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LIFE FORM AND INDEX OF SIMILARITY OF PLANT COMMUNITIES RECORDED AT SARSAWA HILLS DISTRICT KOTLI

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Abstract: Qualitatively Nanophaneropytes were dominated in investigated area followed by therophytes, hemicryptophytes and megaphanerophytes. Geophytes were low in number where as quantitatively nanophanerophytes were also dominant. They were followed by megaphanerophytes and hemicryptophytes. Therophytes and geophytes were low in number.

The highest index of similarity was recorded in between *Themeda-Carissa-Adhatoda* and *Adhatoda-Themeda.* It was followed by *Myrsine-Themeda* and *Themeda-Carissa-Adhatoda, Adhatoda-Themeda-* and *Carissa-Themeda-Dodonaea. Pinus-Poa-Maytenus* and *Colebrookea-Themeda-Dodonaea* and *Adhatoda-Themeda* and *Themeda-Carissa-Adhatoda.*

Index of similarity in plant communities were slightly similar as it varied from 52.55 to 62.04. It is due to similar habitat, soil conditions percentage of phosphorus and equal amount of potassium in soil (Table 4).

INTRODUCTION

Some work has been done on the life form of alpine area of Rudranth [Ram and Arya 1991], grassland ecosystem of South Orissa [Barik and Misra 1998] and Girbanr area [Hussain *et al*. 1997]. No previous work has been done on the life form and similarity index of the study area. However, Malik [1986 and 2005] classified life form spectra of some plant communities of Kotli Ganga Chotti and Bedori Hills qualitatively. The aim of this study was to report life form quantitatively so that the original picture of life form can be determined which is useful for environmentalists, ecologists and those engaged in range management and other fields.

MATERIALS AND METHODS

The study area lies between longitudes 73^{O} $6^{/}$ to 74^{O} $7^{/}$ East and latitudes 33^{O} $20^{/}$ to 30^{O} $40^{/}$ North in the Kotli District (Toposheet No 43 G/15). The elevation ranges from 700 – 1150 meters. The climate of the study area was subtropical chirpine type [Malik 1986].

Life form and similarity index of the study area were constructed according to Raunkiaer [1934] and Mueller Dum-bois and Ellenberg [1974]. The vegetation of the study area was classified into 10 plant communities on the basis of importance value, which will be reported elsewhere.

A complete list of all the 10 plant communities of the study area was compiled on the basis of importance value (Table 1). The life form was constructed according to Raunkiaer [1934] and Mueller Dum-bois and Ellenberg [1974]. Similarity index was recorded after Sorenson [1948].

Table 1: Importance values of 10 plant communities reported from Sarsawa Hills during Monsoon 2003.

