FLORISTIC COMPOSITION AND DIVERSITY ANALYSIS OF KERI HILLS OF DISTRICT KOTLI AZAD JAMMU AND KASHMIR PAKISTAN

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ABSTRACT

The investigated area has need to protect from pressure of local inhabitants and deforestation. The Floristic composition and vegetation analysis of Keri Charhoi hills were analysed. The study found 66 plants species belonging to 36 families. There were 20 plant communities in spring. The soil texture of studied area was loamy to clay loamy. The total soluble salt ranges from 0.02-0.09%, pH from 7.15-7.62, Organic matter ranges from 0.96-1.8%, Phosphorus ranges from 2.5-10.5ppm and Potassium ranges from 104-170ppm. 58 species were palatable and 25 species were non-palatable. Index of diversity was 3.10 in spring and species richness was 0.85 in spring. The species richness was low at base and increases again then decreases at high altitude. In spring, only one community was homogenous and remaining 9 were heterogenous. Similarly, in monsoon, 4 communities were homogenous and other 6 were heterogenous. Biological spectrum shows that in spring Megaphanerophytes and Hemicryptophytes were dominant. Leaf size classes were Nanophylls and Microphylls. On the basis of cluster analysis, four associations were detected in Charhoi hills. All communities were immature in both seasons.

Keywords: Diversity, Floristic composition, Biological spectrum.

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INTRODUCTION

Biodiversity is the sum of species, gene and ecosystem in a region. It is important for survival and economic well-being for human and for the ecosystem stability and function (Singh, 2002). It is assessed that the total number of plant and animal species might be between 13 and 14 million (Heywood, 1995). Forests are major stores of species, habitat, and genetic diversity Forests worldwide are known to be critically important habitats in terms of the biological diversity (Noble and Dirzo, 1997; Samreen et al., 2018).

Vegetation is consisting on diverse plant communities each have their own species composition, structure (Duigan and Bredenkamp, 2003). Knowledge of plant communities helps in management of particular areas (Brown and Brand, 2004). Floristic diversity is the total species within a region wild or cultivated. Floristic studies are undertaken by many researchers worldwide in different levels following variety of sampling and measurement techniques based on their objectives. Plant resources are affected by over anthropogenic affect and natural diseases (Malik and Malik, 2004). Vegetation generally represents flora of an area. The flora comprises of number of species and vegetation refers to their spreading and number of individual (Ali et al., 2016). Floristic composition and diversity of species analysis are essential for providing information on species richness of the forests, useful for forest management purpose and help in understanding ecosystem functions (Giriraj et al., 2008; Pappoe et al., 2010).

Study Area

Keri Charhoi hills were selected for floristic and phytosociological analysis. Charhoi hills are situated in District Kotli Azad Kashmir. A general survey of Hills was conducted during spring 2016. The area is subtropical dry type. The summers are hot and winters are cold. June is the hottest month having temperatures of 38^0C to 25^0C respectively. January is the coldest month with temperatures of about 18^0C and 5^0C respectively. The annual rain fall is 976 millimeters. The maximum rainfall occurs in month of February, August and September. The average annual temperature is 21.9°C. The maximum temperature is between May and July ranges in between 34°C - 37°C. The minimum temperature ranges from 4°C to 23°C. Relative humidity fluctuates in between January to December. Maximum in august (84%) and minimum in may (33.5%). Soil differ from loam to clay loam.

MATERIALS AND METHODS

The Floristic composition and vegetational analysis of Keri Charhoi hills were analysed. Altitudinal range of 500-945m were selected for phytosociological analysis. There were 83 plants species belonging to 46 families were studied. There were 20 plant communities in spring. Quadrat method was used to analyse the vegetation. The sampling size for sampling tree was 10x10 m^2, for shrubs 5x5 m^2 and for herbs 0.5x0.5m^2. The sampling was random. Phytosociological parameters were recorded in each community including density, frequency, cover, importance value index (Cox, 1967); index of diversity, species richness, equitability, species maturity (CE and Wiener, 1949; Sorensen, 1948) degree of aggregation, index of similarity (Pichi, 1948); biological spectrum and leaf spectra following standard protocols (Greig, 2010; Muller and Ellenberg, 1974).

