Research Article

Survey of Plant Communities at UC Birote District Abbottabad

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Abstract | Vegetative sampling of plant communities in UC Birote area of Abbottabad District was carried out. Analytical, synthetic and physiognomic Characteristics of community were worked out. Our main focus was on analytical and physiognamic characters of the community. Quadrat of specific size were used with prescribed numbers, for this purpose. Quadrat sampling is a method by which organisms in a certain proportion (sample) of the habitat are counted directly. All species were counted in each quadrat. Density, cover and frequency of each species in each quadrats was figured out. Overall categories of density, cover and frequency were calculated through different formulae. Ultimately importance value index-IVI was calculated for each species. Dominant species and community types were determined. *Oxalis corniculata* belonging to Family oxalidaceae, *Symphotricum subulatum* belonging to family Asteraceae and *Parthenium hysterophorous* from Asteraceae were found to be dominant referring to the community as such. Qualitative and physiognomic analysis was also worked out and duly presented. Asteraceae was found to be leading family. Most Plant species were annual, herbaceous-threophytes physiognomically. The research work is significant as it provides instant Data about community type of study area which could be of use to future agronomists, ecologists and future scientist.

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Introduction

Foresters and ecologists have both adopted the quadrat method as one of the most accurate ways to examine the occurrence, distribution, and evolution of vegetation since Pound and Clements first brought it to ecological research in 1898 (McIntosh, 1986).

Community is a group of plant species living together in a specific area for example forest and grassland (Gleason, 1926). Plant communities are an association or grouping of plant species that grow together in a particular area (Noble and Slatyer, 1980). A plant community is made up of species of plants that coexist and grow in a certain location while being ecologically connected to one another (Den Hartog and Segal, 1964). Factors that influence species' ability to colonize new areas as well as those that allow them to endure after colonization are particularly important for understanding how communities of species come together (Cramer *et al.*, 2008). The study of plant community- composition and structure

can help conservationists determine the state of plant populations, regeneration, and diversity (Frerker *et al.*, 2014). The best way to understand habit, habitat, niche, vegetation structure, and numerous plant interactions in an ecosystem is to study about plant communities in their natural environment (Silvertown, 2004). AS was done in one study (Hassan *et al.*, 2024). In another study ethnobotanical profile was studied of weeds in maize fields in Khyber Pakhtunkhwa (Ahmed *et al.*, 2024).

Significance of plant communities is proven by the fact that, ecologically plants are responsible for the production of organic compounds for herbivores, which are at the base of the food chain (Gratton and Denno, 2006). The oxygenated atmosphere that covers the globe is mostly produced by plants. Because they are the biosphere's primary producers (Galloway *et al.*, 2003).

Vegetation can be defined as the group of plants growing together in a particular locality (Riss *et al.*, 2000). The vegetation that covers an area has a certain structure and composition that has been established as a result of long-term interaction with biotic and abiotic processes (Richardson *et al.*, 2007). Vegetation needs to be adequately examined in relation to its environment at both the species and community levels since it is the expression of environment in a certain habitat at a Specific moment (Harrison *et al.*, 2006). A region's vegetation can be categorized using its component species that distinguish the plant's physical appearance, physiognomy, and functional combination (Ustin and Gamon 2010). Plant associations represent the average of the world's biggest biomes. It teaches us about the vegetation, habitat, behaviour, niche, etc. (Archibold, 2012).

Vegetative sampling is a quantitative, integrative, and adaptable method for sampling various types of vegetation in the field is vegetative sampling (Tholl, 2021). It can be used to sample grasslands, marshes, and woods (Pennings and Callaway, 1996). Vegetative sampling employs scientifically rigorous fixed-area sample techniques that are both practical, simple to apply, and repeatable. It produces standardized, quantifiable data that is flexible and valuable for a range of academic and practical purposes (Stehman and Czaplewski, 1998). For vegetative sampling following methods can be applied Line intercept, Line transect, Bisect and Quadrate methods, etc.

Characteristics of plant community are classified into three main groups, these are: Analytical, synthetic and physiognomic. Out of above-mentioned groups, this research is based on analytic and Physiognomic characteristics.

Analytical characteristic of the community are those that can be observed or quantified from all angles. These include species types and numbers, species strength, distribution, and individual counts, as well as form, plant heights, area volume, periodicity, growth rate and other factors. In sample plots, they are directly observed or measured (Gray and Elliott, 2009).

Analytical characters include qualitative and quantitative characteristics. Qualitative are usually descriptive and are founded on non-quantitative observations such as the species composition and vegetation stratification. They are only expressed in a qualitative manner (Barnes, 1953).

