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Herbs variation at different canal bank of Tehsil Depalpur

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Abstract

A phytosociological assessment of herbs was directed during 2020 along canal banks and farmlands of Depalpur, District Okara (Pakistan). Plants were photographed collected and mounted on herbarium for identification. Phytosociological data was collected through quadrat method. Floristic analysis revealed that studied area comprised of total 34 herbs species belonging to 27 Genera and 16 Families. Poaceae was the predominant family in the study area with 11 genera, Asteraceae family has 3 genera, Amaranthaceae and Chenopodiaceae have 2 genera, Apocynaceae, Cleomaceae, Barassicaceae, Cypraceae, Asteraceae, Euphorbiaceae, Oxalidaceae, Areaceae, Solanaceae, Typhaceae, Aizoaceae, Aristolochiaceae and Zygophyllaceae all these have 1 genera, next most frequent members in study area were belonged to family Asteraceae with 3 species and 3 genera. Life form also observed from the study sites that were ranging from etc. The most encountered life form was Therophyte (59%) then Chamaephyte (17%), Hemicryptopyhte (12%), Geophyte (9%), Phanerophyte (3%). The highest IVI value of *Cynodon dactylon* (16.63%) that observed from site A. *Dicanthium anulatum* (11.65%) from site B. The maximum index of similarity (SI) was recorded between 1st and 2nd site with 48.4%.

Key words: Herbs, biodiversity, Traditional Spices

Introduction

Plant community is responsible to maintain the biodiversity throughout the world. Plant species may be recognizing through its chemical composition and structural habit. Plants give shelter, food, medicine (Piterskaya 2012). The obvious attribute of life on Earth is increasable diversity and it can be defined as number of various species and their relative frequency. In developing countries 80% people depend on herbal medicine (Ming et al. 2003). Biodiversity increasing the agricultural products as well as increase the disease resistant variety. In 1970s a grassy stunt virus demolished the rice field about 1, 60,000 ha in Asia. It is controlled from a wild rice *Oryza nivara* (phylogenetic taxonomy) sample that has resistant against that virus. These resistances have used to improve the rice crop (Pullaiah et al. 2015). Plant biodiversity is significant and in abundance in China. A large number of angiosperm, gymnosperm and pteridophytes are present there. Some integrate effect (over exploitation of natural resources, habitat destruction, contamination of environment) caused irreversible harm to biodiversity of plants in China (Rahman et al., 2016). Many types of habitat and a number of plant species are threatened worldwide. The threatened plants consist of Central Asia and Arctic species. The positive correlations are found between human density and the number of threatened species. This indirect relation responsible for the loss of the country flora (Nowak et al. 2020). Central Asia is considered as hotspot of biodiversity of plants. Central Asia's temperate forests, and sandy deserts, steppes, including riparian tugai forests, have been identified by the World Wide Fund for Nature (Zhang et al. 2020). Pakistan is an Islamic Republic state which is rich in biodiversity, cover 80% of the total land, especially in arid and semi-arid areas. The altitude of Pakistan is 8611m. Pakistan has an area of 80,943 km², lies between 60°55 to 75°30 E longitudes and 23°45 to 36°50 N latitude. It has a variety of climatic zone (Shinwari 2009). Many plants have medicinal values like, *Solanum surattense* L. belong to *solanaceae* family, *Cyprus rotundus* L. belong to *cyperaceae* family, *Withania somnifera*, *Solanum nigrum* and *Melia azedarcholanum* etc. are most utilized species for treatment of different diseases (Umair et al. 2017). Herbs are small plants with no woody stems; it lies down toward ground after flowering. Herbs include root, leaves, flowers, bark, seed, fruit and trees which are used as food, cosmetics, medicines and dyes (Kaur et al. 2020). For the ease of study, herbs are classified through various systems. Binomial system of nomenclature by Linnaeus is mostly used. ICBN (International Code for Botanical Nomenclature) system is also follow as an ascending order such as Species, Genus, Family, Order, Class, Subdivision, Division, and Kingdom. Professional workers of botanical field and taxonomists are used these systems. Documentation needs an accurately identified plant sample referred by a recognized herbarium (Alamgir 2017).