RESULTS

A total of 66 species belonging to 36 plant families were recorded from the investigated area. The major contributors of local flora included Poaceae (10 spp.) followed by Asteraceae (6 spp.), Euphorbiaceae (2 spp.), Fabaceae (4 spp.) and Lamiaceae (4 spp.), remaining families with species number shown in table 1. megaphanerophytes (30%) was dominant life form in the area followed by hemicryptophytes (23%), Therophyte (22%), nanophenerophytes (15%), geophytes (7%); Chameophytes (1%) and Lianas (0%). The dominant leaf spectrum was leptophyll (30%), followed by microphylls (30%), nanophylls (25%) and mesophylls (15%) [Table-1].

Pinus-Cynodon-Themeda community was recorded from charhoi hills at an

altitude of 500m. latitude and longitude of the community was $31^0.44'$ N -$69^0.74'$ E. this community was dominated by Pinus roxburghii having I.V 110.83. Cynodon dactylon and Themeda anathera were codominant having I.V 43.82 and 30.22 respectively. The soil of community was Loamy having basic pH, saturation 41%, Total soluble salt 0.06%, organic matter 0.96%, Phosphorus 9.8ppm and potassium 120ppm.

Pinus-Cyndon-Lantana community was at an altitude of 614m ($33^0.45'$ N, $73^0.75'$ E) on charhoi hills Pinus roxburghii was dominant with I.V 109.48. Cynodon and Lantana camara are co-dominant with I.V 25.41 and 19.48 respectively. The soil of community was Loamy having basic pH, saturation 38%, Total soluble salt 0.03%, organic matter 1.7%, Phosphorus 2.5ppm and potassium 112ppm.

Pinus-Cynodon-Themeda community was recorded from charhoi hills at an altitude of 681m. latitude and longitude of the community was $33^0.45'$ N-$73^0.808'$ E. this community was dominated by Pinus roxburghii having I.V 62.47. Cynodon dactylon and Themeda anathera are co-dominant having I.V 33.62 and 27.28 respectively. The soil of community was Loamy having basic pH, saturation 43%, Total soluble salt 0.03%, organic matter 0.99%, Phosphorus 3.59ppm and potassium 113ppm.

In Cynodon-Mallotus-Cichorium community Cynodon dactylon with I.V 51.47 was dominant at an altitude of 715m. its longitude and latitude was $33^0.487'$N,$73^0.759'$ E. Mallotus phillipensis and Cichorium intybus are co-dominant species having I.V 26.53 and 26.53 respectively. The soil of community was Loamy having basic pH, saturation 38%, Total soluble salt 0.09%, organic matter 1.19%, Phosphorus 10.02ppm and potassium 150ppm.

Pinus-Cynodon-Lantana community was at an altitude of 743m ($73^0.768'$ E, $33^0.45'$N) were dominated by Pinus roxburghii community with I.V 109.32. Cynodon dactylon and Lantana camara are co-dominant having I.V value 28.27 and 35.55 respectively. The soil of community was Clay Loam having basic pH, saturation 43%, Total soluble salt 0.06%, organic matter 1.53%, Phosphorus 7.52ppm and potassium 104ppm.

Pinus-Cynodon-Trichodesma community was recorded from charhoi hills at an altitude of 836m. latitude and longitude of the community was $33^0.48'$ N-$73^0.758'$ E. this community was dominated by Pinus roxburghii having I.V 89.25. Cynodon dactylon and Trichodesma indicum are co-dominant having I.V 58.91 and 25.74 respectively. The soil of community was Loamy having basic pH, saturation 33%, Total soluble salt 0.07%, organic matter1.5%, Phosphorus 7.44ppm and potassium 105ppm.

Pinus-Mallotus-Cynodon community: Charhoi hills at an altitude of 845m ($73^0.748'$ E, $33^0.45'$ N) were dominated byPinus roxburghii community with I.V 71.24. Mallotus philippensis and Cynodon dactylon are co-dominant having I.V value 41.90 and 27.05 respectively.The soil of community was Loamy having basic pH, saturation 39%, Total soluble salt 0.07%, organic matter 1.12%, Phosphorus 2.5ppm and potassium 170ppm.