Sr. No	Species	Family	Importance Value (I.V)				Class
			Maximum	Minimum	Average	Constancy	
	A. Tree Layer						
1	Acacia arabica Willd	Leguminosae	17.26	17.26	1.72	10	I
2	Ailanthus altissima	Leguminosae	8.27	8.27	0.82	10	I
3	Colebrookea oppositifolia Sm	Acanthaceae	68.19	13.50	11.15	30	II
4	Dalbergia sisoo Messiu	Flacourtiaceae	9.14	6.44	15.11	30	II
5	Ficus carica L.	Urticaceae	11.77	11.77	1.17	10	I
6	Ficus palmata Forssk	Urticaceae	13.14	10.18	2.33	20	I
7	Mallotus philippensis (Lamk) Muell	Euphorbiaceae	6.30	6.30	0.63	10	I
8	Olea ferruginea Royle	Oleaceae	13.73	5.95	3.21	30	II
9	Pinus roxburghii Sargent	Pinaceae	13.64	13.64	1.36	10	I
	B. Shrub Layer						
1	Adhatoda zeylonica Nees	Acanthaceae	57.48	7.65	18.11	60	III
2	Carissa opaca Stap ex Haines	Apocynaceae	60.78	16.53	36.51	100	V
3	Dodonaea viscosa (L.) Jacq	Sapindaceae	54.36	7.11	26.40	90	V
4	Maytenus royleanus Wall	Celastraceae	33.53	6.02	11.27	60	II
5	Myrsine africana (L.) Jacq	Myrsinaceae	44.81	2.70	11.82	70	IV
6	Otostegia limbata (Bth) Bois	Lamiaceae	4.21	1.76	0.59	20	I
7	Punica granatum L.	Punicaceae	10.43	5.92	2.66	30	II
8	Woodfordia floribunda Kerz	Lythraceae	28.03	11.93	6.71	30	II
9	Ziziphus nummularia Miller	Rhamnaceae	6.02	4.87	1.08	20	I
	C. Herb Layer						
1	Adiantum incisum Forssk	Polypodiaceae	5.99	5.99	0.59	10	I
2	Aristida adscensionis L.	Poaceae	12.60	6.71	2.03	20	I
3	Asparagus gracilis Royle	Liliaceae	5.91	3.88	0.97	20	I
4	Agrostis viridis Gouan	Poaceae	11.07	4.83	1.59	20	I
5	Dichanthium annulatum (Forssk) Stapf	Poaceae	14.51	5.37	4.01	40	II
6	Eriophorum comosum Lam	Poaceae	34.46	5.72	9.37	60	III
7	Euphorbia prostrata Ait	Euphorbiaceae	4.82	2.65	1.13	30	II
8	E. indica Lam	Euphorbiaceae	5.00	3.96	4.48	20	I
9	Geranium rotundifolium (L.) P. Beauv	Geraniaceae	4.87	4.87	0.48	10	I
10	Imperata cylindrical L.	Poaceae	8.87	2.73	4.10	60	I
11	Micromeria biflora (Ham) Bth	Lamiaceae	17.64	3.77	6.13	60	I
12	Malvestrum coromandelianum (L.) Garcke	Malivaceae	23.50	9.83	7.18	50	I
13	Poa annua L.	Poaceae	43.07	4.02	9.81	50	I
14	Rumex hastatus D.Don	Polygonaceae	22.90	11.19	3.40	20	I
15	Setaria palmifolea (Koen) Stapf	Poaceae	10.17	4.78	1.49	20	I
16	Solanum xanthocarpum Schrad & Wendle	Solanaceae	4.52	4.52	0.45	10	I
17	Saccharum spontaneum	Poaceae	5.53	5.53	0.55	10	I
18	Sorghum halepense(L.) Pers	Poaceae	9.34	3.00	2.49	40	II
19	Themeda anathera (Nees) Hack	Poaceae	53.77	10.39	42.37	100	V
20	Heteropogon contortus (L.) Beauv	Poaceae	17.20	7.95	4.40	40	II

This work was done during Monsoon 2003. Nomenclature followed here is that of Stewart [1972].

RESULTS AND DISCUSSION

BIOLOGICAL SPECTRUM (LIFE FORM)

The biological spectra of plant communities are presented in Table 2. In *Pinus-Poa-Maytenus* community, there were 12.5% megaphanerophytes. 31.25% each nanophanerophytes and hemicryptophytes, therophytes and geophytes had 18.75% and 6.25% share, respectively. Chamaephytes and Lianas were absent.

Myrsine-Themeda community composed of 17 Spp. Out of which megaphanerophytes, nanophanerophytes and hemicryptophytes had equal share of 23.52% each while therophytes shared 29.41%.

There were 17 Spp. in *Pinus* community. Megaphanerophytes contributed 23.52%, nanophanerophytes showed the highest share (35.29%). Therophytes shared 17.46%.

At a height of 850m *Colebrookea-Themeda-Dodonaea* community existed. Major share of 38.88% was made by nanophanerophytes, megaphanerophytes shared 22.22%, therophytes and hemicryptophytes shared equally of 16.66%, where as geophytes shared 5.55%.

In *Themeda-Carissa-Adhatoda* community, the major contribution was made by nanophanerophytes (31.57%) followed by megaphanerophytes (26.31%) and therophytes (21.01%), geophytes and hemicryptophytes shared 5.26% and 15.78%, respectively.

In *Themeda-Dodonaea-Eriophorum* community megaphanerophytes and hemicryptophytes were equally shared of 31.25% each. Nanophanerophytes shared 18.75% where as therophytes and geophytes shared 12.50% and 6.25% respectively.

In *Adhatoda-Themeda* community major contribution was made by nanophanerophytes (41.17%) followed by megaphanerophytes (11.76%), therophytes (23.52%). Hemicryptophytes and geophytes had equal share pf 17.64% and 5.88% respectively.

