BIOLOGICAL SPECTRA OF SANEY BANEY HILLS DISTRICT KOTLI AZAD JAMMU & KASHMIR

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ABSTRACT: An ecological study was carried out on Saney Baney hills District Kotli Azad Jammu and Kashmir to find out biological spectra of plant communities in different climatic conditions in spring and winter seasons. Fifteen plant communities harbored during the both seasons i.e. spring and winter. Life form as megaphenarophytes and therophytes were dominating in spring season where as hemicryptophytes and therophytes in winter season. Leaf spectra as microphylls and leptophylls were dominant in both the seasons.

Key words: Communities, Sanney Baney hills, Azad Jammu and Kashmir

INTRODUCTION

The arrangement of life form of species in a natural series is known as biological spectrum and it based on life form and leaf spectra. It represents climatic, microclimatic and bioclimatic habitat conditions of particular area (Cain and Castro, 1959). The life form of a plant species is a constant characteristic but some time it varies with different environmental conditions and species go through different life form stages in its lifecycle from seed to maturity. Plants of same life form grow together to compete directly for space (Muller and Ellenberg, 1925).

Qadir and Shetvy (1986) studied four Lybian communities and compared the qualitative spectrum based solely on floristic composition to quantitative characteristics based on importance value. Malik and Hussain (1987) conducted the phytosociological aspects of the vegetation based on the life form of vegetation in Muzafar Abad hills of Pakistan. Birch *et al.* (2000) study the modeling effects of patch size on vegetation dynamics: bracken (*Pteridium aquilinum* L.) under grazing. Batalha and Mantovani (2001) carried out floristic surveys in two Cerrado sites and classified the species in life-form classes. In all these sites, higher proportions of hemicryptophytes and phanerophytes were found. Jha (2003) study some ecological characteristics of selected grasses of forbs found in Morang district of Nepal. Batalha and Martins (2004) study the floristic composition, frequency, and vegetation life-form spectra of a Cerrado site. Zaman (2005) studied the biological spectrum of district Buner, Pakistan to find out habitat and climatic conditions of the area along with the ethnobotanical uses of plants. Hosseini *et al.* (2007) conducted the phytosociological study of ferns in the central Caspian forests of Iran by using biological spectrum techniques.

The investigated area Saney Baney hills is located 59 km from main city of Kotli, Azad Jammu and Kashmir towards southern side. The area is bounded on the north by district Poonch, south by district Mirpur, east occupied by Kashmir and west by Islamabad (Pakistan). Annual rainfall of the area is 1041mm, temperature remains in between 37Co to 38Co during the hottest months of June, and July. The present study provides the phytosociological data regarding the vegetation of the Saney Baney hills. This study explains the existed vegetation structure and species diversity. The findings will help the botanists, ecologists, taxonomists, environmentalists and ethno botanists to work on other areas for enhancing the importance of the vegetation.

MATERIALS AND METHODS

The sub-tropical vegetation of Saney Baney hills was studied during winter and spring seasons by using quadrat method. The size of the quadrat for trees, shrubs and herbs was 10 × 2 m, 5 × 2 m and 0.5 × 0.5 m respectively after Malik and Hussain (1987). Life form and leaf spectra were calculated by using bioclimatic diagram (Raunkiaer, 1934).

RESULTS

The communities in the present study were recorded on the basis of life form and leaf spectra which are as follows:

Communities on the basis of life form

1. ***Themeda-Pinus-Micromeria:*** At 800m community comprised of 15 species, out of which megaphanerophytes were 33.33%,

nanophanerophytes 26.66%, therophytes and hemicryptophytes were 20 and 13.33% respectively. Chamaephytes were 6.66%, but in winter season, this community of plants was absent.

2. ***Themeda-Pinus:*** At 850m community comprised of 17 species megaphanerophytes were 35.36%, nanophanerophytes 23.52% hemicryptophytes 19.6%, therophytes 17.6%, geophytes 6.0% and chamaephytes 5.67%. In winter, season therophytes and hemicryptophytes had equal share of 35.29%, megaphenarophytes 11.76% and nanophanerophytes, chamaephytes and geophytes had an equal share of 5.88%.

