BIOLOGICAL SPECTRUM OF A GRASSLAND COMMUNITY OF RAIRANGPUR IN THE DISTRICT OF MAYURBHANJ, ODISHA

B.N.Chawpattanayak[1] , Kamal L. Barik[2]

[1]*Lecturer in Botany, Rairangpur College, Rairangpur, Mayurbhanj, Odisha. (India)*

[2]*Lecturer in Botany, North Orissa University, Baripada, Mayurbhanj, Odisha (India)*

ABSTRACT

The biological spectrum of a grassland community of Rairangpur (86^0 11' 45'' E ; 22^0 16' 45''N) in the district of Mayurbhanj, Odisha was studied following Raunkiaer [1], Dansereau [2] and Rao [3]. The community comprised of 29 species. They belonged to four different life form classes i.e. Chamaephytes, Hemicryptophytes, Geophytes and Therophytes. The community was found to be Therophytic. The percentage of Therophytes was found to be maximum (37.93%) followed by Chamaephytes (27.59%), Hemicryptophytes (20.69%) and Geophytes (13.79%). The present study exhibited higher percentage of Chamaephytes, Geophytes and Therophytes compared to Raunkiaer's [1] normal spectrum. The species composition, topography, geographical distribution, soil characteristics, climatic conditions and biotic interference of the locality, might be responsible for variation of spectrum value in the grassland community.

Keywords : Life-forms, biological spectrum, grassland community

I. INTRODUCTION

The structural aspects of a community is essential for any in-depth studies relating to ecology of a place. It provides the knowledge about the vegetation of an area i.e the life-form patterns, biological spectrum and also the phytosociology of a vegetation. The biological spectrum is considered as an index for determining the status of a community. When worked out on periodic intervals, biological spectrum may set as guidelines for eco-restoration and optimization of a community. Although such study seems to be classical yet it forms the core of an ecological study pertaining to vegetation analysis. Much work has been carried out on biological spectrum of grassland communities by Raunkiaer [1], Dansereau [2], Rao [3], Singh & Ambasht [4], Misra & Misra [5], Malana & Misra [6], Rath & Misra [7], Naik [8], Patnaik [9], Behera & Misra [10], Pradhan [11], Barik & Misra [12], Batalha & Martins [13] and many others. In this study an attempt has been made to study the biological spectrum of a grassland community of this region.

1.1 Aim of the Study

The aim of this investigation is to assess the biological spectrum of a grassland community of Rairangpur in the district of Mayurbhanj, Odisha.

1.2 Study Site and Environment

The experimental grassland was selected at Sanchampauda (86^0 11' 45'' E ; 22^0 16' 45''N,), Rairangpur, situated at a distance of 95 kms from the North Orissa University and 90 kms from Baripada, the district headquarter of Maurbahnj in the state of Odisha and is located at an average elevation of 248m. The climate of the locality is monsoonal with three distinct season i.e rainy (July to October), winter (November to February) and summer (March to June). The total rainfall during the study period was 1903mm, of which a maximum of 652mm was recorded during the month of July. No rainfall was observed in the month of October, November and December. The soil of the experimental site was found to be moderately acidic. The available phosphorous, potassium and organic carbon contents of the experimental site were found to be low [14].

II. MATERIALS AND METHODS

The plant specimens preferably along with the reproductive parts were collected and brought to the laboratory for identification. The identification of each taxaon was made in consultation with various regional and national flora books i.e. The Botany of Bihar and Orissa by Haines [15], Supplement to the Botany of Bihar and Orissa by Mooney [16], Flora of Orissa by Saxena & Brahmam [17], Flora of the Madras Presidency by Gamble [18], Flora of Bilaspur district, M.P. by Panigrahi & Murti [19] and Murti & Panigrahi [20], Flora of Madhya Pradesh by Verma **et al**. [21], Mudgal **et al**. [22] and Singh **et al**. [23] and The Flora of British India by Hooker [24], The herbarium specimens were prepared following standard methodology as proposed by Jain & Rao [25]. The voucher specimens were preserved and housed in Herbarium, P.G. Department of Botany, North Orissa University, for future use and reference. The life-form of various species was determined based on the position of the parenting buds following Raunkiaer's [1] system, slightly modified by Dansereau [2] and Rao [3].