Quantitative are described in numerical terms. They are calibrated. The main quantitative traits are diversity, cover, biomass, leaf size, frequency, abundance, dominance, etc. (de Bello *et al.*, 2011).

Physiognomic Characters represent the vertical structure, outward appearance including its height and spacing, shape and number, etc., of plants are all combined to generate physiognomy (Oliver, 1980). It gives a description of the size, leaf characteristics, and phenology of the dominating species' life forms (deciduous, evergreen) (Ustin and Gamon, 2010). It is possible to determine that an area is a forest based on the appearance of a community where trees and some shrubs are the dominant species (Mueggler, 1988).

Synthetic characteristics are generalizations that incorporate several analytic characteristics and are developed from data on analytic attributes (Curtis and Mcintosh, 1950).

Quadrat method was used for studying plant community quantitatively. In this study a quadrate of rectangular shape was used (Taj *et al.*, 2022).

Sufficient number of quadrats were be taken during the sampling. In our study Quadrat were used, each was of the size of 1X1 m, placed randomly in study area. All the species within the quadrats were

recorded representing density, cover was measured, converted into basal area in square feet by using a cover conversion table (Supplementary Figure 2). Frequency or occurrence also worked out. Density, cover, frequency and importance value can be calculated separately for each species (Whittaker, 1972). Refer to sample quadrat given below (Figure 1).

Figure 1: *Sample quadrat.*

Materials and Methods

Study area

Abbottabad is a district in Pakistan's Khyber Pakhtunkhwa province (Taj *et al.*, 2022). Mansehra is to the north, Muzaffarabad is to the east, Haripur is to the west, and Rawalpindi is to the south (Figure 2).

Figure 2: *Map of Abbottabad.*

Birote is a town in the Circle Bakote, an area of Abbottabad District in Pakistan, between the borders of Punjab and Kashmir. It is located on the banks of the Jhelum River. Birote is one of the 51 union councils in Pakistan's Khyber-Pakhtunkhwa province (Figure 3).

Birote is located in the south-eastern section of the Circle Bakote Area of Abbottabad district and borders the Tehsil Dheerkot of Bagh District of Kashmir in the east and Mushkpuri Top and Ayubia in the west. The Union Council is organized into four sections: Birote Kalan, Birote Khurd, Kahoo Sharqi, Kahoo Gharb.

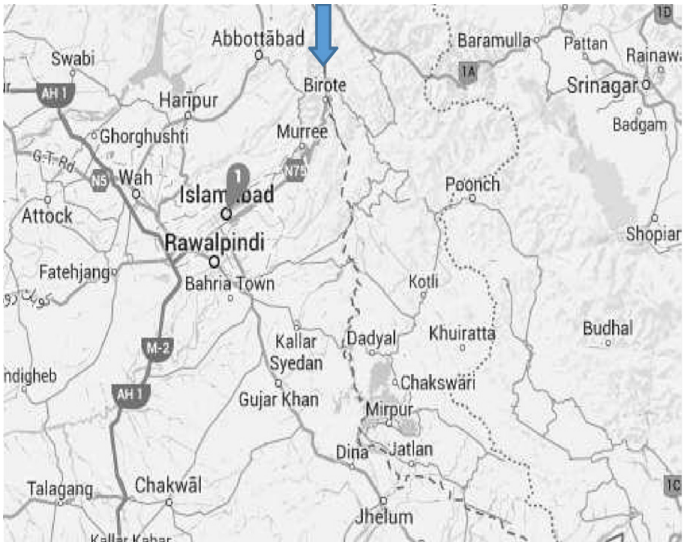

Figure 3: *Birote map.*

Materials used: Iron or wooden nails, Cord or string, Meter scale, Hammer, Measuring tape, Pencil, Note book, etc.

Procedure

Nails and thread were used to create a quadrat of 1×1m on the chosen study location (Figure 4). With the use of a hammer, the nails were embedded in the ground. 10 identical quadrants were created at the research location. The species in the first quadrant was marked as 1 after observing them. It is verified that whether species 1 is present in each quadrant and recorded the observed data on table. We recorded the number of species 2 and 3 in each quadrant and included them in the table in a similar manner. By using the formula, we determined the cover, density and frequency of the plant population**.** We repeated the same procedure for other species and recorded the data in a table, sample given below (Table 1). Our research was based upon analytical (quantitative and qualitative) and physiognomic data, so the same were recorded duly (Table 1 Sample table).

Table 1: Sample table.