3. ***Malvastrum coromandelianum*** (L.) Carcke: At 900m, 18 species comprised of megaphanerophytes 44.44%, nanophanerophytes 39.39%, therophytes and hemicryptophytes had share of 11.11% and 16.66% respectively, but in winter season this communities of plants were absent.

4. ***Themeda-Eriophorum-Pinus:*** In winter season at 925m 16 plant species comprised of hemicryptophytes 43.75%, therophytes and megaphenarophytes 18.75% each. Nanophanerophytes and chamaephytes had a share of 12.58% and 6.25% respectively. However, in spring season this community of plants was absent.

5. ***Olea-Themeda:*** At 950m, 21 species comprised of megaphanerophytes 47.61%, nanophanerophytes 33.33%. Therophytes and hemicryptophytes have equal share of 9.52% each. However, in winter season this community of plants was absent.

6. ***Pinus roxburghii*** Sarg.: At 1000m, 13 species comprised of megaphanerophytes 38.46%. Therophytes and hemicryptophytes had an equal share of 23.07% each, while nanophanerophytes were 15.38%. However, in winter season this community of plants was absent.

7. ***Saccharum-Pinus-Themeda:*** In winter season at 1025m hemicryptophytes were 38.46%, therophytes 30.76%, megaphenarophytes 15.30% where as nanophenarophytes and chamaephytes had an equal share of 7.69% each. However, in spring season this community of plants was absent.

8. ***Pinus-Mallotus:*** At 1050m, 22 species comprised of therophytes 31.81%, hemicryptophytes 30.18%, and megaphanerophytes 22.72%, nanophanerophytes 18.18% while geophytes were 4.5%. However, in winter season this community of plants was absent.

9. ***Heteropogon-Pinus:*** At 1075m, 19 species comprised of megaphanerophytes, nanophanerophytes had an equal share of 21.05% each, hemicryptophytes 42.11%, therophytes 10.5%, and geophytes were 5.21%. However, in winter season this community of plants was absent.

10. ***Eriophorum-Pinus:*** At 1100m, 15 plant species comprised of megaphanerophytes were 33.33%, therophytes were 26.66%, nanophanerophytes and hemicryptophytes were 20 and 13.33% respectively. Geophytes had share of 6.66%. However, in winter season this community of plants was absent.

11. ***Themeda-Geranium-Pinus:*** In winter season at 1125m hemicryptophytes were 30%, megaphenarophytes and therophytes were 20% each while nanophenarophytes, geophytes and chamaephytes had an equal share of 10% each. However, in spring season this community of plants was absent.

12. ***Themeda anathera*** (Ness ex Steud) Hack.: At 1150m, 19 plant species comprised of megaphenarophytes were 26.3%, nanophanerophytes 21.05% and hemicryptophytes 15.76%, geophytes 5.26% and therophytes were 31.56%. In winter season therophytes were 27.27%, megaphanerophytes, nanophanerophytes and hemicryptophytes had an equal share of 18.18% while chamaephytes and geophytes were 9.10% each. However, in winter season this community of plants was absent.

13. ***Saccharum-Pinus:*** At 1200m, 15 plant species comprised of therophytes species were dominant with 33.33% share. Megaphenarophytes and hemicryptophytes had an equal share of 26.66% each and nanophanerophytes share 13.33%. However, in winter season this community of plants was absent.

14. ***Heteropogon-Pinus-Saccharum:*** At 1250m 16 plant species comprised of nanophanerophytes was 31.25%. Megaphanerophytes and therophytes had an equal share of 25% each, while hemicryptophytes were 18.75%. However, in winter season this community of plants was absent.

15. Aristida-Pinus: At 1300m, nine species comprised of nanophanerophytes 33.33%, while megaphanerophytes, therophytes and hemicryptophytes had an equal share of 22.22% each. However, in winter season this community of plants was absent.

As a whole megaphanerophytes with 31.37%, share and nanophenarophytes with 24.70% share were dominant in the spring season while hemicryptophytes and therophytes were dominant in the winter season with 33.13%and 26.41% share.