Evolvulus nummularius L. is a prostrate herbs that is present in the tropical and subtropical regions and recorded in Jhok Reserve Forest in Lahore, city of Punjab Pakistan for the first time. *E. nummularius* has great effect on the productivity of the croplands. Removal of this herb was probably

impossible but now measures should be taken to restrict its further spread within Pakistan (Iqbal et al. 2017). Cortex herbs are identified by the DNA barcode internal transcribed space ITS2 of ribosomal 51 samples related from 19 types herbs (Shaheen et al., 2018).

Herbs also classified on the basis of their life cycle and its duration. These may be annuals, biennials and perennials herbs. Annual herbs complete their life cycle during one season for example mustard, balsam, paddy and jute etc. (Zeven et al 1982). Biennial herbs complete their life cycle in two seasons. In the first season the herb store sufficient food and in the next season reproductive organs formed (Malikova et al. 2010). Adventitious sprouts in monocarpic herbs lessen the limitation of bud after severe injury in biennial plant. Environmental factors such as availability of nitrogen present in soil not show any effect to adventitious sprouting. There is no difference between annual and biennial plants in sprouting (Malikova et al. 2010). Perennial herbs continue for more than two seasons for example banana, ginger, carina etc., are perennial herbs.

The interaction of coffee farm and intercropped herbs in rural area are observed in the state of Mexico and conclude that intercropping herbs such as basil, oregano, spearmint and sage regulate the plagiotropic growth in *Coffea arabica* L. These intercropping herbs in coffee farm increase the yield and quality production (Bustos et al. 2008). On the other hand intensification of everything is bad such as loss of biodiversity through worldwide is increasing day by due to the agricultural intensification. Agricultural land uses have known negative effect instead of known positive effects in all ecosystems. Herbicides, pesticides and other method which used to maintain the agricultural land become responsible to reduce the biodiversity (Tschardtke and Thies 2005).

Phytosociology is a branch of study which deals with the latest plant aggregation at a purpose of vegetation stands (Jansen et al 2020). Phytosociology parameters are used to check the phytochemical screening of a wild medicinal herb *Malva parviflora* L. is commonly known as mallow. Application of TWINSPAN and ADECORANA produced four vegetative groups. These vegetation groups are dominant in cultivated lands. Phytochemicals are observed through canonical analysis that indicates organic carbon, calcium carbonate, electrical conductivity, potassium adsorption ration and carbonates could be effective soil for common mellow distribution. In pharmaceuticals, *M. parviflora* L. plays a vital role as promising plant (Shehata and Galal 2014). With the rise of salinity diversity of herbaceous plant reveals strong pattern and tendency to shrink.

A variety of herbs or herbaceous flora present along the canal banks. Plants that are present near the water have great importance for research purposes. Such plants interact with a number of different organisms and also with physiochemical, morphological and hydrological environment. These interactions give food, shelter and habitat to other organisms (Okigbo et al. 2008).

The selected study area is Depalpur and it is situated at 25 km from the district Okara on the bank of the Beas River in Bari Doab. Okara district is divided into three tehsils, i.e. Depalpur, Okara and Renala khurd. Depalpur is the largest tehsil of Pakistan, and divided into four towns. The total population of Depalpur is 99,858 according to the survey of 2017. The average temperature of Depalpur is 22°C. The average rain fall is 200 mm. The people of Depalpur are mostly rural and depend on the plants resources. The variety of plant resources used for food, medicine, fiber, oil, handicraft material and fuel. The surveys of canal bank are conducted from 2 localities in Depalpur, Province Punjab has the area of 205,344 km² at site of Salam pura canal and Rata ghana canal. The altitude is about 176m, longitude 73.65 and latitude is 30.67. There are three seasons per year: a warm and dry summer (March–April), a monsoon season (May–October), and a cool and dry winter.

Materials and Methods

Firstly selected areas were visited to record the altitudinal, geographical conditions and inspect the range before to start the actual data collection and sampling. During these visits modern technological devices like GPS Garmin (entrex 10) and Portable internet Devices were used.