S. No	Voucher no/ Optional	Species name	Density (D)	Cover (C)	Frequency (F)
1					
2					

Figure 4: *Quadrate positioned at study area.*

Methodology

The research was conducted in the Union Council Birote area of Circle Bakote to determine the type of vegetation. In the Field, a quadrat is used to mark out a specific area of the plant community. All of the species found in each quadrat were identified and counted numerically. A sampling unit of area was taken in a specific size region. Repeated quadrat samples were collected in September and November 2022. Identification of the dominating species in the field and their occurrence are made easier by this study. In each unit, the names of the species and the number of distinct species are noted, and the formula is used to compute the percentage frequency, density, and abundance.

Density

The number of individuals per unit area (for instance, plants per m^2) is referred to as density in vegetation measuring (White and Harper, 1970). It describes how many members of a species were counted in a certain area. This is calculated as follows:

$$\text{Density (D)} = \frac{\text{Total number of individual of a species in all the sample plots}}{\text{Total number of sample plots studied}}$$

Relative density

It is the proportion of a density of a species to that of a stand as a whole. It is calculated by the following formula:

$$\text{Relative density (D3)} = \frac{\text{Total no of individual of species in all quadrats}}{\text{Total no of individual of all species in all quadrats}} \times 100$$

Cover

Cover refers to the area of the plant's surface that is either covered or shaded. The degree of a species' dominance in a layer is generally gauged by its coverage values (Leach and Givnish, 1999).

Basal area

Basal area simply refers to the area of the ground that the crown actually covers (Hyyppa *et al.*, 2001). Basal area in herbaceous vegetation is the covering of the plant 1 inch above the ground. In order to obtain the cover, the diameter of the crown is taken by the help of measuring tape (Schenstrom, 1931). Average cover of a species can be calculated by the help of following formula:

$$\text{Average cover per species (C)} = \frac{\text{Total cover (square feet) of a species}}{\text{Number of plants of a species}}$$

Relative cover

Relative cover of a species is the proportion of the total of a species to the sum of the cover of all the plant of all species in the area (Dickson and Foster 2008).

$$\text{Relative cover of species (C3)} = \frac{\text{Total cover (sq.ft.)of all plants of a sp.}}{\text{Total cover (sq.ft.)of all plants of all sp.}} \times 100$$

Frequency

The number of occurrences is the frequency of each particular species. The species that are present in the sampling unit or the level of species distribution. It is the proportion of sampling plots where an individual species is found. It is concerned with the degree of uniformity in which members of a species occur in a given location. Frequency is determined by the help of following formula:

$$\text{Frequency (F)} = \frac{\text{Number of quadrats of occurrence of a species}}{\text{Total number of quadrat used by sampling}} \times 100$$

Relative frequency

It is the proportion of the total frequency of a species to the sum of the frequency of all the species in the area. It is determined by the following formula:

$$\text{Relative frequency (F3)} = \frac{\text{Frequency a species}}{\text{Total frequency of all species}} \times 100$$

Importance value index (IVI)

Importance value index can be obtained by adding the values of relative density, relative cover and relative frequency and dividing it by three will give

the importance value (IVI) of the species.

$$\text{Importance value index} = \frac{\text{Relative density} + \text{Relative cover} + \text{Relative frequency}}{3}$$

$$\text{OR IVI} = \frac{D3 + C3 + F3}{3}$$

After getting the importance value of all the species the values are arranged in a tabular form.

Name of the community is assigned according to the first two or three dominant plants. Physiognomic characters also worked out. Qualitative as aspect of community was the basis.

Results and Discussion

As mentioned, for quantitative study of the vegetative sampling of the plant community we used quadrat method in the area UC Birote. We made 10 quadrates of 1 meter and laid randomly at the selected site to study the density, cover, and frequency. We calculated the density, cover and frequency of all species individually in the tabulated form, and the measured cover was converted into Basal Area in square feet by using cover conversion table (Supplementary Figure 2). After that by using relative density, relative cover and relative frequency formulae we find out the IVI values to study the dominant species in the quadrates to determines the community type of that area. Ultimately analytical and physiognomic characters of community were studied. In each unit, the Botanical and common names, local names of all species, their Family, Habit, Habitat, and Life form were also noted in a separate table based upon field Data Record (Supplementary Figure 1).

Quantitative analysis by quadrat method-calculations

Community type was studied by carrying out quantitative analysis through quadrat method. By using formulas, the cover, density and frequency of the plant population were determined. Whole data of all species were recorded in the form of tables. As study was based upon analytical qualitative and quantitative and physiognomic characters so for quantitative characteristics, density, frequency, cover, IVI, dominant species and community type was worked out. For qualitative study physiognomic characteristics, botanical name of species, local name/ common name, flower colour, family, habit, habitat and lifeform were worked out. Whole data of all species from the study area were recorded in the form of (Table 2-14) and Figures as representative: Figures 5-7, fresh Plants and Figures 8-10, herb sheets-dominant species). The data is presented as follows:

Field data record of quadrat 1

The density, cover and frequency of all species present in Quadrat 1 is recorded individually and table shows field data record of every individual specie in quadrat 1 (Table 2).

