativa*

##### 2.1 *Portulaca oleracea* - *Withania somnifera*

TWINSPAN analysis of floristic data of Sialkot depicted that this was largest sub community. This community showed its existence throughout the study site of Fakiranwali Bajwa village of Tehsil Pasrur on the edges of cultivated fields and waste lands. This sub- community encompassed eighteen species. Major factor responsible in existence of these species together seemed to be the similarity of habitat requirements. The dominant species of the sub- community were *Acacia nilotica*, *Conyza bonariensis*, *Chenopodium album*, *Lathyrus aphaca*, *Euphorbia prostrata*, *Phalaris minor*, *Polypogon monspeliensis* and *Lolium temulentum*.

##### 2.2 *Ranunculus muricatus* - *Morus alba*

This sub community mostly occupied agricultural fields, waste lands and road sides in Basi wala village of Tehsil Pasrur. This group was recorded from thirty quadrats and % age frequency values of dominating species were high i.e., *Ranunculus muricatus* 46 % and *Morus alba* 31 %.

##### 2.3 *Coronopus didymus* - *Vicia sativa*

This small community was recorded out of twenty eight quadrats studied at Mianwali Bangla Town of Tehsil Daska. Wheat was being cultivated in the fields of sampling area. Perhaps similar ecological requirements made *Coronopus didymus* and *Vicia sativa* to grow together.

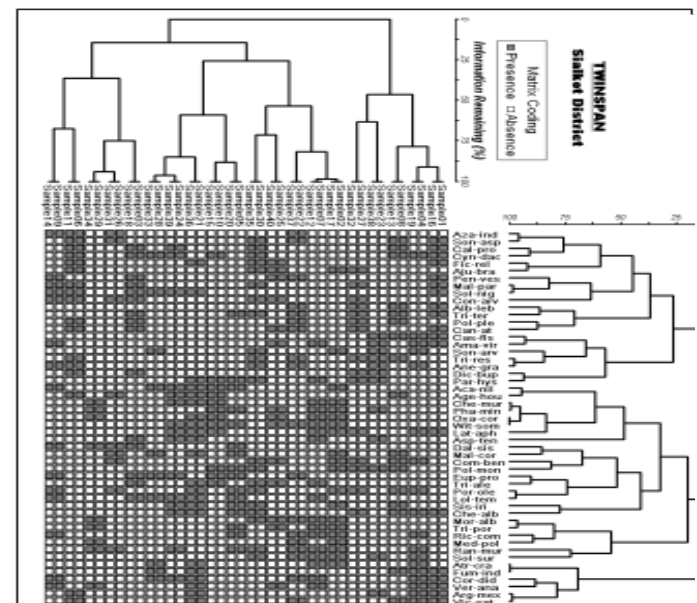


Fig. 1. TWINSPAN Analysis of Floristic Data of Sialkot District

- Arifa Zereen, Associate Professor of Botany, University of Education Bank Road Campus, Lahore Pakistan, PH-03334339697. E-mail: [dr.arifa@ue.edu.pk](mailto:dr.arifa@ue.edu.pk)
- Sheikh Saeed Ahmad, Associate Professor of Botany in Fatima Jinnah Women University, Rawalpindi, Pakistan
- Zaheer-Ud-Din Khan, Professor of Botany, GC University, Lahore, Pakistan
- Almas Jahan, Lecturer, University of Education Bank Road Campus, Lahore Pakistan

IJSER © 2018  
<http://www.ijser.org>