III. RESULTS AND DISCUSSION

The community comprised of 29 species of which 10 species were grasses and 19 species were non-grasses. Out of 29 species, 8 species belonged to the class Chamaephytes (*Desmodium triflorum, Evolvulus alsinoides, Evolvulus nummularius, Hedyotis neesiana, Oldenlandia corymbosa, Rungia repens, Scleria levis and Tridax procumbens)*, 6 species to Hemicryptophytes (*Brachiaria reptans, Chrysopogon aciculatus, Chrysopogon verticillatus, Cynodon dactylon, Elephantopus scaber, Heteropogon contortus)*, 4 species to Geophytes (*Cyperus compressus, Cyperus triceps, Fimbristylis acuminata, Fimbristylis dichotoma)* and 11 species to Therophytes (*Commelina benghalensis, Dactyloctenium aegyptium, Digitaria longiflora, Eleusine indica, Hybanthus enneaspermus, Phyllanthus fraternus, Scoparia dulcis, Setaria pumila, Spermacoce pusilla, Sporobolus indicus, Zornia gibbosa).* The class Phanerophytes was found to be absent (Table -1).

Table – 1 Life forms classes of the experimental grassland community.

Life- form classes	Sl. No.	Name of the Species
Chamaephytes (25.59%)	1	*Desmodium triflorum* (L.) DC.
	2	*Evolvulus alsinoides* (L.) L.
	3	*Evolvulus nummularius* (L.)L.

	4	*Hedyotis neesiana* Arn.
	5	*Oldenlandia corymbosa* L.
	6	*Rungia repens* (L.) Nees
	7	*Scleria levis* Retz.
	8	*Tridax procumbens* L.
Hemicryptophytes (20.69%)	1	*Brachiaria reptans* (L) C.A. Gardner & C.E. Hubb
	2	*Chrysopogon aciculatus* (Retz.) Trin.
	3	*Chrysopogon verticillatus* (Roxb.) Trin. ex Steud
	4	*Cynodon dactylon* (L.) Pers.
	5	*Elephantopus scaber* L.
	6	*Heteropogon contortus* (L.)P. Beauv. ex Roem. & Schult.
Geophytes / Cryptophytes (13.79%)	1	*Cyperus compressus* L.
	2	*Cyperus triceps* Endl.
	3	*Fimbristylis acuminata* Vahl
	4	*Fimbristylis dichotoma* (L.) Vahl
Therophytes (37.93%)	1	*Commelina benghalensis* L.
	2	*Dactyloctenium aegyptium* (L.) Willd.
	3	*Digitaria longiflora* (Retz.) Pers.
	4	*Eleusine indica* (L.) Gaertn.
	5	*Hybanthus enneaspermus* (L.) F. Muell
	6	*Phyllanthus fraternus* Webster
	7	*Scoparia dulcis* L.
	8	*Setaria pumila* (Poir.) Roem. & Schult.
	9	*Spermacoce pusilla* Wall.
	10	*Sporobolus indicus* (L.) R.Br.
	11	*Zornia gibbosa* Span.