In *Carissa-Myrisine-Themeda* community megaphanerophytes and nanophanerophytes shared 14.28% and 21.42%, respectively. Therophytes and hemicryptophytes had equal share of 28.57% while geophytes contributed 7.14%. Community indicated the dominance of annual herbs.

In *Carissa-Themeda-Dodonaea* community nanophanerophytes and therophytes had equal contribution of 25%. Megaphanerophytes and hemicryptophytes also had equal share of 18.75% while geophytes shared 12.50%.

At the top (1150m) *Dodonaea-Carissa-Pinus* community were present. Here nanophanerophytes, hemicryptophytes and therophytes were dominant with 28.55% share. Megaphanerophytes and geophytes also showed equal share of 7.14%.

The Monsoon plant communities harbouring at Kotli hills exhibited the dominance of nanophanerophytes followed by hemicryptophytes, therophytes and megaphanerophytes (Table 3).

Table 2: Biological spectra and phytoclimax of Sarsawa Hils based on sub-life form classes.

Sr. No.	Name of Community	Total Species	Height (m)	Megaphar-nerophytes		Nanophar-nerophytes		Therophytes		Hemicrypto-phytes		Geophytes		Phytoclimate
				No.	%	No.	%	No	%	No.	%	No	%	
1	*Pinus-Poa-Maytenus*	16	700	2	12.50	5	31.25	3	18.75	5	31.25	1	6.25	Nano-Hermi
2	*Myrsine-Themeda*	17	750	4	23.52	4	23.52	5	29.41	4	23.52	-	-	Nano-Thero
3	*Pinus-Themeda*	17	800	4	23.52	6	35.29	3	17.64	3	17.64	1	5.88	Mega- Nano
4	*Colebrookea-Themeda-*	18	850	4	22.22	7	38.88	3	16.66	3	16.66	1	5.55	Mega- Nano
5	*Themeda-Carissa-Adhatoda*	19	900	5	26.31	6	31.57	4	21.05	3	15.78	1	5.26	Mega- Nano
6	*Themeda-Dodonaea-*	16	950	5	31.25	3	18.57	2	12.50	5	31.25	1	6.25	Mega- Hermi
7	*Adhatoda-Themeda*	17	1000	2	11.76	7	41.17	4	23.52	3	17.64	1	5.88	Nano-Thero
8	*Carissa-Myrisine-Themeda*	14	1050	2	14.28	3	21.42	4	28.57	4	28.57	1	7.14	Thero-Hermi
9	*Carissa-Themeda-Dodonaea*	16	1100	3	18.75	4	25.00	4	25.00	3	18.75	2	12.5	Nano-Thero
10	*Dodonaea-Carissa-Pinus*	14	1150	1	7.14	4	28.57	4	28.57	4	28.57	1	7.14	Nano0Thero
Total		164		32	191.25	49	295.24	36	221.67	37	229.63	10	61.85	
Average					19.12		29.52		22.16		22.96		6.18	

Table 3: Biological spectrum of Sarsawa Hills recorded during Monsoon 2003.

	Raunkeriaen [1934]	Quantitative
Megapharnerophytes	19.12	22.70
Nanopharnerophytes	29.52	45.18
Therophytes	22.16	8.25
Hemicryptophytes	22.96	22.87
Geophytes	6.18	0.97

INDEX OF SIMILARITY AND DISSIMILARITY

The highest index of similarity (62.04) was recorded between *Themeda-Carissa-Adhatoda* community and *Adhatoda-Themeda* community followed by *Myrsine-Themeda* and *Themeda-Carissa-Adhatoda, Adhatoda-Themeda* and *Carissa-Themeda-Dodonaea, Pinus-Poa-Maytenus* and *Pinus, Colebrookea-Themeda-Dodonaea* and *Adhatoda-Themeda, Pinus* and *Themeda-Carissa-Adhatoda* communities. The value of index of similarity varied from 52.55 to 62.04 (Table 4). These communities were similar due to similar soil conditions such as soil texture, saturation, pH and organic matter (Table 5).

Table 4: Index of similarity and dissimilarity recorded from Sarsawa Area during Monsoon 2003.

