© 2015 IJSRST | Volume 1 | Issue 1 | Print ISSN: 2395-6011 | Online ISSN: 2395-602X
Themed Section: Science and Technology

Below Ground Biomass 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
Corresponding Author Email : lochannou@gmail.com

ABSTRACT

The below ground biomass 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 "Short term harvest method" as proposed by Odum [1]. The below ground biomass value of the experimental site was found to be maximum in the month of April (615.73 g m^{-2}) and minimum in the month of August (406.82 g m^{-2}). The below ground biomass of the community exhibited an increasing trend from January to April. Thereafter, the value showed a gradual decrease in trend till August. Again, an increasing trend in below ground biomass value was observed from August till the end of the sampling period. Compared to other grassland community, the mean below ground biomass value of the present study did not show similarity. This might be due to the variation in topography, geographical distribution, species composition, climatic conditions, and soil characteristics, rate of decomposition and biotic interference of the locality.

Keywords : Grassland, Community, Biomass, Below Ground

I. INTRODUCTION

The quantity of organic matter accumulated in a given area of a community is the biomass of that area and when it is referred to a particular time, it is known as "standing crop biomass". Biomass can be represented more appropriately in term of dry weight. Literature review reveals a lot of work on below ground biomass in different communities by Odum [1] Ovington **et al.** [2], Wiegert & Evans [3], Dahlman & Kucere [4], Singh [5], Kelley **et al**. [6], Jain & Misra [7], Choudhury [8], Misra [9], Mall & Billore [10], Singh & Ambasht [11], Trivedi & Misra [12], Rath [13], Tiwari [14], Pradhan & Das [15], Misra & Misra [16], Naik [17], Patnaik [18], Pradhan [19], Behera [20], Pucheta **et al**. [21], Barik [22] and many others. However, very little work has been done particularly in northern reason of the state. Therefore, in this investigation an attempt has been made to study the below ground biomass of a grassland community of Rairangpur in the state of Odisha.

1.1 Aim of the Study

The aim of this investigation is to study the below ground biomass 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 Mayurbhanj

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 rain fall 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 [23].

II. METHODS AND MATERIAL

For the determination of various compartmental biomass values "short term harvest method" of Odum [1] was employed. 10 quadrates of 50cm x 50cm size were randomly harvested / clipped, 1cm above the ground during the last week of each month. The dead leaves, stems, seeds, flowers etc. lying on the ground were picked from each quadrate, bagged and labeled separately. The live samples (grasses and non grasses together), standing dead and the below ground parts were collected and packed in sampling bags separately, labeled and brought to the laboratory. These were properly washed and spread on the blotting paper. The plants were then separated compartment wise (i.e. live green, standing dead, litter and below ground parts) and quadrate wise. All these plant materials were labeled and dried in open and then transferred to the oven for drying at 80^0C for 48 hours, weighted and expressed as g m^{-2}.

III. RESULTS AND DISCUSSION

Fig-1 reveals the monthly variation in below ground biomass value of the experimental site. An increasing trend of below ground biomass value was observed from January to April. Thereafter, the value exhibited a decreasing trend. The value started decreasing from April to July and showed a minimum of 406.82 g m^{-2} of below ground biomass value during August. Again, an increasing trend in value was observed from August till the end of the sampling period. The community exhibited a maximum of 615.73 g m^{-2} of litter biomass in the month of April.

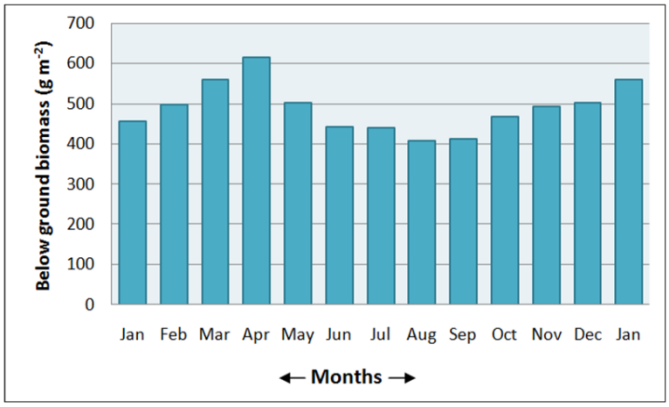

Figure 1. Monthly variation in below ground biomass (g m-2) of experimental grassland community during the study period.

