

INCLUSIVE AND SUSTAINABLE DEVELOPMENT PAPERS

Torque Communities

A study of Botanical Garden Grasslands and Chemistry Department Lawns of Quaid I Azam University, Islamabad, Pakistan

Hifza Shakeel¹

PAPER INFO

Article History:

Received: 1 May 2023

Reviewed: 22 Aug 2023

Published: 26 Aug 2023

Keywords:

Botanical Garden Grasslands

Simpson Diversity Index

Shannon Diversity Index

ABSTRACT

This research endeavors to comprehensively explore and compare the diversity of various habitats, aiming to identify the most diverse among them. The study encompasses a wide array of aspects, including the utilization of the Shannon and Simpson diversity indices to assess the vegetation diversity. Furthermore, a thorough vegetation analysis of Quaid-I-Azam University was conducted, alongside an in-depth examination of the environmental parameters within the study area. A total of 20 species were identified across both habitats, demonstrating overlapping species presence. The comparison between the two habitats was facilitated using the Simpson and Shannon diversity indices. The outcomes indicated that the CDL3 site exhibited higher diversity, housing a total of 8 species. In contrast, the Botanical Garden lawns showcased a maximum of 7 species at the BGL2 site. Interestingly, the study underscores that the Chemistry Department Lawns exhibit greater diversity when contrasted with the Botanical Garden lawns.

Reference Guide:

Shakeel, H. (2023), A study of Botanical Garden Grasslands and Chemistry Department Lawns of Quaid I Azam University, Islamabad, Pakistan, 1(2): pp.58-62. Available at:

www.torquecommunities.org/publications

¹ hifzahshakeel@gmail.com

INTRODUCTION

An area is characterized by its vegetation, which can encompass various forms such as herbs, shrubs, tall grasses, or clustered vegetation. When referring to vegetation, we are addressing the collective plant species present in an area. The growth pattern of vegetation is intricately influenced by a range of environmental factors including temperature, elevation, wind speed, soil texture, as well as factors like grazing and human interaction. This interplay of influences explains why areas with higher grazing pressure tend to exhibit diminished vegetation growth, often resulting in patchy or clustered vegetation patterns, potentially due to variations in underlying soil fertility. For instance, arid desert environments exhibit sparse and patchy growth due to their arid conditions.

The presence or absence of vegetation is regulated by environmental variables (Hoveizeh, 1997; Leonard et al., 1998). Investigating and comprehending the interrelationship between biotic and abiotic components within an ecosystem, and observing how species diversity and richness vary along environmental gradients, are pivotal aspects of ecological research (Tavili and Jafari, 2009).

The analysis of vegetation in a given area serves as an indicator of the local climatic conditions. The types and growth patterns of species reflect the suitability of the environment for their growth. Vegetation can range from roadside growth to managed and unmanaged lawns, and even extend to areas near graveyards. Our study focuses on the vegetation within the botanical garden lawn and the chemistry department lawn at Quaid-I-Azam University in Islamabad.

This study aims to examine the grasslands within the Botanical Garden and Chemistry

Department at Quaid-I-Azam University. It involves evaluating percentage coverage, plant species diversity, diversity indices, and making a comparative assessment between the grasslands of the Botanical Garden and the Chemistry Department. The research also incorporates data on environmental factors influencing the area. Furthermore, this study aids in determining the species richness of the region, and its findings could offer valuable insights for departments such as Plant Sciences in the future.

MATERIALS AND METHODS

Study area

Situated to the north of Islamabad, Quaid I Azam University occupies coordinates of 33.7476° N and 73.1381° E. Encompassing a total area of 6.9 km², the university's campus rests against the foothills of the Margalla range. The average altitude in this vicinity hovers around 600 meters above sea level. The prevailing climate follows a humid subtropical pattern as classified by the Köppen system, influenced markedly by factors like elevation, slope aspect, and wind patterns across the terrain.