Pinus-Cynodon-Lantana community was recorded from charhoi hills at an altitude of 890m. latitude and longitude of the community was $33^0.52'$ N-$73^0.78'$ E. this community was dominated by Pinus roxburghii having I.V 99.81. Cynodon dactylon and Lantana camara are co-dominant having I.V 31.37 and 20.002 respectively. The soil of community was Loamy having basic pH, saturation 32%, Total soluble salt 0.02%, organic matter 1.4%, Phosphorus 10.0ppm and potassium 150ppm.

Pinus-Mallotus-Lantana community was established in Charhoi hills at an altitude of 915m. The community was dominated by Pinus roxburghii having I.V value 112.67. Mallotus philippensis and Lantana camara was co-codominant with I.V 54.90 and 16.14 respectively. The soil of community was Loamy having basic pH, saturation 39%, Total soluble salt 0.02%, organic matter 1.19%, Phosphorus 10.5ppm and potassium 105ppm.

Pinus-Lantana-Mallotus community was recorded from charhoi hills at an altitude of 945m. This community was dominated by Pinus roxburghii having I.V 117.53 Lantana camara and Mallotus philippensis are co-dominant having I.V 36.63 and 21.23 respectively. The soil of community was Loamy having basic pH, saturation 32%, Total soluble salt 0.02%, organic matter 1.4%, Phosphorus 10.0ppm and potassium 150ppm.

Table-1. Species composition and biological spectrum of the identified plant communities.

S.No.	Species Name	Family	Life Form	Leaf Spectra	IVI
1.	Acacia arabica (Lam.) Willd.	Fabaceae	Mp	Mi	1.1
2.	Acacia modesta Wall	Fabaceae	Mp	L	5.0
3.	Adiantum incisum Forssk.	Adiantaceae	H	N	0.2
4.	Adiantum venustum D. Don	Adiantaceae	G	L	2.0
5.	Agrostis viridis Gouan.	Poaceae	H	Mi	0.2
6.	Ailanthus altissima (P Mill) Swingle	Simarubaceae	Mp	Mi	0.9
7.	Ajuga bracteosa Wall.	Lamiaceae	Ch	Mi	1.2
8.	Allium stellatum Nutt. Ex Ker Gawl.	Ammaryllidaceae	G	N	1.9
9.	Artemisia dubia L. ex B.D.	Asteraceae	H	N	0.9
10.	Bidens bipinnata L.	Asteraceae	Th	N	1.9
11.	Bombex ceiba Linn.	Bombaceae	Mp	Me	1.2
12.	Butea monosperma Lam.Taub.	Fabaceae	Mp	Me	5.2
13.	Calotropis procera (Aiton) W.T. Aiton	Asclepiadaceae	Ch	Me	0.5
14.	Canabis sativa L.	Canabinaceae	Th	Mi	2.7
15.	Cardiospermum halicacabum L.	Sapindaceae	L	Mi	0.7
16.	Carissa opaca Stapf. ex. Haines	Apocynaceae	Np	N	1.5
17.	Chrysopogon aucheri (Boiss.) Stapf.	Poaceae	H	N	0.4
18.	Conzyza Canadensis (L.) Cronquist	Asteraceae	Th	Mi	0.2
19.	Cymbopogan schoenanthus (Spreng.)	Poaceae	H	L	1.1
20.	Cynodon dactylon L.	Poaceae	H	N	5.0
21.	Cynoglossum lanceolatum Forrsk.	Boraginaceae	H	N	0.5
22.	Cyperus niveus Retz.	Cyperaceae	G	L	0.1
23.	Dodonaea viscosa L..	Sapindaceae	Np	Mi	6.0
24.	Dicathium annulatum Forrsk.	Poaceae	H	N	1.2
25.	Eriophorum comosum Wall.	Poaceae	H	L	0.3
26.	Euphorbia hirta Linn.	Euphorbiaceae	H	Mi	2.9
27.	Ficus carica L.	Moraceae	Mp	Me	0.3
28.	Ficus palmata Forsk.	Urticaeae	Mp	Me	2.7
29.	Ficus racemosa L.	Moraceae	Mp	Mi	1.0
30.	Fragaria nubicola Landl.	Rosaceae	Th	N	1.2
31.	Geranium rotundifolium L.	Geraniaceae	Th	Mi	0.4
32.	Grewia villosa Willd.	Malvaceae	Mp	Mi	0.4
33.	Lantana camarai L.	Verbenaceae	Np	Mi	1.6
34.	Mallotus philippensis Lam.	Euphorbiaceae	Mp	Me	1.4
35.	Malvestrum coromendelianum Linn.	Malvaceae	H	N	1.2