The gradual increase in biomass value from January to April and then from August to January might be due to favorable climatic condition. The atmospheric temperature, rainfall and soil characteristic might not be conducive for below ground formation. As a result a decreasing trend in value was observed from April to August. The mean below ground biomass of the community when compared with other grassland communities did not show similarity (Table - 1).

Table - 1. Maximum below ground biomass (g m-2) of different herbaceous communities.

Author (s)	Location	Type of community (dominated)	Maximum below ground biomass
Ovington **et al**. (1963)	Cedar Creek	Prairie	669
Wiegert & Evans (1964)	South Michigan	Upland	685
Dahlman & Kucere (1965)	Missouri	Prairie	1901
Singh (1967)	Varanasi	*Dichanthium*	583
Kelley **et al.** (1969)	Tennessee	*Andropogon*	804
Jain & Misra (1972)	Sagar	*Heteropogon*	1537
Choudhury (1972)	Varanasi	*Dichanthium*	1009
Misra (1973)	Ujjain	*Dichanthium*	925
Mall & Billore (1974)	Ratlam	*Sehima*	873
Singh & Ambasht (1975)	Varanasi	*Heteropogon*	184
Trivedi & Misra (1979)	Jhansi	*Dichanthium*	436
Rath (1980)	Berhampur	*Aristida*	851
Tiwari (1986)	Garhwal	*Himalaya*	722
Pradhan & Das (1984)	Sambalpur	*Savanna*	256
Misra & Misra (1984)	Berhampur	*Aristida*	743
Naik (1985)	Rourkela	Mixed type	753
Patnaik (1993)	South Orissa	*Heteropogon*	170
Pradhan (1994)	Bhubaneswar	*Aristida*	736
Behera (1994)	Phulbani	*Heteropogon*	689
Pucheta **et al. (** 2004*)*	Argentina	*Deyeuxia*	1264
Barik (2006)	Berhampur	*Aristida*	644
Present study	Rairangpur	*Crysopogone*	489

The mean below ground biomass value of the present study was found to be comparatively high than the values reported by Singh & Ambasht [11], Trivedi & Misra [12], Pradhan & Das [15] and Patnaik [18] where as less than that reported by Ovington **et al**. [2], Wiegert & Evans [3], Dahlman & Kucere [4], Singh [5], Kelley **et al.** [6], Jain & Misra [7], Choudhury [8], Misra [9], Mall & Billore [10], Rath [13], Tiwari [14], Misra & Misra [16], Naik [17], Pradhan [19], Behera [20], Pucheta **et al. [**21] and Barik [22].

IV. CONCLUSION

The below ground biomass value of the experimental grassland community of Rairangpur in the district of Mayurbhanj, Odisha did not show similarity with other grassland communities of various locations. The topography, atmospheric temperature, physico-chemical characteristics of soil, rate of decomposition, presence of micro organisms in the soil, species composition, precipitation and biotic interference might be responsible for variation in below ground biomass value in the 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 meteorological data; the District Agriculture Officer,

Mayurbhanj, Baripada and the Soil Chemist, District Soil Testing Laboratory, Government of Odisha, Mayurbhanj, Baripada for analysis of soil samples of the experimental site.

VI. REFERENCES

[1]. Odum, E.P., Organic production and turnover in the old field succession. Ecology, 41 39-49 (1960).

[2]. Ovington, J.D., Heitkamp, D. and Lawrence, D.B., Plant biomass and productivity of Prairie, Savana, Oakwood and Maize field ecosystems in central Minnesota. Ecol, 44 52-63 (1963).