A study tour was arranged for two days to collect the plant samples from selected area of canal banks from area of 1 kilometer at the site of SalamPura (A). The canal comes from river Satluj from Ferozepur Head work. The data was collected from farmlands as well. The plant sample was collected from the selected seasonal fields for instant paddy field, maize crop, Sesame field, cotton crop and along with red pepper, okra plants were also available and Sorghum field and 50 quadrats were done along the canal bank. Quadrat of 1*1m² was used through random sampling to collect plants samples. A person of different ages of local area was interviewed inquired for the sake of information. For instance what is the common name of herb species? Do you know about this herb? Are these herbs beneficial or harmful for seasonal fields? Which part of herb is used for medicine? For taxonomic purpose every plant species was collected for identification and deposition with herbarium as voucher specimen. The collected plant specimens were taken to the laboratory and were kept between blotting papers for drying. After collection, specimens were preserved by herbarium. Herbs specimens was collected by using camel hair brush, digger, scissors, newspapers, blotting papers, vasculum for keeping specimen after collection, tooth brush, scotch tape, water bottle and digital camera for photography of different parts such as vegetative, fruits and flowers herbs.

For taxonomic purpose every plant species was collected for identification and deposition with herbarium as voucher specimen. After collection, preservation of specimen occurs by herbarium. Herbs specimens was collected by using camel hair brush, digger, scissors, newspapers, blotting papers, vasculum for keeping specimen after collection, tooth brush, scotch tape, water bottle and digital camera for photography of different parts for example vegetative, fruits and flowers herbs. The collected plant specimens were taken to the laboratory and were kept between blotting papers. The plants were packed in paper bags and dried in an oven for dry purposes.

Results and Discussion

In the present study work, herbs were collected from different localities and were identified by Flora of Pakistan (Ali and Nasir 1971). A collection of 34 plants had been made from 17 Families. Life form was also recorded. Poaceae was the predominant family in the study area with 12 genera, Asteraceae family has 3 genera, Amaranthaceae and Chenopodiaceae have 2 generas, Apocynaceae, Cucurbitaceae, Cleomaceae, Barassicaceae, Cypraceae, Asteraceae, Euphorbiaceae, Oxalidaceae, Areaceae, Solanaceae, Typhaceae, Aizoaceae, Aristolochiaceae and Zygophyllaceae all these have 1 genera (Fig 4.1).

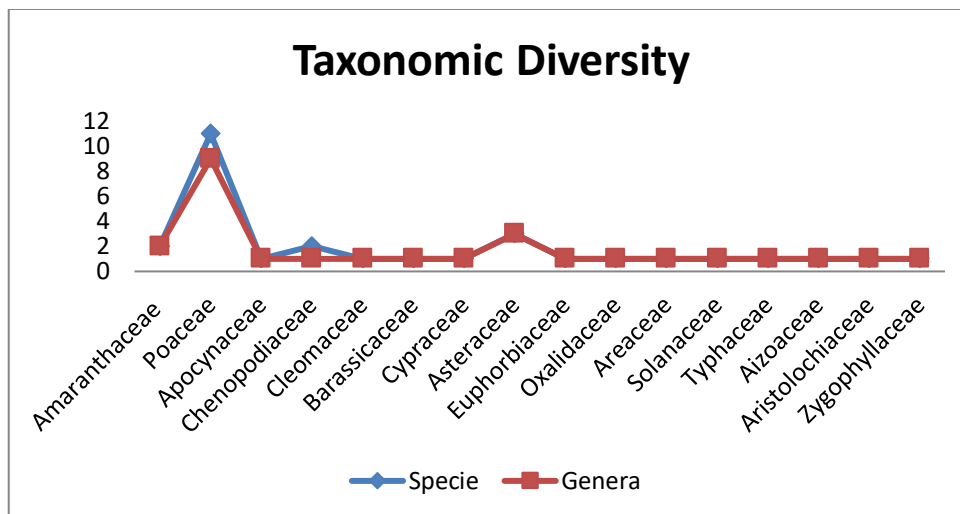


Fig. 1 Taxonomic diversity of dominant herb families

The life form of flora gives out appearance of the vegetation that is product of entire process of life in relation to environment. Life form classification of Raunkiaer (1934) was used which is on the basis of degree of protection and position of parenting bud under the adverse or unfavorable conditions.