36.	Maytenus royleana Wall.	Celastraceae	Np	N	2.5
37.	Medicago polymorpha L.	Papilionaceae	Th	N	0.9
38.	Melia azedarach L.	Meliaceae	Mp	N	1.4
39.	Mentha viridis L.	Lamiaceae	Th	L	0.3
40.	Micromeria biflora (Buch. -Ham. Ex D. Don)	Lamiaceae	Th	L	1.2
41.	Morus alba L.	Moraceae	Mp	Me	1.5
42.	Myrsine africana L.	Myrinaceae	Mp	N	2.5
43.	Nepeta podostachys Benth.	Lamiaceae	Th	L	0.4
44.	Nerium oleander L.	Apocynaceae	Np	N	1.6
45.	Oenothera rosea L.	Onagraceae	G	Mi	3.4
46.	Olea ferruginea Royle.	Oleaceae	Mp	N	4.6
47.	Oxalis corniculata L.	Oxalidaceae	H	N	5.8
48.	Parthenium hysterophorus L.	Asteraceae	Th	Me	0.1
49.	Pinus roxburghii Sarg.	Pinaceae	Mp	L	8.9
50.	Poa annua L.	Poaceae	Th	L	0.8
51.	Poa infirma Kunth.	Poaceae	Th	L	1.4
53.	Punica granatum L.	Puniaceae	Mp	Mi	0.7
54.	Rhynchosia pseudo-cajan Cambess.	Fabaceae	Th	Mi	0.2
55.	Rubus fruticosus L.	Rosaceae	Np	Me	0.9
56.	Rumex hastatus D. Don	Polygonaceae	H	Mi	0.2
57.	Senecio chrysanthemoides DC.	Asteraceae	Th	Me	0.8
58.	Setaria pumila (Poir.) Roem. & Schult.	Poaceae	Th	N	0.13
59.	Silene vulgaris (Moench.)	Caryophyllaceae	Th	N	1.1
60.	Solanum surattense Burm. F.	Solanaceae	H	N	1.5
61.	Sonchus asper (L.) Hill.	Asteraceae	Th	Mi	2.1
62.	Stipa viridula Trin.	Poaceae	H	L	1.9
63.	Themeda anathera (Nees.) Hack.	Poaceae	H	N	3.5
64.	Trichodesma indicum(Linn.) R. Br.	Boraginaceae	Th	Mi	4.0
65.	Verbascum thapsus L.	Scrophulariaceae	Th	Me	0.18
66.	Zanthoxylum alatum Roxb.	Rutaceae	Np	Mi	0.67
67.	Ziziphus jujuba Mill.	Rhamnaceae	Mp	N	0.67

Key to abbreviation: Mp = Megaphanerophytes, Np = Nanophanerophytes, Th = Therophytes, L = Leptophyll, Me = Mesophyll, G = Geophytes, Ch = Chameophytes, N = Nanophyll, Mi = Microphyll

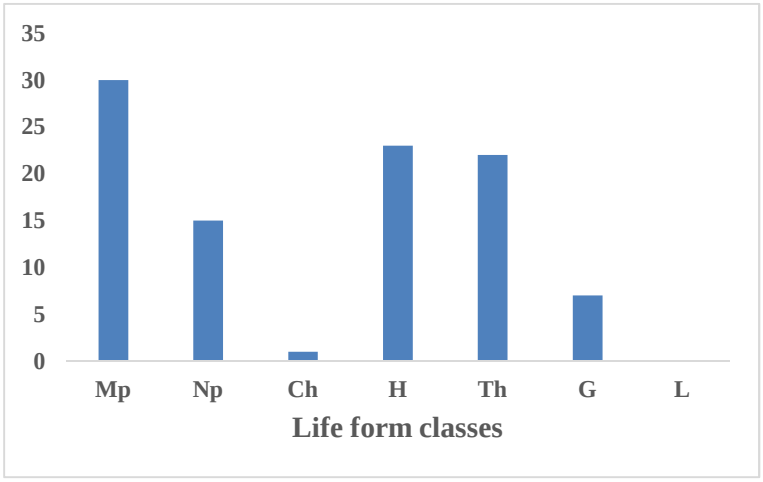

Fig 1. Graphical representation of Life form classes in Spring.