[3]. Wiegert, R.G., and F.C., Evans, Primary production and the disappearance of dead vegetation in a old field in South-East Michigan. Ecol. 45 : 49-63 (1964).

[4]. Dahlman, R.C. and Kucera, C.L. Root productivity and turnover in native Prairie. Ecol, 46 : 84-89 (1965).

[5]. Singh, J.S., Seasonal variation in composition, plant biomass and primary production in grassland at Varanasi, Ph.D. Thesis. BHU, Varanasi (1967).

[6]. Kelley, J.M., Opstrup, P.A., Olson, J. S., Auerbach, S.L., Vandyne, G.M., Models of seasonal productivity in eastern Tennessee. Festuca and Andropogn ecosystem, Oak Ridge National Lab. Report, 4310 : 296 (1969).

[7]. Jain, S. K. and Misra, G. P., Changes in underground biomass and annual increment in upland grassland of Sagar. Trop. Ecol. 13 : 131-138 (1972).

[8]. Choudhury, V.B., Seasonal variation is standing crop and net above ground production in Dichanthium annulatum grassland at Varasani, In : Tropical Ecology with an emphasis on organic production, P. M. Golley and F. B. Golley (eds.), Univ. of Georgia, Athens. 51-57 (1972).

[9]. Misra, C.M., Primary productivity of a grassland ecosystem at Ujjain, Ph.D. Thesis, Vikram Univ., Ujjain (1973).

[10]. Mall, L.P. and Billore, S.K., Dry matter structure and its dynamics in Sehima grassland community. I. Dry matter structure. Trop. Ecol. 15 : 108-118 (1974).

[11]. Singh, U.N., and Ambasht, R.S., Biotic stress and variability in structure and organic (net primary) production of grassland communities at Varanasi, India. Torp. Ecol. 16 : 86-95 (1975).

[12]. Trivedi, B.K., Misra, G.P., Seasonal variation in species composition, plant biomass and net community production of two grasslands in Sehima, Dichanthium cover type. Trop. Ecol. 20 : 114-125 (1979).

[13]. Rath, S.P., Composition, productivity and energetics of grazed and ungrazed grassland of Berhampur, Ph.D. Thesis, Berhampur University, Berhampur, Orissa, India (1980).

[14]. Tiwari, S.C. Variation in primary production of Garhwal Himalayan grasslands, Trop. Ecol. 27 : 166-173 (1986).

[15]. Pradhan, G.B. and Das, M.C., Seasonal variation in plant biomass and net primary productivity of a Savanna type hill ecosystem of Sambalpur, India. Trop. Ecol. 25 : 172-178 (1984).

[16]. Misra, M.K. and Misra, B.N., Biomass and primary production in Indian grassland. Trop. Ecol. 25 : 239-247 (1984).

[17]. Naik, B.K., Phytosociology and primary production of a natural grassland community of western Orissa. Ph.D. Thesis, Sambalpur University, Sambalpur, Orissa (1985).

[18]. Patnaik, S K., Ecological studies of an upland coastal grassland of South Orissa. Ph. D. Thesis, Berhampur University, Berhampur, Orissa, India (1993).

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

[20]. Behera, B.K., Community structure, primary production and energetic of a grassland community of Boudh-Kandhamal (Dist-Phulbani) in Orissa, Ph D. Thesis, Berhampur University, Berhampur, Orissa (1994).

[21]. Pucheta, E., Bonamici, I., Cabido, M., and Diaza, S., Below ground biomass and productivity of a grazed site and a neighbouring ungrazed exclosure in a grassland in central Argentina. Austral Ecol. 29 : 201-208 (2004).

[22]. Barik, K.L., Ecological analysis of an upland grassland community of Eastern Orissa, India. Ekologia. 5 : 1-2, 137-150 (2006).

[23]. Chawpattnayak, B.N and Barik, K.L., Phytodiversity of a grassland community of Rairangpur in the district of Mayurbhanj, Odisha. IJSRSET. 1 : 1, 106-110 (2014).