Field data record of quadrat 2

The density, cover and frequency of all species present in quadrat 2 is recorded individually and table shows field data record of every individual specie in quadrat 2 (Table 3).

Field data record of Quadrat 3

The density, cover and frequency of all species present in quadrat 3 is recorded individually and table shows field data record of every individual specie in quadrat 3 (Table 4).

Table 2: *The density, cover and frequency of individual plant species in quadrat 1.*

S. No	Type	Density	Cover (Inches)	Frequency	Cover conversion basal area
1	*Parthenium hysterophorus L.*	14	38	1	0.7983
2	*Taraxicum officinale*	16	44	1	1.0704
3	*Malvestrum coromandelianum*	12	22	1	0.2676
4	*Oxalis corniculata*	13	31	1	0.5313
5	*Symphotrichum subulatum*	-	-	-	-
6	*Salix purpuria*	-	-	-	-
7	*Justicia* sp.	-	-	-	-
8	*Eclipta alba*	-	-	-	-
9	*Erigeron bonariensis*	-	-	-	-
10	*Euphorbia amygdaloides*	-	-	-	-
11	*Oenothera rosea*	-	-	-	-

Table 3: *The density, cover and frequency of individual plant species in quadrat 2.*

S. No	Type	Dencity	Cover (inches)	Frequency	Cover conversion- basal area
1	*Parthenium hysterophorus L.*	16	33	1	0.6021
2	*Taraxicum officinale*	1	3	1	0.0049
3	*Malvestrum coromandelianum*	33	66	1	2.4084
4	*Oxalis corniculata*	25	25	1	0.3455
5	*Symphotrichum subulatum*	-	-	-	-
6	*Salix purpuria*	-	-	-	-
7	*Justicia sp.*	-	-	-	-
8	*Eclipta alba*	-	-	-	-
9	*Erigeron bonariensis*	-	-	-	-
10	*Euphorbia amygdaloides*	-	-	-	-
11	*Oenothera rosea*	-	-	-	-

Table 4: *The density, cover and frequency of individual plant species in quadrat 3.*

S. No	Type	Dencity	Cover (inches)	Frequency	Cover conversion basal area
1	*Parthenium hysterophorus L.*	26	41	1	0.9288
2	*Taraxicum officinale*	2	7	1	0.0279
3	*Malvestrum coromandelianum*	21	42	1	0.9742
4	*Oxalis corniculata*	36	35	1	0.6773
5	*Symphotrichum subulatum*	-	-	-	-
6	*Salix purpuria*	-	-	-	-
7	*Justicia sp.*	-	-	-	-
8	*Eclipta alba*	-	-	-	-
9	*Erigeron bonariensis*	-	-	-	-
10	*Euphorbia amygdaloides*	-	-	-	-
11	*Oenothera rosea*	-	-	-	-

Table 5: *The density, cover and frequency of individual plant species in quadrat 4.*

S. No	Type	Dencity	Cover (inches)	Frequency	Cover conversion basal area
1	*Parthenium hysterophorus* L.	30	73	1	2.9464
2	*Taraxicum officinale*	6	17	1	0.1597
3	*Malvestrum coromandelianum*	12	24	1	0.3185
4	*Oxalis corniculata*	17	17	1	0.1597
5	*Symphotrichum subulatum*	-	-	-	-
6	*Salix purpuria*	-		-	-
7	*Justicia* sp.	-	-	-	-
8	*Eclipta alba*	-	-	-	-
9	*Erigeron bonariensis*	-	-	-	-
10	*Euphorbia amygdaloides*	-	-	-	-
11	*Oenothera rosea*	-	-	-	-

Field data record of quadrat 4

The density, cover and frequency of all species present in quadrat 4 is recorded individually and table shows field data record of every individual specie in quadrat 4 (Table 5).

Field data record of quadrat 5

The density, cover and frequency of all species present in quadrat 5 is recorded individually and table shows field data record of every individual specie in quadrat 5 (Table 6).