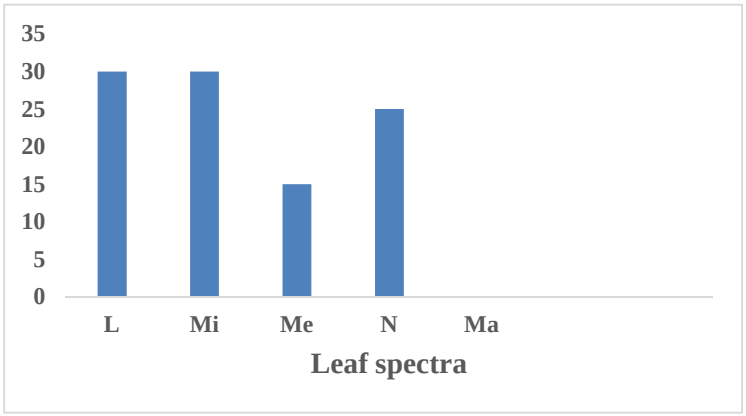

Fig 2. Graphical representation of Leaf spectra classes of Spring

Table-2. Phytosociological characteristics of recorded plant communities.

S. No.	Community	Height (m)	Diversity	Species Richness	Equitability	Maturity index
1.	P-C-T	500	2.03	0.68	0.54	40
2.	P-C-L	614	2.86	0.69	0.97	40
3.	P-C-T	681	2.40	0.81	0.55	54
4.	C-M-C	715	2.70	1.33	0.68	35
5.	P-C-L	743	2.83	0.74	0.90	43
6.	P-C-T	836	2.24	0.91	0.62	45
7.	P-M-C	845	3.10	0.71	1.01	42
8.	P-C-L	890	2.56	0.82	0.72	42
9.	P-M-L	915	2.41	0.65	0.58	38
10.	P-L-M	945	2.23	1.01	0.51	38

Key to abbreviation: P-C-T= Pinus-Cynodon-Themeda, P-C-L= Pinus-Cynodon-Lantana, P-C-T= Pinus-Cynodon-Themeda, C-M-C= Cynodon-Mallotus-Cichorium, P-C-L= Pinus-Cynodon-Lantana, P-C-T= Pinus-Cynodon-Trichodesma, P-M-C= Pinus-Mallotus-Cynodon, P-C-L= Pinus-Cynodon-Lantana, P-M-L= Pinus-Mallotus-Lantana, P-L-M= Pinus-Lantana-Mallotus