COMMUNITIES ON THE BASIS OF LEAF SPECTRA

1. ***Themeda-Pinus-Micromeria:*** At 800m 15 plant species comprised leptophylls had a share of 33.33%, microphylls, nanophylls and mesophylls had a share of 26.66%, 20.00% and13.33% respectively. However, in the winter season the plant community was absent.

2. ***Themeda-Pinus:*** At 850m, 17 plant species comprised of leptophyll and microphyll dominat with equal share of 35.29% each. Mesophyll share 17.64%, while nanophyll were 11.76%. While in the winter season the microphylls were 47.05%, leptophylls were 29.41%, nanophylls and mesophylls had a share of 11.76% and 11.46% respectively.

3. ***Malvastrum coromandelianum*** (L.) Carcke: At 900m 18 plant species comprised of 55.55% microphyll, 22.22% mesophyll, leptophyll and nanophyll have equal share of 11.11% each. However, in the winter season the plant community was absent.

4. ***Themeda-Eriophorum-Pinus:*** In winter season at 925m 16 plant species comprised of 43.50% leptophylls 37.50%, while nanophylls and mesophylls had an equal share of 12.50% each. However, in the spring season the plant community was absent.

5. ***Olea-Themeda:*** At 950m, 21 plant species comprised of 42.85% microphylls, 23.80% nanophylls 14.28% leptophylls and 55% megaphylls were present. However, in the winter season the plant community was absent.

6. ***Pinus roxburghii*** Sarg: At 1000m, 13 plant species comprised of leptophylls and mesophylls had an equal share of 30.76% each. Nanophyll and microphyll were 23.07% and 15.38% respectively. However, in the winter season the plant community was absent.

7. ***Saccharum-Pinus-Themeda:*** At 1025m, 13 plant species comprised of microphylls 46.15%, leptophylls 30.76%, nanophyll 15.38% and mesophylls had a least share of 7.69%. However, in the spring season the plant community was absent.

8. ***Pinus-Mallotus:*** At 1050m, 22 plant species comprised of microphylls were dominant with 31.81% share. Leptophylls and nanophylls contributed equal share of 22.72% each. Mesophylls had a share of 18.18%. However, in the winter season the plant community was absent.

9. ***Heteropogon-Pinus:*** At 1075m, 19 plant species comprised of microphylls 42.11%, nanophylls and microphylls have equal share of 21.05% each. Leptophylls contributed 15.78%. However, in the winter season the plant community was absent.

10. ***Eriophorum-Pinus:*** At 1100m 15 plant species comprised of 33.33% microphylls, mesophylls were 26.66% leptophylls and nanophylls had equal share of 20% each. However, in the winter season the plant community was absent.

11. ***Themeda-Geranium-Pinus:*** At 1125m, 11 plant species comprised of leptophylls and microphylls had an equal share of 30.00% while nanophylls and mesophylls had an equal share of 20% each. However, in the spring season the plant community was absent.

12. ***Themeda anathera*** (Ness ex Steud) Hack: At 1150m, 19 plant species comprised of microphylls were dominant with 31.57%, leptophylls were 20.31% where as nanophylls, and mesophylls had an equal share of 21.05% each. While in the winter season nanophylls were dominant with 36.36%, leptophylls were 27.27% and microphylls and mesophylls had an equal share of 18.18%.

13. ***Saccharum-Pinus:*** At 1200m, 15 plants species comprised of leptophylls 40%, microphyll 33.33%, nanophylls and mesophylls had an equal share of 13.33% each. However, in the winter season the plant community was absent.

14. ***Heteropogon-Pinus-Saccharum:*** At 1250m, 17 plant species comprised of leptophyll and

microphyll have equal share of 31.25% each. Nanophyll and mesophyll also contributed equal share of 18.75% each. However, in the winter season the plant community was absent.

15. Aristida-Pinus: At 1300m, 15 plant species comprised of leptophylls 44.44% and microphylls 33.33%. Nanophylls and mesophylls had an equal share of 11.11% each. However, in the winter season the plant community was absent.

As a whole microphylls and leptophylls were dominant with the share of 34.75% and 20% respectively in the spring season while in the winter season the microphylls and leptophylls with a share of 35.75% and 32.17% were dominant respectively.