Table 6: *The density, cover and frequency of individual plant species in quadrat 5.*

S. No	Type	Dencity	Cover (inches)	Frequency	Cover conversion basal area
1	*Parthenium hysterophorus* L.	5	2	1	0.0005
2	*Taraxicum officinale*	-	-	-	-
3	*Malvestrum coromandelianum*	4	9	1	0.0447
4	*Oxalis corniculata*	10	10	1	0.0552
5	*Symphotrichum subulatum*	14	32	1	0.5661
6	*Salix purpuria*	7	32	1	0.5667
7	*Justicia* sp.	7	7	1	0.0279
8	*Eclipta alba*	1	4	1	0.0088
9	*Erigeron bonariensis*	28	56	1	1.7338
10	*Euphorbia amygdaloides*	4	2	1	0.0022
11	*Oenothera rosea*	2	2	1	0.0022

Table 7: *The density, cover and frequency of individual plant species in quadrat 6.*

S. No	Type	Dencity	Cover (inches)	Frequency	Cover conversion basal area
1	*Parthenium hysterophorus* L.	1	3	1	0.0005
2	*Taraxicum officinale*	-	-	-	-
3	*Malvestrum coromandelianum*	8	16	1	0.1415
4	*Oxalis corniculata*	4	4	1	0.0088
5	*Symphotrichum subulatum*	14	28	1	0.4334
6	*Salix purpuria*	20	28	1	0.4334
7	*Justicia* sp.	4	2	1	0.0022
8	*Eclipta alba*	1	3	1	0.0049
9	*Erigeron bonariensis*	40	70	1	2.7092
10	*Euphorbia amygdaloides*	-	-	-	-
11	*Oenothera rosea*	-	-	-	-

Table 8: *The density, cover and frequency of individual plant species in quadrat 7.*

S. No	Type	Dencity	Cover (inches)	Frequency	Cover conversion basal area
1	*Parthenium hysterophorus* L.	-	--	-	-
2	Taraxicum officinale	-	-	-	-
3	Malvestrum coromandelianum	18	38	1	0.7983
4	Oxalis corniculata	40	40	1	0.8846
5	Symphotrichum subulatum	5	19	1	0.1995
6	Salix purpuria	6	19	1	0.1995
7	*Justicia* sp.	-	-	-	-
8	Eclipta alba	10	19	1	0.1995
9	Erigeron bonariensis	23	58	1	1.8589
10	Euphorbia amygdaloides	-	-	-	-
11	Oenothera rosea	2	-	1	0.0279

Field data record of quadrat 6

The density, cover and frequency of all species present in quadrat 6 is recorded individually and table shows field data record of every individual specie in quadrat 6 (Table 7).

Field data record of quadrat 7

The density, cover and frequency of all species present in quadrat 7 is recorded individually and table shows field data record of every individual specie in quadrat 7 (Table 8).

Table 9: *The density, cover and frequency of individual plant species in quadrat 8.*

S. No	Type	Dencity	Cover (inches)	Frequency	Cover conversion basal area
1	*Parthenium hysterophorus* L.	3	6	1	0.0199
2	*Taraxicum officinale*	-	-	-	-
3	*Malvestrum coromandelianum*	12	27	1	0.4030
4	*Oxalis corniculata*	37	37	1	0.7569
5	*Symphotrichum subulatum*	6	15	1	0.1244
6	*Salix purpuria*	3	15	1	0.1244
7	*Justicia* sp.	2	1	1	0.0005
8	*Eclipta alba*	5	12	1	0.0795
9	*Erigeron bonariensis*	21	48	1	1.2628
10	*Euphorbia amygdaloides*	1	7	1	0.0279
11	*Oenothera rosea*	-	-	-	-

Table 10: *The density, cover and frequency of individual plant species in quadrat 9.*

S. No	Type	Dencity	Cover (inches)	Frequency	Cover conversion basal area
1	*Parthenium hysterophorus L.*	4	7	1	0.0279
2	*Taraxicum officinale*	-	-	-	-
3	*Malvestrum coromandelianum*	28	56	1	1.7338
4	*Oxalis corniculata*	57	57	1	1.7963
5	*Symphotrichum subulatum*	3	8	1	0.0353
6	*Salix purpuria*	3	8	1	0.0353
7	*Justicia sp.*	-	-	-	-
8	*Eclipta alba*	22	64	1	2.2646
9	*Erigeron bonariensis*	40	85	1	3.9943
10	*Euphorbia amygdaloides*	1	5	1	0.0138
11	*Oenothera rosea*	-	-	-	-

Table 11: *The density, cover and frequency of individual plant species in quadrat 10.*

S. No	Type	Dencity	Cover (inches)	Frequency	Cover conversion basal area
1	*Parthenium hysterophorus L.*	-	-	-	-
2	*Taraxicum officinale*	-	-	-	-
3	*Malvestrum coromandelianum*	18	93	1	4.7824
4	*Oxalis corniculata*	83	83	1	3.8099
5	*Symphotrichum subulatum*	-	-	-	-
6	*Salix purpuria*	1	3	1	0.0022
7	*Justicia sp.*	-	-	-	-
8	*Eclipta alba*	14	36	1	0.7165
9	*Erigeron bonariensis*	4	19	1	0.1995
10	*Euphorbia amygdaloides*	-	-	-	-
11	*Oenothera rosea*	-	-	-	-

Field data record of quadrat 8

The density, cover and frequency of all species present in quadrat 8 is recorded individually and table shows field data record of every individual specie in quadrat 8 (Table 9).