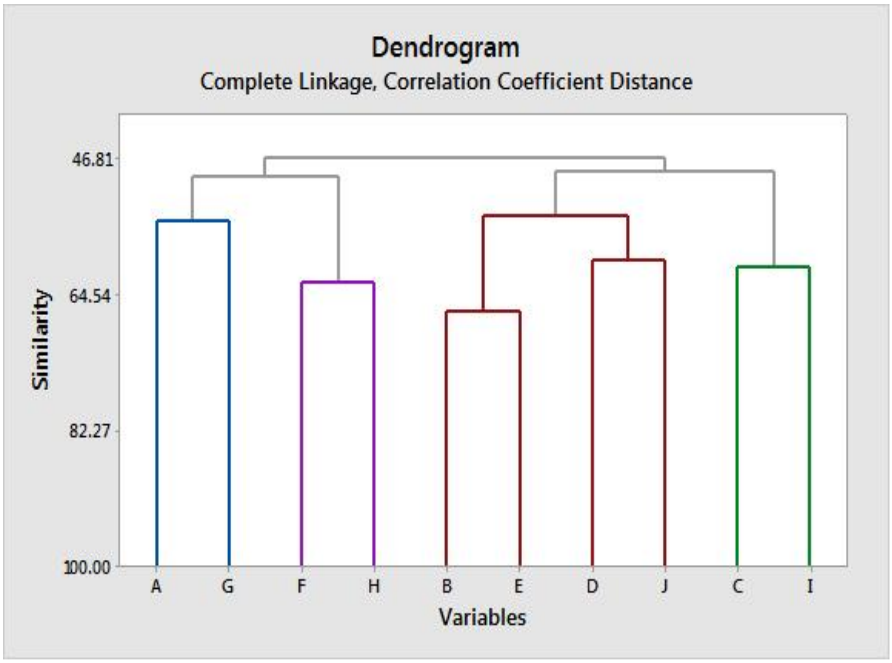

Fig. 3 Graphical representation of Cluster analysis

A= Community 1, B= Community 2, C=Community 3, D=Community 4, E=Community 5, F=Community 6, G=Community 7, H=Community 8, I=Community 9, J=Community 10

Table-3. Index of Similarity and Dissimilarity of Communities in spring.

Altitude (m)	C	500	614	681	715	743	836	845	890	915	945
		A	B	C	D	E	F	G	H	I	J
500	A		90.01	80.12	83.14	85.18	87.57	63.87	73.61	84.94	81.94
614	B	9.99		75.14	66	90.07	86.07	80.61	90.59	92.46	85.95
681	C	19.81	24.14		59.49	73.72	78.44	89.60	41.62	99.62	58.94
715	D	16.85	44	40.51		88.57	68.72	54.38	57.40	82.03	71.32
743	E	24.86	9.93	26.28	11.43		82.26	84.10	88.29	91.66	85.04
836	F	12.43	13.93	21.56	31.28	17.73		79.30	77.86	81.25	69.26
845	G	36.87	19.39	10.4	45.62	15.10	20.69		84.48	78.33	66.37
890	H	26.39	9.41	41.62	42.6	11.70	22.13	15.51		89.78	73.43
915	I	15.06	7.54	99.62	17.97	8.33	18.74	21.66	10.22		82.39
945	J	18.06	14.05	58.94	28.68	14.95	30.75	33.62	26.57	17.61	

A= Community 1, B= Community 2, C=Community 3, D= Community 4, E= Community 5, F= Community 6, G= Community 7, H= Community 8, I= Community 9, J= Community 10

DISCUSSION

It was recorded that life form was dominated by Megaphanerophytes and Hemicryptophytes during spring. Life form give us information about climate of an area. It varies according to height. Hemicryptophytes are indicator of temperate zone while therophytes were due to disturbance. sotherophytes are characteristics of unfavourable conditions. Malik et al. (2007) reported that in Kotli, therophytes were dominant due to disturbance and soil erosion. Therophytes are also increases due to high rain fall. Hemicryptophytes occurs due to degradation. It is estimated that Nanophylls and Microphylls were dominant in spring.

The plants such as Pinus roxburghii, Bombex ceiba, Mallotus philippensis, Olea ferruginea, Lanatana camara, Colebrookea oppositifoliaetc were present. Out of these Mallotus philippensis, Colebrookea oppositifolia, Lantana camara and Carissa opaca are non-palatable species. These are used as fuel wood species. Malik et al. (2007) reported that these species are used for building constructions and for fuel. The area under study has high diversity at bottom and low at height. Malik and Malik (2004) reported the same findings at Kotli hills. In spring species richness increases while in monsoon it was decreases. In spring, annual plants were dominant and in monsoon geophytes disappear. In spring, high value of species richness observed in Cynodon dactylon community while in monsoon Pinus roxburghii communities have high value of species richness. Parthasarathy and Sethi (1997) reported that species richness decreases with increase of woody plant classes. Here species are decreasing due to deforestation.

CONCLUSIONS AND RECOMMENDATIONS

It is concluded that area overall represents degraded forest vegetation, low species richness and prominent anthropogenic disturbances. The area needs complete protection from biotic interferences deforestation, grazing and human influence so that original vegetation can occur again. The Government should take active action against the local inhabitants, which are involved in cutting the forest for earning a lot of money.

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