On the basis of this classification Life form observed from the study sites were ranging from etc. The most encountered life form was Therophyte (59%) and then Chamaephyte (17%) then Hemicryptophyte (12%), Geophyte (9%) and Phanerophyte (3%) (Fig.2)

For quantitative interpretations or data analysis different phytosociological tools were used through quadrats having size $1 \times 1\text{m}^2$ to measure density, relative density, frequency, relative frequency, cover, relative cover and Important Value Index. (Braun-Blanquet 132).

Density shows the numerical values of the species present in the study area. The specie with high relative value were *Cynodon dactylon* with (18.75%), *Polypogon monspelinces* with (14.80%), *Pestia stratiote* (1.80%), *Demostica banecta* (2.93%), *Calotropis gigntea* (1.35%), *Solanum nigrum* (1.24%), *Echinocloa colona* (9.94%), *Cucumis melo* (0.79%), *Parthenium hysterophorus* (2.93%), *Alternanthera* (5.87%), *Oxalis corniculata* (7.11%), *Taraxacum officinale* (4.63%), *Cyprus rotundus* (6.89%), *Dichanthium anulatum* (6.67%), *Polypogon viridus* (8.47%), *Echinolocola crus gali* (3.72%), *Achyranthus aspera* (2.03%) (Fig. 4.3)

Frequency denoted the relative occurrence of the species from the studied sites. The most frequent species observed during study analysis were *Cynodon dactylon* (10%), *Polypogon monspelinces* with (7%), *Pestia stratiote* (3.5%), *Demostica banecta* (4.5%), *Calotropis gigntea* (4.5%), *Solanum nigrum* (2.5%), *Echinocloa colona* (8%), *Cucumis melo* (1.5%), *Parthenium hysterophorus* (5.5%), *Alternanthera* (5%), *Oxalis corniculata* (4.5%), *Taraxacum officinale* (6%), *Cyprus rotundus* (7.5%), *Dichanthium anulatum* (9%), *Polypogon viridus* (16%), *Echinolocola crus gali* (2.5%), *Achyranthus aspera* (2.5%) (Fig. 3)

The species which possesses higher relative cover percentage were *Cynodon dactylon* (21.05%) then *Polypogon monspelinces* with (10.10%), *Pestia stratiote* (1.47%), *Demostica banecta* (2.94%), *Calotropis gigntea* (1.89%), *Solanum nigrum* (1.05%), *Echinocloa colona* (11.78%), *Cucumis melo* (0.63%), *Parthenium hysterophorus* (2.31%), *Alternanthera* (7.36%), *Oxalis corniculata* (8.21%), *Taraxacum officinale* (4.63%), *Cyprus rotundus* (7.36%), *Dichanthium anulatum* (6.94%), *Polypogon viridus* (6.94%), *Echinolocola crus gali* (4.21%), *Achyranthus aspera* (1.05%) (Fig. 3)

Important Value Indices of the representative species were calculated as the sum of relative density, cover and frequency. The important value indexes of the most dominant species were the *Cynodon dactylon* (16.63%), *Polypogon monspelinces* with (10.63%), *Pestia stratiote* (2.26%), *Demostica banecta* (3.46%), *Calotropis gigntea* (2.58%), *Solanum nigrum* (1.59%), *Echinocloa colona* (9.91%), *Cucumis melo* (0.97%), *Parthenium hysterophorus* (3.58%), *Alternanthera* (6.08%), *Oxalis corniculata* (6.60%), *Taraxacum officinale* (5.08%), *Cyprus rotundus* (7.25%), *Dichanthium anulatum* (7.53%), *Polypogon viridus* (10.47%), *Echinolocola crus gali* (3.47%), *Achyranthus aspera* (1.86%) (Fig. 4.3)