Field data record of quadrat 9

The density, cover and frequency of all species present in quadrat 9 is recorded individually and table shows field data record of every individual specie in quadrat 9 (Table 10).

Table 12: *The density, cover and frequency of all species in all quadrat.*

S. No	Type	Dencity	Cover (inches)	Frequency	Basal area
1	*Parthenium hysterophorus* L.	99	203	8	5.38861
2	*Taraxicum officinale*	25	71	4	1.2629
3	*Malvestrum coromandelianum*	166	395	10	12.9238
4	*Oxalis corniculata*	322	339	10	9.8616
5	*Symphotrichum subulatum*	42	102	5	1.3585
6	*Salix purpuria*	40	108	6	2.3379
7	*Justicia*	13	10	3	0.2817
8	*Eclipta alba*	53	138	6	3.2737
9	*Erigeron bonariensis*	156	336	5	11.7595
10	*Euphorbia amygdaloides*	6	14	3	0.0439
11	*Oenothera rosea*	4	9	2	0.0301
	Total	TD= 926	TC= 1725	TF= 62	48.52221

Field data record of quadrat 10

The density, cover and frequency of all species present in quadrat 10 is recorded individually and table shows field data record of every individual specie in quadrat 10 (Table 11).

Calculation of total density, cover and frequency of all species present in all quadrats

The density, cover and frequency of all species present in all quadrats were recorded individually and then density, cover and frequency of all species present in all quadrat were calculated separately which gives us total density, cover and frequency of all species and through this data IVI values were worked out. Ultimately dominant species and community type would be worked out. Table 12 showing field data record of all species in all quadrat. Qualitative and Physiognomic data were also presented in table (Table 12-14).

Degree of dominance

The table given below shows the density, cover, frequency of all the 11 species in all 10 quadrats, their relative densities, relative cover, relative frequencies and their IVI values, which tell us about the dominant species of the area (Table 13).

Community is named after the same: Leading family is Asteraceae. Most plants are herbs. The study covered analytical (qualitative and quantitative) characteristics and Physiognomic characteristics.

Figure 4: *Euphorbia amygloides.*

Figure 5: *Malvastrum coromandelanum.*

Figure 6: *Taraxicum officinale.*

Figure 7: *Symphotricum ubulatum*

Figure 8: *Oxalis corniculate.*

Figure 9: *Parthenium hysterophorus.*

Qualitative analysis of all species present in all quadrats
Qualitative study of the community is presented in tabulated form (Table 14) based upon data gathered through Supplementary Figure 1. Pictures of original plants and herbarium sheets is also presented (As representative: Figures 5-7 fresh Figures 8-10 herb sheets-dominant species).

Plant communities are assemblages of species studied extensively by ecologists. Plant community ecology is the study of the organization and functioning of plant communities.

For quantitative (analytical) study of plant community quadrat method was employed, comprising specific sampling plots in accordance with the study area. This method was used as it is favoured when studying grassland community. A rectangular quadrat was used. The quadrat method is one of the most accurate ways to examine the occurrence, distribution of vegetation in a community. Quadrats were used to calculate the vegetation parameters of each plant species (density, frequency, and abundance). The names of the species and the number of distinct species in each unit were noted comprising quantitative and qualitative (analytical) characteristics (Supplementary Figure 1). Each species cover measured using measuring tapes, and the measured cover converted into Basal Area in square feet by using a cover conversion table (Supplementary Figure 2). The density, cover and frequency of all species present in all quadrat recorded individually and then density, cover and frequency of all species present in all quadrat were calculated separately which gives us total density, cover and frequency

