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STUDY OF BELOW GROUND BIOMASS OF A GRASSLAND COMMUNITY OF SIMILIPAL BIOSPHERE RESERVE, ODISHA

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ABSTRACT

The below ground biomass of a grassland community in Podadiha Forest Block (86^o 27' E ; 21^o 33' N) of Similipal Biosphere Reserve was studied from July 2015 to July 2016. Short term harvest method of Odum[1] was employed for the determination of various compartmental biomass values. The below ground biomass of the community exhibited a gradual increase in biomass value from July to December and attends a peak during January. Then, the value followed a decreasing trend till July. Thereafter, again an increase in below ground biomass value was observed at the end of sampling period. A minimum of 40.92 g m^{-2} and a maximum of 102.98 g m^{-2} of below ground biomass were observed in the month of July and January respectively. Compared to other grassland communities, maximum below ground biomass of the community did not show similarity. This variation is below ground biomass might be due to the variation in climatic condition, topography, soil characteristics, microbial activities in the soil, rate of decomposition and the biotic interference of the locality.

Key Words :- Biomass, Below Ground, Grassland, Community.

I. INTRODUCTION

The quantity of organic material (stored) of a given area in 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 of different climatic regions by Odum[1], Ovington **et al.**[2], Wiegert & Evans[3], Dahlman & Kucere[4], Singh[5], Kelly **et al**.[6], Jain & Misra[7], Choudhury[8], Misra [9], Mall & Billore[10], Singh & Ambasht[11], Trivedi & Misra[12], Rath[13], Pradhan & Das[14],

Misra & Misra[15], Naik[16], Tiwari[17], Patnaik[18], Pradhan[19], Behera[20], Pucheta **et al.**[21], Barik[22], WenHong **et al.** [23], Fiala [24], Kar [25], Rout & Barik [26], Chawpattanayak & Barik [27], Dash & Barik [28] and many others. However, very little work has been done particularly in northern region of the state. Therefore, in this investigation an attempt has been made to study the below ground biomass of a grassland community of Smilipal Biosphere Reserve in the state of Odisha.

1.1 Study Site and Environment

The experimental grassland was selected at Podadiha forest block (86^o 27' E ; 21^o 33' N) of Similipal Biosphere Reserve, situated at an elevation of 115.9m above the mean sea level. The climate of the locality is predominantly monsoonal with three distinct seasons i.e rainy (July to October), winter (November to February) and summer (March to June). 1389.4 mm of rainfall was recorded during the study period i.e. from July 2015 to July 2016. No rainfall was observed during the month of November. The monthly mean minimum and mean maximum atmospheric temperature was found to be normal. The soil of the experimental site was found to be acidic (pH = 4.9). The available phosphorus as well as the organic carbon content of soil was very low. The available potassium content of the soil was found to be maximum in the middle soil and minimum in the lower soil profile [29].

II. MATERIALS AND METHODS

For the determination of various compartmental biomass values "short term harvest method" of Odum[1] was employed. 5 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) along with the standing dead 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, dried in open and then transferred to the oven for drying at 80^{0}C for 48 hours, weighted and expressed as g m^{-2}.

III. RESULTS AND DISCUSSION

Fig.-1 reveals the below ground biomass of the experimental grassland community. The community showed an increasing trend of below ground biomass value from July to December and then attends a peak during January. Thereafter, the value exhibited a gradual decrease in trend up to June. Onwards, again an increasing trend of biomass value was observed at the end of the sampling period. A minimum of 40.92 g m^{-2} and a maximum of 102.98 g m^{-2} of below ground biomass value were observed in the month of July and January respectively. The gradual increase in value from July to January and from June to July might be due to gradual growth and development of rhizoidal system followed by appearance of new species and addition of new rhizoidal system. The

rainfall, atmospheric temperature, relative humidity and soil condition perhaps initiate the decomposition of rhizoidal system, as a result the value decreased gradually from February to June in the community.

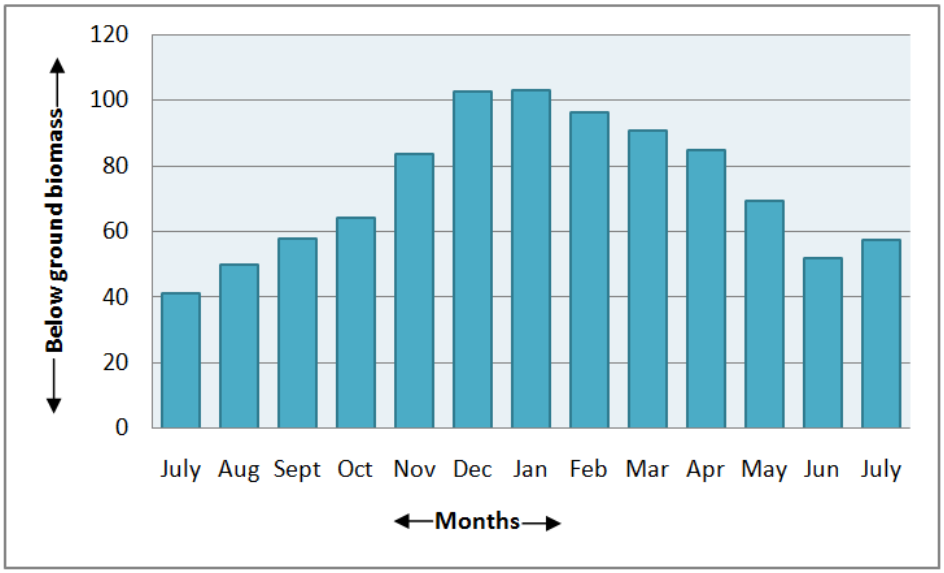

Fig. - 1. Monthly variation in below ground biomass (g m^{-2}) of the experimental site (n = 5 each).

The maximum below ground biomass of the present study when compared with the other grassland communities (Table-1) did not show similarity. The value was found to be less than the values reported by Ovington **et al.**[2], Wiegert & Evans[3], Dahlman & Kucere[4], Singh[5], Kelly **et al**.[6], Jain & Misra[7], Choudhury[8], Misra [9], Mall & Billore[10], Singh & Ambasht[11], Trivedi & Misra[12], Rath[13], Pradhan & Das[14], Misra & Misra[15], Naik[16], Tiwari[17], Patnaik[18], Pradhan[19], Behera[20], Pucheta **et al.**[21], Barik[22], WenHong **et al.** [23], Fiala [24], Kar [25], Rout & Barik [26], Chawpattanayak & Barik [27] and Dash & Barik [28].

Table - 3. 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
Kelly **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
Pradhan & Das (1984)	Sambalpur	Savanna	256
Misra & Misra (1984)	Berhampur	*Aristida*	743
Naik (1985)	Rourkela	Mixed type	753
Tiwari (1986)	Garhwal	Himalaya	722
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
WenHong **et al.** (2008)	China	Meadow	1385
Fiala (2010)	USA	Meadow	600
Kar (2012)	Rangamatia	Mixed type	738
Rout & Barik (2013)	Bangiriposi	*Cynodon*	630
Chawpattanayak & Barik (2015)	Rairangpur	*Chrysopogon*	616
Dash & Barik (2015)	Jharpokharia	*Chrysopogon*	698
Present Study	Podadiha	*Cynodon*	103

IV. CONCLUSION

The below ground biomass of a grassland community varies from place to place and from time to time might be due to the variation in climatic condition, topography, soil characteristics, microbial activities in the soil, rate of decomposition and biotic interference of the locality.

V. ACKNOWLEDGEMENT

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