DISCUSSION

The dominance of the therophytes disturbs environmental condition in the area or human influence is probably not suited to nanophenerophytes. Deforestation, Soil erosion, over grazing and human influence reduces the macrophylls, so therefore therophytes occupied in vacant niches. The area under study experienced heavy biotic pressure in the form of wood extraction, which can be seen from the age class at the time of sampling. Both seasons favor rapid expansion of annuals during spring and winter plants that is why dominant life form is therophytic.

From the analysis, it can be seen that phenarophytes might have been the dominant life form before degradation. The degraded vegetation generally supports the therophytic and hemicryphtophytic type of vegetation (Malik, 1986, Ram and Arya, 1991). Factors like overgrazing, deforestation and urbanization remain the contributing factors in the loss of the vegetation in the area but over the years, many other factors of the vegetation depletion emerged as the natural or artificial factors of vegetation depletion (Malik and Malik, 2004).

The over all vegetation of Saney Baney hills is dominated by microphylls and leptophylls followed by nanophylls with insignificant megaphyllous elements. The reduction in size of leaf indicates dry and xeric conditions, where as increase in the size of leaf shown cool and moist conditions as seen in *Pinus roxburghii* community at 1000m. The climate of the area is sub-tropical dry type in the lower altitude and subtropical in the uplands. Microphyllous elements are predominant in wet climate where as xeric support leptophylic habit as seen in the area.

The collected data regarding the spring and winter plant communities of the Saney Baney hills is tabulated in the TableI and Table II in respect of life form categories and leaf spectra categories. The comparison of life form in spring and winter seasons is shown in Fig.1 and comparison of leaf spectra in spring and a winter season is shown in Fig.2.

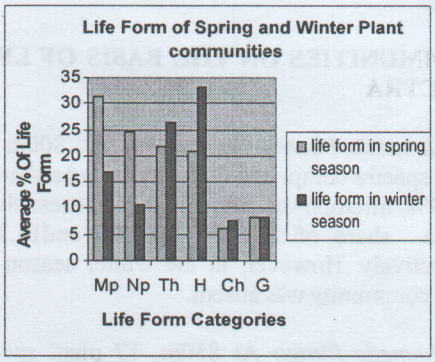

Fig.1. Showing the life form of spring and winter plant communities

Key:
Mp = Megaphenarophyte
Np = Nanophenarophyte
Th = Therophyte
H = Hemicryptophytes
Ch = Chamaephyte
G = Geophytes

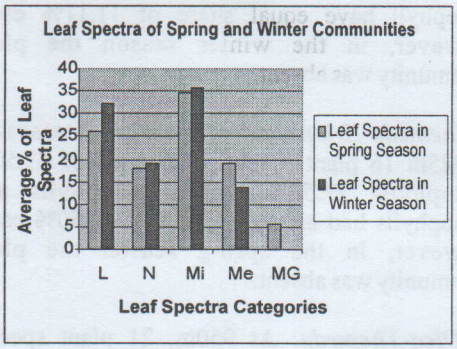

Fig.2. Showing the leaf spectra of spring and winter plant communities

Key:
N = Nanophyll
Me = Mesophyll
Mi = Microphyll
L = Leptophyll
MG = Megaphyll

Table 1: Showing the life form of the different communities found in the spring and winter seasons