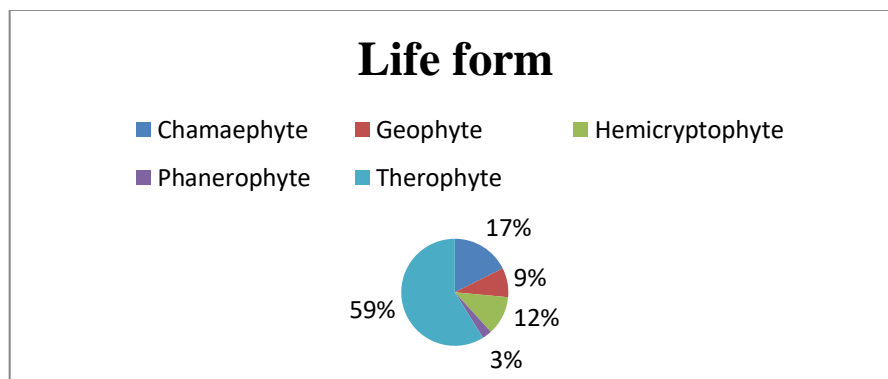


Fig. 2 Percentage occurrences of various life forms of herbs from Tehsil Depalpur

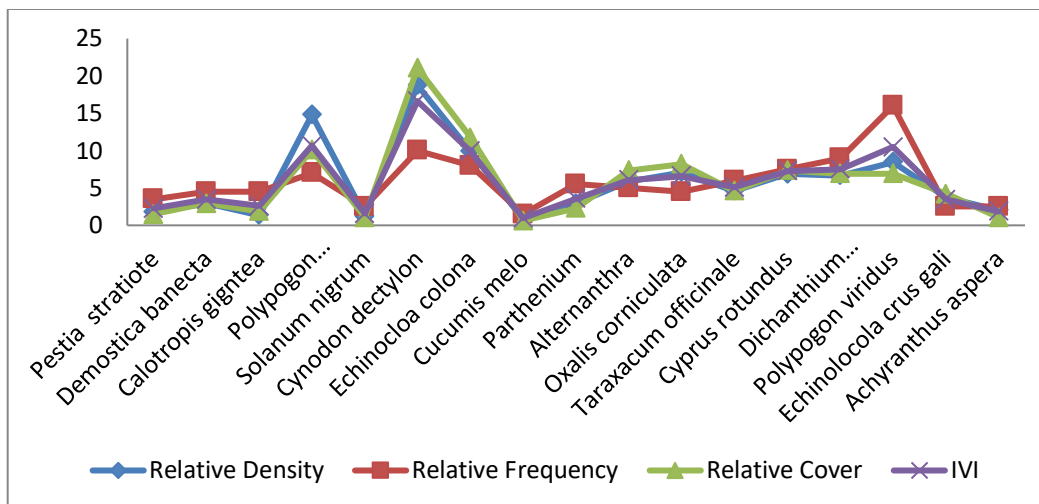


Fig. 3 IVI values of different species of herbs collected from site A (Salam pura canal)