	PPM	MT	P	CTD	TCA	TDE	AT	CMT	CTD	DCP
PPM	X	62.36	46.90	76.46	48.68	80.56	65.96	74.71	72.16	66.33
MT	37.67	X	54.22	50.25	41.79	66.32	36.80	50.01	58.00	64.39
P	53.09	45.77	X	53.36	47.55	57.68	61.77	59.90	62.60	57.05
CTD	23.53	49.74	46.64	X	56.33	47.45	46.93	64.60	60.44	62.53
TCA	51.31	58.20	52.53	43.67	X	64.71	37.96	56.10	48.91	56.73
TDE	19.43	33.67	40.32	52.55	35.29	X	51.84	62.08	46.83	58.42
AT	34.05	63.19	38.23	53.07	62.04	48.16	X	56.76	44.24	48.98
CMT	25.28	49.99	40.10	35.40	43.90	37.92	43.24	X	41.28	44.49
CTD	27.83	42.00	37.40	39.56	51.09	53.17	55.76	58.18	X	35.66
DCP	33.66	35.60	42.95	37.47	43.27	41.58	51.02	55.51	64.34	X

Intermediate similarity was recorded between *Myrsine-Themeda* and *Carissa-Myrsine-Themeda, Myrsine-Themeda* and *Colebrookaea-Themeda-Dodonaea, Pinus* and *Colebrookea-Themeda-Dodonaea, Myrsine-Themeda* and *Pinus, Themeda-Carissa-Adhatoda* and *Carissa-Myrsine-Themeda.* The index of similarity ranged from 40.10 to 49.99.

Very low similarity was recorded in between *Colebrookea-Themeda-Dodonaea* and *Carissa-Themeda-Dodonaea, Pinus* and *Adhatoda-Themeda, Pinus-Poa-Maytenus* and *Myrsine-Themeda, Colebrookea-Themeda-Dodonaea* and *Carissa-Myrisine-Themeda, Pinus-Poa-Maytenus* and *Adhatoda-Themeda, Myrsine-Themeda* and *Themeda-Dodonaea-Eriophorum.* It was due to altitude which varied from 700-1150 meters, soil condition, pH, organic matter and phosphorus percentage was low (Table 5). The life form of vegetation reflects the habitat and environmental condition. The prevalence of nanophanerophytes and hemicryptophytes as the dominant group reflects the environmental conditions were well suited to phanerophytes especially to nanophanerophytes. The area under investigation experiences heavy biotic pressure in the form of wood extraction felling and modification of

forest in term of terrace cultivation that is why megaphanerophytes are less. It appears that megaphanerophytes and nanophanerophytes had the dominating life form before the degradation. The degraded vegetation supports hemicryptophytic type of vegetation whereas disturbed vegetation supports therophytic type.

Table 5: Results of soil recorded from Sarsawa Area during Monsoon 2003.

Sr. No.	Name of plant community	Height (m)	Depth	Saturation %	Texture	pH	Organic Matter %	Phosphorus ppm	Potassium ppm
1	Pinus-Poa-Maytenus	700	15	40	Lomy	6.94	3.44	11.25	60
2	Myrsine-Themeda	750	//	35	//	7.08	0.00	10.00	40
3	Pinus	800	//	37	//	7.05	3.44	11.25	40
4	Colebrookea-Themeda-Dodonaea	850	//	32	//	7.33	4.30	10.00	80
5	Themeda-Carissa-Adhatoda	900	//	33	//	6.80	2.58	5.00	60
6	Themeda-Dodonaea-Eriophorum	950	//	28	Sandy loam	7.13	4.30	2.5	60
7	Adhatoda-Themeda	1000	//	32	Loamy	6.97	0.86	3.75	60
8	Carissa-Myrsine-Themeda	1050	//	32	Loamy	7.26	1.72	1.25	40
9	Carissa-Themeda-Dodonaea	1100	//	38	//	6.85	2.58	10	40
10	Dodonaea-Carissa-Pinus	1150	//	26	Sandy loam	7.15	4.30	15	60

Such types of findings were reported by Malik 2005 while studying life form and index of similarity of the vegetation of Ganga Chotti and Bedori Hills. The differences among the plant communities were due to deforestation, overgrazing, soil erosion, and uprooting of plants by nomads. The area need complete protection from these factors mentioned above, so that the original life form can exists properly.

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