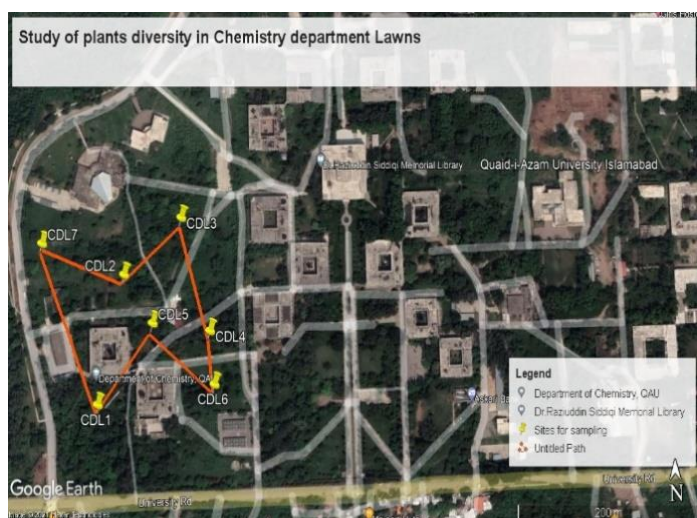
Sr. No	Site Code	Site Name
S1	BGL1	Botanical Garden Lawn 1
S2	BGL2	Botanical Garden Lawn 2
S3	BGL3	Botanical Garden Lawn 3
S4	BGL4	Botanical Garden Lawn 4
S5	BGL5	Botanical Garden Lawn 5
S6	CDL1	Chemistry Department Lawn 1
S7	CDL2	Chemistry Department Lawn 2
S8	CDL3	Chemistry Department Lawn 3
S9	CDL4	Chemistry Department Lawn 4
S10	CDL5	Chemistry Department Lawn 5
S11	CDL6	Chemistry Department Lawn 6
S12	CDL7	Chemistry Department Lawn 7

Table 1: Sites of the study

BGL: Site codes for Botanical Garden Lawns

CDL: Site codes for Chemistry Department Lawns

Google maps image of study area



Method

The data collection approach employed was that of random sampling. This technique ensures that every point within the surveyed area possesses an equal probability of selection during each sampling instance, in accordance with Martin Kant's definition of random sampling. The utilization of quadrat methodology facilitated the assessment of species presence and absence. The quadrat serves the purpose of providing a standardized area for the scrutiny of vegetation.

In this study, triangular quadrats measuring 1.5 meters by 1.5 meters were utilized to evaluate the grasslands. For each

designated sampling lawn, a comprehensive dataset encompassing both floristic and geographical information was amassed. The utilization of the Global Positioning System (GPS) enabled the recording of latitude and longitude for every plot.

Moreover, a range of environmental factors were meticulously recorded for each sampling plot, including temperature, wind speed, weather conditions, humidity levels, slope and aspect of the terrain, soil composition, elevation, grazing intensity, and the influence of anthropogenic activities.

Table 2: Abiotic Factors

Site Code	Latitude	Longitude	Temperature (C)	Humidity %	Elevation (m)	Wind speed (km/h)
CDL 1	33.44.46	73.08.00	22	40	621	7.2
CDL 2	33.44.48	73.08.01	22	40	619	7.2
CDL 3	33.44.49	73.08.04	22	41	628	7.3
CDL 4	33.44.46	73.08.05	23	40	625	7.2
CDL 5	33.44.46	73.08.03	23	40	628	7.3
CDL 6	33.44.45	73.08.05	22	41	621	7.2
CDL 7	33.44.49	73.07.58	22	40	625	7.2
BGL 1	33.44.18	73.09.38	28	24	656	6.5
BGL 2	33.44.14	73.09.40	28	24	659	6.5
BGL 3	33.44.15	73.09.48	28	24	667	6.5
BGL 4	33.44.19	73.09.49	28	24	654	6.6
BGL 5	33.44.20	73.09.43	28	24	659	6.5

In every quadrat, we conducted abundance measurements for each individual species present. A total of 6 species were identified in both the Botanical Garden lawns and the Chemistry Department lawns. These species were found to be common across both study areas. The subsequent table provides a comprehensive overview of the total count of species identified within the Chemistry Department lawns

Chemistry department lawn table

Species Names	CDL 1		CDL 2		CDL 3		CDL 4		CDL 5		CDL 6		CDL 7	
Milletia-Pinnata	12	F	4	R	17	D	15	A	0		0		6	R
Acalypha-Rhombaidea	0		0		10	R	0		21	D	0		0	
Rottboellia	24	D	18	A	0		0		2	R	2	R	0	
Scout Edible	0		9	O	15	F	0		0		0		18	A
Meria azedarad	19	A	0		10	R	3	O	5	O	17	A	0	
Four-leaf Clover	0		4	R	0		1	R	9	F	0		9	O
Rabdosia vubeseens	24	D	0		10	R	0		0		13	O	5	R
Celastry kindsii	0		9	O	16	A	22	D	0		0		0	
Parathenium Weed	1	R	11	F	12	O	0		21	D	19	D	10	F
West Indian Lantana	7	O	21	D	10	R	10	F	12	A	14	F	19	D

- D**=Dominant species
- A** = Abundant Species
- F** = Frequent species
- O** = Occasional species
- R** = Rare species