Table - 2 reveals the biological spectra of some grassland community in comparision to Raunkiaer's [1] normal spectrum. Based on percentage contribution the community was found to be Therophytic. The community showed 25.59% of Chamaephytes, 20.69% of Hemicryptophytes, 13.79% of Geophytes, 37.93% of Therophytes and lack of Phanerophytes. Absence of Phanerophytes was also reported by Singh & Ambasht [4] and Barik & Misra [12]. A higher percentage of Phanerophtic species was reported by Rao [3], while working on grassland of Varanasi in India and by Batalha & Martines [13] on Cerrado site of Brazil. Maximum Therophytic percentage contribution was reported by Rao [3], Singh & Ambasht [4] while working on the grasslands of Varanasi, Misra & Misra [5], Rath & Misra [7] and Barik & Misra [12] on the grasslands of Berhampur, Naik [8] on western Orissa, Pattnaik [9] on South Orissa, Behera & Misra [10] on Phulbani and Pradhan [11] on the grassland of Bhubaneswar. However, in this grassland community the greater percentage of Therophytes and absence of Phanerophytes might be due to the influence of species composition, soil characteristic, climatic condition as well as biotic interference of the locality. Since the experimental grassland was well protected before one year, from the start

of experiment, grazing was not possible. However, there was no such restriction prior to one year. Compared to Raunkiaer's [1] normal biological spectrum, present findings showed, Chamaephytes to be near about 3.06 times higher than that of normal spectrum, 2.3 times higher in case of Geophytes and 2.9 times higher in case of Therophytes where as the parentage of Hemicryptophytes was nearly 1.26 time less than the normal spectrum.

Table-2. Biological spectra of some grassland communities in Comparison to Raunkiaer's (1934) normal spectrum.

Authors	Study Site	Pha%	Cha%	Hem%	Geo%	The%
Raunkiaer's (1934) normal spectrum		46.00	9.00	26.00	6.00	13.00
Rao (1968)	Varanasi	40.00	6.00	1.00	10.00	43.00
Singh & Ambasht (1975)	Varanasi	--	4.20	19.20	6.30	70.20
Misra & Misra (1979)	Berhampur	5.70	25.70	14.30	5.70	48.60
Malana & Misra (1980)	Berhampur	10.00	26.66	23.33	3.33	36.33
Rath & Misra (1980)	Berhampur	5.40	21.60	18.90	2.70	51.30
Naik (1985)	Western Orissa	3.00	21.20	18.20	6.00	51.50
Patnaik (1993)	South Orissa	3.58	17.86	25.00	10.71	42.86
Behera & Misra (1993)	Phulbani	5.71	20.00	11.42	8.57	54.28
Pradhan (1994)	Bhubaneswar	5.88	29.42	11.76	5.88	47..05
Barik & Misra (1998)	Berhampur	--	25.81	12.90	9.68	51.61
Batalha & Martins (2002)	Cerrado	66.75	11.50	18.58	1.77	1.77
Present study	Rairangpur	--	27.59	20.69	13.79	37.93

Pha - Phanerophytes, **Cha** - Chamaephytes, **Hem** - Hemicryptophytes, **Geo** - Geophytes, **The** - Therophytes.

IV. CONCLUSION

The biological spectrum value of experimental grassland community of Rairangpur in Mayurbhanj District of Odisha showed variation compared to other grassland communities as reported earlier. The species composition, topography, temperature variability, physico-chemical characteristics of soil, precipitation, solar insolation and the biotic interference might be responsible for variation in spectrum value in the experimental grassland community.

V. ACKNOWLEDGEMENT

The authors are thankful to Dr. D. Mohanta, Principal, Rairangpur College, Rairangpur; Prof. U.B. Mohapatra, Dr. A.K Biswal, Reader and Dr. A.K Bastia, Reader, Department of Botany, North Orissa University for their co-operation and valuable suggestion. The authors are also indebted to the Block Development Officer, Rairangpur for providing necessary rail fall data and the Soil Chemist, District Soil Testing Laboratory, Government of Odisha, Mayurbhanj, Baripada for analysis of soil samples of the experimental site.

REFERENCES

[1] Raunkiaer C. The life forms of plants and statistical plant geography. Oxford Univ, Press, Oxford, 1934.

[2] Dansereau P. The origin and growth of plant communities. 567-603. In: Growth in living systems, Proc. of an International Symp., Purdue Univ., Basic Book Inc., New York, 1960.