Table 13: *Showing the Degree of Dominance.*

S. No	Type	D1	C1	F1	RD=D1/ TDX100	RC=C1/ TCX100	RF=F1/ TFX100	IVI __ D3+C3+F3	Degree of Dominance
1	*Parthenium hysterophorus l.*	99/10= 9.9	5.38861 99 = 0.0543	8/10 = 0.8	9.9X100 926 =1.0691	0.0543X 100 48.5222 1 = 0.1190	0.8X100 62 =1.290	1.0691+0.1190 +1.290 3 =1.6181	3
2	*Taraxicum officinale*	25/10= 2.5	1.2629 25 =0.0505	4/10 =0.4	2.5X100 926 =0.2699	0.0505X 100 48.5222 1 = 0.1040	0.4X100 62 =0.645	0.2699+0.1040 +0.645 3 =0.3396	8
3	*Malvestrum coromandelianum*	166/10 =16.6	12.9233 166 = 0.077	10/1 0 =1	16.6X10 0 926 =1.7	0.077X1 00 48.5222 1 =0.1586	1X100 62 =1.612	1.7926+0.1586 +1.621 3 1.1877	4
4	*Oxalis corniculata*	322/ 10 =32.3	9.2714 322 =0.028	10/10 =1	32.2X10 0 926 =34.773	0.028X1 00 48.5222 1 =0.0577	1X100 62 =1.612	34.773+0.0577 1.612 3 =12.147	1
5	*Symphotrichum subulatum*	42/1 0 =4.2	1.3585 42 =0.032	5/10 =0.5	4.2X100 926 =0.4535	0.032X100 48.5222 1 =0.065	5X100 62 =8.064	0.4535+0.065+ 8.064 3 =2.8608	2
6	*Salix purpuria*	40/1 0 =4	2.3379 40 =0.0584	6/10 =0.6	4X100 926 =0.4319	0.0584X 100 48.5222 1 =0.1203	0.6X100 62 =0.967	0.4319+0.1203 +0.967 3 =0.5064	7
7	*Justicia sp*	13/1 0 =1.3	0.2819 13 =0.0216	3/10 =0.3	1.3X100 926 =0.1403	0.0216X 100 48.5222 1 =0.0445	0.3X100 62 =0.483	0.1403+0.0445 +0.483 3 =0.2226	9
8	*Eclipta alba*	53/1 0 =5.3	3.2737 53 =0.0617	6/10 =0.6	5.3X100 926 =0.5723	0.0617X 100 48.5222 1 =0.1271	0.6X100 62 =0.967	0.5723+0.1271 +0.967 3 =0.5554	6
9	*Erigeron bonariensis*	156/ 10 =15. 6	11.7597 156 =0.0708	5/10 =0.5	15.6X10 0 926 =1.6846	0.0708X 100 48.5222 1=0.1459	0.5X100 62 =0.806	1.6846+0.1459 +0.806 3 =0.8788	5
10	*Euphorbia amygdaloides*	6/10 =0.6	0.0439 6 =0.00731	3/10 =0.3	0.6X100 926 =0.0647	0.0073X 100 48.5222 1 =0.0150	0.3X100 62 =0.483	0.0647+0.0150 0.483 3 =0.1869	10
11	*Oenothera rosea*	4/10 =0.4	0.0301 4 =0.007525	2/10 =0.2	0.4X100 926 =0.0431	0.00752 5X100 48.5222 1 =0.0155	0.2X100 62 = 0.322	0.0431+0.0155 +0.322 3 =0.1268	11

Dominant species = oxalis corniculata, symphotrichum subulatum, parthenium hysterophorus L. Community type = oxalis corniculata, symphotrichum subulatum, parthenium hysterophorus L.

Table 14: *Botanical name, family, common /local name, flower colour, habit, habitat and life form of plant species.*

Botanical name	Family	Common name/ Local name	Flower colour	Habit	Habitat	Life form
Parthenium hysterophorus L.	Asteraceae	Santa maria,whitetop weed/Gagar ghans	White	Annual, Herbaceous	Semi-arid, Sub-tropical	Erect, branched, aromatic annual, and therophyte
Taraxicumoffi cinale	Asteraceae	Dandelion/ Dhudhal, bahtur	Yellow	Herbaceous,perrenial	Fields road side	Perennial and therophyte
Malvestrum coromandelianum	Malvaceae	Three lobe false mallow/-	Yellow	Perennial, herbaceous	Tropical ,warm Temperate areas	Annual or shortly perennial, therophyte
Oxalis corniculata	Oxalidaceae	Creeping,woodsorrel/ Khatti booti	Bright yellow	Annual perrenial, herb	Gardens, LAWNS	Annual or perennial, therophyte
Symphotrichum subulatum	Asteraceae	Easter annual salt marsh aster/-	White	Annual, binneal, herb	Crop field margins,lawns, road side, tropical	Terrestrial, therophyte
Salix purpuria	Salicaceae	Purple, basket willow/ Baid ka darakht.	Silvery green	Dense, Upright, rounded	Ditches, Along streams	Fast growing, native, deciduous tree in sapling stage
Justicia sp	Acanthaceae	Water willow, shrimp plant/Baikurh	orange	Erect, branched, Evergreen herb	Terrestrial, tropical, subtropical	Perennial herb or shrublet , therophyte
Eclipta alba	Asteraceae	False daisy/Brhingari	White	Moist, short lived perennial	Warm template tropical	therophyte
Erigeron bonariensis	*Asteraceae*	Small horse weed,flax leaf fleabane/Daryai booti	White,pink ,purple	Road side, cultivated fields	Temperate, tropical, dry, sun exposed	Annual, therophyte
Euphorbia amygdaloides	*Euphorbiaceae*	Woods spurge/Thuhur	Yellow,green	Perrenial, bushy	Old wood land	Bushy, evergreen ,perennial , therophyte
Oenothera rosea	Onagraceae	Evening primrose/-	Light yellow	Binennial	Fields, meadows, sandy soil	therophyte