The following table shows the number of species found in Botanical Garden lawns:

Species Names	BGL 1		BGL 2		BGL 3		BGL 4		BGL 5	
Rottboellia	14	O	0		0		2	R	9	O
Scout Edible	4	R	12	O	0		14	A	0	
Cutting lipstick	0		12	O	3	R	7	O	15	D
Solanum Trilobatum	18	F	29	D	7	O	0		0	
Citrus cavaleriei	24	D	19	F	12	F	0		0	
Elymus Hystrix	0		21	A	19	D	0		0	
Common Baby Breath	0		10	R	15	A	0		13	A
eriphonium	19	A	0		0		9	F	10	F
Melaleuca	14	O	0		0		0		8	R
Cyathula Prostrata	0		10	R	0		21	D	0	

Data Analysis

Diversity of plants species at sites:

The diversity of these 12 sites was calculated using Shannon's and Simpson Indices. It shows that CDL3 which is the sampling site of chemistry department lawn is more diverse as compared to other sites where the number of species is less.

According to both Simpson and Shannon index the diversity is higher in CDL3 site where the total number of species present

is equal to 08 while in the Botanical Garden lawns the highest number of species present is 7 in BGL2 site.

Simpson index

	Indexes	Evenness	No. of species
CDL1	0.78348	0.13058	6
CDL2	0.82386	0.117694	7
CDL3	0.877374	0.109672	8
CDL4	0.698824	0.139765	5
CDL5	0.779296	0.129883	6
CDL6	0.770673	0.154135	5
CDL7	0.805518	0.134253	6
BGL1	0.815802	0.135967	6
BGL2	0.84055	0.120079	7
BGL3	0.762338	0.152468	5
BGL4	0.739478	0.147896	5
BGL5	0.803367	0.160673	5

Shannon index

	Indexes	Evenness	No. of species
CDL1	1.570147	0.87631573	6
CDL2	1.791537	0.92066789	7
CDL3	2.054479	0.98799555	8
CDL4	1.285838	0.79893607	5
CDL5	1.578533	0.88099604	6
CDL6	1.469981	0.91335055	5
CDL7	1.673802	0.93416668	6
BGL1	1.697297	0.94727949	6
BGL2	1.867031	0.95946414	7
BGL3	1.466402	0.91112679	5
BGL4	1.410585	0.87644574	5
BGL5	1.581851	0.98285929	5

RESULTS

A remarkable assortment of 20 distinct species was observed within both the

Chemistry Department Lawns and the Botanical Garden Lawns at Quaid-i-Azam University. The evaluation of diversity through the Simpson and Shannon indices underscored higher diversity at CDL 8 sites, where the total species count amounted to 8. In contrast, the BGL2 site exhibited the highest species presence of 7.

Furthermore, the analysis yielded a significant finding: Chemistry Department Lawns exhibit greater diversity in comparison to the Botanical Garden lawns. Evidently, the intricate interplay of anthropogenic activities and intense grazing pressure plays a substantial role in shaping the diversity and growth dynamics of these grasslands.

In summation, the collective findings highlight the impressive diversity present within the grassland lawns of Quaid-I-Azam University.

CONCLUSION

Grasslands play an integral role in the intricate functioning of ecosystems, providing essential stability. This study delved into distinct plant patterns within Quaid-I-Azam University. Notably, the Chemistry Department Lawns exhibited heightened diversity, a contrast attributed to human-driven selectivity in grassland

utilization. The ecosystem's equilibrium was notably influenced by the pronounced impact of both human activities within the university and the substantial grazing pressures exerted.

The insights gained from the investigations offer intricate insights into the vegetation of these specific sites within Quaid-I-Azam University. This wealth of knowledge serves as a stepping stone for future comprehensive studies, enabling us to delve deeper into the nuanced vegetation variations prevalent throughout Quaid-I-Azam University in Islamabad.

ACKNOWLEDGMENTS

We are very thankful to the most talented and respectful supervisor Dr. Riffat Naseem Malik, Associate Professor of Department of Environmental Sciences, Quaid-i-Azam University and the top Pakistani scientist ranked among top 2% world's scientists. We really appreciate her helpful instructions during conducting this study

REFERENCES

- S.S AHMED, S. F. (2009). EVALUATION OF ECOLOGICAL ASPECTS OF ROADSIDE VEGETATION AROUND HAVALIAN CITY USING MULTIVARIATE TECHNIQUES. *Pakistan Journal of Botany*, 53-60.
<https://www.sciencedirect.com/science/article/abs/pii/S1470160X17303023>
<https://agris.fao.org/agris-search/search.do?recordID=PK2008000538>