[3] Rao CC. Biological spectrum of Karamnasa watershed flora (Varanasi, India). In: Proceedings of the symposium on recent advances in Tropical Ecology, Part-II. R. Misra & B. Gopal (eds.) ISTE, BHU, Varanasi, 1968.

[4] Singh UN, Ambasht RS. Biotic stress and variability in structure and organic (net primary) production of grassland communities at Varanasi, India. Torp. Ecol., 1975 ; 16: 86-95

[5] Misra MK, Misra BN. Biological spectrum of a tropical grassland community at Berhampur, Ind. J. For., 1979 ; 2: 313-315.

[6] Malana M, Misra BN. Effect of burning on biological spectrum of tropical grassland, Geobios, 1980 ; 7: 293-295

[7] Rath SP, Misra BN. Effect of grazing on the floristic composition and life form of species in the grassland of Berhampur, Ind. J. For., 1980 ; 3 (4): 336-339.

[8] Naik BK. Phytosociology and primary production of a natural grassland community of western Orissa. Ph.D. Thesis, Sambalpur University, Sambalpur, Orissa, 1985.

[9] Patnaik SK. Ecological studies of an upland coastal grassland of South Orissa, Ph.D. Thesis, Berhampur University, Berhampur, Orissa, India, 1993.

[10] Behera RK, BN Misra. Biological spectrum of a grassland community of Phulbani (India). Mendel. 1993 ; 10 (2-4): 59-61.

[11] Pradhan D. Primary production and phytosociology of a grassland community of Bhubaneswar. Ph.D. Thesis, Berhampur University, Berhampur, Orissa, 1994.

[12] Barik KL, Misra BN. Biological spectrum of a grassland ecosystem of south Orissa. Ecoprint, 1998; 5 (1): 73-77.

[13] Batalha MA, Martins FR. Biological spectra of Cerrado sites, Flora, 2002 ; 197: 452-460.

[14] Chawpattanayak BN, Barik KL. Live green biomass of a grassland community of Rairangpur in the district of Mayurbhanj, Odisha, Int. J. of Adv. Res. in Sci. & Engin.,2013 ; 2 (7): 163-167.

[15] Haines HH. The Botany of Bihar and Orissa, 6 Parts, Adlard & Sons, London, 1921-25.

[16] Mooney HF. Supplement to the Botany of Bihar and Orissa. Catholic Press, Ranchi, 1950.

[17] Saxena HO, Brahmam M. The Flora of Orissa. Vol. I-IV, Regional Research Laboratory (CSIR), Bhubaneswar, Orissa and Forest Development Corporation Ltd., Bhubaneswar, 1994-96.

[18] Gamble JS. Flora of the Presidency of Madras, London Repr. Ed. 1967, Calcutta, 1915-36.

[19] Panigrahi G, Murti SK. Flora of Bilaspur District, M.P. Vol. 1, Botanical Survey of India, Calcutta, 1989.

[20] Murti SK, Panigrahi G. Floral of Bilaspur District, M.P., Vol. 2, Botanical Survey of India, Calcutta, 1999.

[21] Verma DM, Balakrishnan NP, Dixit RD. Flora of Madhya Pradesh, Botanical Survey of India, Vol.-I, Calcutta, 1993.

[22] Mudgal V, Khanna KK, Hajra PK. Flora of Madhya Pradesh. Vol-II, Botanical Survey of India, Calcutta, 1997.

[23] Singh NP, Khanna KK, Mudgal V, Dixit RD. Flora of Madhya Pradesh, Botanical Survey of India, Vol-III, Calcutta, 2001.

[24] Hooker JD. The Flora of British India, Vol.1-7, L. Reeve & Co, London, 1872-97.

[25] Jain SK, Rao R. A handbook of field and herbarium methods. Today & Tomorrows Printers and Publishers, New Delhi, 1977.