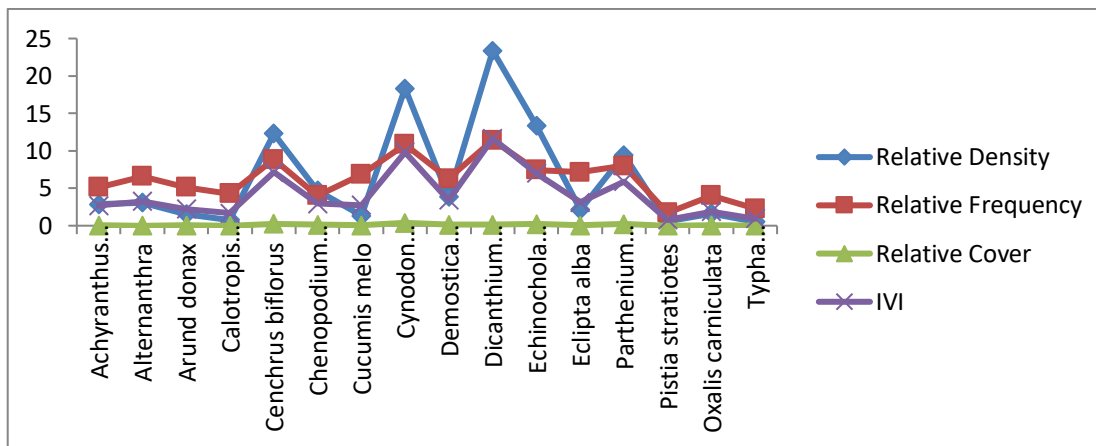


Fig 4. IVI values of different species of herbs collected from site B (Rata Ghana canal)

The present study was also aimed to identify various herb species belonging to different communities based on phytosociological aspects. Which are of prime importance with regards to the study of floristic analysis of characteristic plant community present in Tehsil Depalpur. Flora was used as an indicator of biodiversity as suggested by Mayers (1998) and Reid et al. (1993) due to some reasons like plants are easy to study because they are immovable and more sensitive to environmental changes. The study area of Depalpur is divided into six sites, Two canal banks and four farmlands to check the variation of herbs species .with the quadrat of 1 meter*1 meter for random sampling. Herbs were collected from selected localities and were identified by Flora of Pakistan (Ali and Nasir 1971). The result showed that study area consist of 34 plants species with 31 genera which belonging to 17 families. Poaceae was the predominant family in the study area with 12 genera. (Jafarpour and Manohar 2014) studied the distribution of plants in Fars, Iran with highest distribution of poaceae family by using the statistical tools and species distribution models (SDMs).

Next Asteraceae and Amaranthaceae family was dominating with 3 generas of each family, Chenopodiaceae have 2 generas, Apocynaceae, Cucurbitaceae, Cleomaceae, Barassicaceae, Cypraceae, Euphorbiaceae, Oxalidaceae, Areaceae, Solanaceae, Typhaceae, Aizoaceae, Aristolochiaceae, Cucurbitaceae and Zygophyllaceae all these have 1 genera To study the herbs species in an area random sampling techniques was adapted where sample plots were having equal chance of having particular species.

Quantitative analysis, quadrat method (Braun-Blanquet, 1932) was applied for analyzing the vegetation of the study area. The indigenous folk knowledge of people about plants declining from the world due to modernization.(Akram et al. 2011) The assemblage of knowledge related to natural vegetation, classification, use and management of plants by the societies have great significance for ethnobotanist. The native people and investigators have the challenging task for documentation of indigenous plant s knowledge and the application of their result in the field of community development and conservation of biodiversity. Human and other organism's majorly used plants as food. Approximately, five thousand plant species has been reported used by humans as food. (Shakya 2016). The native people of Depalpur have practical understanding of the use of natural assets in the region. On the basis of Raunkiaer (1934) classification system Life form observed from the study sites were ranging from etc. The most encountered life form was Therophyte (59%) and then Chamaephyte (17%) then Hemicryptopyhte (12%), Geophyte (9%) and Phanerophyte (3%).

Every species was ranked base upon measuring the Important Value Index. The species, attained highest important value in the stand known as dominant species and the species that attained less important value in the stand was considered as rare species of that particular area (Whittaker 1972). Important Value Indices of the representative species were calculated as the sum of relative density, cover and frequency. The important

value indexes of the most dominant species were the *Cynodon dactylon* (16.63%) from the site A. The most dominant IVI value from site B was *Dicanthium anulatum* (11.65%) representing dominant plant species in the study area.

It must be recognized that application of current innovative methods for management of natural resources and sustainable development for the conservation of living of traditional culture is time demanding. Similar condition was observed in study zone. Although humans were utilize plants for in daily life for different purposes however over population result in decreasing the plant species with the passage of time due to over exploitation of vegetation. Therefore in such challenging conditions there was a necessity to document the indigenous information and variation among different areas and recommended possible management strategies to conserve these biological assets.

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