Oxalis corniculatua, Symphotrichum subulatum and Parthenium hysterophorus are dominant species in the study area of UC Birote in district Abbottabad.

of all species and through this data IVI values were worked out. Physiognomic characters were also worked out comprising habit and life form. Community was ultimately identified based on the important value index. A sum of 11 plant species of 5 families were recorded in which the leading family was Asteraceae. The study in UC Birote in district Abbottabad, comprises a comprehensive research based upon analytical (quantitativeand qualitative) and physiognomic characters refer to Tables 2-13 (quantitative data) and Table14 (qualitative and physiognomic data) and Figures 5-7 and Figures 8-10.

Research is significant as it will help future agronomist, agriculturist and scientist to understand the community at UC Birote in Abbottabad District As mentioned.

Results of analytical characteristics-quantitative and qualitative and physiognomic characteristics revealed that *Oxalis corniculata* belonging to family Oxalidaceae was most dominant and abundant in UC Birote Community in Abbottabad District followed by *Symphotrichum subulatum* and *Parthenium hysterophorus*, both from Asteraceae. Thus, the community at UC Birote in Abbottabad District is *Oxalis, Symphotrichum and Parthenium* Community. Asteraceae was the leading family. Out of total 11 species 5 belonged to this family. Physiognomic analysis revealed that all species reported were dicotyledonous and herbaceous, having the life form of therophyte. One tree species was recorded but in sapling stage. The research is comprehensive and provides instant data regarding community type at UC Birote, comprising analytical (quantitative and qualitative) and physiognomic characteristics.

Conclusion

Quadrat method of study, comprising analytical (quantitative and qualitative) characters were worked out in UC Birote, based upon, densities cover and

frequency. The main purpose of this research was to find the IVI value in order to study the dominant species in the area and to establish community type .The collected plant species were *Parthenium hysterophorus* L. (Asteraceae),*Taraxacum officinale* (Asteraceae), *Malvastrum coromandelianum* (Malvaceae), *Oxalis corniculata* (Oxalidaceae), *Symphyotricum subulatum* (Asteraceae), *Salix purpurea* (Salicaceae), *Justicia* sp. (Acanthaceae), *Eclipta alba* (Asteraceae), *Erigeron bonariensis* (Asteraceae), *Euphorbia amygdaloides* (Euphorbiaceae), *Oenothera rosea* (Onagraceae).

The dominant species were *Oxalis corniculata* (Oxalidaceae), *Symphyotricum subulatum* (Asteraceae), and *Parthenium hysterophorus L.* (Asteraceae).

Most of the plant species were annual and herbaceous having life form of therophytes. Leading family in the area was Astereaceae. These three plant species indicate the community type of the area. The study makes record of species, botanical names, local/ common names, family colour of the flower, habit, habitat and life form research covers qualitative and physiognomic aspects as well. Qualitative aspect also covers species count. It is part of analytical research. It is very significant. It provides data to future agronomist, agriculturalist and scientist when they want to utilize land for agriculture and crop practices.

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Novelty Statemenet

This research is Unique as Vegetative Sampling has never been done in the study area mentioned here. The work presented in this article has not been produced and presented anywhere before .

Author's Contribution

Prof Dr. Saadia Afzal: Supervisor, Main Contributor, Facilitator.

Sana Abbas, Khadija Bibi, Rutba Farooq: Student Contributor

Generative AI and AI-assisted technology statement

It is to be noted that no AI tool was used in the completion of this article/ research Work.

Supplementary material

There is supplementary material associated with this article. Access the material online at: https://dx.doi.org/10.17582/journal.pjwsr/2025/31.2.167.181

Conflict of interest

The authors have declared no conflict of interest.

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