BELOW GROUND BIOMASS OF A GRASSLAND COMMUNITY OF BANGIRIPOSI IN ODISHA

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ABSTRACT

The below ground biomass of a grassland community of Bangiriposi ($86^0$32'30'' E ; $22^0$08'30'' N) in the district of Mayurbhanj, Odisha was studied following "short term harvest method" of Odum [1]. The value showed a decreasing trend from January to February, then to March and minimum in the month of April (395.92 g m^{-2}). Onwards, the below ground biomass value of the community exhibited a gradual increase in trend and attend peak in the month of November (630.25 g m^{-2}). Thereafter, the value again started decreasing till the end of the sampling period. The maximum below ground biomass of the community, when compared to other grassland communities of different climatic regions did not show similarity. This variation in below ground biomass value might be due to the variation in topography, geographical distribution, climatic conditions, soil characteristics and the biotic interference of the locality.

Key words: Grassland, community, biomass, below ground.

I. INTRODUCTION

Grassland plays an important role not only for the survival of animals but also for human beings. Most of the herbivores are directly dependent on grassland where as the carnivorous are indirectly dependent on grassland flora. From the prehistoric times to till date, man has been dependent on the grasses for food, shelter and unani medicine. The plant collects minerals and other nutrients from the soil by means of root systems. The knowledge about the underground portion of various plant species is essential for analysis of functional aspects of a community. Literature review reveals a lot of work on below ground biomass of different herbaceous communities at various 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], 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 made so far on the below ground biomass of a grassland community of Mayurbhanj district 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 Bangiriposi in the district of Mayurbhanj, Odisha.

1.2 Study site and environment

The experimental grassland community was selected at Silpunji ($86^0$32'30'' E ; $22^0$08'30'' N) Bangiriposi, in the district of Mayurbhanj, Odisha. The site is situated at a distance of 40 kms. away from North Orissa University and 36 kms. from Baripada, the district head quarter of Mayurbhanj in the state of Odisha. The altitude of the site is above 104.6m. The climatic condition of the locality is monsoonal with three distinct seasons i.e. rainy (July to October), winter (November to February) and summer (March to June). The seasons are classified basing upon the amount of rainfall and also to the prevailing atmospheric temperature. The total rainfall during the study period was found to be 2537.1 mm of which a maximum of 634.6 mm was recorded during July. No rainfall was observed in the month of December. Total number of rainy days was found to be 114 days. The mean minimum and mean maximum atmospheric temperature recorded during the study period was found to be normal. December showed the lowest temperature (11.53^0C) whereas May experienced the highest temperature (37.35^0C) during the study period. The soil of the experimental site was found to be strongly acidic (pH < 5.0). The available phosphorus and potassium content of the soil was found to be very low. The organic carbon (%) also showed very low in concentration [23].

II. MATERIALS AND METHODS

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) and the standing dead parts were collected separately, packed in sampling bags, 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 shows the monthly variation in below ground biomass of the experimental site. It was observed that, the below ground biomass of the community gradually decreased from January to April. Thereafter, the value showed an increasing trend till November. Onwards, again a decreasing trend in value was observed till the end of the sampling period. The community exhibited a minimum of 395.92 g m^{-2} below ground biomass value during April and a maximum of 630.25 g m^{-2} in the month of November. Decrease in below ground biomass from January to April and from November to January was perhaps due to unfavorable climatic conditions of the locality. The amount of precipitation, water holiday capacity of the soil, soil porosity, and soil temperature might be in favour of the

initiation or overall growth and development of root systems, as a result, a gradual increase in below ground biomass was observed from April to October and attained peak in the month of November.

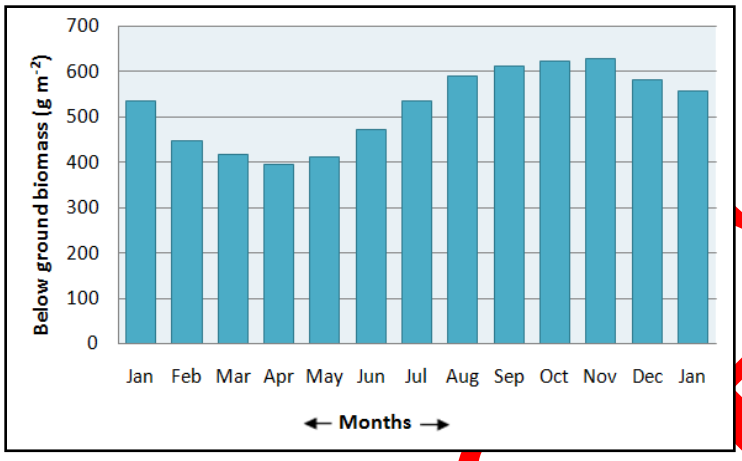

Fig -1 Monthly variations in below ground biomass value (g m^{-2}) of experimental grassland community during the study period.

Table-1 reveals the maximum below ground biomass of different herbaceous communities. On comparison the maximum below ground biomass of the present community did not show similarity with the others. The value was found to be higher than the values reported by Singh [5], Singh & Ambasht [11], Trivedi & Misra [12], Pradhan & Das [15] and Patnaik [18] whereas less than that reported by Ovington **et al**. [2], Wiegert & Evans [3], Dahlman & Kucera [4] Kelly **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].

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 & Kucera (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
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	Bangiriposi	*Cynodon*	630

IV. CONCLUSION

The variation in below ground biomass of a grassland community from place to place and from time to time might be due to the variability in climatic condition, topography, physic-chemical characteristic of soil, species compassion and biotic interference of the locality.

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