S.No	Communities	Altitude (m)	Life form of spring season communities						Life form of winter season communities					
			Mp	Np	Th	H	Ch	G	Mp	Np	Th	H	Ch	G
1	*Themeda-pinus-Micromeria*	800	33.33	26.66	20	13.33	6.66	0	-	-	-	-	-	-
2	*Themeda-pinus*	850	35.36	23.52	17.6	19.6	5.07	6	11.76	5.88	35.29	35.29	5.88	5.88
3	*Malvestrum coromendelianum*	900	44.44	39.39	11.11	16.66	0	0	-	-	-	-	-	-
4	*Themeda Eriphorum*	925	-	-	-	-	-	-	18.75	12.58	18.75	43.75	6.25	0
5	*Olea-Themeda*	950	47.61	33.33	9.52	9.52	0	0	-	-	-	-	-	-
6	*Pinus roxburighii*	1000	38.46	15.38	23.07	23.07	0	0	-	-	-	-	-	-
7	*Saccharum- Pinus- Themeda*	1025	-	-	-	-	-	-	15.30	7.69	30.76	38.46	7.69	0
8	*Pinus- Mallotus*	1050	22.72	18.18	31.81	30.18	0	4.5	-	-	-	-	-	-
9	*Heteropogon-Pinus*	1075	21.05	21.05	10.5	42.11	0	5.21	-	-	-	-	-	-
10	*Eriophorum-Pinus*	1100	33.33	20.0	26.66	13.33	0	6.66	-	-	-	-	-	-
11	*Themeda-Geranium-Pinus*	1125	-	-	-	-	-	-	20.0	10.0	20.0	30.0	10.0	10.0
12	*Themeda anathera*	1150	26.31	21.05	31.56	15.76	0	5.26	18.18	18.18	27.27	18.18	9.10	9.10
13	*Saccharum-Pinus*	1200	26.66	13.33	33.33	26.66	0	0	-	-	-	-	-	-
14	*Heteropogon-pinus-Saccharum*	1250	25.0	31.25	25.0	18.75	0	0	-	-	-	-	-	-
15s	*Pinus-Aristida*	1300	22.22	33.33	22.22	22.22	0	0	-	-	-	-	-	-
Average %			**31.37**	**24.70**	**21.86**	**20.93**	**6.16**	**5.52**	**16.79**	**10.86**	**26.41**	**33.13**	**7.78**	**8.32**

Key: Mp = Megaphenarophyte, **Np** = Nanophenarophyte, **Th** = Therophyte, **H** = Hemicryptophytes, **Ch** = Chamaephyte, **G** = Geophytes

Table 2: Showing the leaf spectra of different communities of winter and spring season

S.No	Communities	Altitude (m)	Leaf spectrum of spring season communities					Leaf spectrum of winter season communities			
			L	N	Mi	Me	MG	L	N	Mi	Me
1	*Themeda-pinus-Micromeria*	800	33.33	20	26.66	13.33	0	-	-	-	-
2	*Themeda-pinus*	850	35.29	11.76	35.29	17.64	0	29.41	11.76	47.05	11.46
3	*Malvestrum coromendelianum*	900	11.11	11.11	55.55	22.22	0	-	-	-	-
4	*Themeda Eriphorum*	925	-	-	-	-	-	43.50	12.50	37.50	12.50
5	*Olea-Themeda*	950	9.50	23.80	42.85	14.78	5.55	-	-	-	-
6	*Pinus roxburighii*	1000	30.76	23.07	15.38	30.76	0	-	-	-	-
7	*Saccharum- Pinus- Themeda*	1025	-	-	-	-	-	30.70	15.38	46.15	7.69
8	*Pinus- Mallotus*	1050	22.72	22.72	36.36	18.18	0	-	-	-	-
9	*Heteropogon-Pinus*	1075	15.78	21.05	42.11	21.05	0	-	-	-	-
10	*Eriophorum-Pinus*	1100	20.0	20.0	33.33	26.66	0	-	-	-	-
11	*Themeda-Geranium-Pinus*	1125	-	-	-	-	-	30.0	20.0	30.0	20.0
12	*Themeda anathera*	1150	20.31	21.05	31.57	21.05	0	27.27	36.36	18.18	18.18
13	*Saccharum-Pinus*	1200	40	13.33	33.33	13.33	0	-	-	-	-
14	*Heteropogon-pinus-Saccharum*	1250	31.25	18.75	31.25	18.75	0	-	-	-	-
15	*Pinus-Aristida*	1300	44.44	11.11	33.33	11.11	0	-	-	-	-
Average %			**26.20**	**18.14**	**34.75**	**19.07**	**5.55**	**32.17**	**19.2**	**35.77**	**13.96**

Key: N = Nanophyll, **Me** = Mesophyll, **Mi** = Microphyll, **L** = Leptophyll, **MG** = Megaphyll

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